APPENDIX I2A: PRELIMINARY WQMP SITE 2

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Preliminary Water Quality Management Plan

For:

Bloomington Commerce Center

TENTATIVE PARCEL MAP NO. 19973

APNs: 0256-111-06, 0256-111-07, 0256-111-08, 0256-111-02, 0256-111-55, 0256-111-56, 0256-111-59, 0256-111-58, 0256-111-60, 0256-111-61, 0256-111-11, 0256-111-45, 0256-111-29,0256-111-44, 0256-111-48, 0256-111-49, 0256-111-42, 0256-111-43, 0256-111-40, 0256-111-41, 0256-111-26, 0256-111-50, 0256-111-51, 0256-111-52, 0256-111-53, 0256-111-18, 0256-111-19

Prepared for:

Howard Industrial Partners

1944 North Tustin Street, Suite 122

Orange, CA 92865

714-769-9155

Prepared by:

JLC Engineering and Consulting, Inc.

41660 Ivy Street, Suite A

Murrieta, CA 92562

951-304-9552

Submittal Date: March 7, 2018

Revision Date: June 20, 2018

August 19, 2020

Approval Date:_____

County of San Bernardino
LAND DEVELOPMENT
PRELIMINARY
APPROVAL
THE APPROVAL OF THIS REPORT SHALL NOT BE CONSTRUED TO BE A PERMIT FOR ANY DEVELOPMENT OR SITE IMPROVEMENT
By: Eric Valencia (I3784)
Date: 12/22/2020 1:35:01 PM
This report has Preliminary Approval. Prior to Final Approval of the report, all outstanding comments and requirements shall be met.

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Howard Industrial Partners by JLC Engineering and Consulting, Inc. The WQMP is intended to comply with the requirements of the County of San Bernardino and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):	PROJ-2020-00034	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):	TPM 19973	Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			0256-111-06, 0256-111-07, 0256-111-08, 0256-111-02, 0256-111-55, 0256-111-56, 0256-111-59, 0256-111-58, 0256-111-60, 0256-111-61, 0256-111-11, 0256-111-45, 0256-111-29,0256-111-44, 0256-111-48, 0256-111-49, 0256-111-42, 0256-111-43, 0256-111-40, 0256-111-41, 0256-111-26, 0256-111-50, 0256-111-51, 0256-111-52, 0256-111-53, 0256-111-18, 0256-111-19

Owner's Signature			
Owner Name: Tim Howard			
Title	Member		
Company	Howard Industrial Partners		
Address	1944 North Tustin Street, Suite 122		
Email	thoward@hipre.net		
Telephone #	714-769-9155		
Signature		Date	

Signature and date required on final

Preparer's Certification

Project Data			
Permit/Application Number(s):	PROJ-2020-00034	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):	TPM 19973	Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			0256-111-06, 0256-111-07, 0256-111-08, 0256-111-02, 0256-111-55, 0256-111-56, 0256-111-59, 0256-111-58, 0256-111-60, 0256-111-61, 0256-111-11, 0256-111-45, 0256-111-29,0256-111-44, 0256-111-48, 0256-111-49, 0256-111-42, 0256-111-43, 0256-111-40, 0256-111-41, 0256-111-26, 0256-111-50, 0256-111-51, 0256-111-52, 0256-111-53, 0256-111-18, 0256-111-19

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Joseph L. Castaneda		PE Stamp Below
Title	President	
Company	JLC Engineering and Consulting, Inc.	
Address	41660 Ivy Street, Suite A	
Email	joe@jlcengineering.com	
Telephone #	951-304-9552	
Signature		
Date		

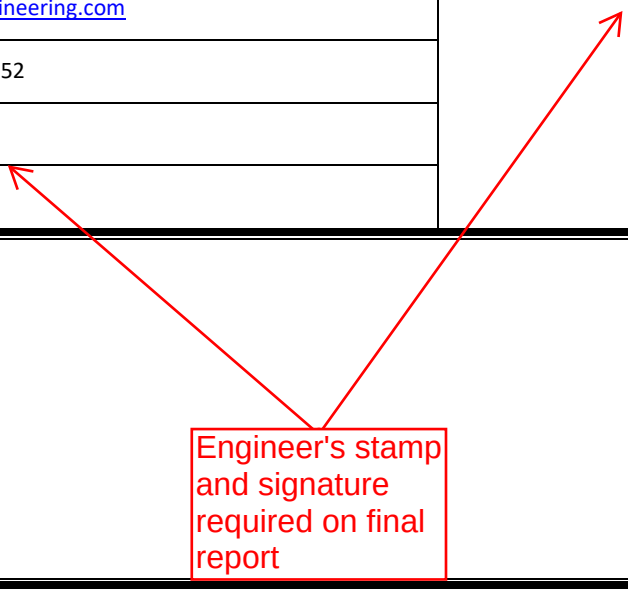

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FIGURE 1 – VICINITY MAP

FIGURE 2 – RECEIVING WATERS MAP

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ATTACHMENT B – INFILTRATION TESTING

ATTACHMENT C – MAINTENANCE AGREEMENT

ATTACHMENT D – WORKSHEET H – SAFETY OF FACTOR AND DESIGN INFILTRATION RATE AND WORKSHEET

ATTACHMENT E – WEIR FLOW LINES AND WATER QUALITY DEPTHS

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	Bloomington Commerce Center				
Project Owner Contact Name:	Tim Howard				
Mailing Address:	1944 North Tustin Street, Suite 122 Orange, CA 92865	E-mail Address:	thoward@hipre.net	Telephone:	714-769-9155
Permit/Application Number(s):	TBD		Tract/Parcel Map Number(s):	TBD	
Additional Information/ Comments:					
Description of Project:	The project site is a proposed industrial building that will be used as a warehouse distribution facility or other similar use. The project site consists of one large building, landscaped area, infiltration basins, a subsurface basin, storm drain infrastructure, and parking area. The project site will discharge back into the natural flow path, which is south of Jurupa Street. Flows will be distributed to mimic the existing flow patterns.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	N/A				

19973

PROJ-2020-00034

please breakdown each DA into their coverings, include
building sqft
asphalt\concrete sqft
gravel sqft
porous paving sqf
landscaping sqft

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☒ Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site	☐ New development involving the creation of 10,000 ft² or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft² or more
☐ Hillside developments of 5,000 ft² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft² of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☒ Parking lots of 5,000 ft² or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft² or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.

2 Project Area (ft2):	2,467,238.4	**3** Number of Dwelling Units:	N/A	**4** SIC Code:	4225

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

6 Does Project include roads? Yes ☒ No ☐ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

Offsite street improvements does not trigger this.

Check no

2.2 Property Ownership/Management

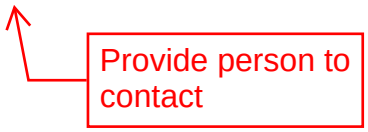
Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

The long term maintenance of the WQMP Facilities shall be by the property owner:

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, CA 92565
(714) 769-9155



2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – animal or human fecal wastes; decomposition of excess organic waste Impaired Water Bodies: Santa Ana River – Reach 2, 3 and 4
Nutrients - Phosphorous	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – fertilizers and eroded soils.
Nutrients - Nitrogen	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – fertilizers and eroded soils.
Noxious Aquatic Plants	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – fertilizers and eroded soils.
Sediment	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – solid materials eroded from land surface.
Metals	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – emissions from brake pad and tire tread wear associated with driving; raw material components in non-metal products such as fuels, adhesives, paints and other coatings. Impaired Water Bodies: Santa Ana River – Reach 3
Oil and Grease	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular fatty acids.
Trash/Debris	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – paper, plastic, polystyrene packing foam, aluminum materials, leaves, grass cuttings, and food waste.
Pesticides / Herbicides	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – used in urban landscaping.
Organic Compounds	E ☒	N ☐	Commercial/Industrial Development, Parking Lots – found in solvents and hydrocarbons from waste handling areas and vehicle or landscape maintenance areas.
Other: Oxygen Demanding Compounds	E ☒	N ☐	Commercial/Industrial Development, Parking Lots
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

1 Project Types that Qualify for Water Quality Credits: *Select all that apply*

☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]

2 Total Credit % N/A *(Total all credit percentages up to a maximum allowable credit of 50 percent)*

Description of Water Quality Credit Eligibility (if applicable)	

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

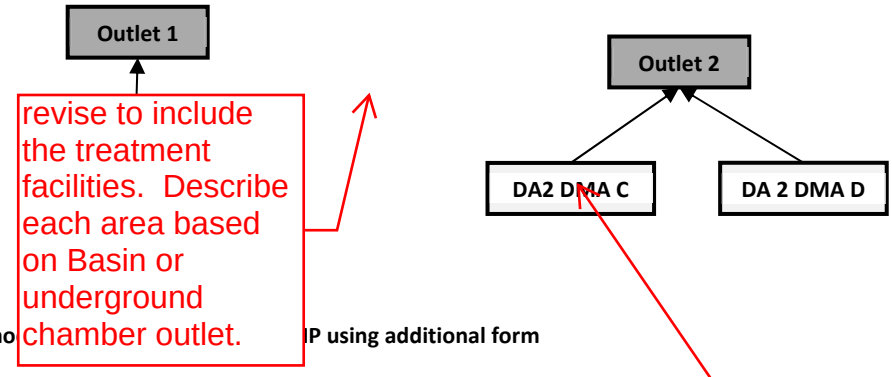
34°02'58.6"N
117°24'28.8"W

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34°03'04"N	Longitude 117°24'07"W	Thomas Bros Map page

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 Does the site have more than one drainage area (DA): Yes☒ No☐ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



revise to include the treatment facilities. Describe each area based on Basin or underground chamber outlet.

Example only – mo **IP using additional form**

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA A to DMA B	DMA A is conveyed to an infiltration basin, that will discharge directly into the a basin within DMA B. Flows ultimate discharge to Outlet 1.
DA1 DMA B to Outlet 1	DMA B collects flows from DMA A, and treats flows through a series of basins. Flows ultimately discharge to Outlet 1
DA1 DMA C to Outlet 2	Flows are conveyed via the vegetat directly to the subsurface system f
DA1 DMA D to Outlet 2	Flows are conveyed to the subsurf

DMA's are material use areas (building sqft, ext..), they make up a DA. DA's are the drainage areas that go to a treatment facility. Your WQMP exhibit shows 5 DA's. The area labeled DA 1 DMA C is actually part of DA 1 DMA D which should just be a DA2

Outlet 1 is located at the south west corner of the project site and Outlet 2 is the location south of Jurupa Road where the project discharges flows.

SF does match WQMP Exhibit

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B1	DMA B2	DMA B3
1 DMA drainage area (ft^2)	244371.6	189486	262231.2	504860.4
2 Existing site impervious area (ft^2) **	0	0	0	0
3 Antecedent moisture condition *For desert areas, use* http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf	1	1	1	1
4 Hydrologic soil group *Refer to Watershed Mapping Tool –* http://permitrack.sbcounty.gov/wap/	A	A	A	A
5 Longest flowpath length (ft)	525	475	882	1180
6 Longest flowpath slope (ft/ft)	0.0147	0.0179	0.0171	0.0108
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren	Barren	Barren	Barren
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	100%	100%	100%	100%

**Although the existing site consists of impervious area, it was analyzed as 0% impervious to be conservative.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA B4			
1 DMA drainage area (ft^2)	246985.2			
2 Existing site impervious area (ft^2) **	0			
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	1			
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	A			
5 Longest flowpath length (ft)	603			
6 Longest flowpath slope (ft/ft)	0.0103			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	100%			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 2 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA C	DMA D		
1 DMA drainage area (ft^2)	829382.4	300128.4		
2 Existing site impervious area (ft^2)	0	0		
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	1	1		
4 Hydrologic soil group *Refer to Watershed Mapping Tool –* *http://permitrack.sbcounty.gov/wap/*	A	A		
5 Longest flowpath length (ft)	1047	1734		
6 Longest flowpath slope (ft/ft)	0.0118	0.0098		
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren	Barren		
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	100%	100%		

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://permitrack.sbcounty.gov/wap/ See 'Drainage Facilities" link at this website*	Santa Ana River - Reach 4 Santa Ana River - Reach 3 Santa Ana River - Reach 2 Santa Ana River - Reach 1
Applicable TMDLs *Refer to Local Implementation Plan*	Pathogens (Indicator Bacteria)
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/ and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Pathogens (Indicator Bacteria); Metals (Copper, Lead)
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	N/A
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	Santa Ana River
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Educational material will be provided to employees at time of hire.
N2	Activity Restrictions	☒	☐	Acitivty restirctions will be enforced, including requiring dumpster lids to be closed at all times; and prohibit blowing, sweeping, or hosing of debris into streets, storm drain inlets, or infiltration basin. Pesticide application shall be done by a certified applicator.
N3	Landscape Management BMPs	☒	☐	The landscaped areas within the project site are to be tended to and maintained by outside contractor.
N4	BMP Maintenance	☒	☐	BMP maintenance will be provided by property owner and will take place at a minimum of twice a year and after any major rainfall event.
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	The project site will not have hazardous waste.
N6	Local Water Quality Ordinances	☒	☐	The project will comply with the County of San Bernardino Water Quality Ordinances, ensuring clean stormwater discharges to public properties.
N7	Spill Contingency Plan	☒	☐	Spill Contingency Plan to be determined by building owner at future date.
N8	Underground Storage Tank Compliance	☐	☒	The project site does not incorporate underground storage tanks.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Project does not include hazardous materials.

