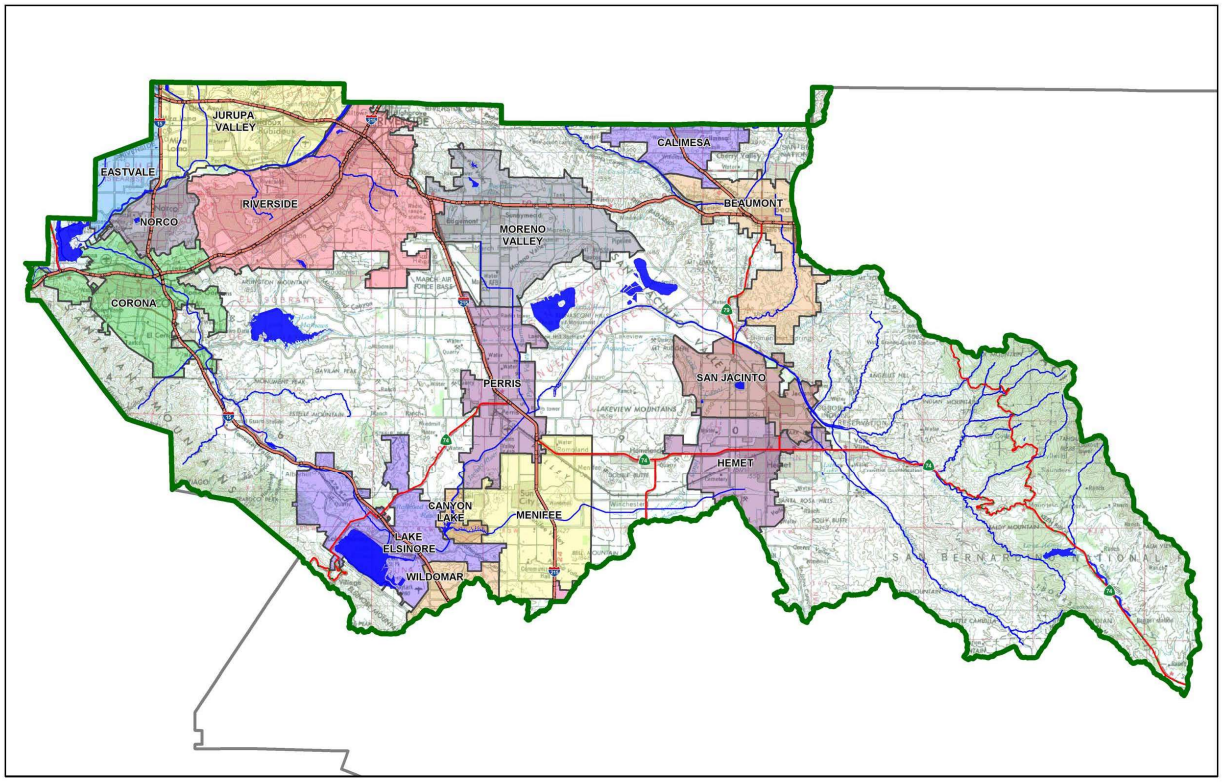
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: W Second Street & 91 Freeway - Corona

Development No: PP2023-0007

Design Review/Case No: PWWQ2022-0016/WQ22-017P



☒ **Preliminary**
☐ **Final**

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Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**
Template revised June 30, 2016

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OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for GREENS DEVELOPMENT by WOODARD GROUP for the W Second Street & 91 Freeway – Corona project.

This WQMP is intended to comply with the requirements of the City of Corona for Order No. R8-2010-0033 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under the City of Corona Water Quality Ordinance (Municipal Code Section 13.27.120).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

DocuSigned by:
82210DAD4BC048B...
Owner's Signature

4/26/2024
Date

Ashutosh Kadakia
Owner's Printed Name

CFO
Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature

4/26/2024
Date

Andrew C. Woodard
Preparer's Printed Name

Principal
Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

This project is a proposal to build two buildings with an associated parking lot. The proposed buildings are a drive-thru and a convenience store with provided parking in between. The site consists of 1.4 acres and is located on the north side of West Second Street at the State Highway 91 onramp between South Buena Vista Avenue and South Lincoln Avenue in the City of Corona, California . The proposed condition site strives to keep the drainage pattern proceeding to the southeast corner of the site, which is where the existing lot drains and collected in a municipally maintained stormwater system. Stormwater from the site will be treated by an infiltration trench.

The existing condition of the site vacant now, but was a mobile home park prior to the 91 freeway expansion. The site structures were demolished prior to the construction of the West Second Street alignment between South Buena Vista Avenue and South Lincoln Avenue.

PROJECT INFORMATION		
Type of Project:	Commercial	
Planning Area:		
Community Name:		
Development Name:	W Second Street & 91 Freeway - Corona	
PROJECT LOCATION		
Latitude & Longitude (DMS): 33°52'50.9"N, 117°34'48.4"W		
Project Watershed and Sub-Watershed: Santa Ana River; Temescal River, Reach 3		
Gross Acres: 1.4 acres APN(s): 118-270-024 & 118-270-054		
Map Book and Page No.: PM51/62, MB 9/6		
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)	Commercial	
Proposed or Potential SIC Code(s)	SIC 5541; 5812; 5411	
Area of Impervious Project Footprint (SF)	45,060 S.F.	
Total Area of <u>proposed</u> Impervious Surfaces within the Project Footprint (SF)/or Replacement	45,060 S.F.	
Does the project consist of offsite road improvements?	☒ Y	☐ N
Does the project propose to construct unpaved roads?	☐ Y	☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y	☒ N
EXISTING SITE CHARACTERISTICS		
Total area of <u>existing</u> Impervious Surfaces within the Project limits Footprint (SF)	0 SF	
Is the project located within any MSHCP Criteria Cell?	☐ Y	☒ N
If so, identify the Cell number:		
Are there any natural hydrologic features on the project site?	☐ Y	☒ N
Is a Geotechnical Report attached?	☒ Y	☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	N/A	
What is the Water Quality Design Storm Depth for the project?	0.75 in.	

A.1 Maps and Site Plans

Appendix 1 includes a map of the local vicinity and existing site. In addition, WQMP Site Plan, located in Appendix 1, includes the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

A.2 Identify Receiving Waters

In order of upstream to downstream, the receiving waters that the project site is tributary to are as follows. A map of the receiving waters is included in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Temescal Reach 1B	None	REC 1,REC2,WARM, WILD,RARE	1.3 miles
Temescal Reach 1A	None	REC 1,REC2,WARM, WILD,RARE	3.6 miles
Prado Management Zone	PH	REC 1,REC2,WARM, WILD,RARE	3.6 miles
Santa Ana River Reach 3	Copper, indicator Bacteria, Lead	AGR, GWR, RARE, REC1, REC2, WARM, WILD	3 miles
Santa Ana River Reach 2	None	AGR, GWR, RARE, REC1, REC2, WARM, WILD	15 miles
Santa Ana River Reach 1	None	REC1, REC2, WARM, WILD	Not a water body classified as RARE
Pacific Ocean	None	IND, NAV, RARE, REC1, REC2, COMM, WILD, SPWN, MAR	32 miles

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*		
City of Corona Conditional Use Permit	☐ Y	☒ N
City of Corona Design Review	☒ Y	☐ N
City of Corona Building Permit	☒ Y	☐ N
City of Corona Grading Permit	☒ Y	☐ N
City of Corona Construction Permit	☒ Y	☐ N

Section B: Optimize Site Utilization (LID Principles)

Site Optimization

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Yes, this site strives to keep the drainage proceeding to the southeast of the site, which is where the existing lots drain and collected in a municipally maintained stormwater system. Stormwater from the project will be collected and treated with an infiltration trench. All flows exceeding the design capture volume will be released from the site and flow into W Second Street through a parkway drain.

Did you identify and protect existing vegetation? If so, how? If not, why?

No, there is no existing vegetation on-site. Landscaping is proposed per City of Corona standards.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Yes, the existing site is covered by undeveloped natural soil. The current infiltration capacity is comprised of the existing soils natural infiltration capacity. The development proposes an infiltration trench that will serve to mimic and exceed the existing infiltration capacity.

Did you identify and minimize impervious area? If so, how? If not, why?

Yes, landscape is proposed to surround the impervious portion of the site.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, drainage from all impervious areas will sheet flow south-east towards inlets that will direct the flow to an appropriately sized infiltration trench located on the southeast corner of the project where water will be treated.

Section C: Delineate Drainage Management Areas (DMAs)

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1][2]	Area (Sq. Ft.)	DMA Type
1-A	Concrete or Asphalt	39,604	D
1-B	Roofs	5,456	D
1-C	Ornamental Landscaping	13,380	D
2-C	Self Treating Landscape	2,192	A

[1]Reference Table 2-1 in the WQMP Guidance Document to populate this column
[2]If multi-surface provide back-up

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
2-C	2,192	Landscape	Dripline per approved Landscape Architects plans

Table C.3 Type 'B', Self-Retaining Areas

N/A

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

N/A

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
1-A	BMP-1
1-B	
1-C	

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

Geotechnical Report

A Geotechnical Report is required by the City of Corona to confirm present and past site characteristics that may affect the use of Infiltration BMPs, see Appendix 3.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☒The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

Harvest and Use BMPs need not be assessed for the site.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option proceed to Section E to document your alternative compliance measures.

☒ None of the above

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
1-A	☒	☐	☐	☐	☐
1-B	☒	☐	☐	☐	☐
1-C	☒	☐	☐	☐	☐

D.5 LID BMP Sizing

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP-1* *Infiltration Trench*		
	[A]		[B]	[C]	[A] x [C]			
1-A	*39604*	Concrete or Asphalt	*1*	*0.89*	*35326.8*	*Design Storm Depth (in)*	*Design Capture Volume,* $\mathbf{V_{BMP}}$ *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
1-B	*5456*	Roofs	*1*	*0.89*	*4866.8*			
1-C	*13380*	Landscape	*0.1*	*0.11*	*1477.9*			
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]
	58440				41671.5	0.75	2604.5	3567

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

The project does not create a Hydrologic Condition of Concern, meeting the criteria for HCOC Exemption as shown below:

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	100 year – 24 hour		
	Pre-condition	Post-condition	% Difference
Time of Concentration			
Volume (Cubic Feet)			

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Susceptibility Maps.

Does the project qualify for this HCOC Exemption? ☒ Y ☐ N

This project drains directly to a storm drain which is connected to the municipally maintained drainage system that outlets to Prado Dam. See HCOC Applicability Map on Appendix 7.

F.2 HCOC Mitigation

As an alternative to the HCOC Exemption Criteria above, HCOC criteria is considered mitigated if the project meets one of the following conditions, as indicated:

☐ a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

☐ b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

☐ c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

☒ d. None of the above.

Section G: Source Control BMPs

The following table identifies the potential sources of runoff pollutants for this project and specifies how they are addressed through permanent control and operational BMPs:

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	-Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	- Maintain and periodically repaint or replace inlet markings. - Provide stormwater pollution prevention information to new site owners, lessees, or operators. - See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com - Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
D1. Need for future indoor & structural pest control	Note building design features that discourage entry of pests.	Provide Integrated Pest Management information to owners, lessees, and operators.
D2. Landscape/ Outdoor Pesticide Use	-State that final landscape plans will accomplish all of the following. -Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. -Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. -Consider using pest-resistant plants, especially adjacent to hardscape. -To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	-Maintain landscaping using minimum or no pesticides. - See applicable operational BMPs in "What you should know for.....Landscape and Gardening" at http://rcflood.org/stormwater/Downloads/LandscapeGardenBrochure.pdf - Provide IPM information to new owners, lessees and operators.

I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: • Hazardous Waste Generation • Hazardous Materials Release Response and Inventory • California Accidental Release (CalARP) • Aboveground Storage Tank • Uniform Fire Code Article 80 Section 103(b) & (c) 1991 Underground Storage Tank www.cchealth.org/groups/hazmat/	N/A
F. Food service	-Describe the location and features of the designated cleaning area. -Describe the items to be cleaned in this facility and how it has been sized to ensure that the largest items can be accommodated.	See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
G. Refuse areas	-State how site refuse will be handled and provide supporting detail to what is shown on plans. - State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	- Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
L. Fuel Dispensing Areas	N/A	-The property owner shall dry sweep the fueling area routinely. See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

N. Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources Rooftop equipment Roofing, gutters, and trim	Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.	
P. Plazas, sidewalks, and parking lots.	N/A	Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: WQMP Covenant & Agreement

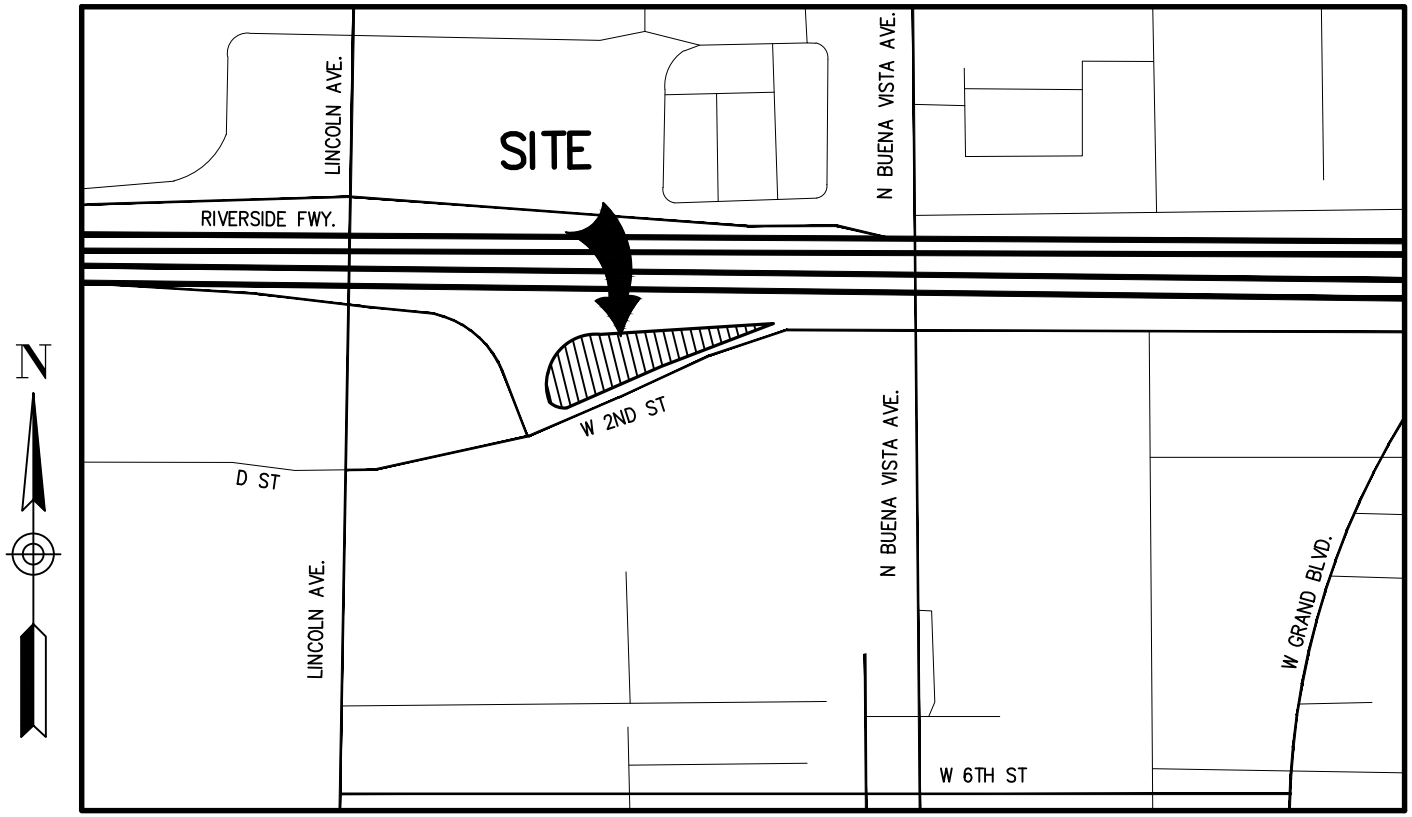
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

Operation and Maintenance Plan and Maintenance Mechanism is included in Appendix 9. Educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP are included in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan



VICINITY MAP

SECTION 26, TOWNSHIP 3 SOUTH, RANGE 7 WEST
NOT TO SCALE

Santa Ana River Watershed Basin Plan Reaches within the City of Corona

Legend

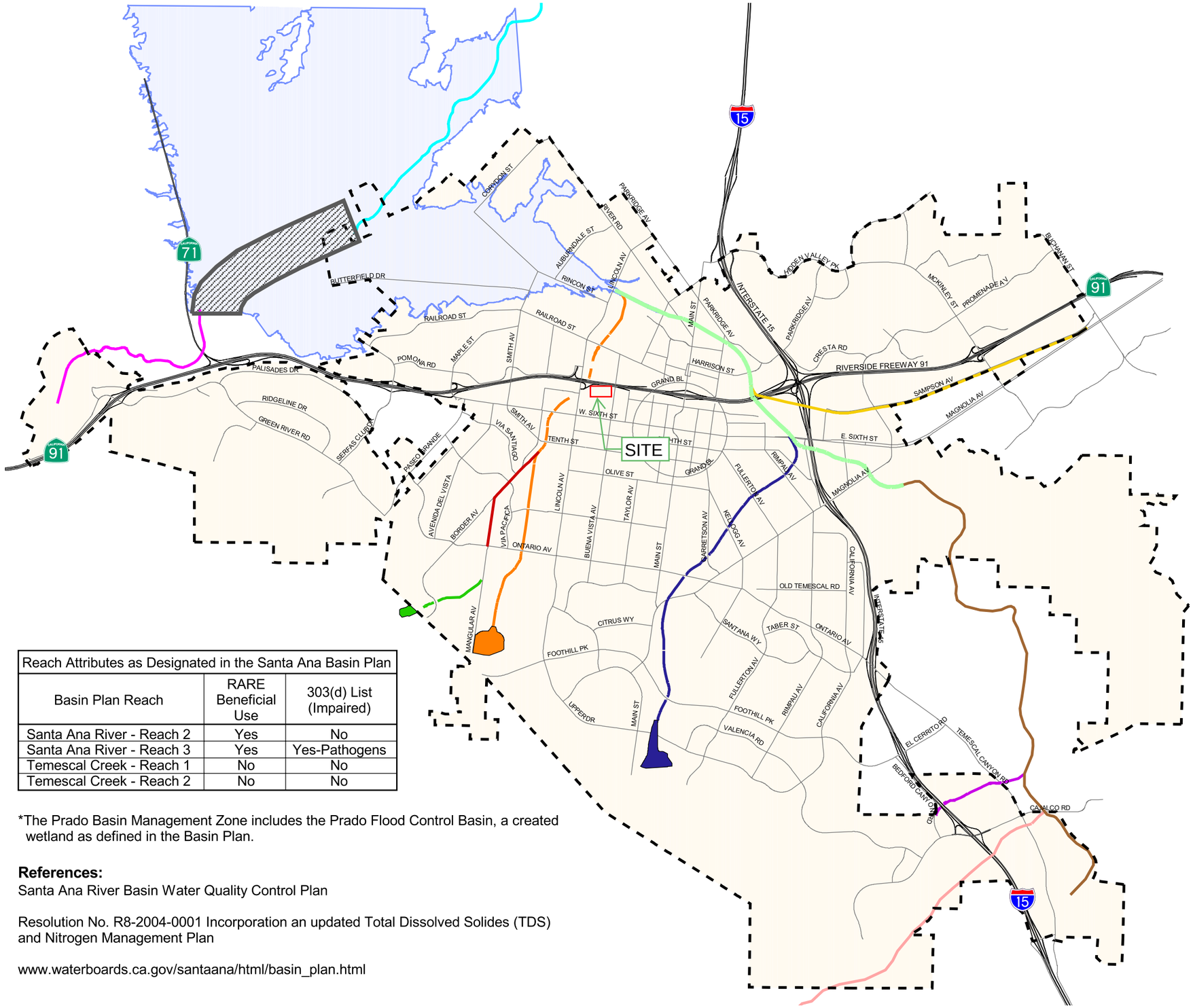
Basin Plan Reaches
- Santa Ana River - Reach 2
- Santa Ana River - Reach 3
- Approximate Extent of Santa Ana River - Reach 3
- Temescal Creek - Reach 1
- Temescal Creek - Reach 2
- Bedford Canyon Wash
- Joseph Canyon Wash

Other Tributaries
- Arlington Channel
- Mangular/Oak Street Channel
- Mabey Canyon Debris Basin
- Mabey Channel
- Main Street Debris Basin
- Main Street Channel
- Oak Street Debris Basin
- Oak Street Channel

Wetlands (Inland)
- Prado Basin Management Zone*

- City Boundary
- Street Centerline

N



Reach Attributes as Designated in the Santa Ana Basin Plan		
Basin Plan Reach	RARE Beneficial Use	303(d) List (Impaired)
Santa Ana River - Reach 2	Yes	No
Santa Ana River - Reach 3	Yes	Yes-Pathogens
Temescal Creek - Reach 1	No	No
Temescal Creek - Reach 2	No	No

*The Prado Basin Management Zone includes the Prado Flood Control Basin, a created wetland as defined in the Basin Plan.

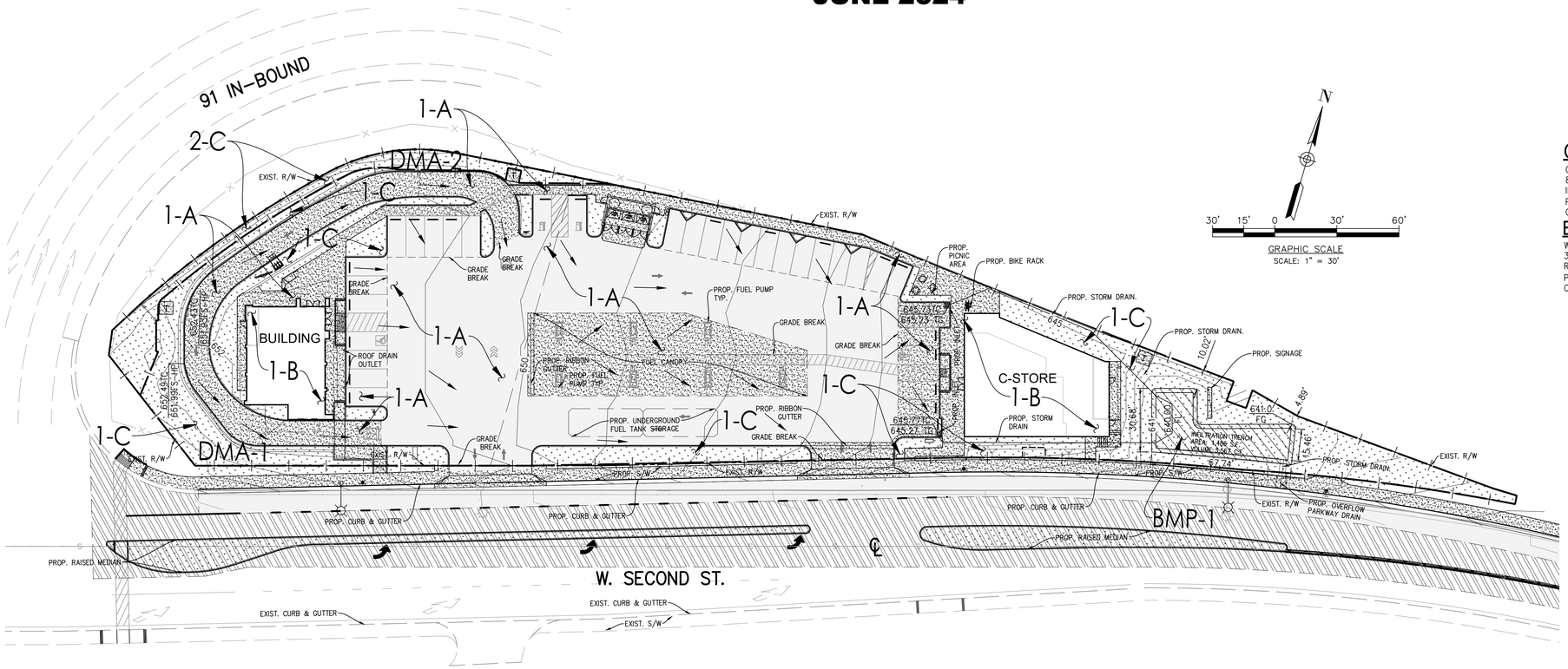
References:

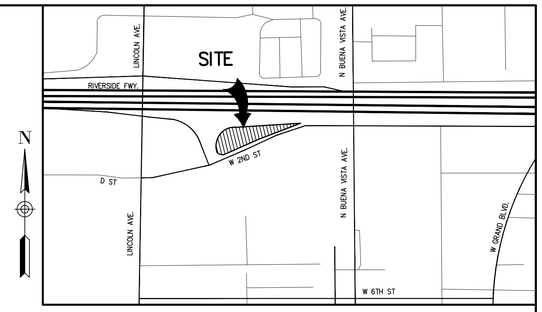
Santa Ana River Basin Water Quality Control Plan