Needs to state along the lines of....at minimum absorbent material will be kept onsite to handle oil in the parking areas

describe how. article 80 talks about hazardous waste

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	The project will comply with all Unifore Fire Codes Implementations.
N11	Litter/Debris Control Program	☒	☐	The project will implement the maintenance and removal of littler from common areas by private contractor.
N12	Employee Training	☒	☐	Training will be required within 6 months of hire dates for new employees, and then annually thereafter.
N13	Housekeeping of Loading Docks	☒	☐	Genearl good housekeeping procedures will include maintenance of loading docks such as inspection/monitoring, cleaning, lubricating, adjusting and documenting.
N14	Catch Basin Inspection Program	☒	☐	The project site will incorporate a catch basin inspection program which will inspect the catch basins on a bi-annual or as needed basis for trash, debris, and other factors that could impact the functionality of the catch basins.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	The project will incoporate street vacuum sweeping along the common street and parking lot areas.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	The project is not a Public Agency Project.
N17	Comply with all other applicable NPDES permits	☒	☐	The project will comply with NPDES No. CAS618036, Order No. R8-2010-0036.

identify what will be stated on the stenciling

Form 4.1-2 Structural Source Control BMPs

Identifier		Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm dra gnage (CASQA New Development BMP Handbook SD-13)	☒	☐	The project will place stenciling/signage at storm drain inlet locations with prohibitive language discouraging the illegal dumping of improper materials.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	The project site does not produce pollutates which require specialized handling or storage. There will be no outside storage.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	The project site implements a common outdoor trash and waste storage area to reduce pollution introduction. Trash recepticals shall be covered or closed at all times with permanent roofing, with signage stating “No Dumping of Hazardous Materials” or equivalent.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Landscaped irrigation systems will be designed efficiently to reduce excessive runoff (i.e. drought tolerant landscaping and/or drip system irrigation).
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Landscaped areas will incorporate a minimum of 1-2" below top of curb/sidewalk/pavement and top of landscape areas.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Sloped areas vary from 2:1 to 5:1, mainly within the infiltration basin. The slopes will be protected to prevent erosion.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☒	☐	Project site will incorporate covered dock areas.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	Project site will incorporate covered maintenance bays will spill containment plans. See BMP Fact sheets included.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	The project site does not incorporate vehicle wash areas.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	The project does not incorporate an outdoor processing area.

what will be implemented? are these just examples? clarify

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	The project site does not permit washing of any kind.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	The project site does not allow fueling.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	The project does not have hillside landscaping.
S14	Wash water control for food preparation areas	☐	☒	The project site does not include food preparation.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	The project site does not include community car wash racks.

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

incorporate percentages of pervious to impervious on the property

Form 4.1-3 Preventative LID Site Design [illegible]klist
Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, oth[illegible]o meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: The project site will minimize the impervious areas by incorporating landscaping in all feasible areas to the maximum extent practicable.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: The project site will utilize infiltration basins, and therefore will maximize the natural infiltration capacity.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Existing southerly drainage pattern is perpetuated, and changed to time of concentration are mitigated through the use of infiltration based facilities, however, the project site is exempt from addressing the Hydrologic Conditions of Concern.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Roof areas will drain to adjacent landscaping, where feasible.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: The project site has been previously used as single family residences, and a Palm Tree Farm. There is significant existing vegetation within the palm tree farm area, however, these trees will not be used.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: The project will incorporate landscaped area over a small portion of the disturbed area.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: The project will minimize unnecessary compaction in the infiltration BMP areas.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation: The project utilizes a vegetated swales adjacent to Maple Road and Jurupa Avenue to convey flows in lieu of an impervious lined swale.
Stake off how through what mechanism landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanati[illegible]ff areas that will be used for landscaping to minimize compation during construction.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

DMA A

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 134164.8	**2** Imperviousness after applying preventative site design practices (Imp%): 0.90	**3** Runoff Coefficient (Rc): _0.7303 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.7818 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 12,531 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

DMA B1

Form 4.72-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 189486	2 Imperviousness after applying preventative site design practices (Imp%): 0.90	3 Runoff Coefficient (Rc): _0.7303 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

5 Compute P_6, Mean 6-hr Precipitation (inches): 0.7818

*P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*

6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

7 Compute design capture volume, DCV (ft^3): 17,697

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*
Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

DMA B2

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 262231.2	2 Imperviousness after applying preventative site design practices (Imp%): 0.90	3 Runoff Coefficient (Rc): _0.7303 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

5 Compute P_6, Mean 6-hr Precipitation (inches): 0.7818

*P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*

6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

7 Compute design capture volume, DCV (ft^3): 24,491

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*
Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

DMA B3

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 504860.4	**2** Imperviousness after applying preventative site design practices (Imp%): 0.90	**3** Runoff Coefficient (Rc): _0.7303 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.7818 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 47,152 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

DMA B4

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 246985.2	**2** Imperviousness after applying preventative site design practices (Imp%): 0.90	**3** Runoff Coefficient (Rc): _0.7303 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.7818 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 23,068 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

DMA C and D

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

1 Project area DA 1 (ft^2): 1129510.8	**2** Imperviousness after applying preventative site design practices (Imp%): 0.90	**3** Runoff Coefficient (Rc): _0.7303 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*

4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.528 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

5 Compute P_6, Mean 6-hr Precipitation (inches): 0.7818

*P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*

6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*	24-hrs ☐ 48-hrs ☒

7 Compute design capture volume, DCV (ft^3): 105,492

*DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)*
Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2

Form 4.2-2 Summary of HCOC Assessment (DA 1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☒

Go to: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below

(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** *Form 4.2-3 Item 12*	**2** *Form 4.2-4 Item 13*	**3** *Form 4.2-5 Item 10*
Post-developed	**4** *Form 4.2-3 Item 13*	**5** *Form 4.2-4 Item 14*	**6** *Form 4.2-5 Item 14*
Difference	**7** *Item 4 – Item 1*	**8** *Item 2 – Item 5*	**9** *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** % *Item 7 / Item 1*	**11** % *Item 8 / Item 2*	**12** % *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3):
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), S_o *= Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) V_{fps} *= (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) T_t *= Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) T_c *= Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet HCOC requirement (min): $T_{C\text{-}HCOC}$ *= (Item 13 * 0.95) – Item 14*								

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs):	*Maximum of Item 8, 9, and 10 (including additional forms as needed)*	
11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs):	*Maximum of Item 11, 12, and 13 (including additional forms as needed)*	
15 Peak runoff reduction needed to meet HCOC Requirement (cfs):	*$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*	

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒
Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒
See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒
If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.

[8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒
If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.

[9] All answers to Item 1 through Item 6 are "No":
Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3): *$V_{retention}$ =Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3): *$V_{retention}$ =Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) $V_{retention}$ *= Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft^3): $V_{retention}$ *=Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft^3): $V_{retention}$ *= Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrel/cisterns: Yes☐ No ☒ *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) $V_{retention}$ *= Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): $V_{retention}$ *=Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: 0 *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

Does not match total DCV

Provide additional testing for BMP "A". as per applicants comments

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 105,492 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A BMP Type Infiltration Basin "A"	DA 1 DMA B1 BMP Type Infiltration Basin "B1"	DA 1 DMA B2 BMP Type Infiltration Basin "B2"
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	6.0	12.1	16.1
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2	2	2
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	3.0	6.05	8.05
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	48
6 Maximum ponding depth (ft) *BMP specific, see T for BMP design details* ***NOTE: INFILTRATION BASINS D PONDING DEPTH ON TABLE 5-4, THEREFORE DEPTHS PROVIDED***			
7 Ponding *tem 4*Item 5) or Item 6* ***SINCE D_{BMP} OWABLE PER HYDRAULICS.***	4.5	3.0	3.0
8 Infiltrati *r of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	7595	8968	6442.6
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0	0	0
10 Amended soil porosity	0	0	0
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	0	0	0
12 Gravel porosity	0	0	0
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	3
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	39873.75	40468.42	32293.53
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0	0	0
16 Total Retention Volume from LID Infiltration BMPs: Continued next page *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: % *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☐ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

Include max ponding depth based on the proposed design of each (i.e. depending on outlet elevation). Show Maximum allowed ponding depth on line 6

Label on site plan. Does this match the basin bottom area? (typ)

Does not match total DCV

Provide additional testing for BMP "B4". as per applicants comments

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 105,492 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA B3 BMP Type Infiltration Basin "B3"	DA 1 DMA B4 BMP Type Infiltration Basin "B4"	DA 2 DMA C & D BMP Type Subsurface Infiltration Basin C
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	11.0	7.35	7.4
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2	2	2
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	5.50	3.68	3.7
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	48
6 Maximum ponding depth (ft) *BMP specific, see for BMP design details* ***NOTE: INFILTRATION BASINS D PONDING D***			
7 Ponding *tem 4*Item 5) or Item 6* ***SINCE D_{BMP} OWABLE PER HYDRAULICS.***	2.0	4.0	5.0
8 Infiltrating surface area, *SA_{BMP} (ft²) the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	13112.41	14766.56	31950.00
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0	0	0
10 Amended soil porosity	0	0	
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	0	0	0
12 Gravel porosity	0	0	0
13 Duration of storm as basin is filling (h	3	3	3
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	44254.38	72633.02	285153.75
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0	0	0

16 Total Retention Volume from LID Infiltration BMPs: 530739.97 *(Sum of Items 14 and 15 for all infiltration B*

17 Fraction of DCV achieved with infiltration BMP: 230.30% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMP's? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

Include max ponding depth based on the proposed design of each (i.e. depending on outlet elevation). Show Maximum allowed ponding depth on line 6

Label on site plan. Does this match the basin bottom area? (typ)

8' per exhibit

Does not meet the DCV requirment

Provide manufacturer calculations/specifications to ensure feasibility. Manufacturer can be changed at final

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): 0
V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16

BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			

9 Total Retention Volume (ft^3) from Harvest and Use BMP *Sum of Item 8 for all harvest and use BMP included in plan*

10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? Yes ☐ No ☐
If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 0 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*	List pollutants of concern *Copy from Form 2.3-1.*	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ + *Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ + *Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (DA 1)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) b_w *= (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) SA_{top} *= (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conform and Alternative Compliance Volume Estimate (DA 1) (DMAs A, B1, B2, B3 and B4)

Does not match Provided Volume

1 Total LID DCV for the Project DA-1 (ft^3): 124,939 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 245,586 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 2) (DMAs C and D)

1 Total LID DCV for the Project DA-1 (ft^3): 105,492 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 285,154 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for HCOC performance criteria (ft^3): 0 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

additional comments to be provided at final report"

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

revise

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Infiltration Basins	Property Owner	Check for ponding water longer than 72 hours, inspect outlet structure and fix if necessary, mow/maintain vegetation, removed litter and debris, stabilize eroded banks if necessary, remove sediment volume when volume has been reduced by 10%	After storm event to bi-annually
Subsurface Infiltration Basin	Property Owner	Check for ponding water longer than 72 hours, inspect outlet structure and fix if necessary, removed litter and debris, remove sediment volume when volume has been reduced by 10%, any additional tasks specified by manufacturer.	After storm event to bi-annually
Trash Receptacles	Property Owner	Ensure lids for receptacles are closed at all times, add stencil "No Dumping Hazardous Materials" or similar on receptacles	As Needed
Private Parking Lot Sweeping	Property Owner	Sweep Parking Lots	Every Two Weeks
Catch Basins	Property Owner	Inspect Catch Basins, remove trash and debris	After storm event to bi-annually
Catch Basin Stenciling	Property Owner	Check that signage is visible; remove/replace sign if illegible; remove graffiti; repair broken signs	Minimum of twice annually, repair as needed

provide specs

vacuum sweeping

Loading Docks	Property Owner / POA	Sweep and clear debris from dock areas to remove potential stormwater contaminants	Monthly
Landscape Maintenance	Property Owner / POA	Maintain landscape area vegetation, slope protection and 1" – 2" depressed grades, adjacent to hardscape and prevent discharges of landscape maintenance waste into storm drains	Weekly
N1 Education for Property Owners, Tenants, and Occupants	Property Owner / POA	The current property owner/POA shall be familiar with the contents of the WQMP and the County & City Ordinance and brochures and furnish copies of city and County BMP factsheets to all future property owners.	Education materials should be kept onsite for reference.
N2 Activity Restrictions	Property Owner / POA	Property owners and their tenants or occupants shall not be allowed to discharge chemicals, chemical residues, wastewater or other prohibited discharges listed in the City stormwater Ordinance, to the outside, paved areas of the site; or store chemicals or other pollutant sources in a non-spill contained or covered facilities as stipulated in the CC&Rs	The property owners / POA shall control the discharge of stormwater pollutants from this site.
N3 Landscape Management	Property Owner / POA	The POA and their landscape maintenance contractor shall inspect the irrigation system plant health and erosion problems after each landscape procedure and shall report all repairs and problems to the POA. All routine landscaping maintenance.	Inspection Weekly
N4 BMP Maintenance	Property Owner / POA	The POA shall inspect for standing water in the water retention/infiltration basins, 48 hours after storm events. BMP maintenance shall be performed per the schedule in Form 5-1, as needed to restore free drainage.	The POA shall inspect 48 hours after storm events.
N10 Uniform Fire Code Implementation	Property Owner / POA	The current owners or the future POA shall require all fire code requirements to be implemented at this project site.	Property Owner / POA
N11 Litter Control	Property Owner / POA	The property owners, POA and their contractor shall pick up litter and sweep and clean the existing trash enclosure weekly. The trash enclosure is designed to divert all flows around the dumpsters and shall be roofed. The HOA shall contract with a refuse company to have the dumpsters emptied on a weekly basis, at a minimum.	Trash pickup once per week. Trash enclosure should be kept clean from litter and be swept on a weekly basis.
N14 Catch Basin Inspection	Property Owner / POA	The on-site catch basins shall be inspected monthly during the rainiy season (October-May) and before and after each storm to ensure proper operation. The HOA shall contract with a qualified landscape contractor to inspect and clean out accumulation of	Quarterly inspections during the rainy season (October – May)

		trash, litter and sediment and check for evidence of illegal dumping of waste materials into on-site drains.	and before and after each storm to ensure proper operation.
N15 Vacuum Sweeping of Private Streets and Parking Lots	Property Owner / POA	The paved areas and common open areas of the project site shall be swept and cleaned weekly by the POA's contractor.	Inspection weekly
S3 Design and construct outdoor material storage areas to reduce pollution introduction	Property Owner / POA	Stormwater flows are diverted away from the trash enclosure. All dumpsters shall have working lids which shall be kept closed, at all times. Trash enclosure shall comply with CASQA SD-32 and shall have doors and a solid roof.	Construction Superintendent
S4 Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Property Owner / POA	The irrigation system will include devices to prevent low head drainage, overspray and run off through the use of pressure regulating devices, check valves, rain shutoff valves, flow sensors, pressure drop sensors, proper spacing, low precipitation emission devices and ET or weather based controllers. Landscape and irrigation shall be consistent with the State Model Water Efficient landscape Ordinance and the City of Ontario landscape Development Standards. Plants installed will be arranged according to similar hydrozones and meet the required water budget for the site. Shade trees shall be used to intercept rainwater and reduce heat gain on paving.	Landscape & irrigation to be inspected weekly after each landscape procedure.
S5 Finish grade of landscaped areas	Property Owner / POA	All landscaped areas shall comply with depressed grading requirements by finish grading to a minimum of 1" below pavement grades or top-of-curb.	Landscape & irrigation to be inspected weekly after each landscape procedure.

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

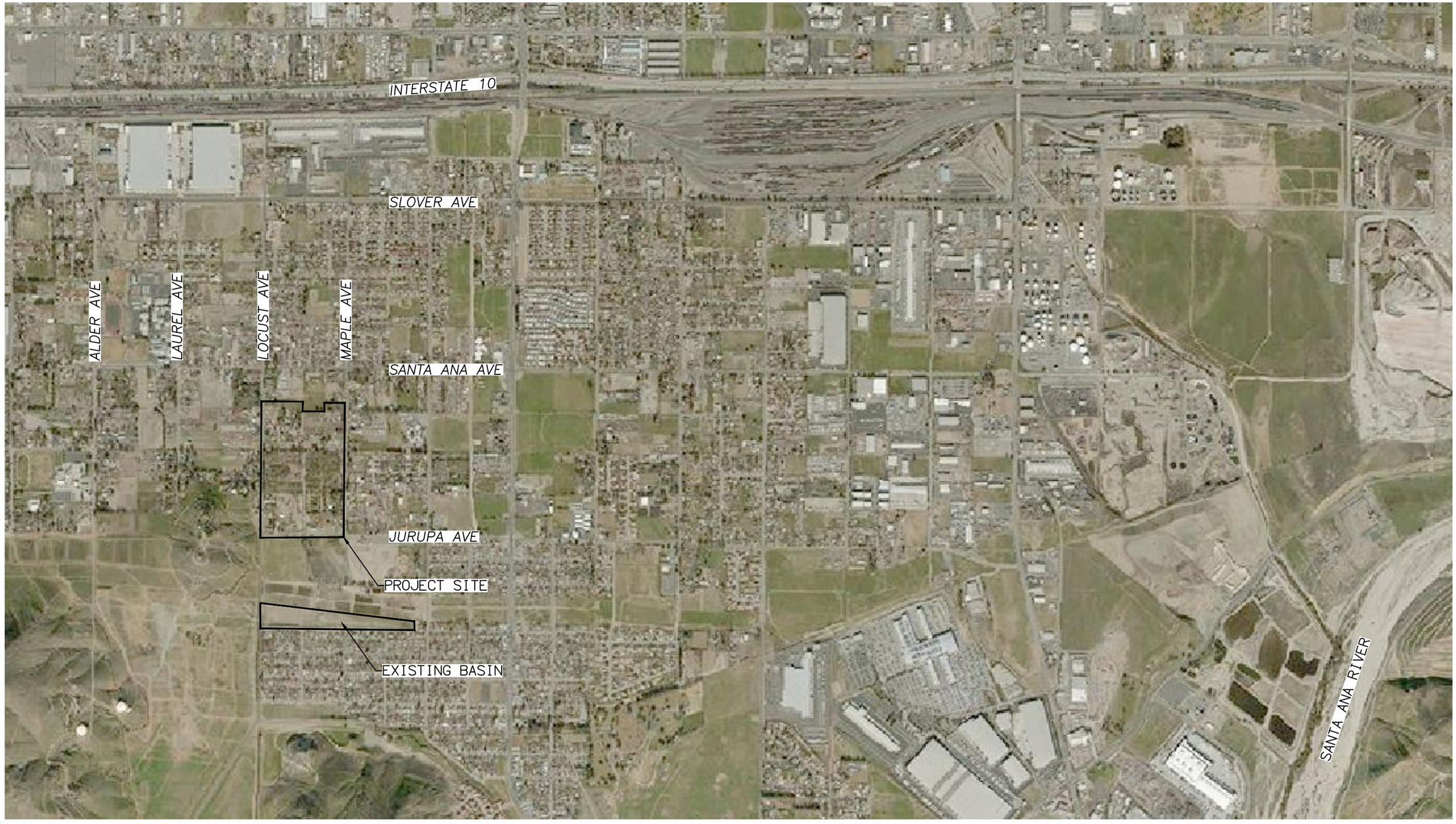
6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements

FIGURE 1 – VICINITY MAP



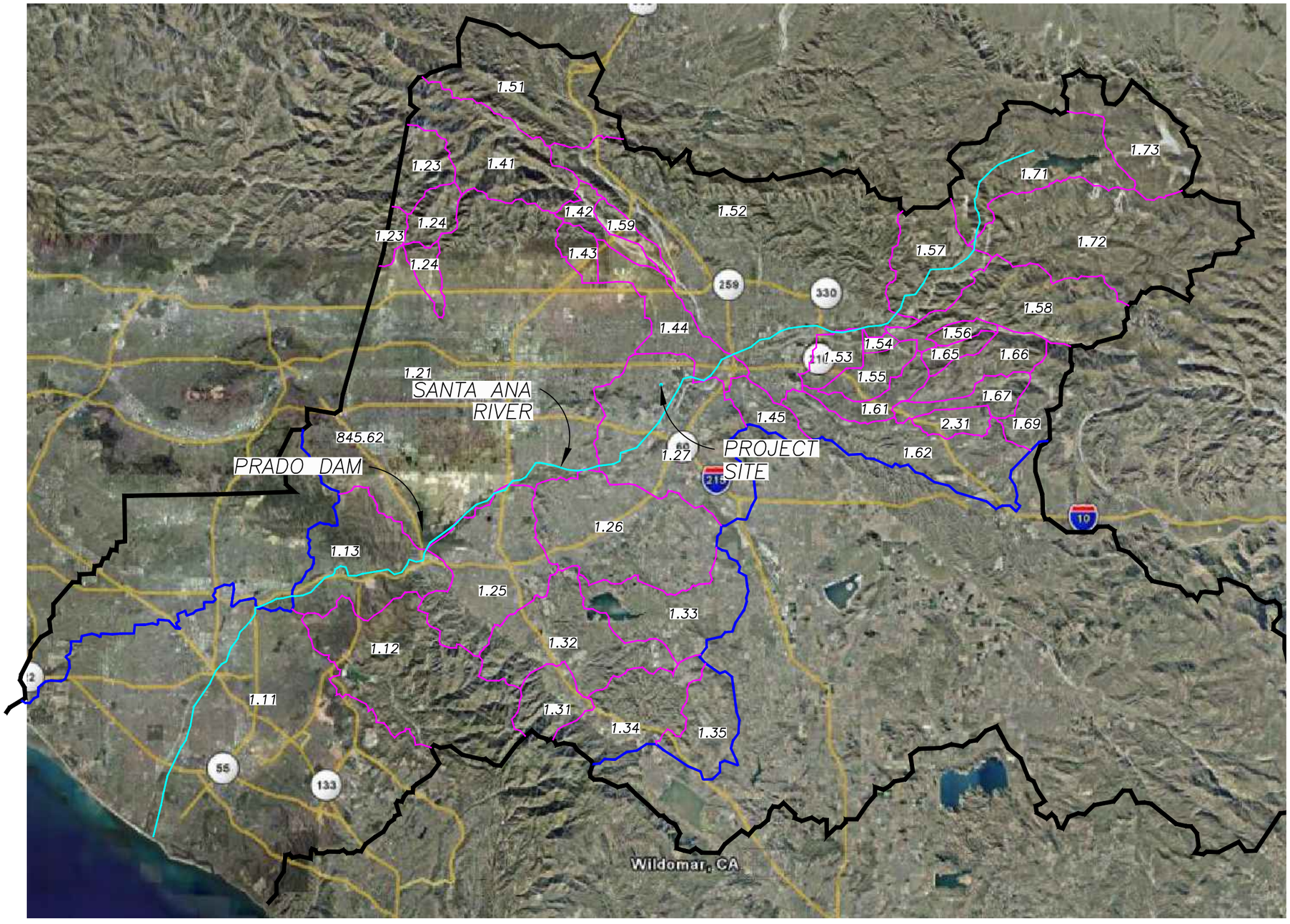
BLOOMINGTON COMMERCE CENTER
VICINITY MAP

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

FIGURE 1

Drawing Name: O:\257.02.18\Engineering\WQMP\Exhibits and Figures\Figure 1-Vicinity Map.dwg
Last Opened: Mar 06, 2018 - 3:29pm by jcarver

FIGURE 2 – RECEIVING WATERS MAP



BLOOMINGTON COMMERCE CENTER RECEIVING WATERS MAP

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

FIGURE 2

Drawing Name: O:\257.02.18\Engineering\WQMP\Exhibits and Figures\Receiving waters and vicinity map.dwg
Last Opened: Mar 06, 2018 - 3:07pm by jcarver