Resolution No. R8-2004-0001 Incorporation an updated Total Dissolved Solides (TDS) and Nitrogen Management Plan

www.waterboards.ca.gov/santaana/html/basin_plan.html

WQMP SITE PLAN
W. SECOND STREET & 91 FREEWAY
CORONA, CALIFORNIA
JUNE 2024





VICINITY MAP
SECTION 26, TOWNSHIP 3 SOUTH, RANGE 7 WEST
NOT TO SCALE

OWNER/APPLICANT
GREENS LA CADENA LLC
8815 RESEARCH DRIVE
IRVINE, CA 92618
PH: (949) 322-1760
CONTACT: ATMAN KADAKIA

ENGINEER
WOODARD GROUP
3585 MAIN STREET, SUITE 205
RIVERSIDE, CA 92501
PH: (951) 907-5077
CONTACT: ANDREW C. WOODARD

LEGEND
- EXISTING PROPERTY LINE
- PROPOSED RIGHT OF WAY
- EXISTING RIGHT OF WAY
- EXISTING CENTERLINE
- PROPOSED CURB
- EXISTING CURB
- PROPOSED SIDEWALK
- EXISTING SIDEWALK
- EXISTING DIRT ROAD
- PROPOSED PARKING STRIPE
- EXISTING EASEMENT
- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- EXISTING FENCE
- EXISTING BUILDING
- EXISTING CONCRETE
- 12" SD — PROPOSED UNDERGROUND UTILITY
- 12" SD — EXISTING UNDERGROUND UTILITY
- EXISTING EDGE OF PAVEMENT
- PROPOSED EDGE OF PAVEMENT
- EXISTING CONTOUR ELEVATION
- 915 / 901.5 — EXISTING SPOT ELEVATION
- ROOF DRAIN
- PROPOSED AC PAVEMENT
- PROPOSED LANDSCAPE
- PROPOSED CONCRETE
- PROPOSED INFILTRATION TRENCH

BMP LEGEND
- DIRECTION OF FLOW
- PROPOSED DRAINAGE MANAGEMENT AREA BOUNDARY
- 1-A — PROPOSED DRAINAGE MANAGEMENT AREA IDENTIFICATION
- BMP-1 — PROPOSED INFILTRATION TRENCH

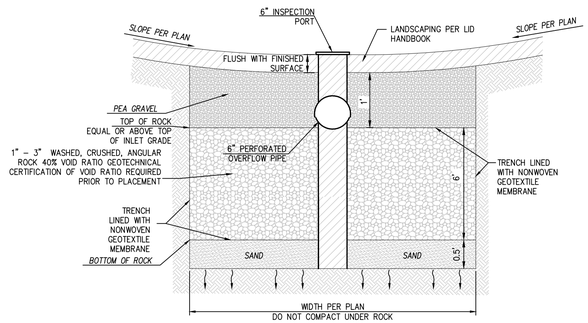
LID SOURCE CONTROL
- ON-SITE STORM DRAIN INLET – MAINTAIN PERIODICALLY
- LANDSCAPE / OUTDOOR PESTICIDE USE – MAINTAIN LANDSCAPE USING MINIMUM OR NO PESTICIDES. MINIMIZE IRRIGATION AND RUNOFF TO PROMOTE SURFACE INFILTRATION.
- REFUSE AREAS – OUTDOORS DUMPSTERS OR OTHER RECEPTACLES
- FOOD SERVICES – DESIGNATED CLEANING AREAS.
- FUEL DISPENSING AREAS – DRY SWEEP THE FUELING AREA ROUTINELY.
- PARKING LOT – SWEEP REGULARLY

LOT DRAINAGE MANAGEMENT AREAS

DMA ID	SURFACE TYPE	AREA (S.F.)	PERV. (S.F.)	IMPERV. (S.F.)	% PERV.	% IMPERV.	DCV (CF)	V_{BMP} (CF)	BMP NAME/TYPE
1–A	CONCRETE OR ASPHALT	39,604	13,380	45,060	22.9	77.1	2,604.5	3,567	DMA–1 INFILTRATION–TRENCH
1–B	ROOF	5,456							
1–C	ORNAMENTAL LANDSCAPE	13,380							
EFFECTIVE AREA		58,440							

LOT DRAINAGE MANAGEMENT AREAS

DMA ID	SURFACE TYPE	AREA (S.F.)	PERV. (S.F.)	IMPERV. (S.F.)	% PERV.	% IMPERV.	DCV (CF)	V_{BMP} (CF)	BMP NAME/TYPE
2–C	ORNAMENTAL LANDSCAPE	2,192	2,192	0	100	0	–	–	DMA–1 SELF TREATING AREA
EFFECTIVE AREA		2,192							



INFILTRATION TRENCH DETAIL – BMP 1
NOT TO SCALE

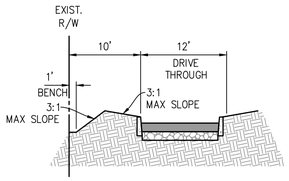
woodard group

WQMP SITE PLAN
W. SECOND STREET
& 91 FREEWAY

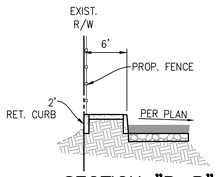
Appendix 2: Construction Plans

Grading and Drainage Plans

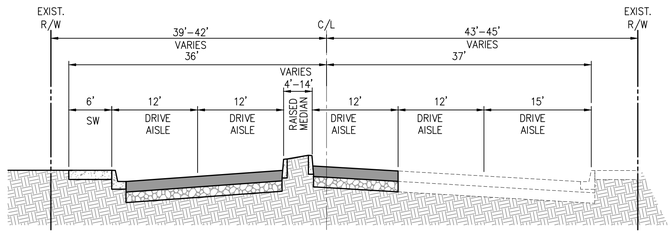
CONCEPTUAL GRADING PLAN
W. 2ND STREET & 91 FREEWAY
CORONA, CALIFORNIA
JUNE 2024



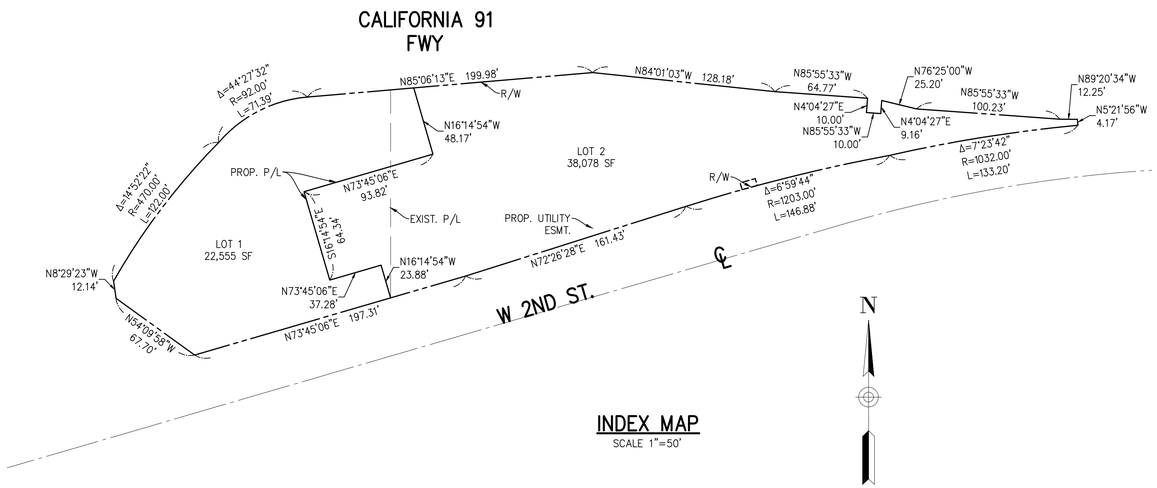
SECTION "A–A"
SCALE: 1"=10'



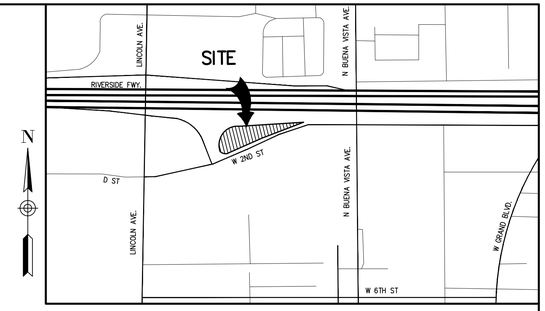
SECTION "B–B"
SCALE: 1"=10'



W. 2ND ST.
SCALE: 1"=10'



INDEX MAP
SCALE 1"=50'



VICINITY MAP
SECTION 26, TOWNSHIP 3 SOUTH, RANGE 7 WEST
NOT TO SCALE

OWNER/APPLICANT
GREENS GROUP
16530 BAKE PARKWAY, 2ND FLOOR
IRVINE, CA. 92618
PH: (949) 322–1760
CONTACT: ATMAN KADAKIA

LEGAL DESCRIPTION
APN: 118–270–024 & 118–270–054 PORTIONS

CALTRANS PARCELS NOS. 22217 AND 22219–REM

ENGINEER
WOODARD GROUP
1485 SPRUCE ST., SUITE "M"
RIVERSIDE, CA 92507
PH: (951) 907–5077
CONTACT: ANDREW C. WOODARD

TOPOGRAPHY SOURCE
PERFORMED BY:
WOODARD GROUP
3585 MAIN STREET, SUITE 205
RIVERSIDE, CA 92501
PH: (951) 907–5077

DATE: JULY 2022

ACREAGE
APN: 118–270–024 POR.
APN: 118–270–054 POR.
GROSS ..... 1.40 ACRES
NET ..... 1.40 ACRES
DISTURBED AREA ..... 1.40 ACRES

ARCHITECT
AO ARCHITECTS
144 NORTH ORANGE STREET
ORANGE, CA 92866
(714) 639–9860

FEMA FLOOD ZONE DESIGNATION
ZONE X – BASE FLOOD ELEVATIONS DETERMINED.
FLOOD INSURANCE RATE MAP
RIVERSIDE COUNTY, CALIFORNIA AND INCORPORATED AREAS.
PANEL 689 OF 3805
MAP NUMBER 06065C0689G
EFFECTIVE DATE
AUGUST 28, 2008

ZONING/LAND USE/GENERAL PLAN
EXISTING ZONING C3/MP
EXISTING LAND USE: ..... VACANT
EXISTING GENERAL PLAN: ..... GC/HDR
PROPOSED ZONING: C3
PROPOSED LAND USE: ..... GAS & RESTAURANT
PROP GENERAL PLAN: ..... GC

UTILITY PROVIDERS
WATER: ..... CITY OF CORONA
SEWER: ..... CITY OF CORONA
ELECTRICITY: ..... SO CAL EDISON
GAS: ..... SO CAL GAS
TELEPHONE: ..... VERIZON
TELEVISION: .....AIR WAVES / CHARTER COMMUNICATIONS

ASSESSOR PARCEL NO

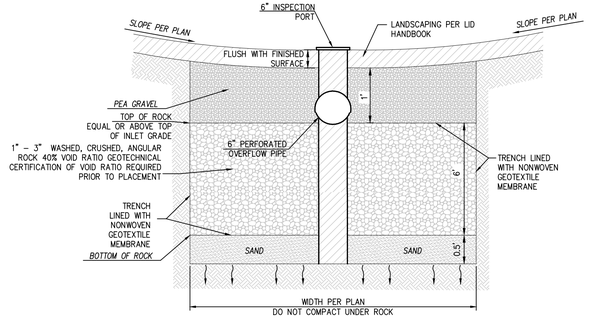
BOOK	PAGE	PARCELS
118	270	024 POR.
118	270	054 POR.

LEGEND

	EXISTING PROPERTY LINE
	PROPOSED RIGHT OF WAY
	EXISTING RIGHT OF WAY
	EXISTING CENTERLINE
	PROPOSED CURB
	EXISTING CURB
	PROPOSED SIDEWALK
	EXISTING SIDEWALK
	EXISTING DIRT ROAD
	PROPOSED PARKING STRIPE
	EXISTING EASEMENT
	EXISTING CONTOUR MAJOR
	EXISTING CONTOUR MINOR
	EXISTING FENCE
	EXISTING BUILDING
	EXISTING CONCRETE
12" SD	PROPOSED UNDERGROUND UTILITY
12" SD	EXISTING UNDERGROUND UTILITY
	EXISTING EDGE OF PAVEMENT
	PROPOSED EDGE OF PAVEMENT
915	EXISTING CONTOUR ELEVATION
×901.5	EXISTING SPOT ELEVATION
	ROOF DRAIN
	PROPOSED AC PAVEMENT
	PROPOSED LANDSCAPE
	PROPOSED CONCRETE
	PROPOSED INFILTRATION CHAMBER
	PROPOSED STREET IMPROVEMENTS

ABBREVIATIONS

R/W	RIGHT OF WAY
P/L	PROPERTY LINE
EXIST.	EXISTING
PROP.	PROPOSED
S.F.	SQUARE FEET
D/W	DRIVEWAY
S/W	SIDEWALK
M.H.	MANHOLE
FS	FINISH SURFACE
TC	TOP OF CURB
FL	FLOW LINE
FG	FINISH GRADE
TG	TOP OF GRATE
INV.	INVERT
S.D.	STORM DRAIN
EG	EXISTING GROUND
T.B.R.	TO BE REMOVED
P.I.P.	PROTECT IN PLACE
P.P.	POWER POLE
F.H.	FIRE HYDRANT
L/S	LANDSCAPE
TW	TOP OF WALL
TRW	TOP OF RETAING WALL
R&R	REMOVE AND RELOCATE



INFILTRATION TRENCH DETAIL – BMP 1
NOT TO SCALE

MARK	REVISIONS	DATE	BY

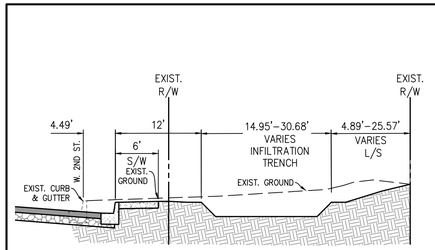
CONCEPTUAL GRADING PLAN
W. 2ND STREET & 91 FREEWAY

FOR: GREENS GROUP

SCALE:	1"=30'
DATE:	06/2024
DESIGNED:	OG
CHECKED:	AW
PLN CK REF:	
F.B.	

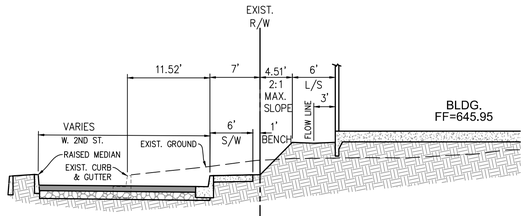
woodard group

W.O.
SHEET 1
OF 3 SHEETS
DWG. NO. 1086



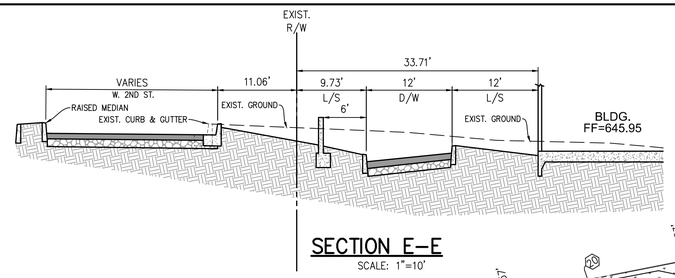
SECTION C-C

SCALE: 1"=10'



SECTION D-D

SCALE: 1"=10'



SECTION E-E

SCALE: 1"=10'

ALTERNATIVE #2: EXTEND THE SIDEWALK ALONG THE NORTH SIDE OF 2ND STREET TO BUENA VISTA AVENUE.

ALTERNATIVE #1: SIGNALIZED CROSSWALK ACROSS 2ND STREET.

CONSTRUCTION NOTES

1. PROPOSED DRIVEWAY APPROACH PER CITY OF CORONA STD. NO. 131
2. PROPOSED ON-SITE A.C PAVING.
3. PROPOSED CONCRETE HARDSCAPE.
4. PROPOSED 6" CURB ONLY.
5. PROPOSED 3' WIDE CONCRETE RIBBON GUTTER.
6. PROPOSED 0" CURB ONLY.
7. PROPOSED TRASH ENCLOSURE.
8. PROPOSED ADA RAMP.
9. PROPOSED LANDSCAPE.
10. PROPOSED COLD PLANE AND OVERLAY.
11. PROPOSED SAWCUT LINE
12. OVERFLOW PARKWAY DRAIN.
13. PROPOSED WQMP INFILTRATION TRENCH.
14. PROPOSED TRANSFORMER.
15. JOIN TO EXISTING CONDITION.
16. EXISTING CURB TO BE PROTECT IN PLACE.
17. EXISTING CURB & GUTTER TO BE PROTECT IN PLACE.
18. PROPOSED 2' CMU BLOCK SCREEN WALL PER LANDSCAPE ARCHITECTS PLAN.
19. PROP. 6" CURB & GUTTER.
20. PROPOSED UTILITIES, SEE PAGE 3.

GRAPHIC SCALE
SCALE: 1" = 20'

MARK	REVISIONS	DATE	BY

CONCEPTUAL GRADING PLAN
W. 2ND STREET & 91 FREEWAY

FOR:	GREENS LA CADENA LLC
SCALE:	1"=20'
DATE:	06/2024
DESIGNED:	OG
CHECKED:	AW
PLN CK REF:	
F.B.	

woodard group

W.O.
SHEET 2
OF 3 SHEETS
DWG. NO. 1086

ALTERNATIVE #2: EXTEND THE SIDEWALK ALONG THE NORTH SIDE OF 2ND STREET TO BUENA VISTA AVENUE.

91-E IN-BOUND

EXIST. CURB

EXIST. FENCE T.B.R.

EXIST. R/W

PROP. SIGNAGE

EXIST. TRAFFIC SIGNAL LIGHT P.I.P.

EXIST. R/W

EXIST. R/W

EXIST. R/W

EXIST. F.H R&R

639.29 FL

EXIST. P.P R&R

PROP. S/W

PROP. CURB & GUTTER

PROP. RAISED MEDIAN

BMP-1

P2
C-STORE
FF=645.95

BUILDING
P1
FF=652.40

GRADE BREAK

PROP. MONUMENT SIGN

PROP. F.H.

PROP. ST. LIGHT

EXIST. P.P R&R

EXIST. SEWER

EXIST. WATER MAIN

EXIST. CURB & GUTTER

EXIST. S/W

W. 2ND ST.

ALTERNATIVE #1: SIGNALIZED CROSSWALK ACROSS 2ND STREET.

CONSTRUCTION NOTES

(21) PROPOSED SEWER LATERAL AND CLEAN OUT.
(22) PROPOSED DOMESTIC SERVICE, METER AND BACKFLOW DEVICE.
(23) PROPOSED IRRIGATION SERVICE, METER AND BACKFLOW DEVICE.
(24) PROP. FIRE SERVICE & DCDA BACKFLOW DEVICE.
(25) PROP. INLET.
(26) PROPOSED STORM DRAIN PIPE.
(27) OVERFLOW PARKWAY DRAIN.

N

20' 10' 0 20' 40'

GRAPHIC SCALE
SCALE: 1" = 20'

MARK	REVISIONS	DATE	BY

CONCEPTUAL GRADING PLAN
W. 2ND STREET & 91 FREEWAY

FOR: GREENS LA CADENA LLC

SCALE:	1"=20'
DATE:	06/2024
DESIGNED:	OG
CHECKED:	AW
PLN CK REF:	
F.B.	

woodard group

W.O.
SHEET 3
OF 3 SHEETS
DWG. NO. 1086

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

Sladden Engineering

45090 Golf Center Parkway, Suite F, Indio, CA. 92201 (760) 863-0713 Fax (760) 863-0847
6782 Stanton Avenue, Suite C, Buena Park, CA. 90621 (714) 523-0952 Fax (714) 523-1369
450 Egan Avenue, Beaumont, CA. 92223 (951) 845-7743 Fax (951) 845-8863
www.sladdenengineering.com

December 20, 2021

Project No. 644-21066
21-12-145

Greens Group, Inc.
8815 Research Drive
Irvine, California 92618

Project: Proposed Commercial Development
APN 118-270-024 & 054
West Second Street
Corona, California

Subject: Percolation/Infiltration Testing for On-Site Stormwater Management

Ref: Geotechnical Investigation, Proposed Commercial Development, APN 118-270-024 & 054, West Second Street, California; prepared by Sladden Engineering, Project No 644-21066, Report No. 21-12-143, dated December 20, 2021.

In accordance with your request, we have performed percolation testing on the subject site to evaluate the infiltration potential of the near surface soil to assist in stormwater management system design. It is our understanding that on-site stormwater retention including infiltration is proposed for the project.

Percolation testing was performed on November 30, 2021 within three (3) shallow tests bores excavated on the site. Testing was performed at depths of approximately 5.00 and 10.00 feet below existing grade. The approximate locations of the test holes are presented on the attached Exploration Location Plan (Figure 2). Testing was performed by placing water within the test bore and recording the drop in the water surface with time. Testing was performed in general accordance with the *United States Bureau of Reclamation (BOR) Procedure 7300-89 (1999).* Test results are summarized in the following table.

PERCOLATION TEST RESULTS

Test No.	Depth (Ft)	USCS	Percolation Rate (in/hr)	Infiltration Rate (in/hr)
P-1	5.00	SC/SM	76.50	9.79
P-2	10.00	SW	80.25	10.48
P-3	10.00	SW	71.25	8.87

The percolation rates determined represent the ultimate field rates that do not include a safety factor. The corresponding infiltration rates were calculated using the Porchet Method.

Based on our field investigation and our review of groundwater levels[1] within the vicinity, it is our professional opinion that groundwater should not be a controlling factor in on-site stormwater retention/infiltration system design.

If you have any questions regarding this memo or the testing summarized herein, please contact the undersigned.