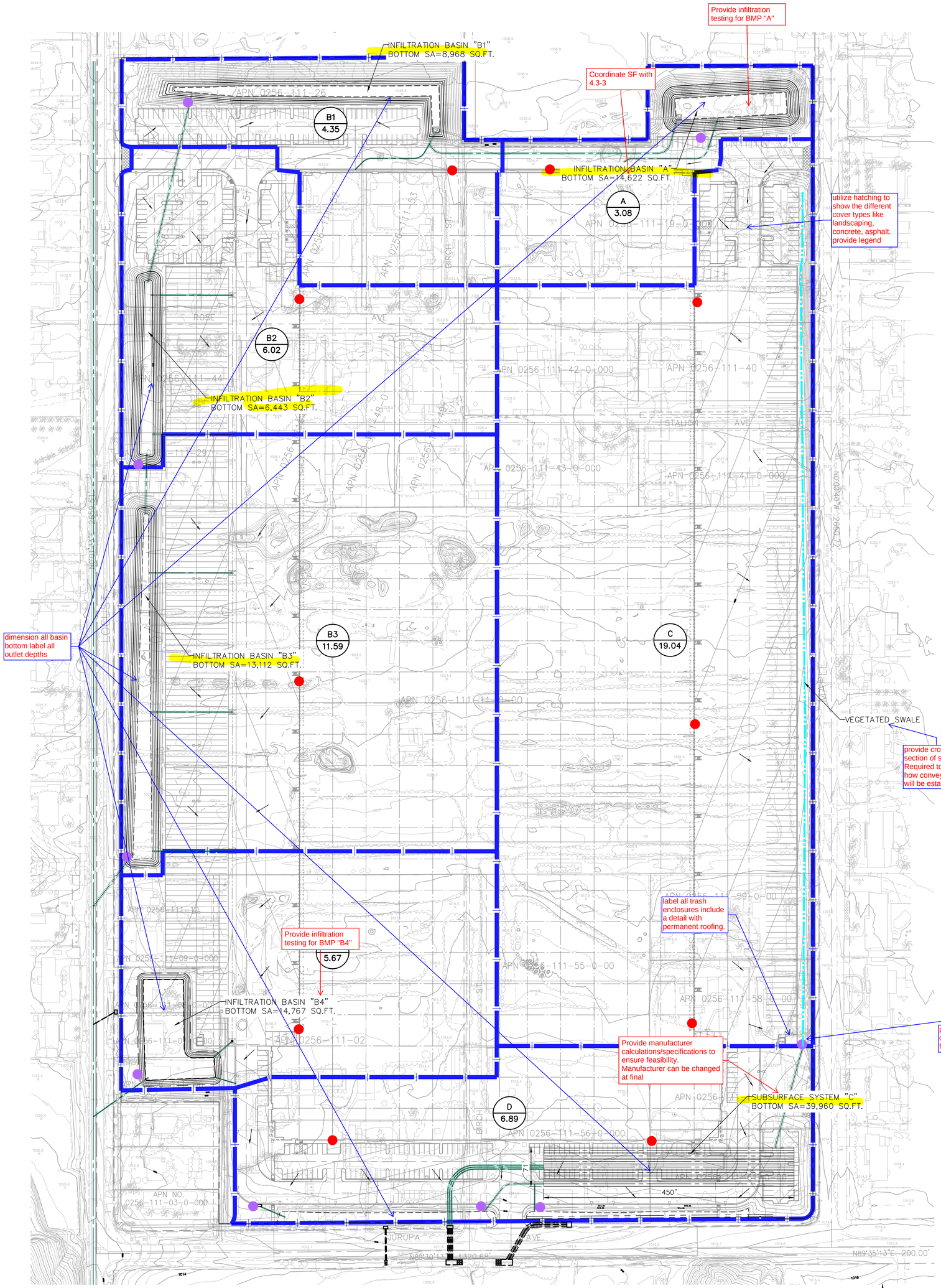
FIGURE 3 – WQMP SITE PLAN

SHEET 1 OF 1

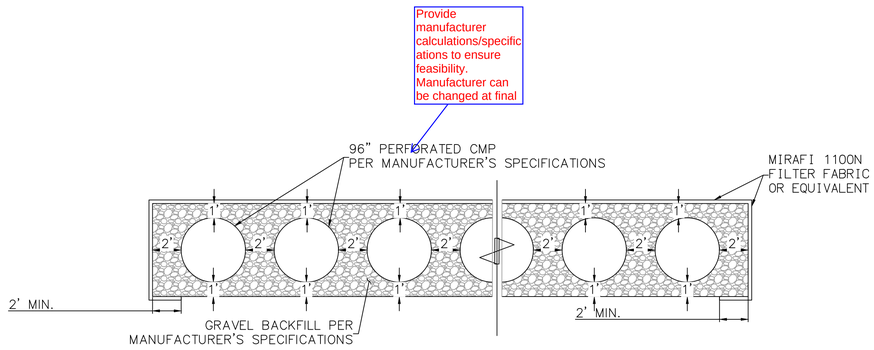
BLOOMINGTON COMMERCE CENTER

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

WQMP SITE PLAN



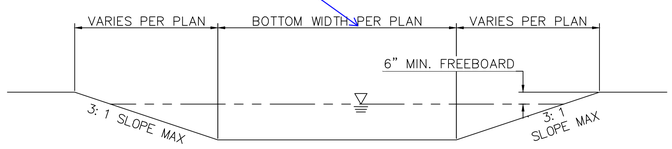
Provide manufacturer calculations/specifications to ensure feasibility. Manufacturer can be changed at final



SUBSURFACE SYSTEM TYPICAL SECTION

N.T.S.

not labeled on plan provide width



INFILTRATION BASIN TYPICAL SECTION

N.T.S.

DMA	AREA (AC)	DOWNSTREAM BASIN	BOTTOM SURFACE AREA (SQ. FT.)	WQ PONDED DEPTH (FT)
A	3.08	A	7,595	4.50
B1	4.35	B1	8,968	3.00
B2	6.02	B2	6,443	3.00
B3	11.59	B3	13,112	2.00
B4	5.67	B4	14,767	4.00
C	19.04	C	31,950	8.00
D	6.89	C	31,950	8.00

LEGEND:

- DMA BOUNDARY
- XXX / X.X — DMA AREA / ACRES
- provide detail. — STENCILING LOCATIONS
- APPROXIMATE ROOF DRAIN LOCATIONS
- FLOW PATH

N

GRAPHIC SCALE
80' 0 40' 80' 160'
1" = 80'

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

FIGURE 3

BLOOMINGTON COMMERCE

WQMP SITE PLAN

ATTACHMENT A – NOAA ATLAS 14 RAINFALL

34°02'58.6"N
117°24'28.8"W

Coordinates do not match project location

NOAA Atlas 14, Volume 6, Version 2
Location name: Bloomington, California, U
Latitude: 34.0569°, Longitude: -117.3909°
Elevation: 1031.07 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.108 (0.090–0.131)	0.140 (0.117–0.170)	0.183 (0.151–0.222)	0.218 (0.179–0.268)	0.267 (0.212–0.339)	0.306 (0.238–0.397)	0.346 (0.262–0.460)	0.388 (0.286–0.532)	0.447 (0.316–0.640)	0.495 (0.337–0.735)
10-min	0.155 (0.129–0.188)	0.201 (0.167–0.244)	0.262 (0.217–0.318)	0.312 (0.257–0.383)	0.383 (0.304–0.486)	0.438 (0.341–0.569)	0.495 (0.376–0.660)	0.556 (0.410–0.762)	0.641 (0.453–0.918)	0.710 (0.484–1.05)
15-min	0.188 (0.156–0.227)	0.243 (0.202–0.295)	0.316 (0.263–0.385)	0.378 (0.311–0.464)	0.463 (0.368–0.588)	0.530 (0.412–0.688)	0.599 (0.454–0.798)	0.673 (0.496–0.922)	0.776 (0.548–1.11)	0.859 (0.585–1.27)
30-min	0.280 (0.233–0.339)	0.362 (0.301–0.440)	0.472 (0.392–0.575)	0.563 (0.464–0.692)	0.690 (0.549–0.877)	0.790 (0.614–1.03)	0.894 (0.678–1.19)	1.00 (0.739–1.38)	1.16 (0.817–1.66)	1.28 (0.873–1.90)
60-min	0.407 (0.340–0.494)	0.528 (0.439–0.640)	0.688 (0.571–0.837)	0.821 (0.675–1.01)	1.00 (0.799–1.28)	1.15 (0.895–1.49)	1.30 (0.987–1.73)	1.46 (1.08–2.00)	1.69 (1.19–2.41)	1.87 (1.27–2.77)
2-hr	0.595 (0.496–0.721)	0.764 (0.635–0.927)	0.986 (0.818–1.20)	1.17 (0.962–1.43)	1.42 (1.13–1.80)	1.61 (1.25–2.10)	1.81 (1.38–2.42)	2.02 (1.49–2.77)	2.31 (1.63–3.31)	2.55 (1.73–3.77)
3-hr	0.740 (0.617–0.897)	0.948 (0.789–1.15)	1.22 (1.01–1.49)	1.44 (1.19–1.77)	1.75 (1.39–2.22)	1.98 (1.54–2.57)	2.22 (1.68–2.96)	2.47 (1.82–3.39)	2.81 (1.99–4.03)	3.09 (2.10–4.58)
6-hr	1.04 (0.869–1.26)	1.34 (1.11–1.62)	1.72 (1.43–2.09)	2.03 (1.67–2.49)	2.44 (1.94–3.11)	2.77 (2.15–3.59)	3.09 (2.35–4.12)	3.43 (2.53–4.70)	3.89 (2.74–5.56)	4.25 (2.89–6.30)
12-hr	1.39 (1.16–1.68)	1.79 (1.49–2.17)	2.30 (1.91–2.80)	2.72 (2.24–3.34)	3.28 (2.61–4.16)	3.70 (2.88–4.81)	4.13 (3.13–5.50)	4.57 (3.37–6.27)	5.17 (3.65–7.40)	5.63 (3.84–8.35)
24-hr	1.85 (1.64–2.14)	2.41 (2.13–2.78)	3.13 (2.76–3.62)	3.71 (3.24–4.32)	4.48 (3.80–5.40)	5.07 (4.21–6.24)	5.66 (4.59–7.14)	6.27 (4.94–8.12)	7.08 (5.36–9.55)	7.71 (5.64–10.8)
2-day	2.25 (1.99–2.60)	2.98 (2.64–3.44)	3.93 (3.47–4.55)	4.70 (4.11–5.48)	5.74 (4.86–6.92)	6.54 (5.42–8.04)	7.35 (5.95–9.25)	8.18 (6.44–10.6)	9.30 (7.04–12.5)	10.2 (7.45–14.2)
3-day	2.41 (2.13–2.78)	3.25 (2.87–3.75)	4.34 (3.82–5.01)	5.23 (4.57–6.10)	6.45 (5.46–7.77)	7.39 (6.13–9.09)	8.36 (6.77–10.5)	9.36 (7.38–12.1)	10.7 (8.12–14.5)	11.8 (8.64–16.5)
4-day	2.59 (2.29–2.99)	3.52 (3.11–4.06)	4.74 (4.18–5.49)	5.75 (5.03–6.71)	7.13 (6.04–8.59)	8.21 (6.81–10.1)	9.31 (7.55–11.7)	10.5 (8.25–13.6)	12.0 (9.12–16.2)	13.3 (9.73–18.6)
7-day	2.96 (2.62–3.42)	4.07 (3.60–4.70)	5.53 (4.88–6.40)	6.74 (5.89–7.86)	8.40 (7.11–10.1)	9.70 (8.05–11.9)	11.0 (8.95–13.9)	12.5 (9.82–16.1)	14.4 (10.9–19.4)	15.9 (11.7–22.2)
10-day	3.22 (2.85–3.71)	4.45 (3.93–5.13)	6.07 (5.35–7.03)	7.42 (6.49–8.65)	9.28 (7.86–11.2)	10.7 (8.91–13.2)	12.3 (9.93–15.4)	13.9 (10.9–17.9)	16.1 (12.2–21.7)	17.8 (13.0–24.9)
20-day	3.90 (3.45–4.50)	5.43 (4.80–6.26)	7.47 (6.59–8.65)	9.18 (8.03–10.7)	11.6 (9.78–13.9)	13.4 (11.1–16.5)	15.4 (12.5–19.4)	17.5 (13.8–22.6)	20.4 (15.4–27.5)	22.8 (16.7–31.8)
30-day	4.62 (4.09–5.32)	6.43 (5.69–7.42)	8.87 (7.82–10.3)	10.9 (9.55–12.7)	13.8 (11.7–16.6)	16.1 (13.3–19.8)	18.5 (15.0–23.3)	21.0 (16.6–27.2)	24.7 (18.7–33.3)	27.6 (20.2–38.5)
45-day	5.52 (4.89–6.36)	7.63 (6.75–8.81)	10.5 (9.25–12.1)	12.9 (11.3–15.0)	16.3 (13.8–19.6)	19.0 (15.8–23.4)	21.9 (17.7–27.6)	25.0 (19.7–32.4)	29.4 (22.3–39.7)	33.1 (24.2–46.1)
60-day	6.45 (5.71–7.44)	8.83 (7.81–10.2)	12.1 (10.6–14.0)	14.8 (12.9–17.3)	18.7 (15.8–22.5)	21.8 (18.1–26.8)	25.1 (20.4–31.7)	28.7 (22.6–37.2)	33.9 (25.7–45.7)	38.2 (27.9–53.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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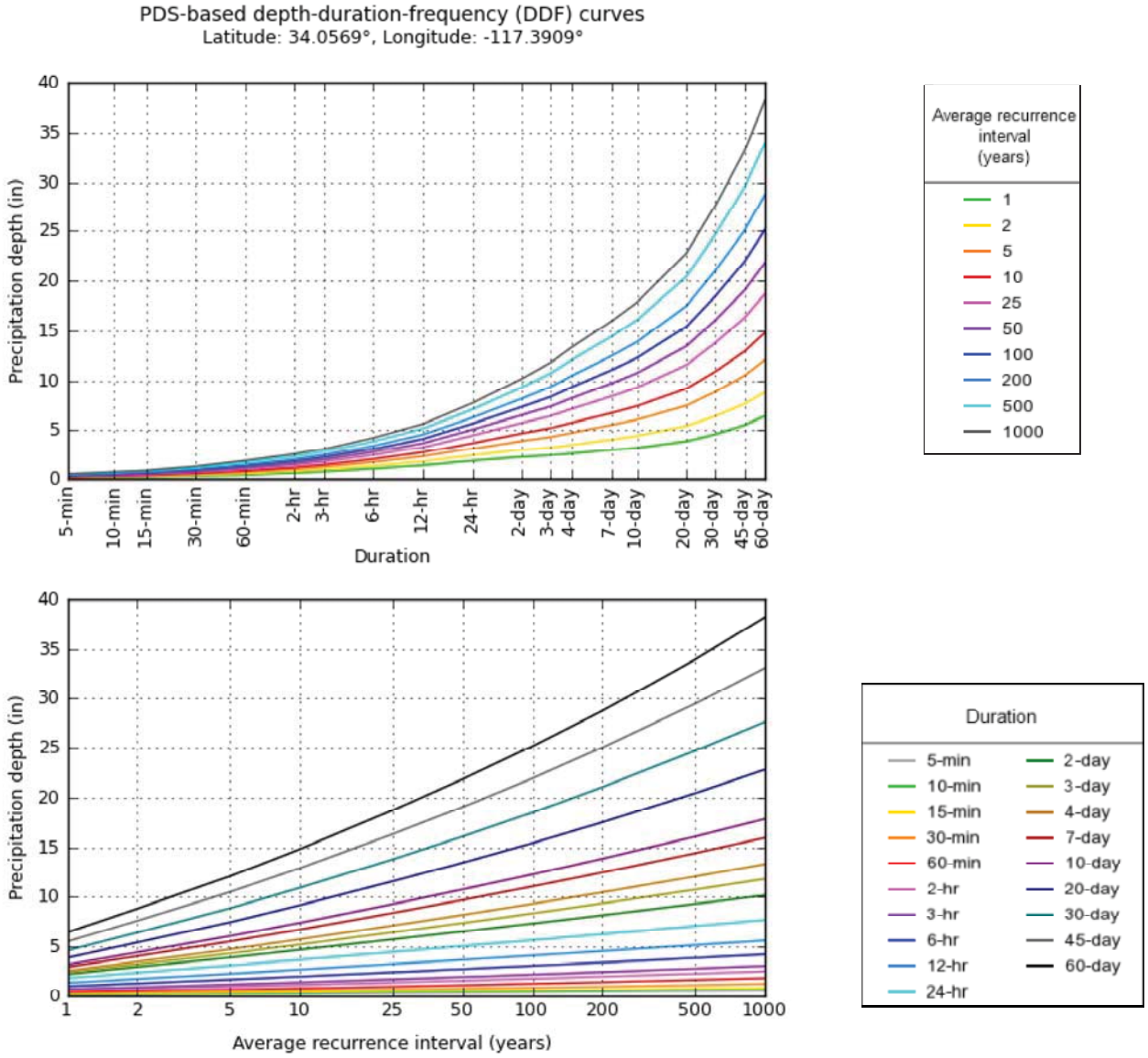
PF graphical