Respectfully submitted,
SLADDEN ENGINEERING

Matthew J. Cohrt
Principal Geologist

CERTIFIED ENGINEERING GEOLOGIST
MATTHEW J. COHRT
2634
STATE OF CALIFORNIA

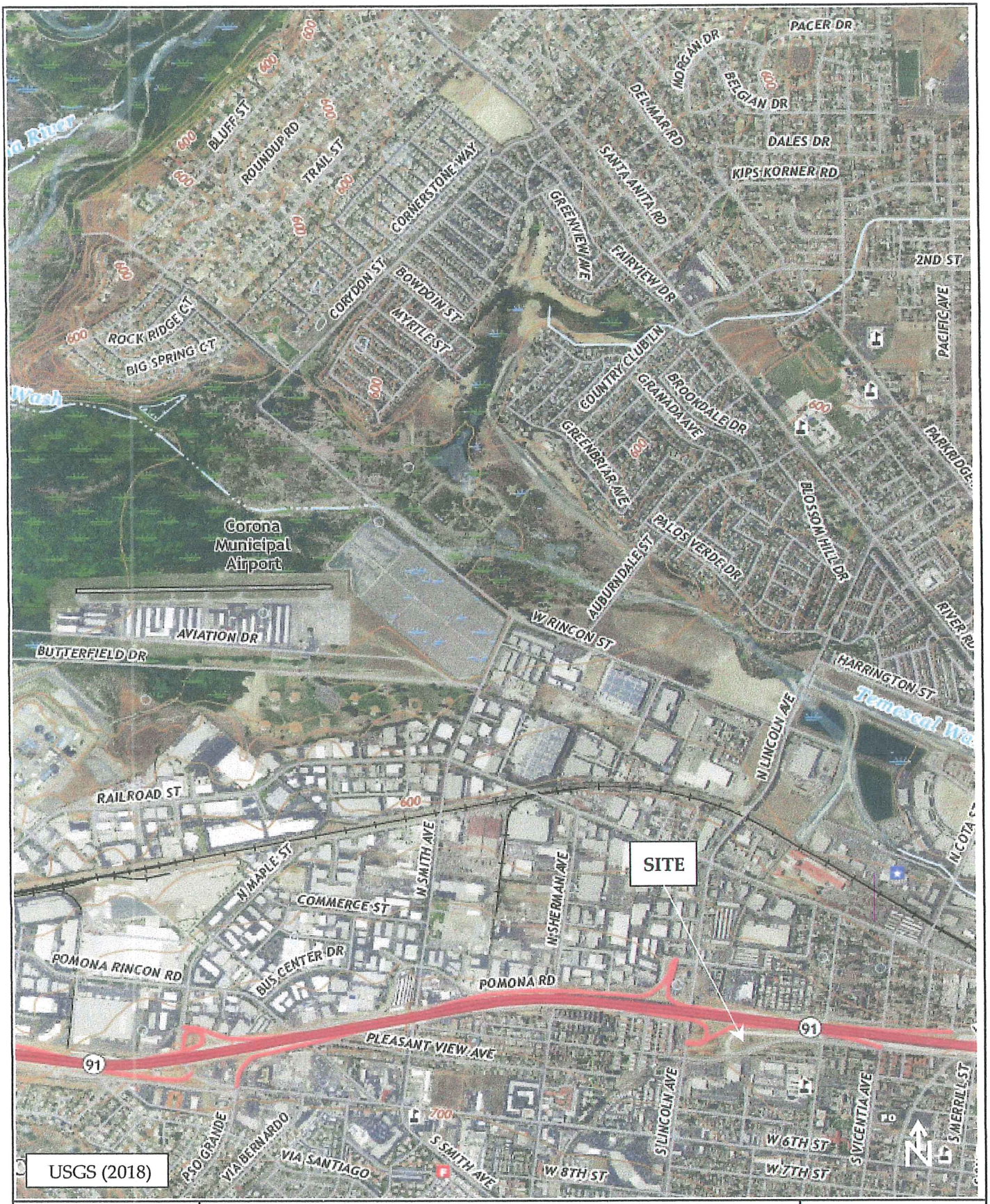
Brett L. Anderson
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
BRETT L. ANDERSON
No. C45389
CIVIL ENGINEERING
STATE OF CALIFORNIA

Copies: 4/Addressee

[1] California Department of Water Resources (CDWR), 2021, Historical Data by Well-Map Interface, available at: http://wdl.water.ca.gov/waterdatalibrary/Home.aspx

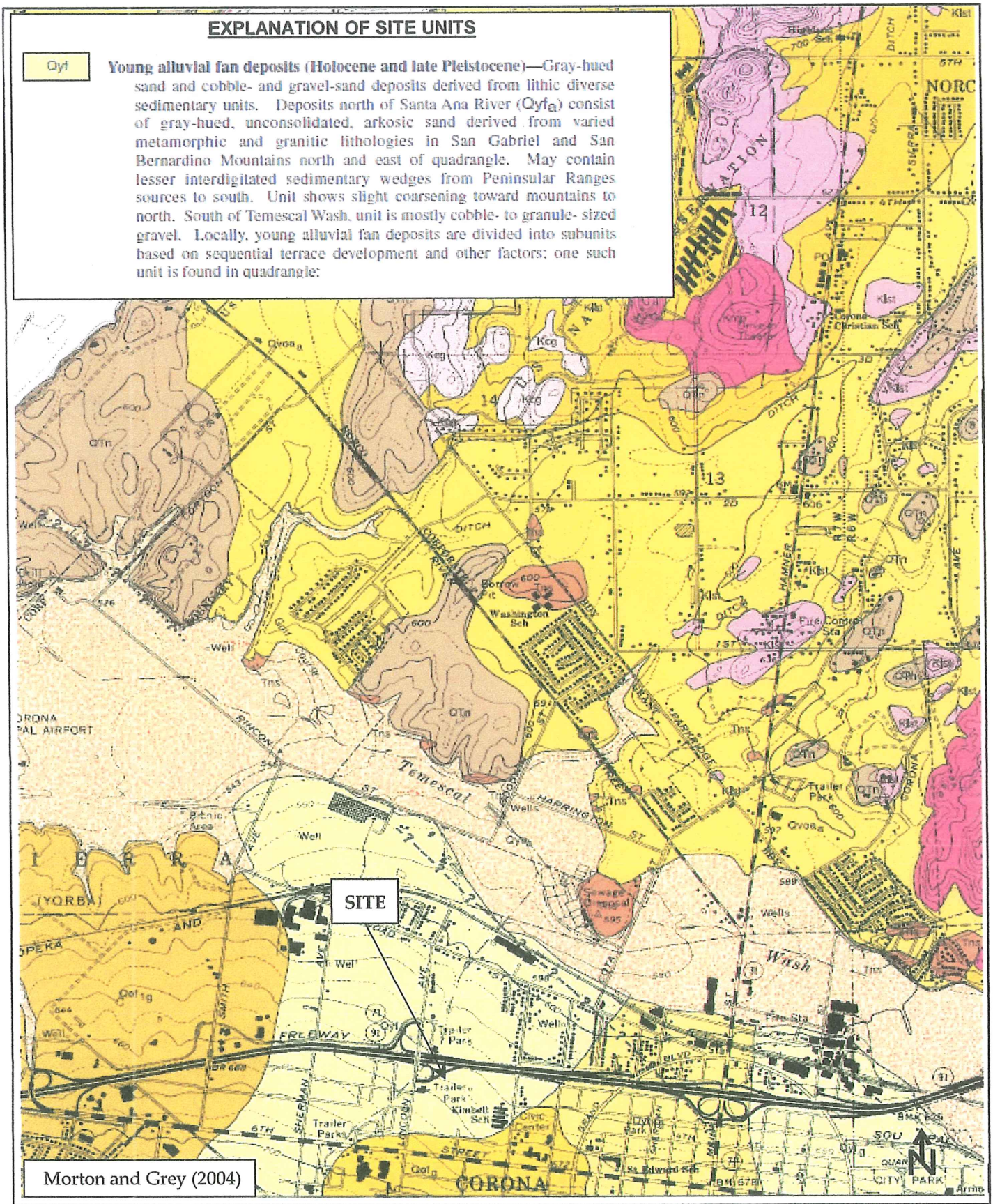
SITE LOCATION MAP
REGIONAL GEOLOGIC MAP
EXPLORATION LOCATION PLAN



Sladden Engineering	SITE LOCATION MAP	FIGURE 1
	Project Number: 644-21066	
	Report Number: 21-12-145	
	Date: December 20, 2021	

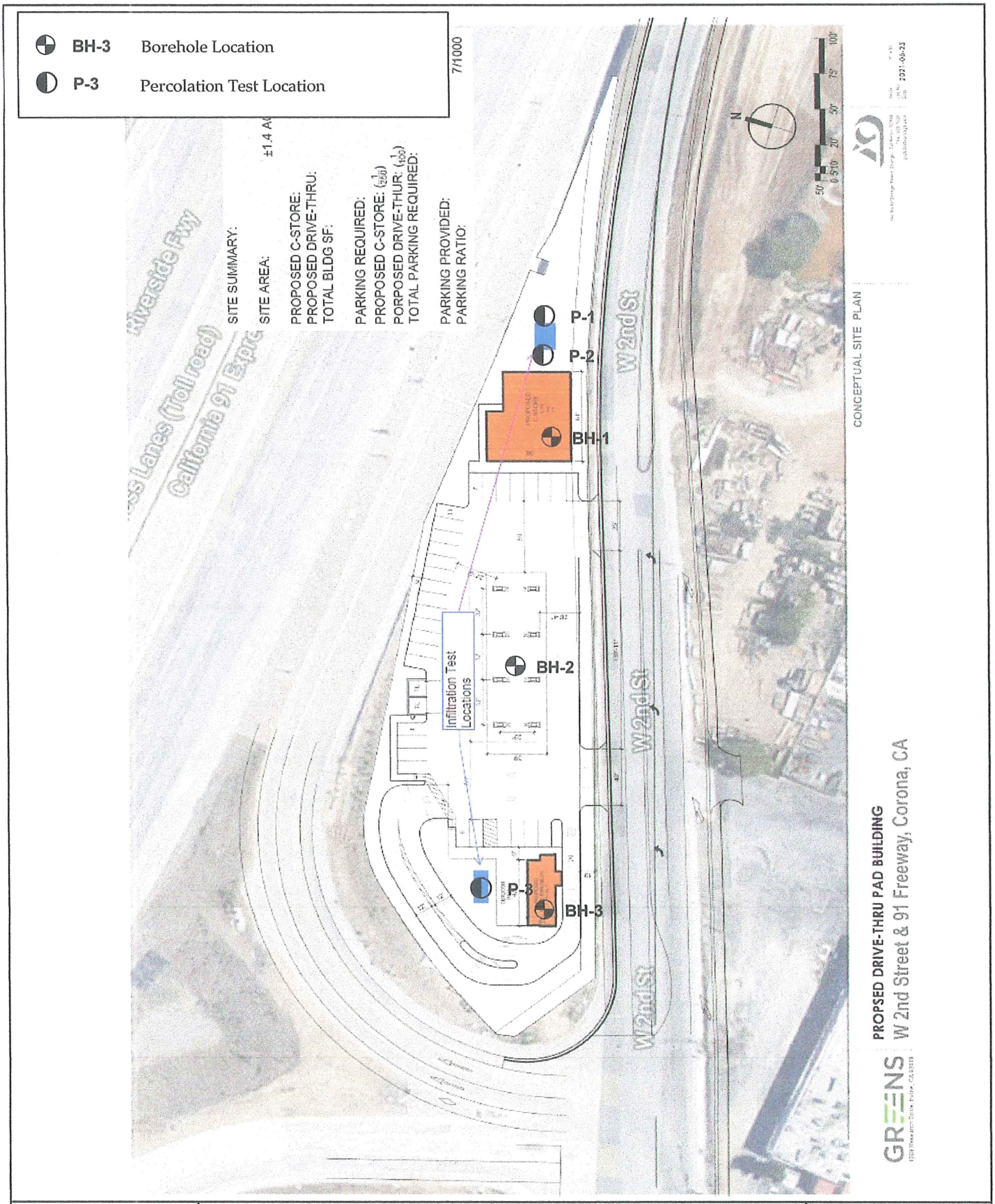
EXPLANATION OF SITE UNITS

Qyf — **Young alluvial fan deposits (Holocene and late Pleistocene)**—Gray-hued sand and cobble- and gravel-sand deposits derived from lithic diverse sedimentary units. Deposits north of Santa Ana River (Qyf_a) consist of gray-hued, unconsolidated, arkosic sand derived from varied metamorphic and granitic lithologies in San Gabriel and San Bernardino Mountains north and east of quadrangle. May contain lesser interdigitated sedimentary wedges from Peninsular Ranges sources to south. Unit shows slight coarsening toward mountains to north. South of Temescal Wash, unit is mostly cobble- to granule- sized gravel. Locally, young alluvial fan deposits are divided into subunits based on sequential terrace development and other factors; one such unit is found in quadrangle:



Morton and Grey (2004)

Sladden Engineering	REGIONAL GEOLOGIC MAP	FIGURE 2
	Project Number: 644-21066	
	Report Number: 21-12-145	
	Date: December 20, 2021	



Sladden Engineering	EXPLORATION LOCATION PLAN	FIGURE
	Project Number: 644-21066	3
	Report Number: 21-12-145	
	Date: December 20, 2021	

BORELOGS

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	BH-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0–6		Clayey Sand (SC); pale yellowish brown, dry, fine- to coarse-grained (Fill). No Recovery.
X	19 15 16						6–14		Clayey Sand (SC); pale yellowish brown, dry, medium dense, fine- to coarse-grained with gravel (Qyf).
	6 8 20			26.3	4.3				
	13 13 15			56.4	6.2	110.3	14–20		Sandy Clay (CL); reddish brown, dry, very stiff, low plasticity with gravel (Qyf).
	28 27 17			16.7	5.2		20–26		Clayey Sand (SC); grayish brown, dry, dense, fine- to coarse-grained with gravel (Qyf).
	36 50-6			5.4	3.8	114.8	26		Sand (SP); grayish brown, dry, very dense, fine- to coarse-grained with gravel (Qyf).
							26–50		Terminated at 26.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No:	644-21066	Page	1
Report No:	21-12-145		

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	BH-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0		Clayey Sand (SC); pale yellowish brown, dry, fine- to coarse-grained (Fill).
							2		
							4		
	2 3 4			49.5	5.0		6		Clayey Sand (SC); pale yellowish brown, dry, loose, fine-grained (Fill).
							8		
	8 9 8			47.6	4.8	100.8	10		Clayey Sand (SC); pale yellowish brown, dry, medium dense, fine-grained with gravel (Qyf).
							12		
							14		
	6 8 8			38.9	6.2		16		Clayey Sand (SC); pale yellowish brown, dry, medium dense, fine-grained with gravel (Qyf).
							18		
							20		
	50-6						22		No Recovery.
							24		
							26		
	18 24 35			20.2	5.8		28		Clayey Sand (SC); grayish brown, dry, very dense, fine-grained with gravel (Qyf).
							30		Terminated at 26.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No:	644-21066	Page	2
Report No:	21-12-145		

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	BH-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
	18 15 13	1	36	46.0	8.1		2–4		Clayey Sand (SC); dark yellowish brown, slightly moist, medium dense, fine-grained (Fill).
	16 50-6			7.1	2.2		6–8		Sandy Gravel (GW); yellowish brown, dry to slightly moist, very dense, fine- to coarse-grained (Qyf).
	5 5 7			39.1	9.6		10–12		Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine-grained (Qyf).
	5 6 7			57.2	13.5	117.8	14–16		Sandy Clay (CL); reddish brown, slightly moist, medium stiff, low plasticity with gravel (Qyf).
	25 27 23			14.8	5.9		18–20		Clayey Sand (SC); grayish brown, dry, dense, fine- to coarse-grained (Qyf).
							22–24		Gravel at 24 Feet.
	24 23 30			9.5	5.8	121.9	26–28		Sand (SP); yellowish brown, dry, dense, fine- to coarse-grained (Qyf).
	18 21 35			14.9	5.4		30–32		Clayey Sand (SC); yellowish brown, dry, very dense, fine- to coarse-grained (Qyf).
							32–34		Gravel at 33 Feet.
	18 50-6			13.1	5.2		34–36		Clayey Gravel (GC); dark yellowish brown, dry to slighlty moist, very dense, fine- to coarse-grained (Qyf).
	6 8 15			26.3	8.6		38–40		Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained (Qyf).
	5 8 12			70.0	16.1	113.9	42–44		Sandy Clay (CL); reddish brown, moist, stiff, low plasticity (Qyf).
	13 19 13			26.1	7.7		46–48		Clayey Sand (SC); yellowish brown, moist, dense, fine- to coarse-grained (Qyf).

Completion Notes:
Terminated at 51.5 Feet bgs.
No Bedrock Encountered.
No Groundwater or Seepage Encountered.

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No: 644-21066
Report No: 21-12-145

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	P-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Clayey Sand (SC); dark yellowish brown, slightly moist, fine-to coarse-grained with gravel and debris (Fill).
							4		Silty Sand (SM); dark yellowish brown, slightly moist, fine- to coarse-grained (Qyf).
							6		Terminated at 5.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Cased to Facilitate Percolation Testing
							8		
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No:	644-21066	Page	4
Report No:	21-12-145		

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	P-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0–4		Clayey Sand (SC); dark yellowish brown, slightly moist, fine-to coarse-grained with gravel (Fill).
							6–10		Gravelly Sand (SW); yellowish brown, dry, fine- to coarse-grained (Qyf).
							10–50		Terminated at 10.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Cased to Facilitate Percolation Testing

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No:	644-21066	Page	5
Report No:	21-12-145		

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	P-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0–2		Clayey Sand (SC); dark yellowish brown, slightly moist, fine-to coarse-grained with gravel (Fill).
							2–6		Gravelly Sand (SW/SP); yellowish brown, dry, fine- to coarse-grained (Qyf).
							6–10		Terminated at 10.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Cased to Facilitate Percolation Testing

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

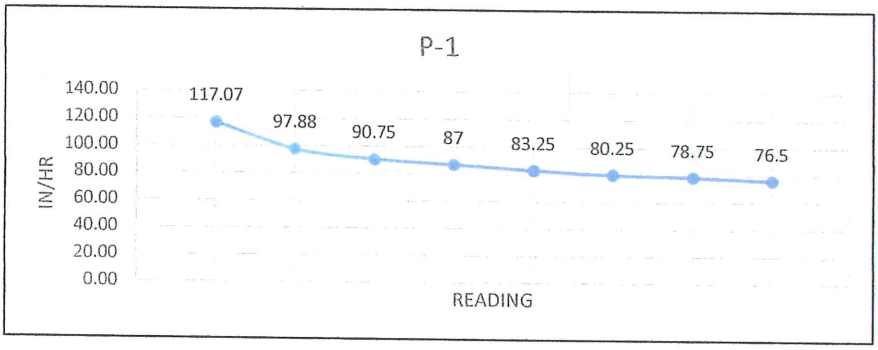
Project No:	644-21066	Page	6
Report No:	21-12-145		

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	W. 2nd Street, Corona	Depth (ft):	5.00
Job No. :	644-21066	USCS Soil Class:	SC
Date:	11/30/2021	Sandy Soil:	M.C.
Test Hole #:	P-1	Tested By:	R.F.

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	10.25	5.00	20	0	20	117.07
B	12.26	5.00	20	0	20	97.88

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	10.00	5.00	20	4 7/8	15 1/8	90.75
2	10.00	5.00	20	5 4/8	14 4/8	87
3	10.00	5.00	20	6 1/8	13 7/8	83.25
4	10.00	5.00	20	6 5/8	13 3/8	80.25
5	10.00	5.00	20	6 7/8	13 1/8	78.75
6	10.00	5.00	20	7 2/8	12 6/8	76.5



PERCOLATION RATE CONVERSION (PORCHET METHOD)

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

Δt =	10.00
D_f =	52.75
r =	4.00
D_0 =	40
D_t =	60.00
H_0 =	20
H_f =	7.25
ΔH =	12.75
H_{avg} =	13.63

Δt (minutes)
D_f (Final Depth to water)
r (hole radius in inches)
D_0 (Initial Depth to water)
D_t (Total Depth of test hole)
H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

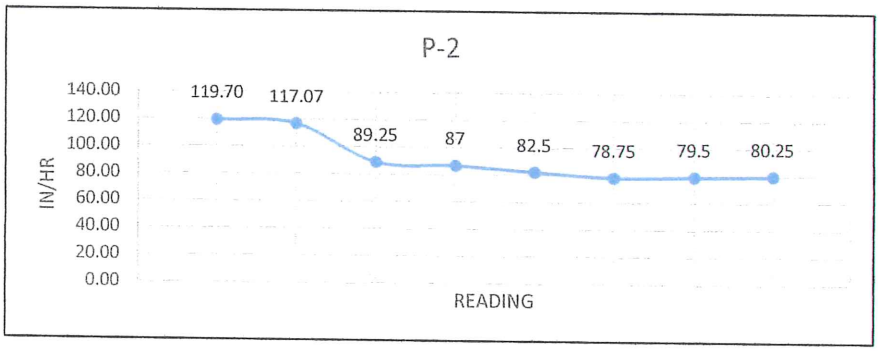
Field Rate: 76.5 in/hr
Infiltration Rate: 9.79 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	W. 2nd Street, Corona	Depth (ft):	10.00
Job No. :	644-21066	USCS Soil Class:	SC
Date:	11/30/2021	Sandy Soil:	M.C.
Test Hole #:	P-2	Tested By:	R.F.

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	10.03	10.00	20	0	20	119.70
B	10.25	10.00	20	0	20	117.07

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	10.00	10.00	20	5 1/8	14 7/8	89.25
2	10.00	10.00	20	5 4/8	14 4/8	87
3	10.00	10.00	20	6 2/8	13 6/8	82.5
4	10.00	10.00	20	6 7/8	13 1/8	78.75
5	10.00	10.00	20	6 6/8	13 2/8	79.5
6	10.00	10.00	20	6 5/8	13 3/8	80.25



PERCOLATION RATE CONVERSION (PORCHET METHOD)

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

Δt =	10.00
D_f =	113.38
r =	4.00
D_0 =	100
D_t =	120.00
H_0 =	20
H_f =	6.625
ΔH =	13.38
H_{avg} =	13.31

Δt (minutes)

D_f (Final Depth to water)

r (hole radius in inches)

D_0 (Initial Depth to water)

D_t (Total Depth of test hole)

H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

Field Rate: 80.25 in/hr

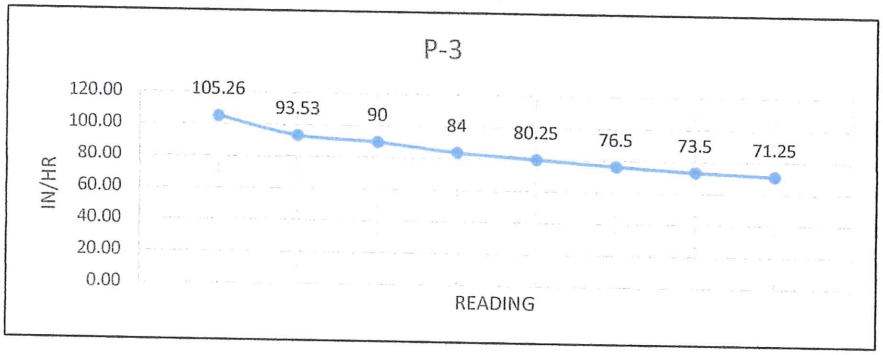
Infiltration Rate: 10.48 in/hr

STORMWATER PERCOLATION SHEET (LESS THAN 10 FT)

Project:	W. 2nd Street, Corona	Depth (ft):	10.00
Job No. :	644-21066	USCS Soil Class:	SC
Date:	11/30/2021	Sandy Soil:	M.C.
Test Hole #:	P-3	Tested By:	R.F.

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
A	11.40	10.00	20	0	20	105.26
B	12.83	10.00	20	0	20	93.53

READING	TIME (min)	DEPTH (ft)	INITIAL W (in)	FINAL W (in)	ΔW (in)	IN/HR
1	10.00	10.00	20	5	15	90
2	10.00	10.00	20	6	14	84
3	10.00	10.00	20	6 5/8	13 3/8	80.25
4	10.00	10.00	20	7 2/8	12 6/8	76.5
5	10.00	10.00	20	7 6/8	12 2/8	73.5
6	10.00	10.00	20	8 1/8	11 7/8	71.25



PERCOLATION RATE CONVERSION (PORCHET METHOD)

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

Δt =	10.00
D_f =	111.88
r =	4.00
D_0 =	100
D_t =	120.00
H_0 =	20
H_f =	8.125
ΔH =	11.88
H_{avg} =	14.06

Δt (minutes)

D_f (Final Depth to water)

r (hole radius in inches)

D_0 (Initial Depth to water)

D_t (Total Depth of test hole)

H_0 (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

H_f (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

ΔH (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

H_{avg} (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

Field Rate:	71.25 in/hr
Infiltration Rate:	8.87 in/hr

GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
APN 118-270-024 & 054
WEST SECOND STREET
CORONA, CALIFORNIA

-Prepared By-

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December 20, 2021

Project No. 644-21066
21-12-143

Greens Group, Inc.
8815 Research Drive
Irvine, California 92618

Subject: Geotechnical Investigation

Project: Proposed Commercial Development
APN 118-270-024 & 054
West Second Street
Corona, California

Sladden Engineering is pleased to present the results of our geotechnical investigation performed for the proposed new commercial development to be constructed on the north side of West 2nd Street at the State Highway 91 freeway onramp the City of Corona, California. Our services were completed in accordance with our revised proposal for geotechnical engineering services dated September 9, 2021 and your authorization to proceed with the work. The purpose of our investigation was to explore the subsurface conditions at the site in order to provide recommendations for foundation design and site preparation. Evaluation of environmental issues and hazardous wastes was not included within the scope of services provided.

The opinions, recommendations and design criteria presented in this report are based on our field exploration program, laboratory testing and engineering analyses. Based on the results of our investigation, it is our professional opinion that the proposed project is feasible from a geotechnical perspective provided that the recommendations presented in this report are implemented into design and carried out through construction.

We appreciate the opportunity to provide service to you on this project. If you have any questions regarding this report, please contact the undersigned.

Respectfully submitted,
SLADDEN ENGINEERING

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GEOTECHNICAL INVESTIGATION
PROPOSED COMMERCIAL DEVELOPMENT
APN 118-270-024 & 054
WEST SECOND STREET
CORONA, CALIFORNIA

TABLE OF CONTENTS

INTRODUCTION

This report presents the results of the geotechnical investigation performed for the proposed new commercial development to be constructed on the north side of West 2nd Street at the State Highway 91 onramp between South Buena Vista Avenue and South Lincoln Avenue in the City of Corona, California. The site is located at approximately 33.8807 degrees North latitude and 117.5801 degrees West longitude. The approximate location of the site is indicated on the Site Location Map (Figure 1).

Our investigation was conducted in order to evaluate the engineering properties of the subsurface materials, to evaluate their *in-situ* characteristics, and to provide engineering recommendations and design criteria for site preparation, foundation design and the design of various site improvements. This study also includes a review of published and unpublished geotechnical and geological literature regarding seismicity at and near the subject site.

PROJECT DESCRIPTION

Based on the provided Conceptual Site Plan (Greens, 2021), it is our understanding that the proposed project will consist of constructing a commercial development on the subject site. The project will consist of constructing a new drive-thru restaurant, convenience store and fuel station. We anticipate the project will also include paved parking areas, trash enclosures, underground utilities, exterior concrete flatwork, landscape areas and various other site improvements. For our analyses, we expect that the proposed commercial structures will consist of relatively light weight wood-frame or light gauge steel structures supported on conventional shallow spread footings and concrete slabs-on-grade.

We anticipate that grading will include significant cuts and fills to accomplish the desired pad elevations and provide adequate gradients for site drainage. This does not include the removal and re-compaction of any artificial fill soil and primary foundation bearing soil within the building envelopes. Upon completion of precise grading plans, Sladden should be retained in order to verify that the recommendations presented within in this report are incorporated into the design of the proposed project.