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Created (GMT): Mon Feb 5 17:14:56 2018

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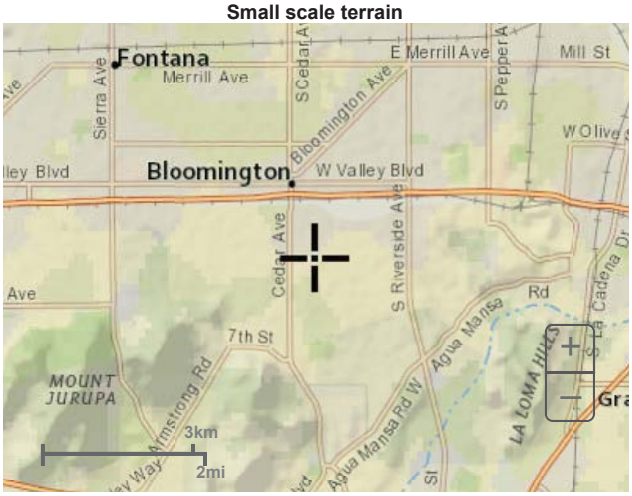
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

ATTACHMENT B – INFILTRATION TESTING

February 27, 2018

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Howard Industrial Partners
155 N. Riverview Drive
Anaheim Hills, California 92808

Attention: Mr. Tim Howard

Project No.: **18G108-2**

Subject: **Results of Infiltration Testing**
Proposed Commercial/Industrial Building
SEC Locust Avenue and Jurupa Avenue
San Bernardino County, California

Reference: Geotechnical Investigation, Proposed Commercial/Industrial Building, SEC Locust Avenue and Jurupa Avenue, San Bernardino County, California, prepared by Southern California Geotechnical, Inc. (SCG) for Howard Industrial Partners, SCG Project No. 18G108-1, dated February 27, 2018.

Gentlemen:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 18P134, dated January 22, 2018. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the onsite soils. The infiltration testing was performed in general accordance with the Technical Guidance Document for Water Quality Management Plans prepared for the County of San Bernardino Areawide Stormwater Program dated June 7, 2013. The San Bernardino County standards defer to guidelines published by Riverside County Department of Environmental Health (RCDEH).

Site and Project Description

The site is located on the northeast corner of Locust Avenue and Jurupa Avenue in San Bernardino County, California. The site is bounded to the north by two (2) single-family residences and the Orange Empire Dog Club, to the west by Locust Avenue, to the south by Jurupa Avenue, and to the east by Maple Avenue. The general location of the site is illustrated on the Site Location Map, included as Plate 1 of this report.

The subject site consists of twenty-six (26) individual parcels with a combined total of approximately 56.6 acres in size. In total across all of the parcels, there appears to be thirty-five (35) residences, six (6) commercial buildings, twenty-nine (29) sheds and barns, and twenty-one (21) container structures, trailers, and RV's.

The northwestern ten (10) parcels are currently developed as single-family residences. There are ten (10) single-family residences within these parcels. The residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, exposed soil, and turf grass. Some residences appear to also have livestock boarded within their properties.

The northeastern parcels are currently developed as a nursery and includes one (1) industrial building that is currently being utilized as a pallet facility and two (2) single-family residences. The industrial building is a single-story structure of wood frame and metal siding construction, assumed to be supported on conventional shallow foundations. These residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. The ground surface cover in the nursery area consists of moderate to dense vegetation including shrubs, trees, native grass, weeds, and above ground planters. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, exposed soils, and turf grass.

Below the nursery parcel are four (4) parcels each currently developed with single-family residences. The residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, and exposed soils. Some of these residences appear to also have livestock boarded within their properties.

The central region of the site is currently developed as a palm tree farm (The Palm Market). This portion of the site is approximately 26.5 acres in size. The Palm Market consists of hundreds of palm trees in rows with below-ground irrigation systems separated by access roads. There are also various sheds, container structures, trailers, and RV's throughout the property as well as above ground planters containing smaller palm trees. Several large stockpiles of palm tree debris and other organic matter are located primarily in the north-central portion of The Palm Market. Several of these palm debris stockpiles possess heights of 10 to 15± feet and areas ranging from 2,500 to 10,000± sq. ft. Overall ground surface cover consists of dense vegetation separated by access roads paved with recycled crushed asphaltic concrete.

The southwestern portion of the site contains four (4) parcels. Three (3) of these parcels are currently developed as single-family residences and are adjacent to Locust Avenue. The residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, and exposed soils. The fourth parcel that is adjacent to Jurupa Avenue is currently developed as a church. The church facility consists of four (4) single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. A children's playground and a below-ground pool are located within the church parcel. Groundcover consists of asphaltic concrete, recycled crushed concrete, and exposed soils.

The southeastern portion of the site contains five (5) parcels each of which are currently developed with single-family residences. These five (5) residences are single-story structures of wood frame and stucco construction, assumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. Ground surface cover surrounding the residences consists of concrete pavements in the driveway areas, concrete flatwork, and exposed soils. There is also a large garage that is a single-story structure of wood frame and metal siding construction, assumed to be supported on conventional shallow foundations.

Topographic information was obtained from client. This plan indicates the existing site topography. The highest spot elevation indicated on the site plan is 1037± feet msl, near the northwestern corner of the site. The lowest elevation indicated on the site plan is 1012± feet msl near the southeastern corner of the site. Site topography within the subject area generally slopes downward to the south at an approximate gradient of 1 percent.

Proposed Development

The site plan provided to our office by the client indicates that the new development will be developed with a single commercial/industrial building. The new building will be located in the central area of the site and will be 1,251,640± ft^2 in size. Loading docks will be constructed along the west and east sides of the building. The building will be surrounded by asphaltic concrete pavements for parking and drive lanes and Portland cement concrete pavements for the loading dock areas. Several landscape planters and concrete flatwork will be included throughout the site.

We understand that the proposed development will include on-site infiltration to dispose of storm water. Based on an infiltration test exhibit provided to our office and conversations with representatives of FM Civil Engineers, Inc., the project civil engineer, the proposed infiltration systems will consist of six (6) infiltration/detention basins located along the perimeters of the subject site. The bottoms of the proposed infiltration basins will extend to depths ranging from 3 to 13± feet below the existing site grades.

Concurrent Study

Southern California Geotechnical, Inc. (SCG) recently conducted a geotechnical investigation at the subject site. As a part of this study, fifteen (15) borings were advanced to depths of 5 to 30± feet below existing site grades.

Crushed asphaltic concrete drive areas were present at the ground surface at several of the boring locations. The crushed asphaltic concrete layers consist of 6 to 8± inches of asphaltic concrete, with no discernable base layer. Artificial fill soils were encountered beneath the crushed asphaltic concrete layer and at the ground surface at several of the boring locations. These fill soils extend to depths of 2½ to 5½± feet below existing grades and generally consist of loose to medium dense silty fine sands and fine to coarse sands with occasional fine to coarse gravel and cobbles.

Native alluvial soils were encountered at all but one of the boring locations, which was terminated in artificial fill soils at a depth of 5± feet. The alluvium within the upper 3 to 12± feet generally consists of loose to medium dense gravelly fine to coarse sands, fine sandy silts, and

silty fine to coarse sands with varying amounts of fine to coarse gravel and cobbles. One fine to coarse sandy gravel layer was observed at one of the borings, extending from 8½ to 12± feet. At greater depths, the alluvial soils generally consist of dense to very dense gravelly fine to coarse sands, fine sandy silts, and silty fine to coarse sands with varying amounts of fine to coarse gravel and cobbles, extending to the maximum depth explored of 30± feet.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings, and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 30± feet at the time of the subsurface exploration. As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the groundwater depths in this area is the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 1,160 feet west from the site. Water level readings within this monitoring well indicates a high groundwater level of 176.33± feet (October 2011).

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for this project consisted of eight (8) infiltration test borings, advanced to depths of 3 to 13± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration borings (identified as I-1 through I-8) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Asphaltic concrete pavements were encountered at the ground surface at Infiltration Boring No. I-4. At this location, the pavements consist of 3± inches of asphaltic concrete with no discernable layer of underlying aggregate base. Artificial fill soils were encountered at the ground surface at Infiltration Boring Nos. I-1, I-2, and I-8, extending 3± feet below existing grades. The fill soils generally consist of very loose to loose silty fine sands with varying medium to coarse sands and fine to coarse gravel. The fill soils possess a disturbed appearance, resulting in their classification as artificial fill.

Native alluvial soils were encountered beneath the pavements and artificial fill soils, and at the ground surface at the remaining boring locations, extending to at least 13± feet below existing site grades. The alluvial soils generally consist of loose to very dense silty fine sands and gravelly

fine to coarse sands with varying medium to coarse sands, fine to coarse gravel, cobbles, and silt content. Free water was not encountered during the drilling of any of the infiltration borings. The Boring Logs, which illustrate the conditions encountered at the boring locations, are included with this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the proposed storm water infiltration systems that will be used to dispose of storm water at the subject site. As previously mentioned, the infiltration testing was performed in general accordance with Technical Guidance Document for Water Quality Management Plans, prepared for the County of San Bernardino Areawide Stormwater Program.

Pre-soaking

In accordance with the county infiltration standards for sandy soils, the infiltration test borings were pre-soaked 2 hours prior to infiltration testing or until all of the water had percolated through each test hole. The pre-soaking process consisted of filling each test boring by inverting a full 5-gallon bottle of clear water supported over the hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of the hole. Pre-soaking was completed after all of the water had percolated through each test hole.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of the test hole. In accordance with the San Bernardino County guidelines, since "sandy soils" were encountered at the bottom of all eight (8) of the infiltration test borings (where 6 inches of water infiltrated into the surrounding soils for two consecutive 25-minute readings), readings were taken at 10-minute intervals for a total of 1 hour at each test location. After each reading, water was added to each boring so that the depth of the water was at least 5 times the radius of the hole. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates for the tests are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	13	Gravelly fine to coarse sand, little silt	12.1
I-2	13	Gravelly fine to coarse sand, trace silt	16.1
I-3	9	Gravelly fine to coarse sand, little silt	11.0
I-4	3	Silty fine to medium sand, trace coarse sand	3.7
I-5	3	Silty fine to medium sand, trace coarse sand	2.6
I-6	3	Silty fine to coarse sand, little to some fine gravel	10.0
I-7	3	Silty fine to medium sand, little to some fine gravel, trace coarse sand	7.4
I-8	11	Silty fine sand, trace medium sand	6.0

Laboratory Testing

Grain Size Analysis

The grain size distribution of selected soils taken from the base of each infiltration test boring has been determined using a range of wire mesh screens. The analysis was performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of the analysis are presented at the end of this report.

Design Recommendations

A total of eight (8) infiltration tests were performed at the subject site. As noted above, the infiltration rates at these locations range from 2.6 to 16.1 inches per hour. The primary factors affecting the infiltration rates are the varying relative densities and the silt content of the encountered soils, which vary at different depths and locations at the subject site.

Based on the infiltration test results, the following infiltration rates are recommended:

Infiltration Basin	Infiltration Rate (in/hr)
A	12.1
B	16.1
C	11.0
D	2.6
E	7.4
F	6.0

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of each proposed infiltration system correspond with those presented in this report to ensure that the performance of each system will be consistent with the rates reported herein.

The design of the storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Bloomington and/or County of San Bernardino guidelines. It is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at eight (8) discrete locations and that the overall infiltration rates of the proposed infiltration systems could vary considerably.

Infiltration versus Permeability

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. The infiltration rate presented herein was determined in accordance with the San Bernardino County guidelines, and is considered valid for the time and place of the actual test. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration System

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the buildings, it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

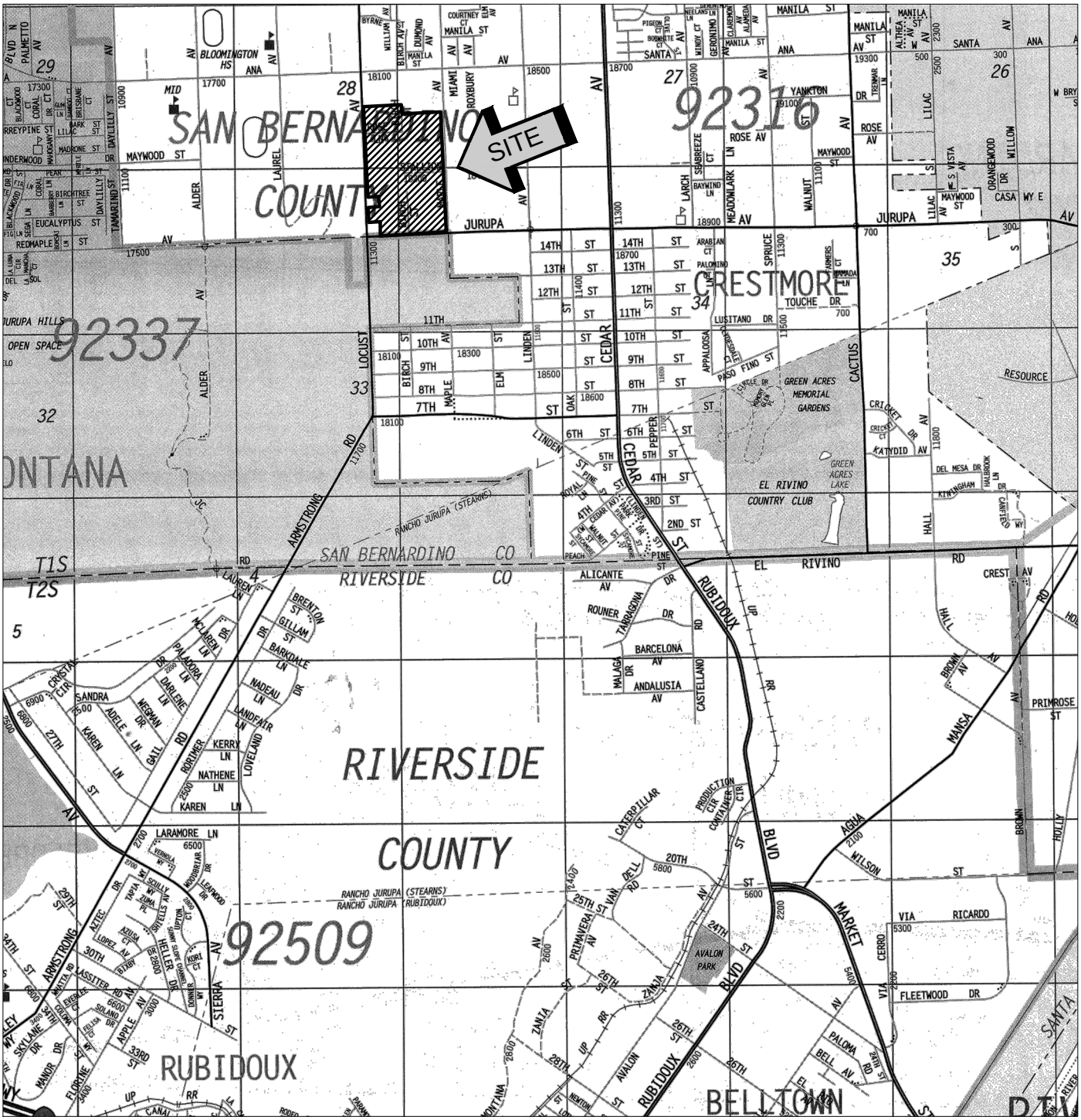
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Scott McCann
Staff Scientist

Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (10 pages)
Infiltration Test Results Spreadsheets (8 pages)
Grain Size Distribution Graphs (8 pages)



SOURCE: SAN BERNARDINO COUNTY
THOMAS GUIDE, 2013

SITE LOCATION MAP

PROPOSED COMMERCIAL/INDUSTRIAL BUILDING
SAN BERNARDINO COUNTY, CALIFORNIA

SCALE: 1" = 2400'	
DRAWN: JLH CHKD: DN	
SCG PROJECT 18G108-2	
PLATE 1	

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

Coordinate with WQMP exhibit, to match BMP naming convention and basin locations

Verify infiltration testing locations versus latest infiltration BMP locations. Note, number of infiltration tests provided versus the size of the proposed infiltration area will need to be considered in the factor of safety.

6.0
INFILTRATION BASIN "F"

7.4
INFILTRATION BASIN "E"

2.6
INFILTRATION BASIN "D"

12.1
INFILTRATION BASIN "A"

16.1
INFILTRATION BASIN "B"

11.0
INFILTRATION BASIN "C"

PROPOSED BUILDING
APPROX. 1,251,640 SQ FT

N.A.P.

LOCUST AVENUE

ROSE AVENUE

JURUPA AVENUE

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- 1.2 INFILTRATION RATE (IN./HR.)
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 18G108-1)
- EXISTING STRUCTURES TO BE DEMOLISHED

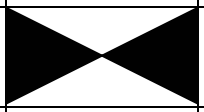
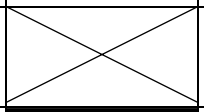
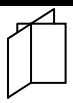
NOTE: SITE PLAN OBTAINED FROM HPA ARCHITECTURE

INFILTRATION TEST LOCATION PLAN
PROPOSED COMMERCIAL/INDUSTRIAL BUILDING
SAN BERNARDINO COUNTY, CALIFORNIA

SCALE: 1" = 175'
DRAWN: JLH
CHKD: RGT
SCG PROJECT 18G108-2
PLATE 2

SOUTHERN CALIFORNIA GEOTECHNICAL

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

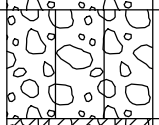
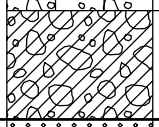
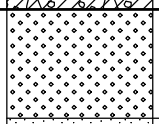
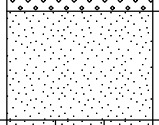
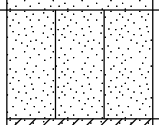
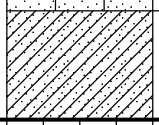
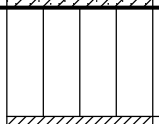
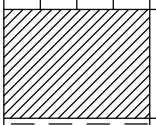
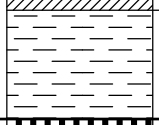
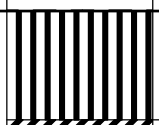
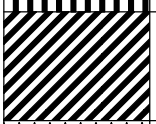
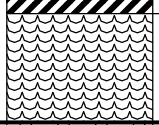
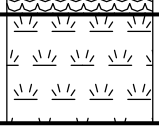
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		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, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS 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, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS 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 OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-1

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1035 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		2			FILL: Brown Silty fine Sand, little medium Sand, trace coarse Sand, trace fine root fibers, very loose-damp		7					
		24			ALLUVIUM: Light Gray Brown Gravelly fine to coarse Sand, occasional Cobbles, trace to little Silt, medium dense-dry		2					
5		19					2					
		10			Brown Silty fine Sand, trace medium Sand, trace calcareous veining, loose to medium dense-damp to moist		9					
10		33			Light Gray Brown Gravelly fine to coarse Sand, little Silt, occasional Cobbles, dense-dry to damp		3					
					Boring Terminated at 13'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG **PLATE I-1**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1032 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		7			FILL: Brown Silty fine to medium Sand, little to some fine to coarse Gravel, little coarse Sand, loose-damp		3					
		8			ALLUVIUM: Brown Silty fine Sand, little medium to coarse Sand, little fine Gravel, loose-damp		3					
5		21			Light Brown Silty fine Sand, trace medium to coarse Sand, little fine to coarse Gravel, medium dense-dry to damp		2					
		55			Light Gray Brown Gravelly fine to coarse Sand, trace Silt, occasional Cobbles, very dense-dry		1					
10		62/11"					2					
					Boring Terminated at 13'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG **PLATE I-2**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-3

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1025 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		21			ALLUVIUM: Brown Silty fine Sand, little medium to coarse Sand, trace fine Gravel, trace roots, medium dense-dry to damp		4					
		22					2					
5												
		28			Light Brown Silty fine to medium Sand, little coarse Sand, little fine Gravel, medium dense-dry to damp		2					
		14			Light Gray Brown Gravelly fine to coarse Sand, little Silt, medium dense-dry		1					
					Boring Terminated at 9'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG **PLATE I-3**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-4

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1012 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		4			3± inches Asphaltic concrete, no discernible Aggregate base ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand, very loose-damp		6					
					Boring Terminated at 3'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG **PLATE I-4**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-5

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1011 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		8			ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand, loose-damp		7					
					Boring Terminated at 3'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG

PLATE I-5

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-6

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1011 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		15			ALLUVIUM: Light Brown Silty fine to coarse Sand, little to some fine Gravel, medium dense-damp		4					
					Boring Terminated at 3'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG **PLATE I-6**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-7

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1014 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
	X	10			ALLUVIUM: Light Brown Silty fine to medium Sand, little to some fine Gravel, trace coarse Sand, trace fine root fibers, loose to medium dense-damp		5					
					Boring Terminated at 3'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG **PLATE I-7**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-8

JOB NO.: 18G108-2 | DRILLING DATE: 2/5/18 | WATER DEPTH: Dry
PROJECT: Proposed C/I Bldg | DRILLING METHOD: Hollow Stem Auger | CAVE DEPTH: ---
LOCATION: San Bernardino County, California | LOGGED BY: Jason Hiskey | READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: 1032 feet MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	COMMENTS
		4	1.5		FILL: Brown Silty fine Sand, little coarse Sand, trace fine Gravel, very loose to loose-damp		7					
		17			ALLUVIUM: Light Gray Brown Gravelly fine to coarse Sand, little Silt, medium dense to dense-dry to damp		3					
5		33					3					
					Brown Silty fine Sand, tarce medium Sand, loose-damp							
10		9					8					
					Boring Terminated at 11'							

TBL 18G108-2.GPJ SOCALGEO.GDT 2/28/18

TEST BORING LOG **PLATE I-8**

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	13.0	(ft)

Infiltration Test Hole	I-1

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	12:45 PM	6.0	11.20	1.03	1.29	14.19	Pre-Sat
	Final	12:51 PM		12.23				
P2	Initial	12:52 PM	3.0	11.20	0.63	1.49	15.26	
	Final	12:55 PM		11.83				
1	Initial	12:56 PM	10.0	11.30	1.27	1.07	12.37	Infiltration Testing
	Final	1:06 PM		12.57				
2	Initial	1:07 PM	10.0	11.30	1.25	1.08	12.08	
	Final	1:17 PM		12.55				
3	Initial	1:18 PM	10.0	11.30	1.25	1.08	12.08	
	Final	1:28 PM		12.55				
4	Initial	1:29 PM	10.0	11.30	1.26	1.07	12.23	
	Final	1:39 PM		12.56				
5	Initial	1:40 PM	10.0	11.30	1.25	1.08	12.08	
	Final	1:50 PM		12.55				
6	Initial	1:51 PM	10.0	11.30	1.25	1.08	12.08	
	Final	2:01 PM		12.55				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.2
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	12.9	(ft)