Structural foundation loads were not available at the time of this report. Based on our experience with relatively lightweight concrete tilt-up structures, we expect that isolated column loads will be less than 30 kips and continuous wall loads will be less than 3.0 kips per linear foot. If these assumed loads vary significantly from the actual loads, we should be consulted to verify the applicability of the recommendations provided.

SCOPE OF SERVICES

The purpose of our investigation was to determine specific engineering characteristics of the surface and near surface soil in order to develop foundation design criteria and recommendations for site preparation. Specifically, our site characterization consisted of the following tasks:

- Site reconnaissance to assess the existing surface conditions on and adjacent to the site.
- The excavation of three (3) exploratory boreholes and three (3) percolation test holes to depths between approximately 5 and 51 feet bgs in order to characterize the subsurface soil conditions. Representative samples of the soil were classified in the field and retained for laboratory testing and engineering analyses.
- The performance of laboratory testing on selected samples to evaluate their engineering characteristics.
- The review of geologic literature with respect to potential geologic hazards.
- The performance of engineering analyses to develop recommendations for foundation design and site preparation.
- The preparation of this report summarizing our work at the site.

SITE CONDITIONS

The subject site is located on the north side of West 2nd Street at the State Highway 91 onramp between South Buena Vista Avenue and South Lincoln Avenue in the City of Corona, California. The property consists of two (2) parcels (APN 118-270-024 & 054) that occupy a combined area of approximately 4.6 acres. At the time of our investigation, the site was undeveloped and occupied by two (2) wash-out roller trailers and a tarp covered soil area surrounded by erosion control straw wattles.

Based on our review historic aerial imagery (Google Earth, 2021), the site was previously occupied by a recreational vehicle (RV) sales and/or service facility, paved parking area and a residential trailer park. The site structures were demolished prior to the construction of the 91 Freeway eastbound onramp that currently bounds the northern and western portions of the site and prior to the construction of the West 2nd Street alignment between South Buena Vista Avenue and South Lincoln Avenue. The project site is bounded by the 91 Freeway eastbound onramp to the north and west, and West 2nd Street to the south and east.

The project site is relatively level with minimal surface gradients. According to the USGS 7.5′ Corona North Quadrangle map (2018), the site is at an approximate elevation of 655 feet above mean sea level (MSL). No ponding water or surface seeps were observed at or near the site during our investigation conducted on October 27, 2021. Site drainage appears to be controlled via sheet flow and surface infiltration.

GEOLOGIC SETTING

The project site is located in the Peninsular Ranges Physiographic Province of California. The Peninsular Ranges are mountainous areas that extend from the western edge of the continental borderland to the Salton Trough and from the Transverse Ranges Physiographic Province in the north to the tip of Baja California in the south. The province is characterized by elongated, northwest-southeast trending mountain ranges and valleys and is truncated at its northern margin by the east-west grain of the Transverse Ranges.

The site has been mapped by Morton and Grey (2004) to be immediately underlain by young alluvial fan deposits (Qyf). The geologic setting for the site and site vicinity is presented on the Regional Geologic Map (Figure 2).

SUBSURFACE CONDITIONS

The subsurface conditions at the site were investigated by drilling three (3) exploratory boreholes and three (3) percolation test holes on the site. The approximate locations of the boreholes and test holes are illustrated on the Borehole Location Plan (Figure 3). The boreholes and test holes were advanced using a truck-mounted Mobile B-61 drill-rig equipped with 8-inch outside diameter hollow stem augers. A representative of Sladden was on-site to log the materials encountered and retrieve samples for laboratory testing and engineering analyses.

During our field investigation, artificial fill soil was encountered to a depths between approximately four (4) and eight (8) feet below the (existing) ground surface (bgs). Just below the artificial fill soil, native alluvial materials were encountered to the maximum explored depth of approximately 50 feet bgs. Generally, the native alluvial soil consisted of sandy gravel (GW), clayey sand (SC) and sandy clay (CL) with gravel. Generally, the granular materials appeared dry to moist, medium dense to dense and fine- to coarse-grained with gravel. Cohesive layers appeared dry to moist, medium stiff to very stiff and exhibited characteristic so low plasticity soil.

The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples. The final logs are included in Appendix A of this report. The stratification lines represent the approximate boundaries between soil types, although the transitions may be gradual and variable across the site.

Groundwater was not encountered to a maximum explored depth of approximately 50 feet bgs during our field investigation. Based on our experience in the project vicinity, and our review of groundwater elevations in the project vicinity (CDWR, 2021), it is our opinion that groundwater should not be a factor during construction of the proposed project.

SEISMICITY AND FAULTING

The southwestern United States is a tectonically active and structurally complex region, dominated by northwest trending dextral faults. The faults of the region are often part of complex fault systems, composed of numerous subparallel faults that splay or step from the main fault traces. Strong seismic shaking could be produced by any of these faults during the design life of the proposed project.

We consider the most significant geologic hazard to the project to be the potential for moderate to strong seismic shaking that is likely to occur during the design life of the project. The proposed project is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene epoch (about the last 11,000 years). A potentially active fault is defined by the State as a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago).

Table 1 lists the closest known potentially active faults that was generated in part using the EQFAULT computer program (Blake, 2000), as modified using the fault parameters from The Revised 2002 California Probabilistic Seismic Hazard Maps (Cao et al, 2003), Southern Earthquake Data Center (SCEDC, 2021) and the Quaternary Fault and Fold Database of the United States (USGS, 2021). This table does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any of the other faults in the region.

TABLE 1
CLOSEST KNOWN ACTIVE FAULTS

Fault Name	Distance (Km)	Maximum Event
Elsinore – Chino	3.1	7.25*
Elsinore – Glen Ivy	5.7	6.8
Whittier	6.0	6.8
San Jose	26.6	6.4
Cucamonga	30.4	6.9
Sierra Madra	30.7	7.2
San Jacinto – San Bernardino	32.6	6.7
Elsinore – Temecula	34.0	6.8
San Jacinto – San Jacinto Valley	35.1	6.9

*BSSC (2014)

SITE SPECIFIC GROUND MOTION PARAMETERS

Sladden has reviewed the 2019 California Building Code (CBC) and ASCE7-16 and developed site specific ground motion parameters for the subject site. The project Seismic Design Maps and site-specific ground motion parameters are summarized in the following table and included within Appendix C. The project Structural Engineer should verify that all design parameters provided are applicable for the subject project.

TABLE 2
GROUND MOTION PARAMETERS

Latitude / Longitude	33.8807/-117.5801
Risk Category	II
Site Class	D
Code Reference Documents	ASCE 7-16; Chapter 11 & 21

Description	Type	Map Based	Site-Specific
MCE_R Ground Motion (0.2 second period)	S_S	2.068	---
MCE_R Ground Motion (1.0 second period)	S_1	0.776	---
Site-Modified Spectral Acceleration Value	S_{MS}	2.068	**2.036**
Site-Modified Spectral Acceleration Value	S_{M1}	null	**1.862**
Numeric Seismic Design Value at 0.2 second SA	S_{DS}	1.379	**1.537**
Numeric Seismic Design Value at 1.0 second SA	S_{D1}	null	**1.242**
Site Amplification Factor at 0.2 second	F_a	1	**1**
Site Amplification Factor at 1.0 second	F_v	null	**2.5**
Site Peak Ground Acceleration	PGA_M	0.955	**0.891**

GEOLOGIC HAZARDS

The subject site is located in an active seismic zone and will likely experience strong seismic shaking during the design life of the proposed project. In general, the intensity of ground shaking will depend on several factors including: the distance to the earthquake focus, the earthquake magnitude, the response characteristics of the underlying materials, and the quality and type of construction. Geologic hazards and their relationship to the site are discussed below.

I. Surface Rupture. Surface rupture is expected to occur along preexisting, known active fault traces. However, surface rupture could potentially splay or step from known active faults or rupture along unidentified traces. Based on review of Jennings (1994), CGS (2021) and Morton and Grey (2004) faults are not mapped on the site. In addition, no signs of active surface faulting were observed during our review of non-stereo digitized photographs of the site and site vicinity (Google, 2021). Finally, no signs of active surface rupture or secondary seismic effects (lateral spreading, lurching etc.) were identified on-site during our field investigation. Therefore, it is our opinion that risks associated with primary surface ground rupture should be considered "low".

II. Ground Shaking. The site has been subjected to past ground shaking by faults that traverse through the region. Strong seismic shaking from nearby active faults is expected to produce strong seismic shaking during the design life of the proposed project. Based on site-specific ground motion parameters developed for the property (Appendix C), the site modified peak ground acceleration (PGAm) is estimated to be 0.891g.

III. Liquefaction/Seismic Settlement. Liquefaction is the process in which loose, saturated granular soil loses strength as a result of cyclic loading. The strength loss is a result of a decrease in granular sand volume and a positive increase in pore pressures. Generally, liquefaction can occur if all of the following conditions apply; liquefaction-susceptible soil, groundwater within a depth of 50 feet or less, and strong seismic shaking.

Based on the dense nature of the underlying earth materials and the recorded depth to groundwater in the site vicinity (> 50 ft. bgs) (CDWR, 2021), it is Sladden's professional opinion that risks associated with liquefaction should be considered "negligible".

IV. Tsunamis and Seiches. Because the site is situated at an elevated inland location and is not immediately adjacent to any impounded bodies of water, risk associated with tsunamis and seiches is considered "negligible".

V. Slope Failure, Landslides, Rock Falls. The site is situated on relatively level ground and is not immediately adjacent to any slopes or hillsides that could be potentially susceptible to slope instability. No signs of slope instability in the form of landslides, rock falls, earthflows or slumps were observed at or near the subject site during our investigation. As such, risks associated with slope instability should be considered "negligible".

VI. Expansive Soil. Expansion Index testing of select samples was performed in order to evaluate the expansive potential of the materials underlying the site. Based the results of our laboratory testing (EI = 36), the materials underlying the site are considered to have a "low" expansion potential. Because site grading will result in substantial blending of the near surface soil, expansion potential should be based on post grading expansion test results.

VII. Flooding and Erosion. No signs of flooding or erosion were observed during our field investigation. However, risks associated with flooding and erosion should be evaluated and mitigated by the project design Civil Engineer.

CONCLUSIONS

Based on the results of our investigation, it is our professional opinion that the project should be feasible from a geotechnical perspective provided that the recommendations provided in this report are incorporated into design and carried out through construction. The main geotechnical concerns in the design and construction of the proposed project is the previous site use and the presence of artificial fill soil and potentially compressible surface and near surface soil.

Because of the presence of artificial fill soil and the previous site use, remedial grading including overexcavation and recompaction is recommended for the proposed building and foundation areas. We recommend that remedial grading within the proposed building areas include over-excavation and/or re-compaction of the artificial fill and primary foundation bearing soil. Specific recommendations for site preparation are presented in the Earthwork and Grading section of this report.

Groundwater was not encountered to a maximum explored depth of approximately 51 feet bgs during our field investigation. Based on the conditions encountered during our field investigation, groundwater should not be a factor during the construction of the proposed project.

Caving did occur to varying degrees within each of our exploratory bores and the surface soil may be susceptible to caving within deeper excavations. All excavations should be constructed in accordance with the normal CalOSHA excavation criteria. On the basis of our observations of the materials encountered, we anticipate that the subsoil will conform to that described by CalOSHA as Type C. Soil conditions should be verified in the field by a "Competent person" employed by the Contractor.

The following recommendations present more detailed design criteria that have been developed based on our field investigation and laboratory testing.

EARTHWORK AND GRADING

All earthwork including excavation, backfill and preparation of the surface soil, should be performed in accordance with the geotechnical recommendations presented in this report and portions of the local regulatory requirements, as applicable. All earthwork should be performed under the observation and testing of a qualified soil engineer. The following geotechnical engineering recommendations for the proposed project are based on observations from the field investigation program, laboratory testing and geotechnical engineering analyses.

a. Stripping. Areas to be graded should be cleared of any existing vegetation, associated root systems, and debris. All areas scheduled to receive fill should be cleared of old fills and any irreducible matter. The stripping should be removed off site or stockpiled for later use in landscape areas. Voids left by obstructions should be properly backfilled in accordance with the compaction recommendations of this report.

b. Preparation of Building Areas. In order to achieve a firm and uniform foundation bearing conditions, we recommend over-excavation and re-compaction throughout the building areas. All artificial fill and native low density near surface soil should be removed to competent native soil or to a minimum depth of 3 feet below the bottom of the footings, whichever is deeper. Remedial grading should extend laterally a minimum of five feet beyond the building foundations. The soil exposed by over-excavation should be scarified, moisture conditioned to near optimum moisture content, and compacted to at least 90 percent relative compaction prior to fill placement.

c. Compaction. Soil to be used as engineered fill should be free of organic material, debris, and other deleterious substances, and should not contain irreducible matter greater than three inches in maximum dimension. All fill materials should be placed in thin lifts, not exceeding six inches in a loose condition at near optimum moisture content. If import fill is required, the material should be of a low to non-expansive nature and should meet the following criteria:

Plastic Index	Less than 12
Liquid Limit	Less than 35
Percent Soil Passing #200 Sieve	Between 15% and 35%
Maximum Aggregate Size	3 inches

The subgrade soil and all fill material should be compacted with acceptable compaction equipment to at least 90 percent relative compaction. The exposed subgrade should be observed by a representative of Sladden Engineering prior to fill placement. Compaction testing should be performed in order to verify proper compaction. Table 3 provides a summary of the excavation and compaction recommendations.

TABLE 3
SUMMARY OF RECOMMENDATIONS

*Remedial Grading	Over-excavation and re-compaction within the building envelope and extending laterally at least 5 feet beyond the building limits and to competent native soil or to a minimum depth of 3 feet below the bottom of the footings, whichever is deeper.
Native / Import Engineered Fill	Place in thin lifts not exceeding 6 inches in a loose condition, compact to a minimum of 90 percent relative compaction.
Asphalt Concrete Sections	Compact the top 12 inches to at least 95 percent compaction within 2 percent of optimum moisture content.

*Actual depth may vary and should be determined by a representative of Sladden Engineering in the field during construction.

d. Shrinkage and Subsidence. Volumetric shrinkage of the material that is excavated and replaced as controlled compacted fill should be anticipated. We estimate that this shrinkage could vary from 10 to 15 percent. Subsidence of the surfaces that are scarified and compacted should be between 1 and 2 tenths of a foot. This will vary depending upon the type of equipment used, the moisture content of the soil at the time of grading and the actual degree of compaction attained.

FOUNDATIONS: CONVENTIONAL SHALLOW SPREAD FOOTINGS

The proposed structures may be supported upon conventional shallow spread footings. Exterior footings should extend at least 18 inches beneath lowest adjacent grade and interior footings should extend at least 12 inches below slab subgrade. Isolated square or rectangular footings at least 2 feet square and continuous footings at least 12 inches wide may be designed using allowable bearing pressures of 2000 and 1800 pounds per square foot, respectively. The allowable bearing pressure may be increased by approximately 250 psf for each additional 1 foot of width and 250 psf for each additional 6 inches of depth, if desired. The maximum allowable bearing pressure should be limited to 3000 psf unless confirmed by Sladden Engineering subsequent to performing specific settlement calculations. The allowable bearing pressures are for dead and frequently applied live loads and may be increased by 1/3 to resist wind, seismic or other transient loading. All footings should be reinforced in accordance with the project structural engineer's recommendations.

Based on the allowable bearing pressures recommended above the total static settlement of conventional shallow spread footings is anticipated to be less than one inch, provided that foundation area preparation conforms to the recommendations provided in this report. Differential static settlement is anticipated to be approximately one-half the total static settlement for similarly loaded footings spaced approximately 40 feet apart.

Resistance to lateral loads may be provided by a combination of friction acting at the base of the slabs or foundations and passive earth pressure along the sides of the foundations. A coefficient of friction of 0.45 between soil and concrete may be used for dead load forces only. A passive earth pressure of 275 pounds per square foot, per foot of depth, may be used for the sides of footings that are placed against properly compacted native soil. Passive earth pressure should be ignored within the upper 1 foot except where confined.

All footing excavations should be observed by a representative of the project geotechnical consultant to verify adequate embedment depths prior to placement of forms, steel reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, disturbed, sloughed or moisture-softened soils and/or any construction debris should be removed prior to concrete placement. Excavated soil generated from footing and/or utility trenches should not be stockpiled within the building envelope or in areas of exterior concrete flatwork.

SLABS-ON-GRADE

In order to reduce the risk of heave, cracking and settlement, concrete slabs-on-grade must be placed on properly compacted fill as outlined in the previous sections. The slab subgrades should remain near optimum moisture content and should not be permitted to dry prior to concrete placement. All slab subgrades should be firm and unyielding. Disturbed soil should be removed and then replaced and compacted to a minimum of 90 percent relative compaction.

Slab thickness and reinforcement should be determined by the structural engineer. All slab reinforcement should be supported on concrete chairs to ensure that reinforcement is placed at slab mid-height. Considering the expected uses, we recommend a minimum slab thickness of 6.0 inches within warehouse areas and 4.0 inches within office areas.

Slabs with moisture sensitive surfaces should be underlain with a moisture vapor barrier consisting of a polyvinyl chloride membrane such as 10-mil Visqueen. All laps within the membrane should be sealed and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete and to limit damage. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface can not be achieved by grading, consideration should be given to placing a 1-inch thick leveling course of sand across the pad surface prior to placement of the membrane.

RETAINING WALLS

Cantilever retaining walls may be designed using "active" pressures. Active pressures may be estimated using an equivalent fluid weight of 35 pcf for gently sloping (less than 3H:1V) native backfill soil acting in a triangular pressure distribution with free-draining backfill conditions. "At Rest" pressures should be utilized for restrained walls. At rest pressures may be estimated using an equivalent fluid weight of 55 pcf for native backfill soil with level free-draining backfill conditions.

We recommend that a back drain system be provided behind all retaining walls or that the walls be designed for full hydrostatic pressures. The back drains should consist of a heavy walled, four inch diameter, perforated pipe sloped to drain to outlets by gravity, and of clean, free-draining, three-quarter to one and one-half inch crushed rock or gravel. The crushed rock or gravel should extend to within one foot of the surface. The upper one foot should be backfilled with compacted, fine-grained soil to exclude surface water. A Mirafi 140N (or equivalent) filter cloth should be placed between the on-site native material and the drain rock.

ON-SITE PAVEMENT DESIGN

Asphalt concrete pavements should be designed in accordance with the Caltrans Highway Design Manual based on R-Value and Traffic Index. The R-Value of the near surface was estimated to be 80. On-site soil and any imported soil should be tested after grading for R-Value prior to establishing final pavement design sections. For preliminary pavement design, Traffic Indices (TI) of 6.0 and 7.5 were used for the light duty and heavy duty pavements, respectively. We assumed Asphalt Concrete (AC) over Class II Aggregate Base (AB). The preliminary flexible pavement layer thickness is as follows:

TABLE 5
RECOMMENDED ASPHALT PAVEMENT SECTION LAYER THICKNESS

Pavement Material	Recommended Thickness	
	TI = 6.0	TI = 7.5
Asphalt Concrete Surface Course	3.0 inches	4.0 inches
Class II Aggregate Base Course	4.0 inches	6.0 inches
Compacted Subgrade Soil	12.0 inches	12.0 inches

Asphalt concrete and Class II aggregate base should conform to the latest edition of the Standard Specifications for Public Works Construction ("Greenbook") or CalTrans Standard Specifications. The aggregate base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM Method D 1557.

CORROSION SERIES

The soluble sulfate concentrations of the surface soil were determined to be 340 parts per million (ppm). The soil is considered to have a "low" corrosion potential with respect to concrete. The use of Type V cement and special sulfate resistant concrete mixes should not be required. The soluble sulfate content of the surface soil should be reevaluated after grading and appropriate concrete mix designs should be established based upon post-grading test results.

The pH level of the surface soil was 8.7. Based on soluble chloride concentration testing (90 ppm), the soil is considered to have a "negligible" corrosion potential with respect to normal grade steel. The minimum resistivity of the surface soil was found to be 910 ohm-cm, which suggests that the site soil is considered to have a "severe" corrosion potential with respect to ferrous metal installations. A corrosion expert should be consulted regarding appropriate corrosion protection measures for corrosion sensitive installations.

UTILITY TRENCH BACKFILL

All utility trench backfill should be compacted to a minimum of 90 percent relative compaction. Trench backfill materials should be placed in lifts no greater than six inches in a loose condition, moisture conditioned (or air-dried) as necessary to achieve near optimum moisture content and then mechanically compacted in place to a minimum of 90 percent relative compaction. A representative of the project geotechnical consultant should test the backfill to verify adequate compaction.

EXTERIOR CONCRETE FLATWORK

To minimize cracking of concrete flatwork, the subgrade soil below concrete flatwork areas should first be compacted to a minimum of 90 percent relative compaction. A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soil.

DRAINAGE

All final grades should be provided with positive gradients away from foundations to provide rapid removal of surface water runoff to an adequate discharge point. No water should be allowed to be pond on or immediately adjacent to foundation elements. In order to reduce water infiltration into the subgrade soil, surface water should be directed away from building foundations to an adequate discharge point. Subgrade drainage should be evaluated upon completion of the precise grading plans and in the field during grading.

LIMITATIONS

The findings and recommendations presented in this report are based upon an interpolation of the soil conditions between the exploratory boring locations and extrapolation of these conditions throughout the proposed building area. Should conditions encountered during grading appear different than those indicated in this report, this office should be notified.

The use of this report by other parties or for other projects is not authorized. The recommendations of this report are contingent upon monitoring of the grading operation by a representative of Sladden Engineering. All recommendations are considered to be tentative pending our review of the grading operation and additional testing, if indicated. If others are employed to perform any soil testing, this office should be notified prior to such testing in order to coordinate any required site visits by our representative and to assure indemnification of Sladden Engineering.

We recommend that a pre-job conference be held on the site prior to the initiation of site grading. The purpose of this meeting will be to assure a complete understanding of the recommendations presented in this report as they apply to the actual grading performed.

ADDITIONAL SERVICES

Once completed, final project plans and specifications should be reviewed by use prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. Following review of plans and specifications, observation should be performed by the Soil Engineer during construction to document that foundation elements are founded on/or penetrate into the recommended soil, and that suitable backfill soil is placed upon competent materials and properly compacted at the recommended moisture content.

Tests and observations should be performed during grading by the Soil Engineer or his representative in order to verify that the grading is being performed in accordance with the project specifications. Field density testing shall be performed in accordance with acceptable ASTM test methods. The minimum acceptable degree of compaction should be 90 percent for subgrade soils and 95 percent for Class II aggregate base as obtained by the ASTM Test Method D1557. Where testing indicates insufficient density, additional compactive effort shall be applied until retesting indicates satisfactory compaction.