Infiltration Test Hole	I-2

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	11:00 AM	2.0	11.10	0.85	1.38	33.08	Pre-Sat
	Final	11:02 AM		11.95				
P2	Initial	11:03 AM	2.0	11.10	0.83	1.39	32.09	
	Final	11:05 AM		11.93				
1	Initial	11:06 AM	10.0	11.20	1.51	0.95	16.30	Infiltration Testing
	Final	11:16 AM		12.71				
2	Initial	11:17 AM	10.0	11.20	1.53	0.94	16.67	
	Final	11:27 AM		12.73				
3	Initial	11:28 AM	10.0	11.20	1.51	0.95	16.30	
	Final	11:38 AM		12.71				
4	Initial	11:39 AM	10.0	11.20	1.50	0.95	16.12	
	Final	11:49 AM		12.70				
5	Initial	11:50 AM	10.0	11.20	1.50	0.95	16.12	
	Final	12:00 PM		12.70				
6	Initial	12:01 PM	10.0	11.20	1.50	0.95	16.12	
	Final	12:11 PM		12.70				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	9.1	(ft)

Infiltration Test Hole	I-3

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	8:00 AM	5.0	7.30	0.86	1.37	13.43	Pre-Sat
	Final	8:05 AM		8.16				
P2	Initial	8:06 AM	5.0	7.30	0.83	1.39	12.84	
	Final	8:11 AM		8.13				
1	Initial	8:12 AM	10.0	7.40	1.19	1.11	11.23	Infiltration Testing
	Final	8:22 AM		8.59				
2	Initial	8:23 AM	10.0	7.40	1.19	1.11	11.23	
	Final	8:33 AM		8.59				
3	Initial	8:34 AM	10.0	7.40	1.17	1.12	10.95	
	Final	8:44 AM		8.57				
4	Initial	8:45 AM	10.0	7.40	1.17	1.12	10.95	
	Final	8:55 AM		8.57				
5	Initial	8:56 AM	10.0	7.40	1.18	1.11	11.09	
	Final	9:06 AM		8.58				
6	Initial	9:07 AM	10.0	7.40	1.17	1.12	10.95	
	Final	9:17 AM		8.57				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.8
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	3.0	(ft)

Infiltration Test Hole	I-4

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	9:00 AM	5.0	1.19	0.65	1.49	9.45	Pre-Sat
	Final	9:05 AM		1.84				
P2	Initial	9:06 AM	5.0	1.20	0.55	1.53	7.80	
	Final	9:11 AM		1.75				
1	Initial	9:12 AM	10.0	1.25	0.54	1.48	3.94	Infiltration Testing
	Final	9:22 AM		1.79				
2	Initial	9:23 AM	10.0	1.21	0.53	1.53	3.76	
	Final	9:33 AM		1.74				
3	Initial	9:34 AM	10.0	1.29	0.50	1.46	3.69	
	Final	9:44 AM		1.79				
4	Initial	9:45 AM	10.0	1.30	0.50	1.45	3.71	
	Final	9:55 AM		1.80				
5	Initial	9:56 AM	10.0	1.30	0.50	1.45	3.71	
	Final	10:06 AM		1.80				
6	Initial	10:07 AM	10.0	1.30	0.50	1.45	3.71	
	Final	10:17 AM		1.80				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.3
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	3.0	(ft)

Infiltration Test Hole	I-5

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	8:00 AM	10.0	1.11	0.55	1.62	3.70	Pre-Sat
	Final	8:10 AM		1.66				
P2	Initial	8:11 AM	12.0	1.14	0.53	1.60	3.01	
	Final	8:23 AM		1.67				
1	Initial	8:24 AM	10.0	1.14	0.43	1.65	2.85	Infiltration Testing
	Final	8:34 AM		1.57				
2	Initial	8:35 AM	10.0	1.14	0.41	1.66	2.70	
	Final	8:45 AM		1.55				
3	Initial	8:46 AM	10.0	1.15	0.40	1.65	2.64	
	Final	8:56 AM		1.55				
4	Initial	8:57 AM	10.0	1.16	0.39	1.65	2.58	
	Final	9:07 AM		1.55				
5	Initial	9:08 AM	10.0	1.20	0.38	1.61	2.57	
	Final	9:18 AM		1.58				
6	Initial	9:19 AM	10.0	1.20	0.38	1.61	2.57	
	Final	9:29 AM		1.58				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.3
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	3.1	(ft)

Infiltration Test Hole	I-6

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	9:45 AM	2.0	1.30	0.59	1.51	21.18	Pre-Sat
	Final	9:47 AM		1.89				
P2	Initial	9:48 AM	2.0	1.30	0.53	1.54	18.69	
	Final	9:50 AM		1.83				
1	Initial	9:12 AM	10.0	1.36	1.28	1.10	12.13	Infiltration Testing
	Final	9:22 AM		2.64				
2	Initial	9:23 AM	10.0	1.40	1.20	1.10	11.37	
	Final	9:33 AM		2.60				
3	Initial	9:34 AM	10.0	1.40	1.16	1.12	10.82	
	Final	9:44 AM		2.56				
4	Initial	9:45 AM	10.0	1.40	1.12	1.14	10.29	
	Final	9:55 AM		2.52				
5	Initial	9:56 AM	10.0	1.40	1.10	1.15	10.03	
	Final	10:06 AM		2.50				
6	Initial	10:07 AM	10.0	1.40	1.10	1.15	10.03	
	Final	10:17 AM		2.50				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.2
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	3.0	(ft)

Infiltration Test Hole	I-7

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	10:00 AM	6.0	1.20	0.77	1.42	9.74	Pre-Sat
	Final	10:06 AM		1.97				
P2	Initial	10:07 AM	5.0	1.20	0.64	1.48	9.33	
	Final	10:12 AM		1.84				
1	Initial	10:13 AM	10.0	1.30	0.94	1.23	8.08	Infiltration Testing
	Final	10:23 AM		2.24				
2	Initial	10:24 AM	10.0	1.30	0.92	1.24	7.85	
	Final	10:34 AM		2.22				
3	Initial	10:35 AM	10.0	1.30	0.92	1.24	7.85	
	Final	10:45 AM		2.22				
4	Initial	10:46 AM	10.0	1.30	0.89	1.26	7.51	
	Final	10:56 AM		2.19				
5	Initial	10:57 AM	10.0	1.30	0.88	1.26	7.40	
	Final	11:07 AM		2.18				
6	Initial	11:08 AM	10.0	1.30	0.88	1.26	7.40	
	Final	11:18 AM		2.18				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0.3
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Commercial/Industrial Building
Project Location	San Bernardino County, CA
Project Number	18G108-2
Engineer	Scott McCann

Test Hole Radius	4	(in)
Test Depth	10.8	(ft)

Infiltration Test Hole	I-8

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)	
P1	Initial	11:30 AM	10.0	9.00	0.78	1.41	5.94	Pre-Sat
	Final	11:40 AM		9.78				
P2	Initial	11:41 AM	10.0	8.90	0.79	1.51	5.67	
	Final	11:51 AM		9.69				
1	Initial	11:52 AM	10.0	9.00	0.77	1.42	5.84	Infiltration Testing
	Final	12:02 PM		9.77				
2	Initial	12:03 PM	10.0	9.07	0.76	1.35	6.01	
	Final	12:13 PM		9.83				
3	Initial	12:14 PM	10.0	9.10	0.76	1.32	6.13	
	Final	12:24 PM		9.86				
4	Initial	12:25 PM	10.0	9.10	0.76	1.32	6.13	
	Final	12:35 PM		9.86				
5	Initial	12:36 PM	10.0	9.10	0.75	1.33	6.03	
	Final	12:46 PM		9.85				
6	Initial	12:47 PM	10.0	9.10	0.75	1.33	6.03	
	Final	12:57 PM		9.85				

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where: Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval H above GS= 0
H_{avg} = Average Head Height over the time interval

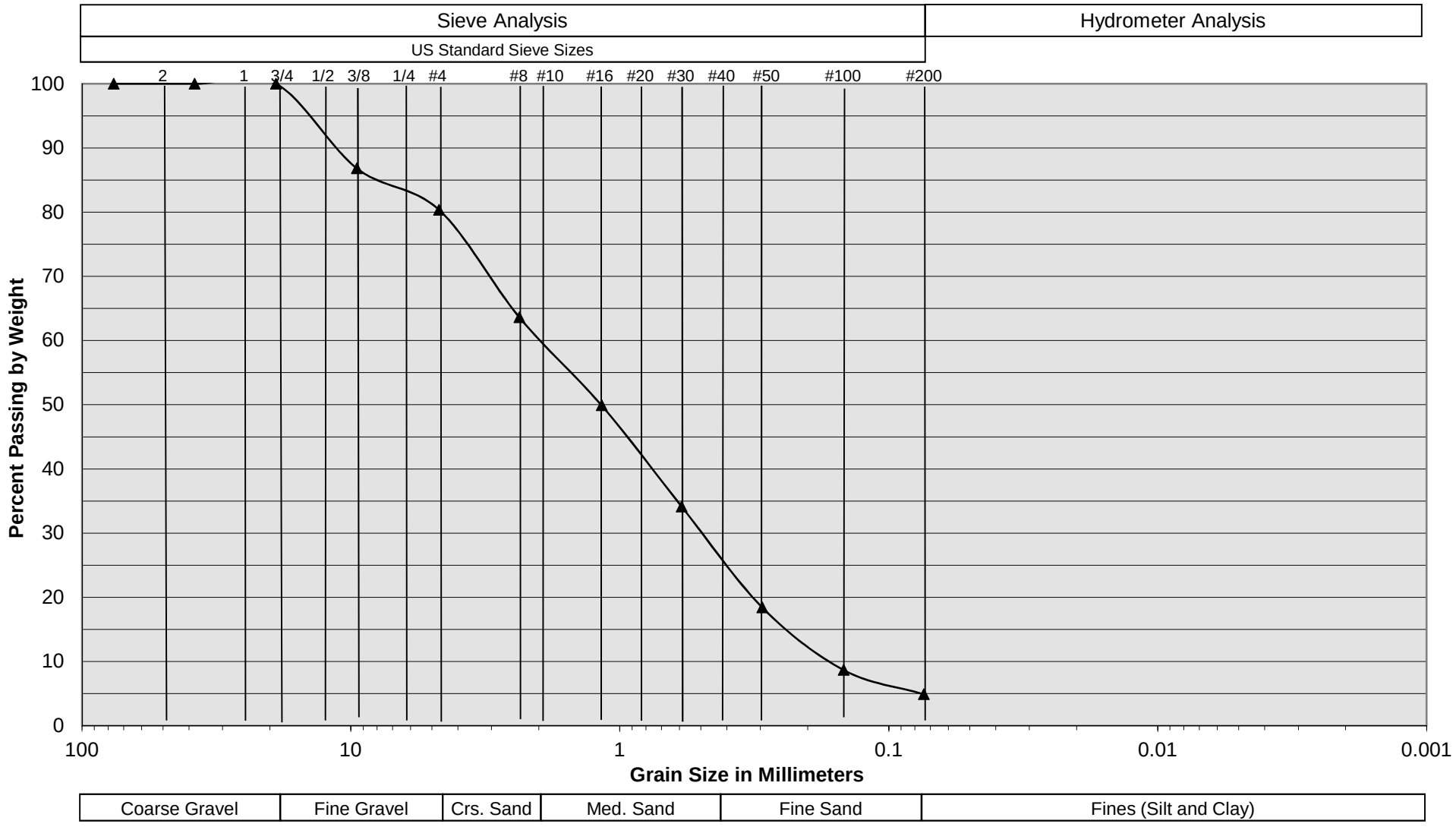
Grain Size Distribution

Sample Description	I-1 @ 11.5 feet
Soil Classification	Light Gray Brown Gravelly fine to coarse Sand, little Silt

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-1

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-2 @ 11.5 feet
Soil Classification	Light Gray Brown Gravelly fine to coarse Sand, trace Silt

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

Sample Description	I-3 @ 7.5 feet
Soil Classification	Light Gray Brown Gravelly fine to coarse Sand, little Silt

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

Sample Description	I-4 @ 1.5 feet
Soil Classification	Brown Silty fine to medium Sand, trace coarse Sand