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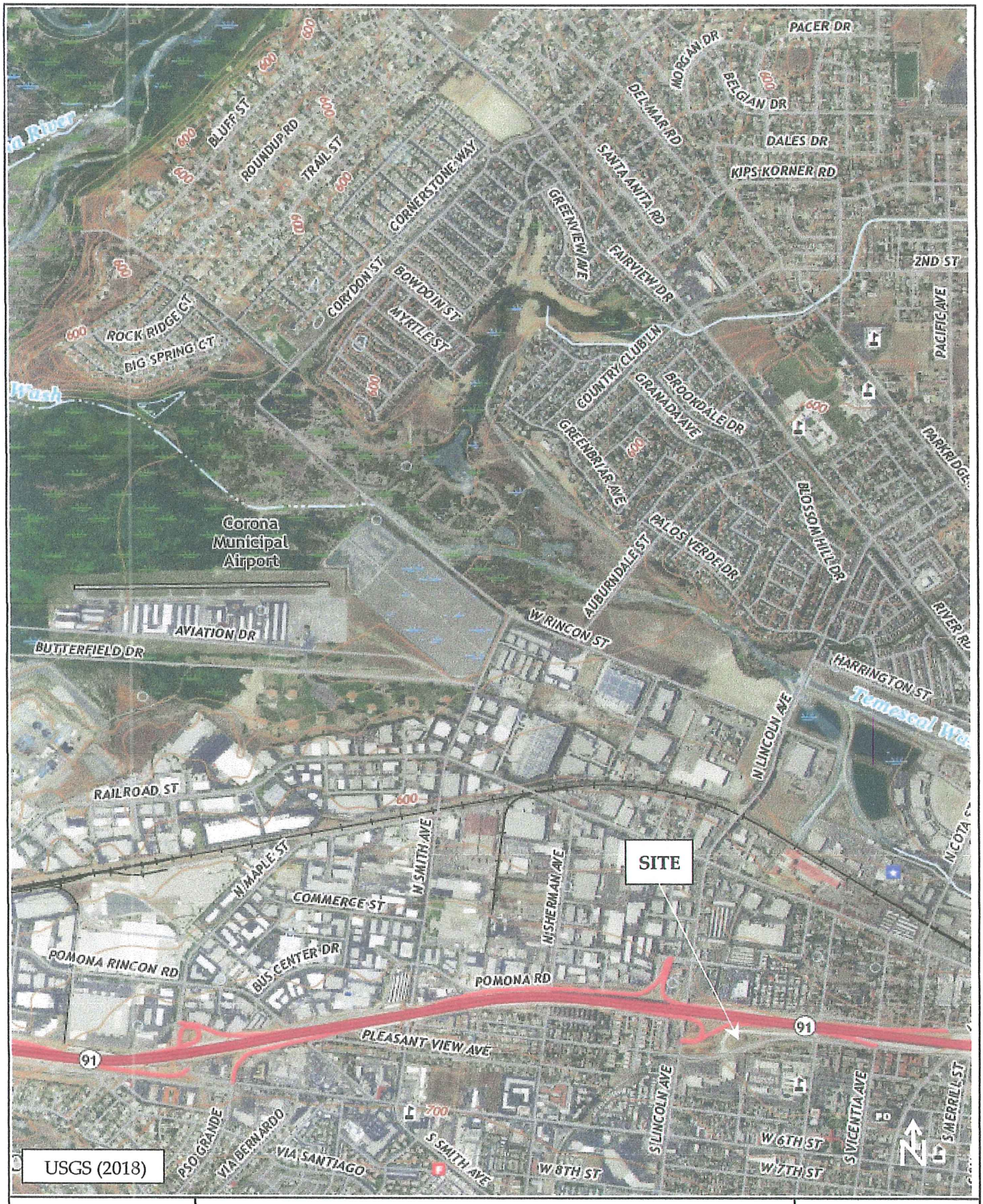
FIGURES

SITE LOCATION MAP
REGIONAL GEOLOGIC MAP
EXPLORATION LOCATION PLAN

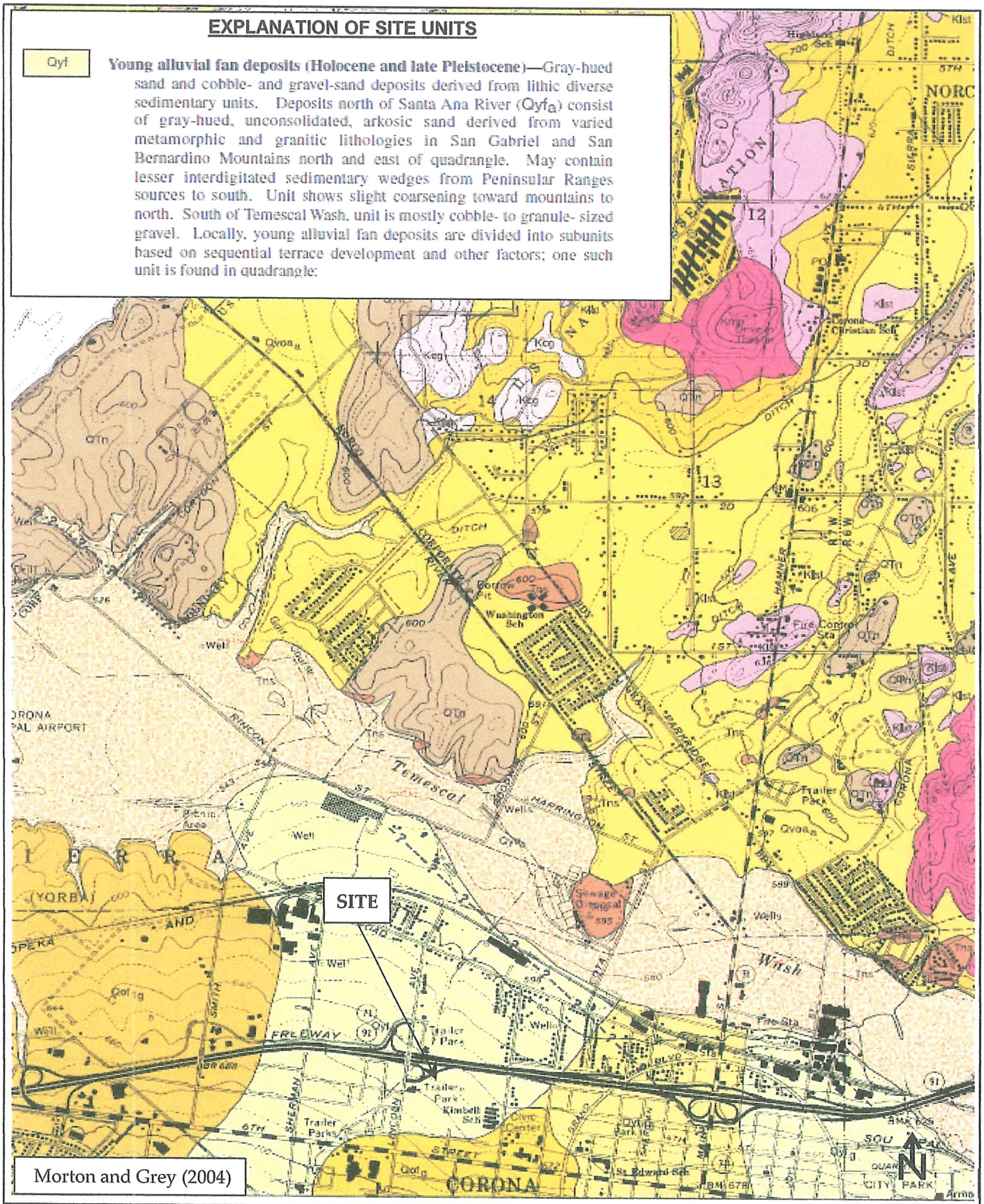


Sladden Engineering	SITE LOCATION MAP	FIGURE 1
	Project Number: 644-21066	
	Report Number: 21-12-143	
	Date: December 16, 2021	

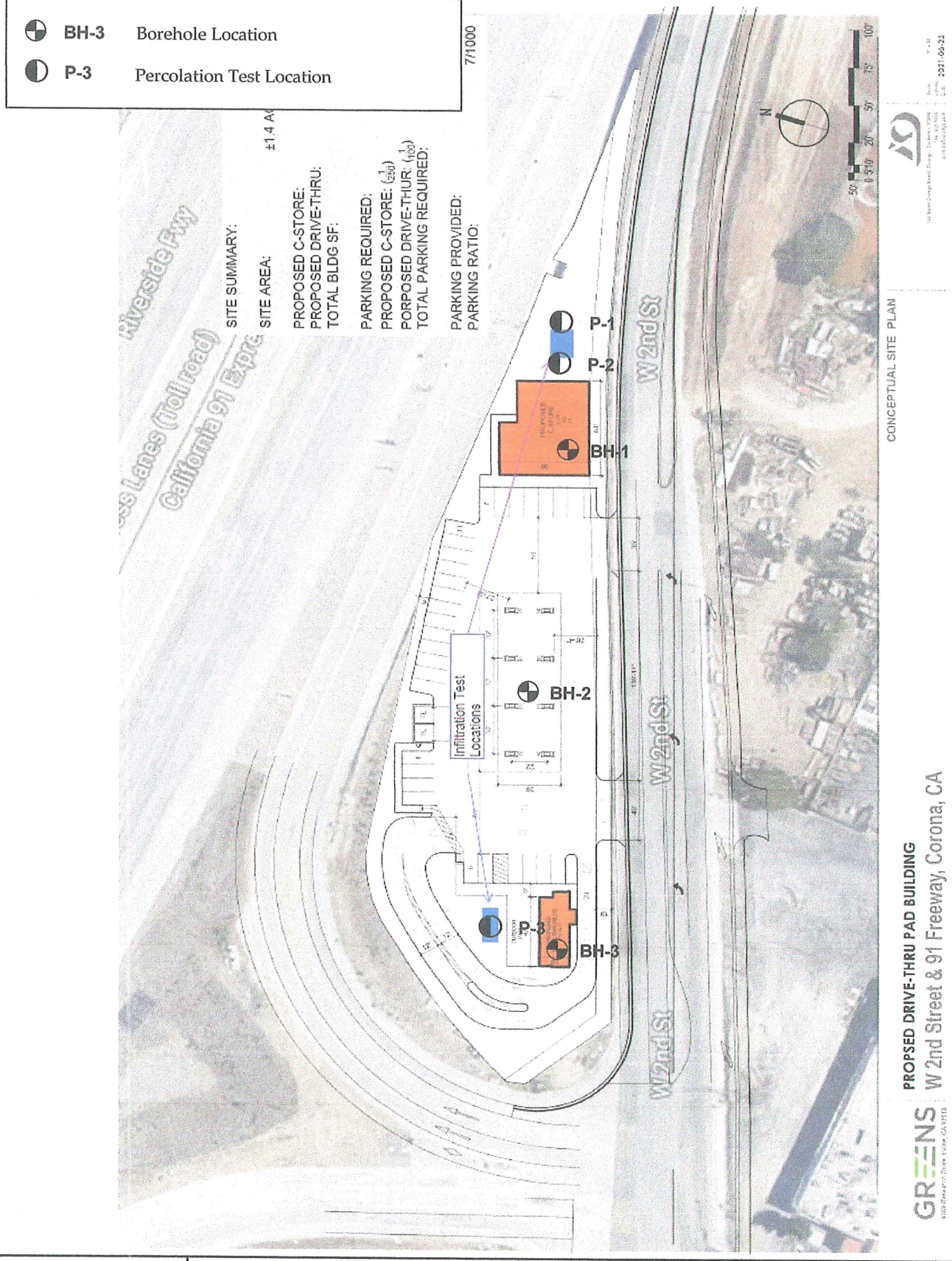
EXPLANATION OF SITE UNITS

Qyf

Young alluvial fan deposits (Holocene and late Pleistocene)—Gray-hued sand and cobble- and gravel-sand deposits derived from lithic diverse sedimentary units. Deposits north of Santa Ana River (Qyf_a) consist of gray-hued, unconsolidated, arkosic sand derived from varied metamorphic and granitic lithologies in San Gabriel and San Bernardino Mountains north and east of quadrangle. May contain lesser interdigitated sedimentary wedges from Peninsular Ranges sources to south. Unit shows slight coarsening toward mountains to north. South of Temescal Wash, unit is mostly cobble- to granule- sized gravel. Locally, young alluvial fan deposits are divided into subunits based on sequential terrace development and other factors; one such unit is found in quadrangle:



Sladden Engineering	REGIONAL GEOLOGIC MAP	FIGURE 2
	Project Number: 644-21066	
	Report Number: 21-12-143	
	Date: December 16, 2021	



EXPLORATION LOCATION PLAN

FIGURE 3

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Sladden Engineering

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

For our field investigation three (3) exploratory bores and three (3) percolation test holes were excavated on October 27, 2021 utilizing a truck mounted hollow stem auger rig (Mobile B-61). Continuous logs of the materials encountered were made by a representative of Sladden Engineering. Materials encountered in the boreholes were classified in accordance with the Unified Soil Classification System which is presented in this appendix.

Representative undisturbed samples were obtained within our bores by driving a thin-walled steel penetration sampler (California split spoon sampler) or a Standard Penetration Test (SPT) sampler with a 140 pound automatic-trip hammer dropping approximately 30 inches (ASTM D1586). The number of blows required to drive the samplers 18 inches was recorded in 6-inch increments and blowcounts are indicated on the boring logs.

The California samplers are 3.0 inches in diameter, carrying brass sample rings having inner diameters of 2.5 inches. The standard penetration samplers are 2.0 inches in diameter with an inner diameter of 1.5 inches. Undisturbed samples were removed from the sampler and placed in moisture sealed containers in order to preserve the natural soil moisture content. Bulk samples were obtained from the excavation spoils and samples were then transported to our laboratory for further observations and testing.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			TYPICAL NAMES	
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN No.200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No.4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY-GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN No.4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN No.200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS & 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, CLEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS: LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

EXPLANATION OF BORE LOG SYMBOLS


California Split-spoon Sample


Unrecovered Sample


Standard Penetration Test Sample


Groundwater depth

Note: The stratification lines on the borelogs represent the approximate boundaries between the soil types; the transitions may be gradual.

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BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	BH-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0–6		Clayey Sand (SC); pale yellowish brown, dry, fine- to coarse-grained (Fill).
X	19 15 16						6		No Recovery.
	6 8 20			26.3	4.3		6–14		Clayey Sand (SC); pale yellowish brown, dry, medium dense, fine- to coarse-grained with gravel (Qyf).
	13 13 15			56.4	6.2	110.3	14–20		Sandy Clay (CL); reddish brown, dry, very stiff, low plasticity with gravel (Qyf).
	28 27 17			16.7	5.2		20–26		Clayey Sand (SC); grayish brown, dry, dense, fine- to coarse-grained with gravel (Qyf).
	36 50-6			5.4	3.8	114.8	26		Sand (SP); grayish brown, dry, very dense, fine- to coarse-grained with gravel (Qyf).
							26–50		Terminated at 26.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No:	644-21066	Page	1
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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	BH-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Clayey Sand (SC); pale yellowish brown, dry, fine- to coarse-grained (Fill).
	2 3 4			49.5	5.0		6		Clayey Sand (SC); pale yellowish brown, dry, loose, fine-grained (Fill).
	8 9 8			47.6	4.8	100.8	10		Clayey Sand (SC); pale yellowish brown, dry, medium dense, fine-grained with gravel (Qyf).
	6 8 8			38.9	6.2		16		Clayey Sand (SC); pale yellowish brown, dry, medium dense, fine-grained with gravel (Qyf).
	50-6						20		No Recovery.
	18 24 35			20.2	5.8		26		Clayey Sand (SC); grayish brown, dry, very dense, fine-grained with gravel (Qyf).
							28		Terminated at 26.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							50		

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No:	644-21066	Page	2
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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	BH-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
	18 15 13	1	36	46.0	8.1		2–4		Clayey Sand (SC); dark yellowish brown, slightly moist, medium dense, fine-grained (Fill).
	16 50-6			7.1	2.2		6–8		Sandy Gravel (GW); yellowish brown, dry to slightly moist, very dense, fine- to coarse-grained (Qyf).
	5 5 7			39.1	9.6		10–12–14		Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine-grained (Qyf).
	5 6 7			57.2	13.5	117.8	16–18		Sandy Clay (CL); reddish brown, slightly moist, medium stiff, low plasticity with gravel (Qyf).
	25 27 23			14.8	5.9		20–22		Clayey Sand (SC); grayish brown, dry, dense, fine- to coarse-grained (Qyf).
							24		Gravel at 24 Feet.
	24 23 30			9.5	5.8	121.9	26–28		Sand (SP); yellowish brown, dry, dense, fine- to coarse-grained (Qyf).
	18 21 35			14.9	5.4		30–32		Clayey Sand (SC); yellowish brown, dry, very dense, fine- to coarse-grained (Qyf).
							34		Gravel at 33 Feet.
	18 50-6			13.1	5.2		36–38		Clayey Gravel (GC); dark yellowish brown, dry to slighlty moist, very dense, fine- to coarse-grained (Qyf).
	6 8 15			26.3	8.6		40–42–44		Clayey Sand (SC); yellowish brown, slightly moist, medium dense, fine- to coarse-grained (Qyf).
	5 8 12			70.0	16.1	113.9	46–48		Sandy Clay (CL); reddish brown, moist, stiff, low plasticity (Qyf).
	13 19 13			26.1	7.7		50		Clayey Sand (SC); yellowish brown, moist, dense, fine- to coarse-grained (Qyf).

Completion Notes:
Terminated at 51.5 Feet bgs.
No Bedrock Encountered.
No Groundwater or Seepage Encountered.

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

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Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	P-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							2		Clayey Sand (SC); dark yellowish brown, slightly moist, fine-to coarse-grained with gravel and debris (Fill).
							4		Silty Sand (SM); dark yellowish brown, slightly moist, fine- to coarse-grained (Qyf).
							6		Terminated at 5.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Cased to Facilitate Percolation Testing
							8		
							10		
							12		
							14		
							16		
							18		
							20		
							22		
							24		
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

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Report No:	21-12-143		

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	P-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0–4		Clayey Sand (SC); dark yellowish brown, slightly moist, fine-to coarse-grained with gravel (Fill).
							4–10		Gravelly Sand (SW); yellowish brown, dry, fine- to coarse-grained (Qyf).
							10		Terminated at 10.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Cased to Facilitate Percolation Testing

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No:	644-21066	Page	5
Report No:	21-12-143		

Sladden Engineering

BORE LOG

Equipment:	MOBILE B-61	Date Drilled:	10/27/2021
Elevation:	655 Ft. (MSL)	Boring No:	P-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Density, pcf	Depth (Feet)	Graphic Lithology	Description
							0–4		Clayey Sand (SC); dark yellowish brown, slightly moist, fine-to coarse-grained with gravel (Fill).
							4–10		Gravelly Sand (SW/SP); yellowish brown, dry, fine- to coarse-grained (Qyf).
							10		Terminated at 10.0 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered. Cased to Facilitate Percolation Testing

Completion Notes:

PROPOSED COMMERCIAL DEVELOPMENT
W. 2ND STREET & 91 FREEWAY, CORONA, CALIFORNIA

Project No: 644-21066
Report No: 21-12-143

APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

Representative bulk and relatively undisturbed soil samples were obtained in the field and returned to our laboratory for additional observations and testing. Laboratory testing was generally performed in two phases. The first phase consisted of testing in order to determine the compaction of the existing natural soil and the general engineering classifications of the soils underlying the site. This testing was performed in order to estimate the engineering characteristics of the soil and to serve as a basis for selecting samples for the second phase of testing. The second phase consisted of soil mechanics testing. This testing including consolidation, shear strength and expansion testing was performed in order to provide a means of developing specific design recommendations based on the mechanical properties of the soil.

CLASSIFICATION AND COMPACTION TESTING

Unit Weight and Moisture Content Determinations: Each undisturbed sample was weighed and measured in order to determine its unit weight. A small portion of each sample was then subjected to testing in order to determine its moisture content. This was used in order to determine the dry density of the soil in its natural condition. The results of this testing are shown on the Bore Logs.

Maximum Density-Optimum Moisture Determinations: Representative soil types were selected for maximum density determinations. This testing was performed in accordance with the ASTM Standard D1557, Test Method A. The results of testing are presented graphically in this appendix. The maximum densities are compared to the field densities of the soil in order to determine the existing relative compaction to the soil.

Classification Testing: Soil samples were selected for classification testing. This testing consists of mechanical grain size analyses. This provides information for developing classifications for the soil in accordance with the Unified Soil Classification System which is presented in the preceding appendix. This classification system categorizes the soil into groups having similar engineering characteristics. The results of this testing is very useful in detecting variations in the soils and in selecting samples for further testing.

SOIL MECHANIC'S TESTING

Expansion Testing: One (1) bulk sample was selected for Expansion testing. Expansion testing was performed in accordance with the UBC Standard 18-2. This testing consists of remolding 4-inch diameter by 1-inch thick test specimens to a moisture content and dry density corresponding to approximately 50 percent saturation. The samples are subjected to a surcharge of 144 pounds per square foot and allowed to reach equilibrium. At that point the specimens are inundated with distilled water. The linear expansion is then measured until complete.

Direct Shear Testing: One (1) sample was selected for Direct Shear testing. This test measures the shear strength of the soil under various normal pressures and is used to develop parameters for foundation design and lateral design. Tests were performed using a recompacted test specimen that was saturated prior to tests. Tests were performed using a strain controlled test apparatus with normal pressures ranging from 800 to 2300 pounds per square foot.

Consolidation Testing: One (1) relatively undisturbed sample was selected for consolidation testing. For this test, a one-inch thick test specimen was subjected to vertical loads varying from 575 psf to 11520 psf applied progressively. The consolidation at each load increment was recorded prior to placement of each subsequent load. The specimens were saturated at 575 psf or 720 psf load increment.

Corrosion Series Testing: The soluble sulfate concentrations of the surface soil were determined in accordance with California Test Method Number (CA) 417. The pH and Minimum Resistivity were determined in accordance with CA 643. The soluble chloride concentrations were determined in accordance with CA 422.

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Maximum Density/Optimum Moisture

ASTM D698/D1557

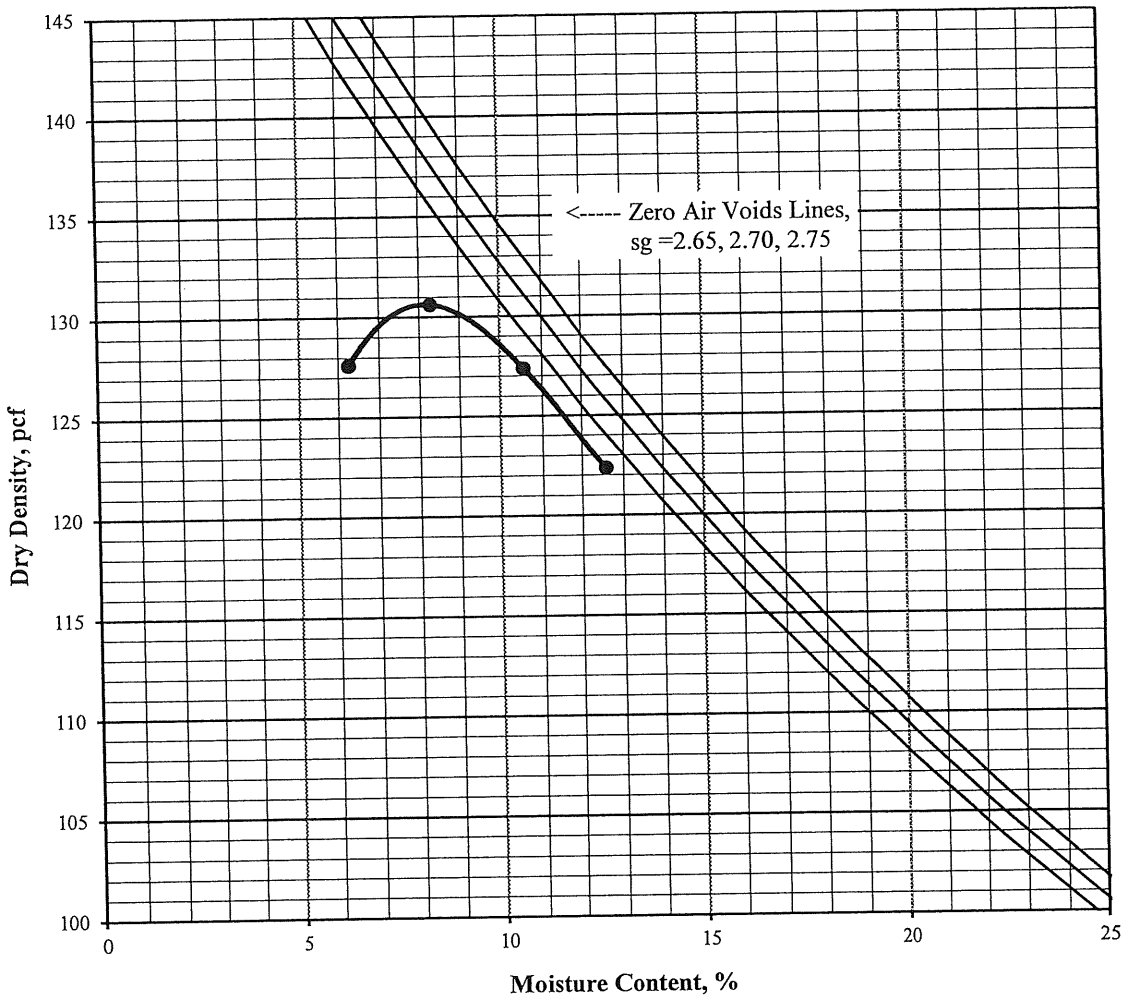
November 23, 2021

Project Number: 644-21066
Project Name: West 2nd Street
Lab ID Number: LN6-21573
Sample Location: BH-3 Bulk 1 @ 0-5'
Description: Dark Brown Clayey Sand w/Gravel (SC)

ASTM D-1557 A
Rammer Type: Machine

Maximum Density: **135 pcf**
Optimum Moisture: **7%**
Corrected for Oversize (ASTM D4718)

Sieve Size	% Retained
3/4"	
3/8"	
#4	15.0



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Expansion Index

ASTM D 4829

November 23, 2021

Job Number: 644-21066

Job Name: West 2nd Street

Lab ID Number: LN6-21573

Sample ID: BH-3 Bulk 1 @ 0-5'

Soil Description: Dark Brown Clayey Sand w/Gravel (SC)

Wt of Soil + Ring:	598.6
Weight of Ring:	191.0
Wt of Wet Soil:	407.6
Percent Moisture:	6.8%
Sample Height, in	0.95
Wet Density, pcf:	130.4
Dry Denstiy, pcf:	122.1

% Saturation:	48.4

Expansion **Rack # 3**

Date/Time	11/19/2021	3:20 PM
Initial Reading	0.0000	
Final Reading	0.0359	

Expansion Index **36**

(Final - Initial) x 1000

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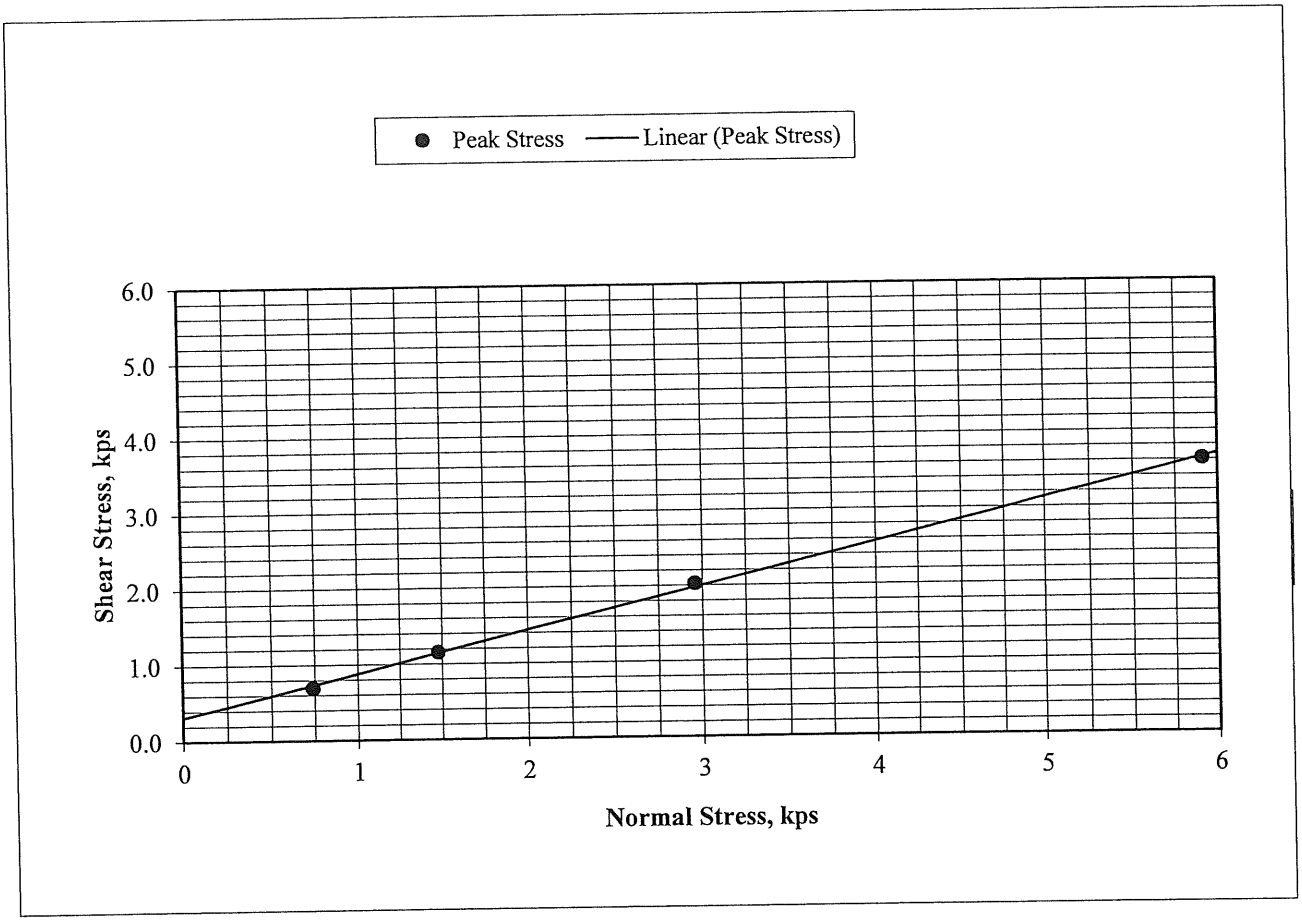
Direct Shear ASTM D 3080-04
(modified for unconsolidated condition)

Job Number: 644-21066
Job Name West 2nd Street
Lab ID No. LN6-21573
Sample ID BH-3 Bulk 1 @ 0-5'
Classification Dark Brown Clayey Sand w/Gravel (SC)
Sample Type Remolded @ 90% of Maximum Density

November 23, 2021
Initial Dry Density: 117.5 pcf
Initial Mosture Content: 8.2 %
Peak Friction Angle (Ø): 29°
Cohesion (c): 320 psf

Test Results	1	2	3	4	Average
Moisture Content, %	15.8	15.8	15.8	15.8	15.8
Saturation, %	98.2	98.2	98.2	98.2	98.2
Normal Stress, kps	0.739	1.479	2.958	5.916	
Peak Stress, kps	0.698	1.155	2.027	3.619	



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Gradation

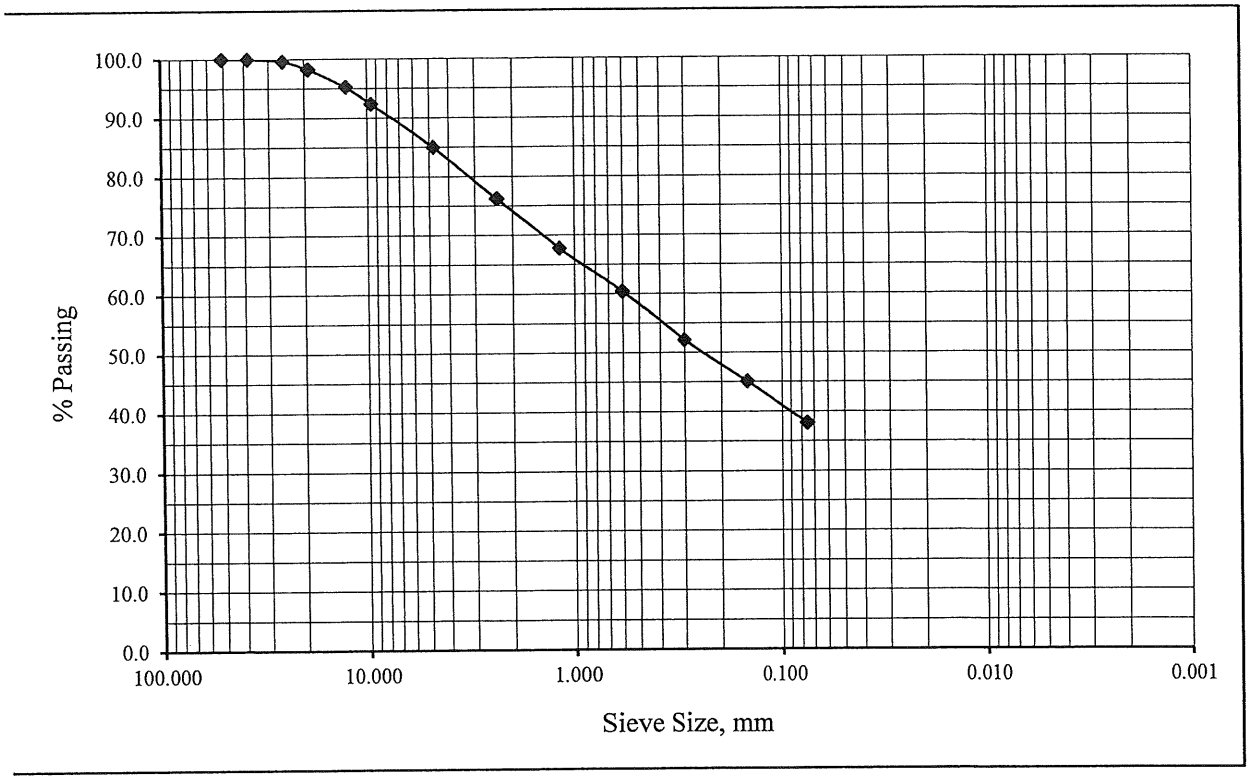
ASTM C117 & C136

Project Number: 644-21066
Project Name: West 2nd Street
Lab ID Number: LN6-21573
Sample ID: BH-3 Bulk 1 @ 0-5'

November 23, 2021

Soil Classification: SC

Sieve Size, in	Sieve Size, mm	Percent Passing
2"	50.8	100.0
1 1/2"	38.1	100.0
1"	25.4	99.6
3/4"	19.1	98.3
1/2"	12.7	95.3
3/8"	9.53	92.4
#4	4.75	85.0
#8	2.36	76.2
#16	1.18	67.8
#30	0.60	60.5
#50	0.30	52.2
#100	0.15	45.1
#200	0.075	38.1



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Gradation

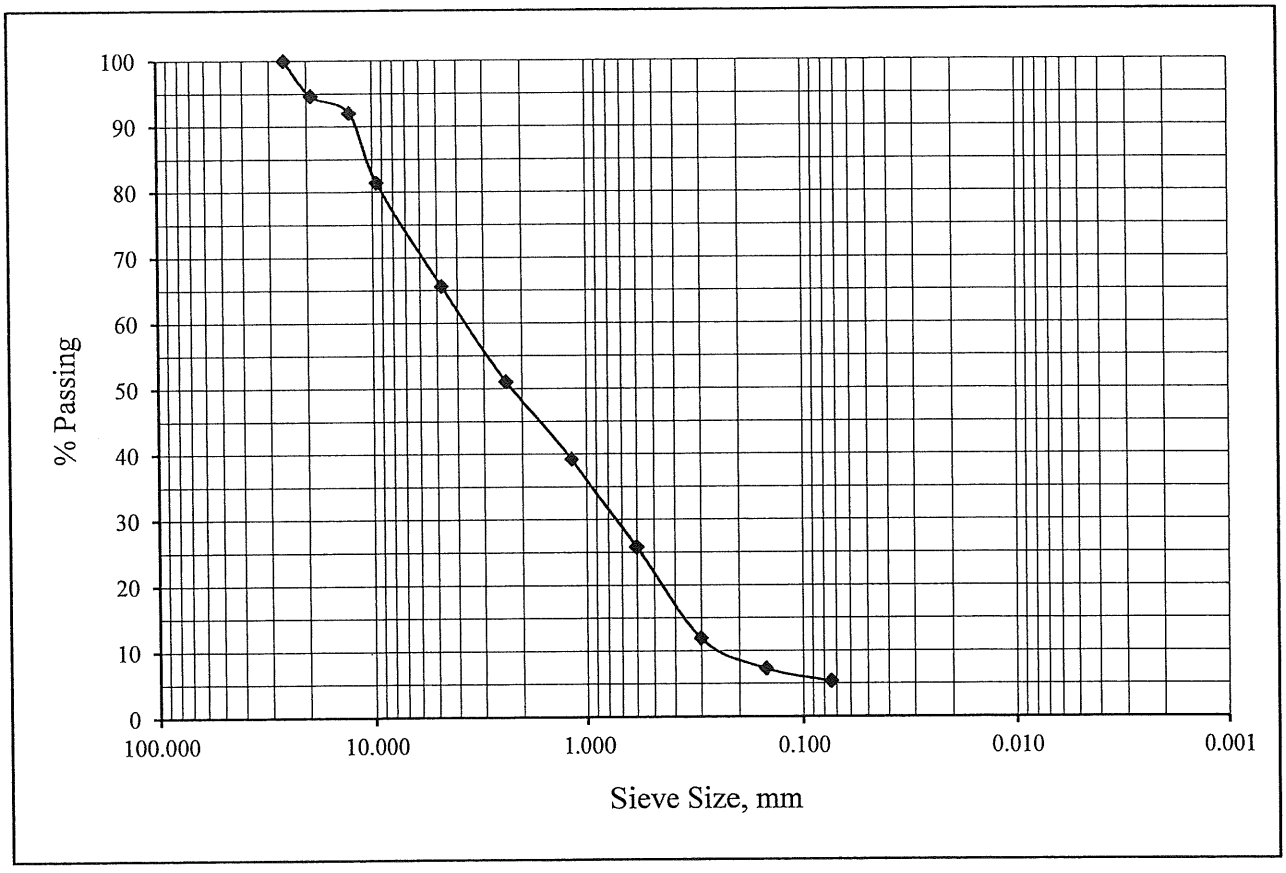
ASTM C117 & C136

Project Number: 644-21066
Project Name: West 2nd Street
Lab ID Number: LN6-21573
Sample ID: BH-1 R-5 @ 25'

November 23, 2021

Soil Classification: SP-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	94.6
1/2"	12.7	92.1
3/8"	9.53	81.4
#4	4.75	65.6
#8	2.36	51.1
#16	1.18	39.3
#30	0.60	25.8
#50	0.30	11.9
#100	0.15	7.3
#200	0.074	5.4



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Gradation

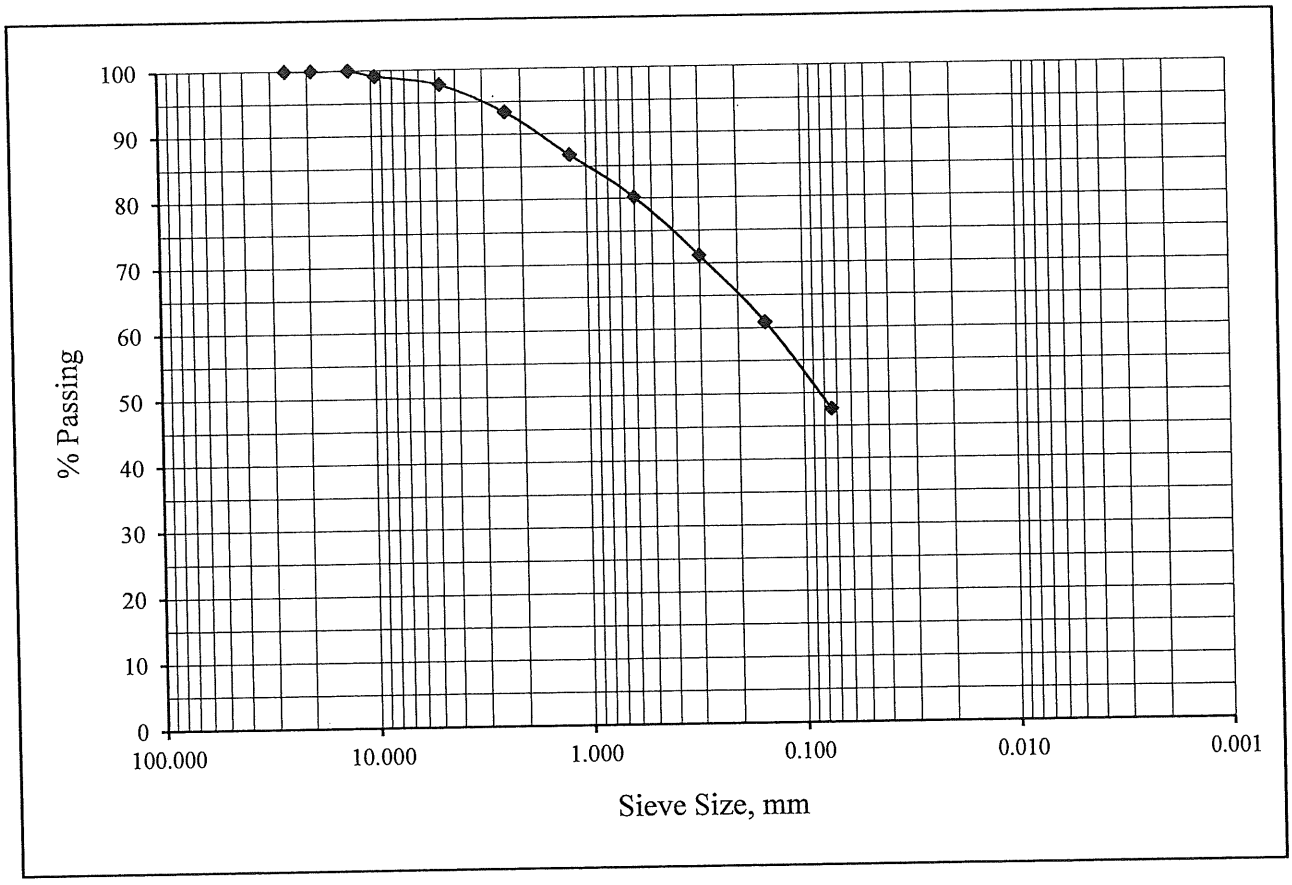
ASTM C117 & C136

November 23, 2021

Project Number: 644-21066
Project Name: West 2nd Street
Lab ID Number: LN6-21573
Sample ID: BH-2 R-2 @ 10'

Soil Classification: SC

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	99.1
#4	4.75	97.7
#8	2.36	93.4
#16	1.18	86.8
#30	0.60	80.2
#50	0.30	71.2
#100	0.15	60.9
#200	0.074	47.6



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Gradation

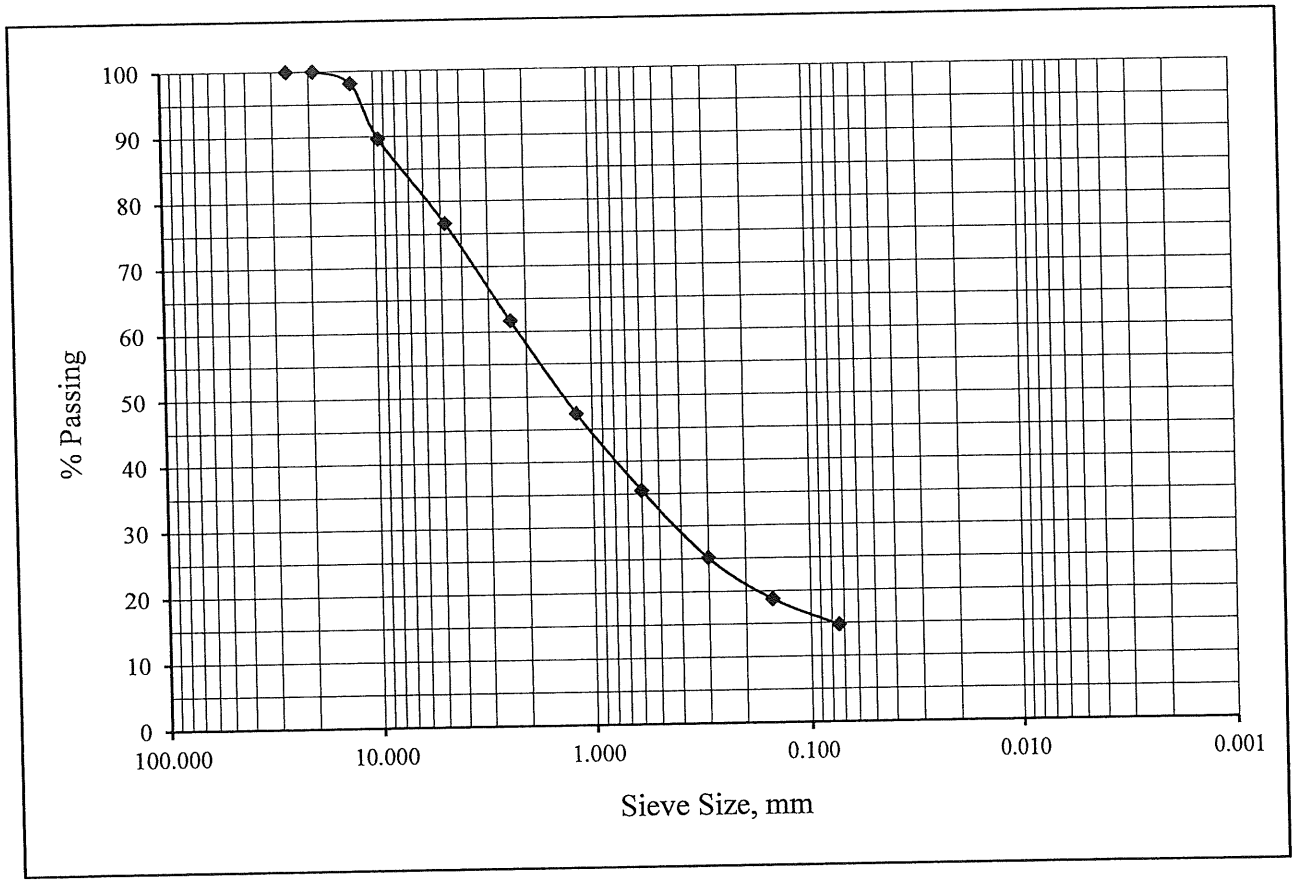
ASTM C117 & C136

November 23, 2021

Project Number: 644-21066
Project Name: West 2nd Street
Lab ID Number: LN6-21573
Sample ID: BH-3 S-5 @ 20'

Soil Classification: SC

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	98.1
3/8"	9.53	89.7
#4	4.75	76.6
#8	2.36	61.7
#16	1.18	47.4
#30	0.60	35.5
#50	0.30	25.1
#100	0.15	18.8
#200	0.074	14.8



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One Dimensional Consolidation

ASTM D2435 & D5333

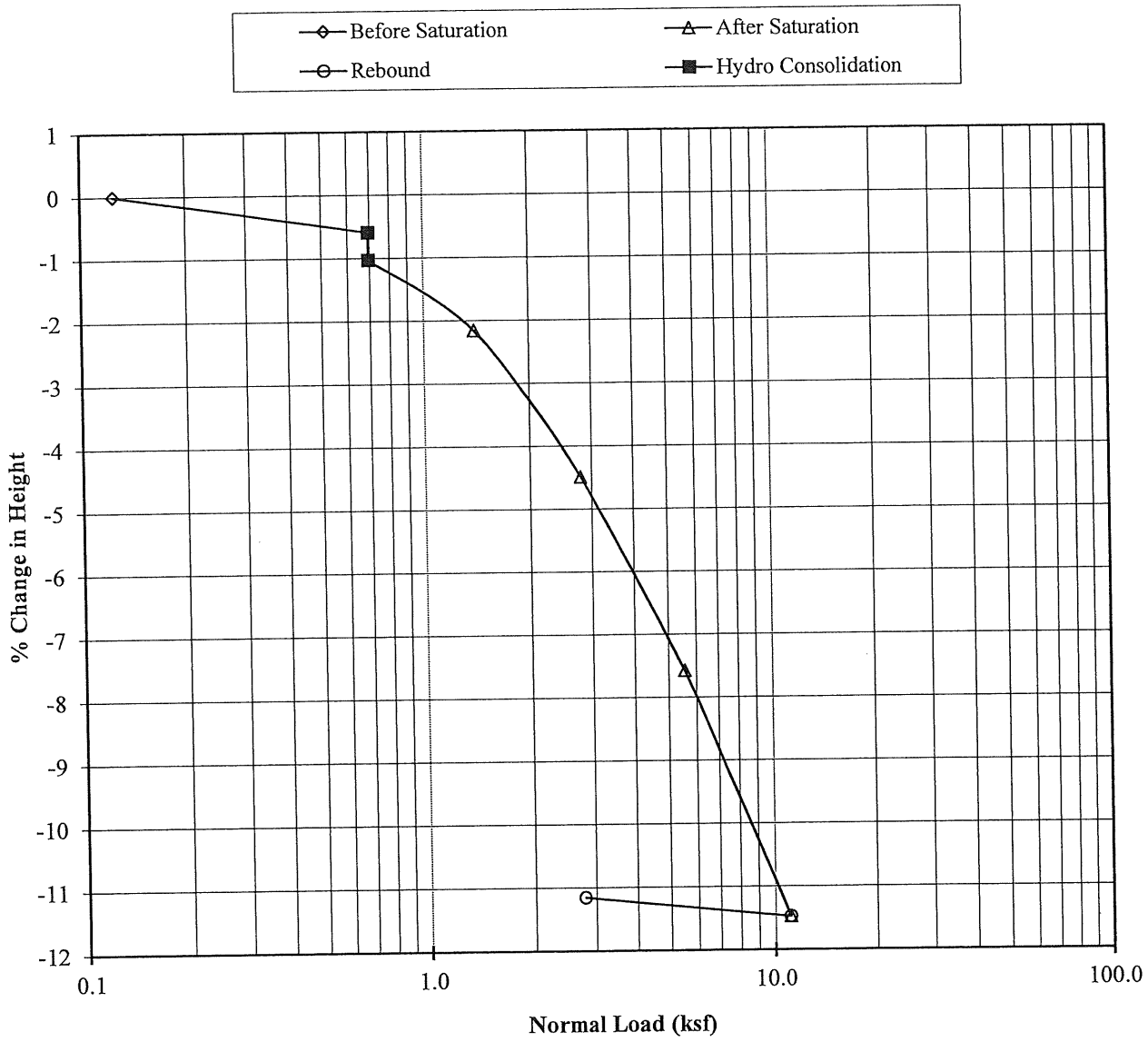
November 23, 2021

Job Number: 644-21066
Job Name: West 2nd Street
Lab ID Number: LN6-21573
Sample ID: BH-2 R-2 @ 10'
Soil Description: Dark Brown Clayey Sand (SC)

Initial Dry Density, pcf:	89.8
Initial Moisture, %:	4.8
Initial Void Ratio:	0.856
Specific Gravity:	2.67

Hydrocollapse: 0.4% @ 0.694 ksf

% Change in Height vs Normal Presssure Diagram



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45090 Golf Center Pkwy, Suite F, Indio CA 92201 (760) 863-0713 Fax (760) 863-0847
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Date: November 23, 2021

Account No.: 644-21066

Customer: Greens Group, Inc.