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

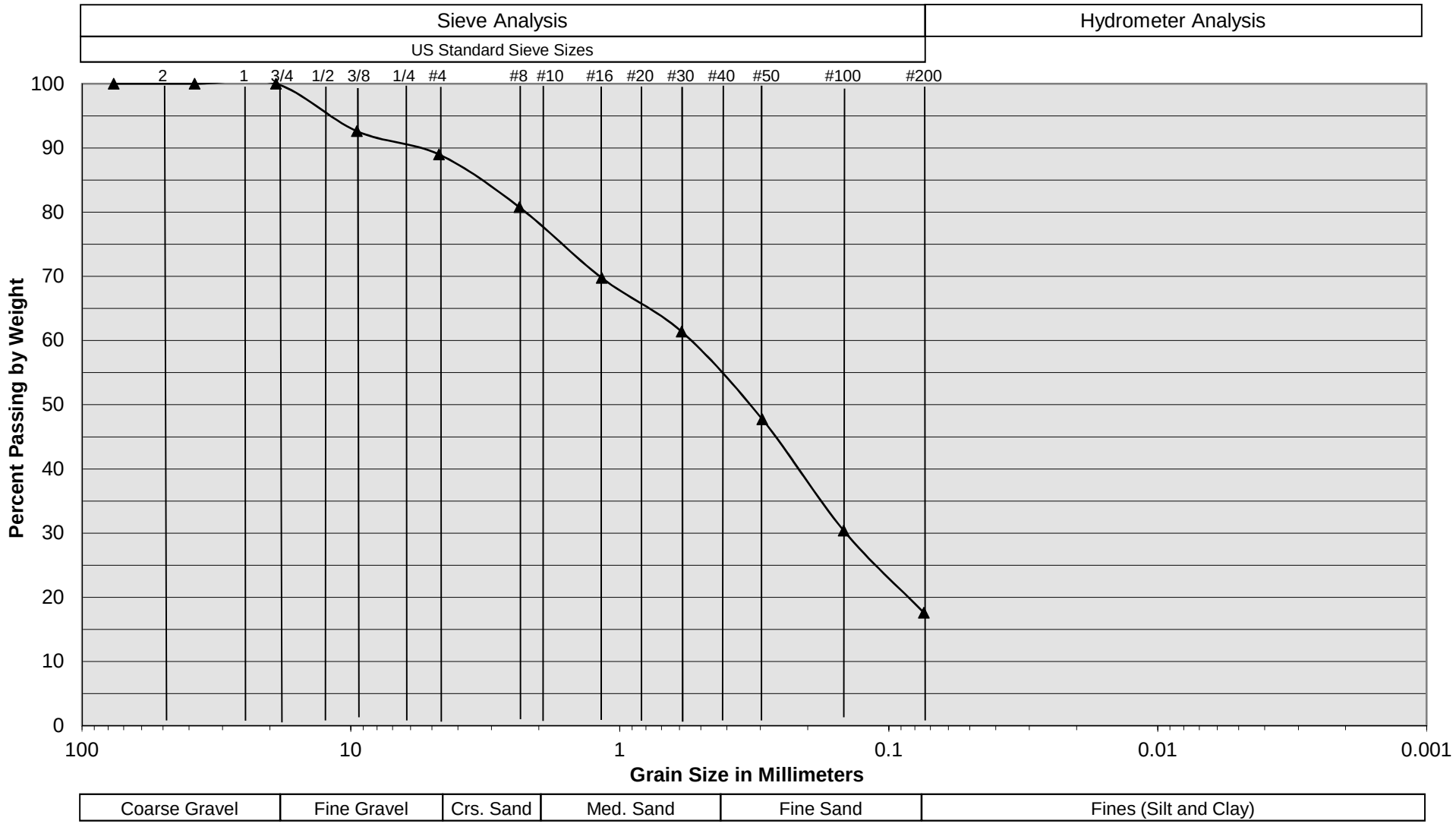
Grain Size Distribution

Sample Description	I-5 @ 1.5 feet
Soil Classification	Brown Silty fine to medium Sand, trace coarse Sand

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-5

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-6 @ 1.5 feet
Soil Classification	Light Brown Silty fine to coarse Sand, little to some fine Gravel

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-6

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

Sample Description	I-7 @ 1.5 feet
Soil Classification	Light Brown Silty fine to medium Sand, little to some fine Gravel, trace coarse Sand

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution

Sample Description	I-8 @ 9.5 feet
Soil Classification	Brown Silty fine Sand, trace medium Sand

Proposed Commercial/Industrial Building
San Bernardino County, CA
Project No. 18G108-2
PLATE C-8

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

GEOTECHNICAL LEGEND

⌖ INFILTRATION TEST LOCATION

NOTE: AERIAL PHOTOS OBTAINED FROM GOOGLE EARTH
NOTE: SITE PLANS OBTAINED FROM HPA ARCHITECTURE

SoCalGeo NORTH

PRELIMINARY INFILTRATION RESULTS
PROPOSED COMMERCIAL/INDUSTRIAL BUILDING
SAN BERNARDINO COUNTY, CALIFORNIA

SCALE: 1" = 175'	
DRAWN: JLH CHKD: DRK	
SCG PROJECT 18G108-1	
PLATE X	

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL

ATTACHMENT C – MAINTENANCE AGREEMENT

RECORDING REQUESTED BY:
County of San Bernardino
Department of Public Works

AND WHEN RECORDED MAIL TO:
County of San Bernardino
Department of Public Works
825 E. Third Street, Room 117
San Bernardino, CA 92415-0835

SPACE ABOVE THIS LINE FOR RECORDER'S USE

COVENANT AND AGREEMENT REGARDING WATER QUALITY MANAGEMENT PLAN AND STORMWATER BEST MANAGEMENT PRACTICES TRANSFER, ACCESS AND MAINTENANCE

THIS PAGE ADDED TO PROVIDE ADEQUATE SPACE FOR RECORDING INFORMATION

Covenant and Agreement Regarding Water Quality Management Plan and Stormwater Best Management Practices
Transfer, Access and Maintenance

OWNER NAME: _____

PROPERTY ADDRESS: _____

_____

APN: _____

THIS AGREEMENT is made and entered into in

_____ ,California, this _____ day of

_____ , by and between

_____ , hereinafter

referred to as Owner, and the COUNTY OF SAN BERNARDINO, a political subdivision of the State of California, hereinafter referred to as "the County";

WHEREAS, the Owner owns real property ("Property") in the County of San Bernardino, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of initial approval of development project known as

_____ within the Property described herein, the County required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff; and

WHEREAS, the Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, dated _____, on file with the County and incorporated herein by this reference, hereinafter referred to as "WQMP", to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff; and

WHEREAS, said WQMP has been certified by the Owner and reviewed and approved by the County; and

WHEREAS, the Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs.

NOW THEREFORE, it is mutually stipulated and agreed as follows:

1. Owner shall comply with the WQMP

2. All maintenance or replacement of BMPs proposed as part of the WQMP are the sole responsibility of the Owner in accordance with the terms of this Agreement.

3. Owner hereby provides the County's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by the County Director of Public Works, no advance notice, for the purpose of inspection, sampling, testing of the BMPs, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 5 below. The County shall make every effort at all times to minimize or avoid interference with Owner's use of the Property. Denial of access to any premises or facility that contains WQMP features is a breach of this Agreement and may also be a violation of the County's Pollutant Discharge Elimination System regulations, which on the effective date of this Agreement are found in County Code Sections 35.0101 et seq. If there is reasonable cause to believe that an illicit discharge or breach of this Agreement is occurring on the premises then the authorized enforcement agency may seek issuance of a search warrant from any court of competent jurisdiction in addition to other enforcement actions. Owner recognizes that the County may perform routine and regular inspections, as well as emergency inspections, of the BMPs. Owner or Owner's successors or assigns shall pay County for all costs incurred by County in the inspection, sampling, testing of the BMPs within thirty (30) calendar days of County invoice.

4. Owner shall use its best efforts diligently to maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the County, the Owner shall provide the County with documentation identifying the material(s) removed, the quantity, and disposal destination), testing construction or reconstruction.

5. In the event Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) business days of being given written notice by the County , the County is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense against the Property and/or to the Owner or Owner's successors or assigns, including administrative costs, attorneys fees and interest thereon at the maximum rate authorized by the County Code from the date of the notice of expense until paid in full. Owner or Owner's successors or assigns shall pay County within thirty (30) calendar days of County invoice.

6. The County may require the owner to post security in form and for a time period satisfactory to the County to guarantee the performance of the obligations stated herein. Should the Owner fail to perform the obligations under the Agreement, the County may, in the case of a cash bond, act for the Owner using the proceeds from it, or in the case of a surety bond, require the surety(ies) to perform the obligations of this Agreement.

7. The County agrees, from time to time, within ten (10) business days after request of Owner, to execute and deliver to Owner, or Owner's designee, an estoppel certificate requested by Owner, stating that this Agreement is in full force and effect, and that Owner is not in default hereunder with regard to any maintenance or payment obligations (or specifying in detail the nature of Owner's default). Owner shall pay all costs and expenses incurred by the County in its investigation of whether to issue an estoppel certificate within thirty (30) calendar days after receipt of a County invoice and prior to the County's issuance of such certificate. Where the County cannot issue an estoppel certificate, Owner shall pay the County within thirty (30) calendar days of receipt of a County invoice.

8. Owner shall not change any BMPs identified in the WQMP without an amendment to this Agreement approved by authorized representatives of both the County and the Owner.

9. County and Owner shall comply with all applicable laws, ordinances, rules, regulations, court orders and government agency orders now or hereinafter in effect in carrying out the terms of this Agreement. If a provision of this Agreement is terminated or held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall remain in full effect.

10. In addition to any remedy available to County under this Agreement, if Owner violates any term of this Agreement and does not cure the violation within the time already provided in this Agreement, or, if not provided, within thirty (30) calendar days, or within such time authorized by the County if said cure reasonably requires more than the subject time, the County may bring an action at law or in equity in a court of competent jurisdiction to enforce compliance by the Owner with the terms of this Agreement. In such action, the County may recover any damages to which the County may be entitled for the violation, enjoin the violation by temporary or permanent injunction without the necessity of proving actual damages or the inadequacy of otherwise available legal remedies, or obtain other equitable relief, including, but not limited to, the restoration of the Property and/or the BMPs identified in the WQMP to the condition in which it/they existed prior to any such violation or injury.

11. This Agreement shall be recorded in the Office of the Recorder of San Bernardino County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the County, including interest as herein above set forth, subject to foreclosure in event of default in payment.

12. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, then the Owner and its successors or assigns agree(s) to hold the County harmless and pay all costs incurred by the County in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

13. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

14. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of

this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the County at the same time such notice is provided to the successor.

15. Time is of the essence in the performance of this Agreement.

16. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

17. Owner agrees to indemnify, defend (with counsel reasonably approved by the County) and hold harmless the County and its authorized officers, employees, agents and volunteers from any and all claims, actions, losses, damages, and/or liability arising out of this Agreement from any cause whatsoever, including the acts, errors or omissions of any person and for any costs or expenses incurred by the County on account of any claim except where such indemnification is prohibited by law. This indemnification provision shall apply regardless of the existence or degree of fault of indemnitees. The Owner's indemnification obligation applies to the County's "active" as well as "passive" negligence but does not apply to the County's "sole negligence" or "willful misconduct" within the meaning of Civil Code Section 2782, or to any claims, actions, losses, damages, and/or liabilities, to the extent caused by the acts or omissions of any third party contractors undertaking any work (other than field inspections) or other maintenance on the Property on behalf of the County under this Agreement..

[REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK]

IF TO COUNTY :

Director of Public Works

825 E. Third Street, Room 117

San Bernardino, CA 92415-0835

IF TO OWNER:

_____

_____

_____

IN WITNESS THEREOF, the parties hereto have affixed their signatures as of the date first written above.

OWNER:

Signature: _____

Name: _____

Title: _____

Date: _____

FOR: Maintenance Agreement, dated _____, for the project known as _____ _____ (APN)_____, As described in the WQMP dated _____.

OWNER:

Signature: _____

Name: _____

Title: _____

Date: _____

NOTARIES ON FOLLOWING PAGE

A notary acknowledgement is required for recordation.

ACCEPTED BY:

KEVIN BLAKESLEE, P.E., Director of Public Works

Date: _____

Attachment: Notary Acknowledgement

ATTACHMENT 1
Notary Acknowledgement)

EXHIBIT A
(Legal Description)

EXHIBIT B
(Map/illustration)

ATTACHMENT D – WORKSHEET H – SAFETY OF FACTOR AND DESIGN INFILTRATION RATE AND WORKSHEET

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

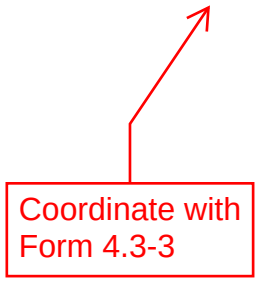
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater/impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1
B	Design	Tribuary area size	0.25	3	0.75
		Level of pretreatment/expected sediment loads	0.25	2	0.5
		Redundancy	0.25	2	0.5
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2
Combined Safety Factor, STOTAL = S_A x S_B				2	
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)				Varies	
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{observed} / S_{TOTAL}$				Varies	

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

This sheet is provided for all Testing Locations. A safety factor of 2.0 shall be used for all the infiltration testing.

NOTE: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

ATTACHMENT E – WEIR FLOW LINES AND WATER QUALITY DEPTHS

DMA/Basin	Tributary Area (ac)	Design Capture Volume (ft^3)	Weir Flow Line Elevation	Depth	Treated Volume (Per WQMP)
A	3.08	12,531	1027	4.5	39,874
B1	4.35	17,697	1025.5	3	40,468
B2	6.02	24,491	1022	3	32,294
B3*	11.59	47,152	1018	2	44,254
B4	5.67	23,068	1017	4	72,633
C	25.93	105,492	1010	8	285,154