Location: APN's 118-270-024 & 003, West 2nd Street, Corona

Analytical Report

Corrosion Series

	pH per CA 643	Soluble Sulfates per CA 417 ppm	Soluble Chloride per CA 422 ppm	Min. Resistivity per CA 643 ohm-cm
BH-3 @ 0-5'	8.7	340	90	910

APPENDIX C

SITE-SPECIFIC GROUND MOTION PARAMETERS
SEISMIC DESIGN MAP & REPORT

Project: W. 2nd Street and 91 Freeway, Corona
Project Number: 644-21066
Client: Greens Group, Inc.
Site Lat/Long: 33.8807/-117.5801
Controlling Seismic Source: Elsinore

REFERENCE	NOTATION	VALUE
Site Class	C, D, D default, or E	D measured
Site Class D - Table 11.4-1	F_a	1.0
Site Class D - 21.3(ii)	F_v	2.5
$0.2*(S_{D1}/S_{DS})$	T_0	0.128
S_{D1}/S_{DS}	T_S	0.638
Fundamental Period (12.8.2)	T	Period
Seismic Design Maps or Fig 22-14	T_L	8
Equation 11.4-4 - $2/3*S_{M1}$	S_{D1}	0.8795*
Equation 11.4-2 - F_V*S_1	S_{M1}	1.3192*

REFERENCE	NOTATION	VALUE
Fv (Table 11.4-2)[Used for General Spectrum]	F_v	1.7
Design Maps	S_s	2.068
Design Maps	S_1	0.776
Equation 11.4-1 - F_A*S_S	S_{MS}	2.068*
Equation 11.4-3 - $2/3*S_{MS}$	S_{DS}	1.379*
Design Maps	PGA	0.868
Table 11.8-1	F_{PGA}	1.1
Equation 11.8-1 - F_{PGA}*PGA	PGA_M	0.955*
Section 21.5.3	80% of PGA_M	0.764
Design Maps	C_{RS}	0.915
Design Maps	C_{R1}	0.906

RISK COEFFICIENT

Cr - At Perods <=0.2, Cr=C_{RS}	C_{RS}	0.915
Cr - At Periods >=1.0, Cr=C_{R1}	C_{R1}	0.906

Cr - At Periods between 0.2 and 1.0 use trendline formula to complete

Period	Cr
0.200	0.915
0.300	0.914
0.400	0.913
0.500	0.912
0.600	0.911
0.680	0.910
1.000	0.906

* **Code based design value.** See accompanying data for Site Specific Design values.

Mapped values from https://seismicmaps.org/

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PROBABILISTIC SPECTRA[1]
2% in 50 year Exceedence

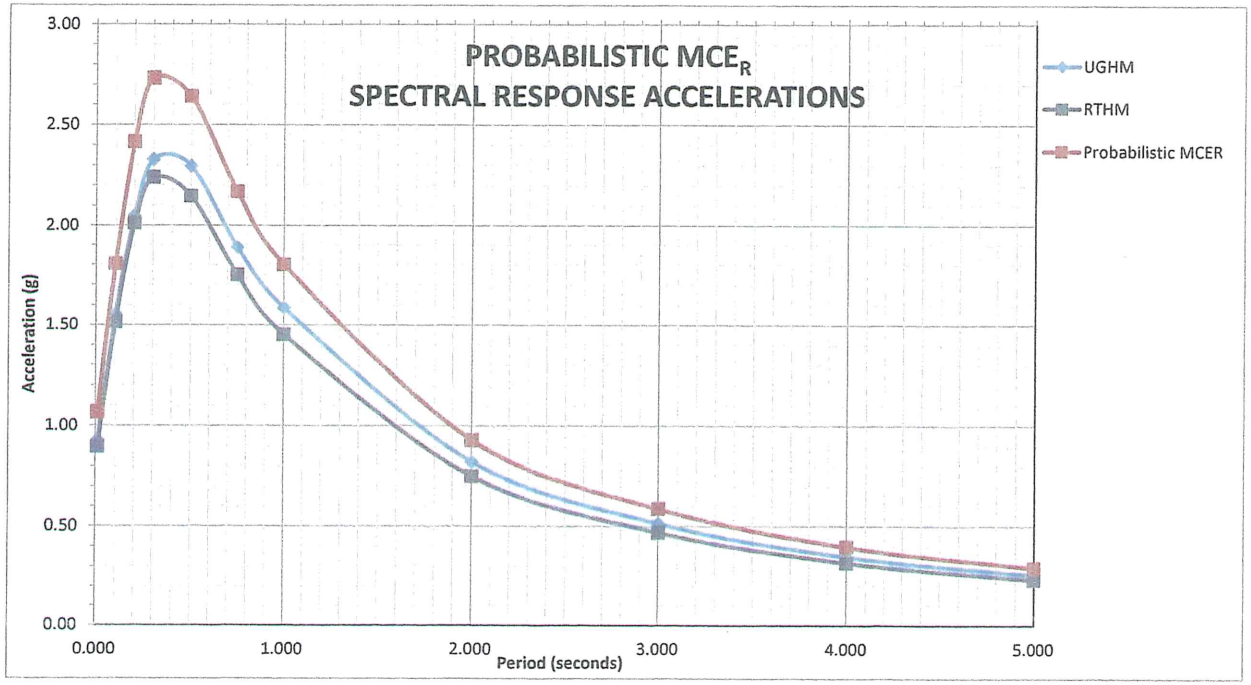
Project No: 644-21066

Period	UGHM	RTHM	Max Directional Scale Factor[2]	Probabilistic MCE
0.010	0.930	0.897	1.19	1.067
0.100	1.555	1.516	1.19	1.804
0.200	2.049	2.012	1.20	2.414
0.300	2.328	2.239	1.22	2.732
0.500	2.296	2.147	1.23	2.641
0.750	1.889	1.749	1.24	2.169
1.000	1.587	1.453	1.24	1.802
2.000	0.823	0.751	1.24	0.931
3.000	0.515	0.470	1.25	0.588
4.000	0.348	0.318	1.25	0.398
5.000	0.257	0.233	1.26	0.294

[1] Data Sources:
https://earthquake.usgs.gov/hazards/interactive/
https://earthquake.usgs.gov/designmaps/rtgm/

[2] Shahi-Baker RotD100/RotD50 Factors (2014)

Probabilistic PGA: 0.930
Is Probabilistic $Sa_{(max)}$<1.2F_a? NO



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DETERMINISTIC SPECTRUM

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations[1]

Controlling Source: Elsinore

Is Probabilistic $Sa_{(max)}$<1.2Fa? NO

Period	Deterministic PSa Median + 1.σ for 5% Damping	Max Directional Scale Factor[2]	Deterministic MCE	Section 21.2.2 Scaling Factor Applied
0.010	0.891	1.19	1.060	1.060
0.020	0.898	1.19	1.068	1.068
0.030	0.909	1.19	1.082	1.082
0.050	0.954	1.19	1.135	1.135
0.075	1.126	1.19	1.340	1.340
0.100	1.324	1.19	1.576	1.576
0.150	1.607	1.20	1.928	1.928
0.200	1.803	1.20	2.163	2.163
0.250	1.970	1.21	2.383	2.383
0.300	2.066	1.22	2.521	2.521
0.400	2.129	1.23	2.619	2.619
0.500	2.083	1.23	2.562	2.562
0.750	1.737	1.24	2.154	2.154
1.000	1.480	1.24	1.835	1.835
1.500	1.060	1.24	1.314	1.314
2.000	0.801	1.24	0.993	0.993
3.000	0.540	1.25	0.675	0.675
4.000	0.365	1.25	0.456	0.456
5.000	0.264	1.26	0.332	0.332

Project No: 644-21066

Is Determinstic $Sa_{(max)}$<1.5*Fa? NO

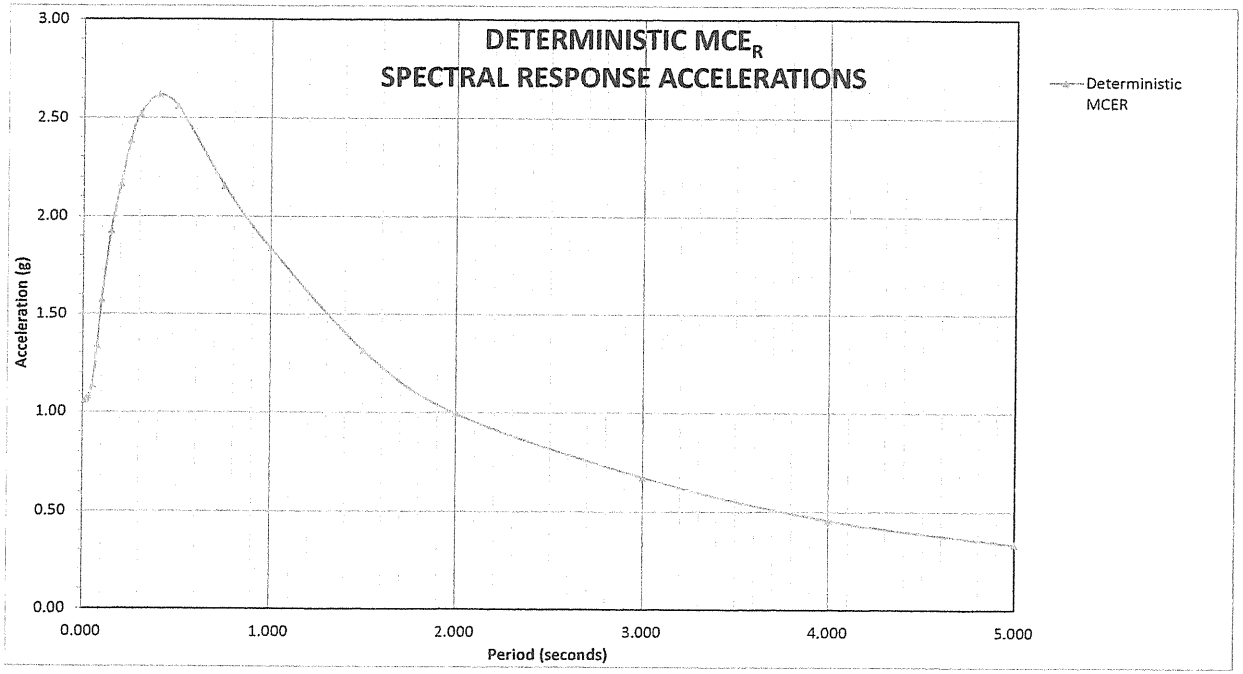
Section 21.2.2 Scaling Factor: N/A

Deterministic PGA: 0.891

Is Deterministic PGA >=F_{PGA}*0.5? YES

[1] NGAWest 2 GMPE worksheet and Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) - Time Dependent Model

[2] Shahi-Baker RotD100/RotD50 Factors (2014)



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SITE SPECIFIC SPECTRA

Period	Probabilistic MCE	Deterministic MCE	Site-Specific MCE	Design Response Spectrum (Sa)
0.010	1.067	1.060	1.060	[illegible]
0.100	1.804	1.576	1.576	[illegible]
0.200	2.414	2.163	2.163	[illegible]
0.300	2.732	2.521	2.521	[illegible]
0.500	2.641	2.562	2.562	[illegible]
0.750	2.169	2.154	2.154	[illegible]
1.000	1.802	1.835	1.802	[illegible]
2.000	0.931	0.993	0.931	[illegible]
3.000	0.588	0.675	0.588	[illegible]
4.000	0.398	0.456	0.398	[illegible]
5.000	0.294	0.332	0.294	[illegible]

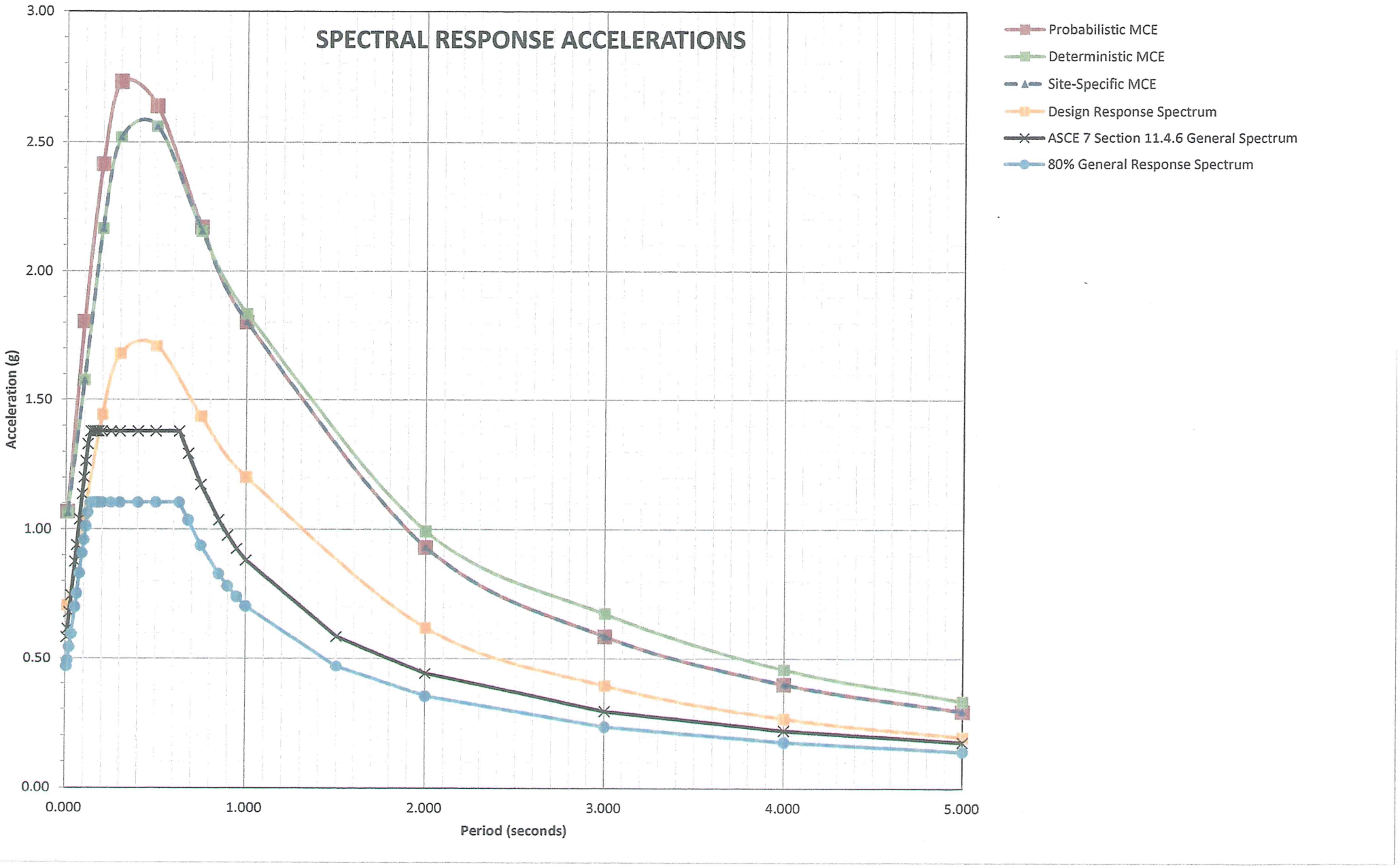
ASCE 7-16: Section 21.4
Site Specific

	Calculated Value	Design Value
SDS:	1.537	1.537
SD1:	1.242	1.242
SMS:	2.306	2.306
SM1:	1.862	1.862
Site Specific PGAm:	0.891	0.891
Site Class:	D measured	

Seismic Design Category - Short* E
Seismic Design Category - 1s* E
* Risk Categories I, II, or III

Period	ASCE 7 SECTION 11.4.6 General Spectrum	80% General Response Spectrum
0.005	0.584	0.467
0.010	0.616	0.493
0.020	0.681	0.545
0.030	0.746	0.597
0.050	0.876	0.701
0.060	0.940	0.752
0.075	1.038	0.830
0.090	1.135	0.908
0.100	1.200	0.960
0.110	1.265	1.012
0.120	1.330	1.064
0.136	1.379	1.103
0.150	1.379	1.103
0.160	1.379	1.103
0.170	1.379	1.103
0.180	1.379	1.103
0.200	1.379	1.103
0.250	1.379	1.103
0.300	1.379	1.103
0.400	1.379	1.103
0.500	1.379	1.103
0.630	1.379	1.103
0.680	1.293	1.035
0.750	1.173	0.938
0.850	1.035	0.828
0.900	0.977	0.782
0.950	0.926	0.741
1.000	0.879	0.704
1.500	0.586	0.469
2.000	0.440	0.352
3.000	0.293	0.235
4.000	0.220	0.176
5.000	0.176	0.141

Project No: 644-21066


SPECTRAL RESPONSE ACCELERATIONS
Acceleration (g)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.000
1.000
2.000
3.000
4.000
5.000
Period (seconds)
Probabilistic MCE
Deterministic MCE
Site-Specific MCE
Design Response Spectrum
ASCE 7 Section 11.4.6 General Spectrum
80% General Response Spectrum

W 2nd Street and 91 Freeway, Corona

Latitude, Longitude: 33.8807, -117.5801

Date	12/16/2021, 1:49:56 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.068	MCE_R ground motion. (for 0.2 second period)
S_1	0.776	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.068	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.379	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.868	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.955	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.193	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.398	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.068	Factored deterministic acceleration value. (0.2 second)
S1RT	0.776	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.856	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.81	Factored deterministic acceleration value. (1.0 second)
PGAd	0.868	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.915	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	0.906	Mapped value of the risk coefficient at a period of 1 s

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Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

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PHASE 1 ENVIRONMENTAL SITE ASSESSMENT REPORT

FEBRUARY 6, 2024
PROJECT # P1E 2024-01-07

SUBJECT PROPERTY
231 SOUTH LINCOLN AVENUE
CORONA, CA 92882
APNs: 118-270-024 and 118-270-054

PREPARED FOR:
ASHUTOSH KADAKIA
16530 BAKE PARKWAY,
IRVINE, CA 92618
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(949) 359-3858

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT REPORT
231 South Lincoln Avenue, Corona, CA 92882

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1.0 EXECUTIVE SUMMARY

A Phase 1 Environmental Site Assessment has been conducted for the Subject Property, a summary of the Findings, Opinion, Conclusions and Recommendations are provided below:

Findings:	***Comments***
Site Legal Description	The Subject Property consists of two parcels, located at 231 South Lincoln Avenue, Corona, CA 92882. The property is identified as APN 118270024 and 118270054.
Subject Property History	In 1948, the property consists of vacant land and portions of the rear yard and detached garage of at least one single family home. By 1971, the homes were cleared, and the west portion of the Subject Property is vacant land, A mobile home park exists to the east which includes the east portion of the Subject Property. By 1980, the auto dealership on the west portion of the Subject Property appears to be under construction and has been completed and listed as Honda Cars of Corona in 1981. By 1994, the auto dealership and mobile home park existed and extend beyond the Subject Property boundaries. The Subject Property appears similar from 2005 to 2010. By 2016, the dealership and mobile home park has been cleared and the property is currently under grading for the expansion of the freeway to the north, including a large soil mound on the west portion of the Subject Property. By 2022, the property is a vacant lot.
Site Observations	The Subject Property is a vacant lot. No significant staining was observed throughout the outdoor grounds of the Subject Property.
EDR Findings for Subject Property	The Subject Property was listed in Environmental Records Sources searched 231 South Lincoln Avenue, Corona, CA under the LUST, RCRA-SQG, SWEEPS UST, HIST UST, CA FID UST, CORTESE, CERS, HWTS, HAZNET, FINDS, ECHO, and UST FINDER RELEASE databases, and is discussed in Section 5.2.
EDR Findings for Adjacent Properties	The adjacent properties to the north and south were listed and are discussed in Section 5.3.
EDR Findings for Surrounding Properties	Surrounding Sites identified as a potential concern are discussed in Section 5.4.
Local Records	A Case Closure letter and Case Summary were located on GEOTRACKER for Honda Cars of Corona (Former) and are discussed in Section 6.2. A record request was submitted to the Riverside County Department of Environmental Health regarding the closed LUST case listed for Suzuki Cars and Trucks of Corona (Honda Cars of Corona (Former) which is listed on GEOTRACKER as closed as of December 2011. As of the date of this report, they have not completed a review of their records.

Opinions:	***Identified?***		***Comments***
	Yes	***No***	
Recognized Environmental Condition (REC)	**X**		During the expansion of the freeway and construction of freeway ramps, the Subject Property was utilized as storage of soils, with portions of the property being graded. It is unclear if off-site soils were temporarily stored on property or if any were left on site in the grading of the lot to its current state; therefore, the import of soils

			from an unknown location to the Subject Property is considered a significant data gap and is a REC.
Historical Recognized Environmental Condition (HREC)	**X**		The Subject Property is located within the boundary of the former Honda Cars of Corona which operated from the 1980s to 2000s. A release was identified during the removal of two USTs in 1997, assessments occurred from 1998 to 2004 with remediation (SVE) in 2003 and 2006 to 2007. Confirmation soil sampling was conducted in January 2011. Remains chemicals of concern were identified from a depth of 5 feet below ground surface to a depth of 85 feet below ground surface. A Closure Letter was issued on December 1, 2011. Based on the remaining chemicals of concern in soil and case closure, this is considered a HREC.
Controlled Recognized Environmental Condition (CREC)		**X**	No CRECs were identified.
Significant Data Gaps	**X**		See REC.
Vapor Intrusion Risk	**X**		See REC.
De Minimis Condition		**X**	No De Minimis Conditions were identified.
Business Environmental Risk (BER)		**X**	No Business Environmental Risks were identified.

Conclusion

We have performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E1527-21 of the Subject Property which consists of two parcels, located at 231 South Lincoln Avenue, Corona, CA 92882. The Subject Property is identified as APNs 118270024 and 118270054. Any exceptions to, or deletions from, this practice are described in the Limitations Section of this report. This assessment has revealed the following recognized environmental conditions, historical recognized environmental conditions, controlled recognized environmental conditions, and/or significant data gaps in connection with the Subject Property:

- REC – Soil of unknown source was stored and potentially used to grade the Subject Property during expansion of the adjoining freeway to the north.
- HREC – Closed LUST case for former Honda Cars of Corona.

Recommendations

Additional Environmental Investigations are recommended at this time. A soil investigation is recommended to determine if Subject Property has been impacted by the potential import of soils from an unknown source.

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SOIL SAMPLING LETTER

FEBRUARY 20, 2024
PROJECT # P1E 2024-02-06

SUBJECT PROPERTY

231 SOUTH LINCOLN AVENUE,
CORONA, CA 92882
APNS: 118270024 AND 118270054

PREPARED FOR:

ASHUTOSH KADAKIA
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SOIL SAMPLING LETTER
231 SOUTH LINCOLN AVENUE, CORONA, CA 92882

Table of Contents

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Subject: Soil Sampling Letter for
231 South Lincoln Avenue,
Corona, CA 92882

1. Introduction

As requested, Priority One Environmental, Inc. has prepared a Soil Sampling Letter for the property located at 231 South Lincoln Avenue, Corona, CA 92882 (Subject Property).

The purpose of this sampling is to determine if soils used in the grading of the Subject Property by Caltrans during freeway expansion is free of contamination.

2. Sampling Strategy

1. Three boreholes will be dug at specific portions of the site and one soil sample will be collected from each borehole.
2. Soil samples will be collected using the following Protocol:

- Samples should be obtained using hand tools and samples will be collected 3-6” below ground surface.
- Each sample shall be described by a staff scientist.
- Soil samples will be retained and shipped under proper chain-of-custody to the laboratory for analysis.
- Soil samples shall have an EPA approved/appropriate Method analysis performed. QA/QC sampling should also follow regulatory agency guidelines. Suggested analyses include:
- Total Petroleum hydrocarbons TPH-g, TPH-d, and TPH-mo shall be analyzed.
- Volatile Organic Compounds (VOCs) by EPA 8021B or other approved method for petroleum or chlorinated contaminants.
- RCRA CAM 17 Metals.

Soil Sampling Method

Samples were obtained using hand tools to achieve the desired depth. Samples were collected in a container and a composite sample was collected from each of the three sets and placed in lab approved glass jars. The selected samples were immediately placed on ice and transported under chain of custody to DHS-certified Enviro-Chem, Inc. in Pomona, California.

1. Laboratory Results

Soil Laboratory

Lab Name	Enviro Chem Laboratories
Lab Location	Pomona, CA.
# Of soil samples delivered:	3
# Of water samples delivered:	N/A
# Of soil vapor samples delivered:	N/A
Date samples delivered to Lab	2/13/2024
Date results were provided to P1E.	2/20/2024

Laboratory Result for Soil

The table below presents the laboratory results as reported by Enviro Chem, Inc. Complete laboratory results are attached. The Regional Screening Levels were reviewed for each chemical in a residential setting. Screening levels provide a risk-based determination of environmental concerns on a potentially contaminated property. Note that the lab reports concentrations are in parts per million (mg/kg). If there is a number in the column in the table, it means a chemical was detected and the number represents the concentration. If there is a ND in the column it means *"non-Detect"*. Results in **bold** indicate levels detected above regional screening levels.

Analysis: Total Petroleum Hydrocarbons (TPH) Carbon Chain Analysis EPA Method 8015B Unit: mg/Kg			
Sample ID	**C-4-C10**	**C10-C28**	**C28-C35**
S-1	ND	ND	ND
S-2	ND	11.6	80.4
S-3	ND	31.8	259
RSL (Tier 1)	100	260	1,600

Samples S-1 was non detect. Samples S-2 and S-3 detected a low level of Total Petroleum Hydrocarbons in the Diesel and Motor Oil range, below tier 1 screening levels.

Volatile Organic Compounds (VOCs) EPA Method 5030B/8260B Unit: mg/Kg						
Sample ID		S-1	S-2	S-3	**Regional Screening Level**	
Compound		CONC mg/kg	CONC mg/kg	CONC mg/kg	**Tier 1 ESLs**	**Com/Ind**
Acetone		ND	ND	ND	--	--
Benzene		ND	ND	ND	--	--
Bromobenzene		ND	ND	ND	--	--
Bromochloromethane		ND	ND	ND	--	--
Bromodichloromethane		ND	ND	ND	--	--
Bromoform		ND	ND	ND	--	--
Bromoethane		ND	ND	ND	--	--
2-Butanone (MEK)		ND	ND	ND	--	--

n-Butylbenzene		ND	ND	ND	--	--
Sec-Butylbenzene		ND	ND	ND	--	--
Tert-butylbenzene		ND	ND	ND	--	--
Carbon Tetrachloride		ND	ND	ND	--	--
Chlorobenzene		ND	ND	ND	--	--
Chloroethane		ND	ND	ND	--	--
Chloroform		ND	ND	ND	--	--
Chloromethane		ND	ND	ND	--	--
2-Chlorotoluene		ND	ND	ND	--	--
4-Chlorotoluene		ND	ND	ND	--	--
Cyclohexane		ND	ND	ND	--	--
Dibromochloromethane		ND	ND	ND	--	--
1,2-Dibromo-3-chloropropane		ND	ND	ND	--	--
1,2-Dibromoethane		ND	ND	ND	--	--
Dibromoethane		ND	ND	ND	--	--
1,2-Dichlorobenzene		ND	ND	ND	--	--
1,3-Dichlorobenzene		ND	ND	ND	--	--
1,4-Dichlorobenzene		ND	ND	ND	--	--
Dichlorodifluoromethane		ND	ND	ND	--	--
1,1-Dichloroethane		ND	ND	ND	--	--
1,2-Dichloroethene		ND	ND	ND	--	--
1,1-Dichloroethene		ND	ND	ND	--	--
Cis-1,2-Dichloroethene		ND	ND	ND	--	--
Trans-1,2-Dichloroethene		ND	ND	ND	--	--
1,2-Dichloropropane		ND	ND	ND	--	--
2,2-Dichloropropane		ND	ND	ND	--	--
1,3-Dichloropropane		ND	ND	ND	--	--
1,1-Dichloropropene		ND	ND	ND	--	--
Cis-1,3-Dichloropropene		ND	ND	ND	--	--
Trans-1,3-Dichloropropene		ND	ND	ND	--	--
Ethylbenzene		ND	ND	ND	--	--
2-Hexanone		ND	ND	ND	--	--
Hexachlorobutadiene		ND	ND	ND	--	--
Isopropylbenzene		ND	ND	ND	--	--
4-Isopropyltoluene		ND	ND	ND	--	--
4-Methyl-2-Pentanone		ND	ND	ND	--	--
Methyl Tert-Butyl Ether (MTBE)		ND	ND	ND	--	--
Methylene Chloride		ND	ND	ND	--	--
Naphthalene		ND	ND	ND	--	--
n-Propylbenzene		ND	ND	ND	--	--
Styrene		ND	ND	ND	--	--
1,1,1,2-Tetrachloroethane		ND	ND	ND	--	--
1,1,2,2-Tetrachloroethane		ND	ND	ND	--	--
Tetrachloroethene (PCE)		ND	ND	ND	--	--
Toluene		ND	ND	ND	--	--
1,2,3-Trichlorobenzene		ND	ND	ND	--	--
1,2,4-Trichlorobenzene		ND	ND	ND	--	--
1,1,1-Trichloroethane		ND	ND	ND	--	--

1,1,2-Trichloroethane		ND	ND	ND	--	--
Trichloroethene (TCE)		ND	ND	ND	--	--
Trichlorofluoromethane		ND	ND	ND	--	--
1,2,3-Trichloropropane		ND	ND	ND	--	--
1,2,4-Trimethylbenzene		ND	ND	ND	--	--
1,3,5-Trimethylbenzene		ND	ND	ND	--	--
Vinyl Chloride		ND	ND	ND	--	--
m/p-Xylene		ND	ND	ND	--	--
o-Xylene		ND	ND	ND	--	--

All samples were non-detect of Volatile Organic Compounds (VOCs)

Metals				
Element	Concentration (mg/Kg)			RSLs
Sample ID	S-1	S-2	S-3	Tier 1
Antimony (Sb)	ND	ND	ND	--
Arsenic (As)	**9.99**	**10.5**	**6.17**	0.26
Barium (Ba)	75.5	124	86	390
Beryllium (Be)	ND	ND	ND	--
Cadmium (Cd)	**2.91**	**3.39**	**2.46**	1.90
Chromium Total (Cr)	42	46.9	39.0	160
Chromium VI (Cr6)	--	--	--	--
Cobalt (Co)	10.4	10.2	8.36	23
Copper (Cu)	16.3	16.5	21.0	180
Lead (Pb)	7.13	10.8	8.04	32
Mercury (Hg)	0.037	0.035	0.020	13
Molybdenum (Mo)	ND	ND	ND	--
Nickel (Ni)	10.2	12.1	10.9	86
Selenium (Se)	ND	ND	ND	--
Silver (Ag)	ND	ND	ND	--
Thallium (T1)	ND	ND	ND	--
Vanadium (V)	**38.6**	**47.3**	**33.6**	18
Zinc (Zn)	78.3	84.7	82.2	340

Arsenic was detected in all samples above the 2019 Regional Screening Levels. However, a report commissioned by the U.S. Department of Energy and conducted by the Lawrence Berkeley National Laboratory at the University of California states that the 95th percentile background level for California is between 14 and 17 mg/kg. (Please see the Appendix for the full report.) As such, the levels detected are well within normal background levels for the area and are not anticipated to impact human health at this time.

The elevated metals were compared to the results of the Report "Background Concentrations of Trace and Major Elements in California Soils" by Kearney Foundation of Soil Science, Division Of Agriculture And Natural Resources, University Of California, Dated March 1996[2]. The comparison for Vanadium is as follows:

Evaluation of Metals to Background Report				
Metal	**Maximum identified on Site**	**Tier 1 Level**	**Average Background Level**	**Maximum Background Level**
Vanadium	47.3 mg/kg	18 mg/kg	112 mg/kg	288 mg/kg
Cadmium	3.39 mg/kg	1.90 mg/kg	0.36 mg/kg	1.70 mg/kg

Based on the above evaluation, the levels of Vanadium reported in the samples analyzed from the site appear to be within the maximum reported background levels within California. The sample results appear to be background levels and not contamination.

Cadmium was detected in all three samples (2.91, 3.39, and 2.46 mg/kg, respectively) above tier 1 screening levels. However, the levels are well below the commercial/industrial screening levels 1,100 mg/kg.

Summary and Opinion

Three composite samples of nine locations were collected (S-1, S-2, and S-3). See Plate 1 attached in the appendix.

- Low levels of Total Petroleum Hydrocarbons in the diesel and motor oil range were detected in S-2 and S-3 below tier 1 screening levels.
- Soil samples were non-detect for Volatile Organic Compounds (VOCs)
- Metals were consistent with regional background levels, except for Cadmium which was detected in all three soils samples (2.91, 3.39, and 2.46 mg/kg, respectively) above tier 1 screening levels. However, the levels are well below the commercial/industrial screening levels 1,100 mg/kg. Based on the proposed use of the Subject Property as commercial use, the levels detected are not anticipated to impact the Subject Property.

Conclusion/Recommendations

The purpose of this sampling is to determine if soils used in the grading of the Subject Property by Caltrans during freeway expansion is free of contamination. Based on the results of this soil sampling investigation, no further action is recommended.

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

N/A

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Woodard Group	Date	5/1/2024
Designed by	OG	Case No	
Company Project Number/Name	2nd Street & 91 Freeway - Corona		

BMP Identification

BMP NAME / ID: BMP-1 - INFILTRATION TRENCH

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.75 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
1-A	*39604*	*Concrete or Asphalt*	*1*	*0.89*	*35326.8*			
1-B	*5456*	*Roofs*	*1*	*0.89*	*4866.8*			
1-C	*13380*	*Ornamental Landscaping*	*0.1*	*0.11*	*1477.9*			
	58440	***Total***			**41671.5**	**0.75**	***2604.5***	***3567***

Notes:

Infiltration Trench - Design Procedure	BMP ID: BMP-1	Legend:	Required Entries / Calculated Cells
Company Name:	Woodard Group	Date:	5/1/2024
Designed by:	OG	County/City Case No.:	

Design Volume

Enter the area tributary to this feature, Max = 10 acres	A_t =	1	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	2,605	ft^3

Calculate Maximum Depth of the Reservoir Layer

Enter Infiltration rate	I =	9.8	in/hr
Enter Factor of Safety, FS (unitless)	FS =	3	
Obtain from Table 1, Appendix A: "Infiltration Testing" of this BMP Handbook			
	n =	40	%
Calculate D_1. $D_1 = \frac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times (n/100) \times FS}$	D_1 =	48.95	ft
Enter depth to historic high groundwater mark (measured from finished grade)		60	ft
Enter depth to top of bedrock or impermeable layer (measured from finished grade)		100	ft
D_2 is the smaller of: Depth to groundwater - 11 ft; & Depth to impermeable layer - 6 ft	D_2 =	49.0	ft
D_{MAX} is the smaller value of D_1 and D_2, must be less than or equal to 8 feet.	D_{MAX} =	8.0	ft

Trench Sizing

Enter proposed reservoir layer depth D_R, must be ≤ D_{MAX}	D_R =	6.00	ft
Calculate the design depth of water, d_W			
Design d_W = (D_R) x (n/100)	Design d_W =	2.40	ft
Minimum Surface Area, A_S $A_S = \frac{V_{BMP}}{d_W}$	A_S =	1,085	ft^2
Proposed Design Surface Area	A_D =	1,486	ft^2
Minimum Width = D_R + 1 foot pea gravel		7.00	ft
Sediment Control Provided? (Use pulldown)			
Geotechnical report attached? (Use pulldown)			

If the trench has been designed correctly, there should be no error messages on the spreadsheet.

3.2 INFILTRATION TRENCH

Type of BMP	LID - Infiltration
Treatment Mechanisms	Infiltration, Evapotranspiration (when vegetated), Evaporation
Maximum Drainage Area	10-acres
Other Names	None

Description

Infiltration trenches are shallow excavated areas that are filled with rock material to create a subsurface reservoir layer. The trench is sized to store the design capture volume, V_{BMP}, in the void space between the rocks. Over a period of 72 hours, the stormwater infiltrates through the bottom of the trench into the surrounding soil. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.

Figure 1 shows the components of an infiltration trench. The section shows the reservoir layer and observation well, which is used to monitor water depth. An overflow pipe that is used to bypass flows once the trench fills with stormwater is also shown.

Site Considerations

Location

The use of infiltration trenches may be restricted by concerns over groundwater contamination, soil permeability, and clogging at the site. See the applicable WQMP for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin's long term performance. These basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur.
- Sites with very low soil infiltration rates.
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect groundwater quality.
- Sites with unstabilized soil or construction activity upstream.
- On steeply sloping terrain.
- Infiltration trenches located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions.

This BMP has a flat surface area, so it may be challenging to incorporate into steeply sloping terrain.

Setbacks

Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process as they affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration trench infeasible. In that instance, another BMP must be selected.

In addition to setbacks recommended by the geotechnical engineer, infiltration trenches must be set back:

- 10 feet from the historic high groundwater mark (measured vertically from the bottom of the trench, as shown in Figure 1)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the trench, as shown in Figure 1)
- From all mature tree drip lines as indicated in Figure 1
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report.

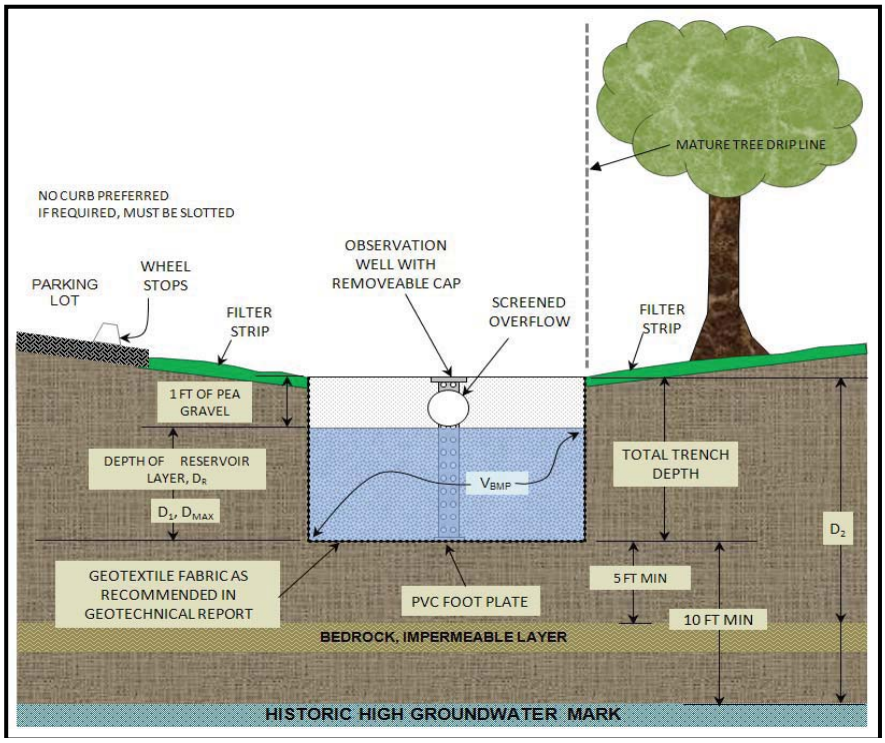


Figure 1 Section View of an Infiltration Trench

Sediment Control

Infiltration BMPs have the risk of becoming plugged over time. To prevent this, sediment must be removed before stormwater enters the trench. Both sheet and concentrated flow types have requirements that should be considered in the design of an infiltration trench.

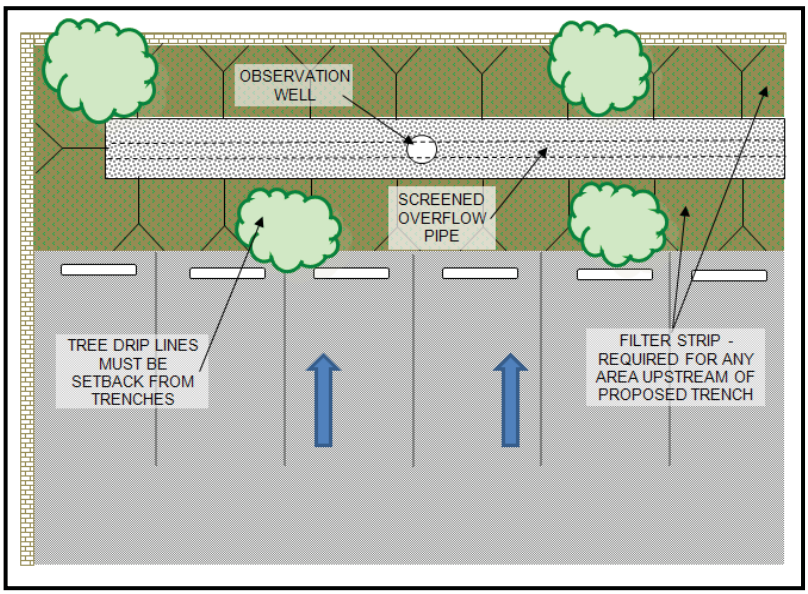


Figure 2 Plan View, Sheet Type Flows

When sheet type flows approach the trench along its length (as illustrated in Figure 2), a vegetated filter strip should be placed between the trench and the upstream drainage area. The filter strip must be a minimum of 5 feet wide and planted with grasses (preferably native) or covered with mulch.

Concentrated flows require a different approach. A 2004 Caltrans BMP Retrofit Report found that flow spreaders recommended in many water quality manuals are ineffective in distributing concentrated flows. As such, concentrated flows should either be directed toward a traditional vegetated swale (as shown on the right side of Figure 3) or to catch basin filters that can remove litter and sediment. Catch basins must discharge runoff as surface flow above the trench; they cannot outlet directly into the reservoir layer of the infiltration trench. If catch basins are used, the short and long term costs of the catch basin filters should be considered.

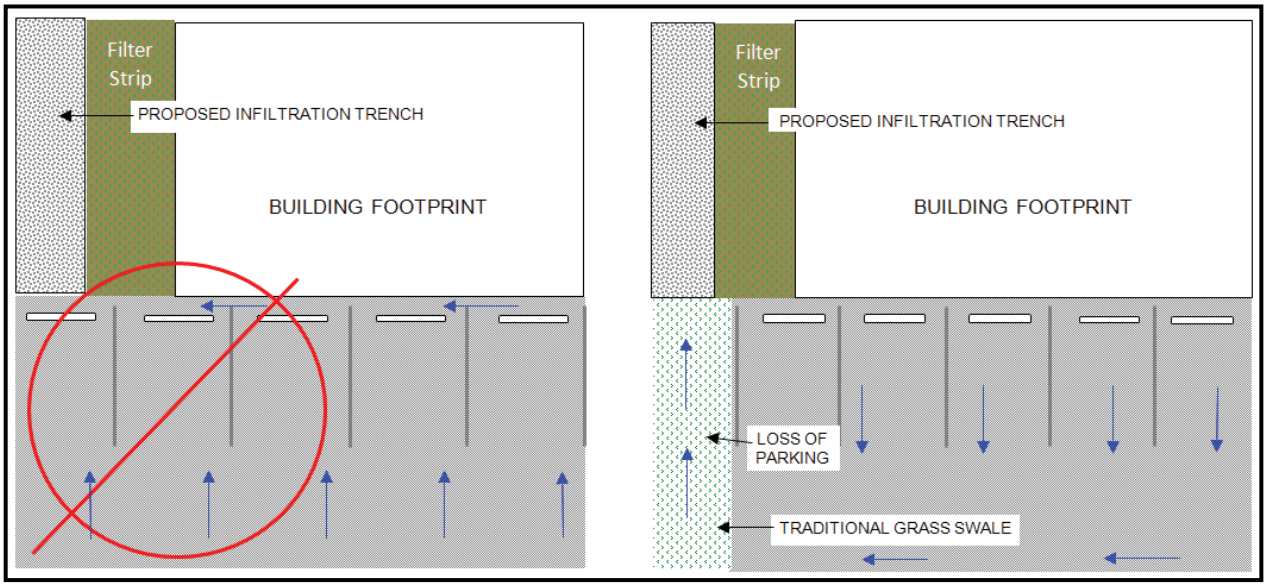


Figure 3 Plan View, Concentrated Flows

Additional Considerations

Class V Status

In certain circumstances, for example, if an infiltration trench is "deeper than its widest surface dimension," or includes an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids below the surface of the ground, it would probably be considered by the EPA to be a Class V injection well. Class V injection wells are subject to regulations and reporting requirements via the Underground Injection Control (UIC) Program. To ensure that infiltration trenches are not considered Class V wells, the design procedure in this manual requires that the trench not be deeper than it is wide.

Geotechnical Report

A geotechnical report must be included for all infiltration trenches. Appendix A of this Handbook entitled "Infiltration Testing Guidelines", details which types of infiltration tests are acceptable and how many tests or boring logs must be performed. A Geotechnical Report must be submitted in support of all infiltration trenches. Setbacks to walls and foundations must be included in the Geotechnical Report.

Observation Wells

One or more observation wells should be provided. The observation well consists of a vertical section of perforated pipe, 4 to 6 inches in diameter, installed flush with top of trench on a foot plate and have a locking, removable cap.

Overflow

An overflow route is needed to bypass storm flows larger than the V_{BMP} or in the event of clogging. Overflow systems must connect to an acceptable discharge point such as a downstream conveyance system.

Maintenance Access

Normal maintenance of an infiltration trench includes maintenance of the filter strip as well as debris and trash removal from the surface of the trench and filter strip. More substantial maintenance requiring vehicle access may be required every 5 to 10 years. Vehicular access along the length of the swale should be provided to all infiltration trenches. It is preferred that trenches be placed longitudinally along a street or adjacent to a parking lot area. These conditions have high visibility which makes it more likely that the trench will be maintained on a regular basis.

Inspection and Maintenance

Schedule	Inspection and Maintenance Activity
Every two weeks, or as often as necessary to maintain a pleasant appearance	- Maintain adjacent landscaped areas. Remove clippings from landscape maintenance activities. - Remove trash & debris
3 days after Major Storm Events	- Check for surface ponding. If ponding is only above the trench, remove, wash and replace pea gravel. May be needed every 5-10 years. - Check observation well for ponding. If the trench becomes plugged, remove rock materials. Provide a fresh infiltration surface by excavating an additional 2-4 inches of soil. Replace the rock materials.

Design and Sizing Criteria

Design Parameter	Design Criteria
Design Volume	V_{BMP}
Design Drawdown time	72 hrs
Maximum Tributary Drainage Area	10 acres
Maximum Trench Depth	8.0 ft
Width to Depth Ratio	Width must be greater than depth
Reservoir Rock Material	AASHTO #3 or 57 material or a clean, washed aggregate 1 to 3-in diameter equivalent
Filter Strip Width	Minimum of 5 feet in the direction of flow for all areas draining to trench
Filter Strip Slope	Max slope = 1%
Filter Strip Materials	Mulch or grasses (non-mowed variety preferred)
Historic High Groundwater Mark	10 ft or more below bottom of trench
Bedrock/Impermeable Layer Setback	5 ft or more below bottom of trench
Tree Setbacks	Mature tree drip line must not overhang the trench
Trench Lining Material	As recommended in Geotechnical Report

Infiltration Trench Design Procedure

1. Enter the area tributary to the trench, maximum drainage area is 10 acres.

2. Enter the Design Volume, $V_{BMP,}$ determined from Section 2.1 of this Handbook.

3. Enter the site infiltration rate, found in the geotechnical report.

4. Enter the factor of safety from Table 1 of Appendix A, Infiltration Testing.

5. Determine the maximum reservoir layer depth, $D_{MAX.}$ The value is obtained by taking the smaller of two depth equations but may never exceed 8 feet. The first depth, D_1 is related to the infiltration rate of the soil. The second depth, $D_{2,}$ is related to required setbacks to groundwater, bedrock/impermeable layer. These parameters are shown in Figure 1.

   Calculate D_1.

$$D_1 = \frac{I\left({}^{in}/_{hr}\right) \times 72\ (hrs)}{12\left({}^{in}/_{ft}\right) \times {}^{n}/_{100} \times FS}$$

   Where:

   I = site infiltration rate (in/hr), found in the geotechnical report
   FS = factor of safety, refer to Appendix A - Infiltration Testing
   n = porosity of the trench material, 40%

   Calculate D_2. Enter the depth to the seasonal high groundwater and bedrock/impermeable layer measured from the finished grade. The spreadsheet checks the minimum setbacks shown in Figure 1 and selects the smallest value. The equations are listed below for those doing hand calculations.

   Minimum Setbacks (includes 1 foot for pea gravel):

   = Depth to historic high groundwater mark - 11 feet
   = Depth to impermeable layer - 6 feet

   D_2 is the smaller of the two values.

   D_{MAX} is the smaller value of D_1 and $D_{2,}$ and must be less than or equal to 8 feet.

6. Enter the proposed reservoir layer depth, D_R. The value must be no greater than D_{MAX}.

7. Find the required surface area of the trench, A_S. Once D_R is entered, the spreadsheet will calculate the corresponding depth of water and the minimum surface area of the trench.

$$Design\ d_W = D_R \times \left({}^{n}/_{100}\right) \qquad A_S = \frac{V_{BMP}}{Design\ d_W}$$

Where:

A_S = minimum area required (ft^2)
V_{BMP} = BMP storage volume (ft^3)
Design d_W = Depth of water in reservoir layer (ft)

8. Enter the proposed design surface area; it must be greater than the minimum surface area.

9. Calculate the minimum trench width. This is to ensure that EPA's Class V Injection well status is not triggered. The total trench depth (shown in Figure 1) includes the upper foot where the overflow pipe is located. The minimum surface dimension is D_R + 1 foot.

Additional Items

The following items detailed in the preceding sections should also be addressed in the design.

- Sediment Control
- Geotechnical Report
- Observation well(s)
- Overflow

Reference Material

California Stormwater Quality Association. California Stormwater BMP Handbook New Development and Redevelopment. 2003.

County of Los Angeles Department of Public Works. Stormwater BMP Best Management Practice Design and Maintenance Manual for Publicly Maintained Storm Drain Systems. Los Angeles, CA, 2009.

LandSaver Stormwater Management System. Tech Sheet - Porosity of Structural Backfill. 2006.

United States Environmental Protection Agency. Office of Water, Washington D.C. Storm Water Technology Fact Sheet Vegetated Swales. 1999.

United States Environmental Protection Agency. Office of Water. Memorandum on Clarification on Which Stormwater Infiltration Practices/technologies Have the Potential to Be Regulated as "Class V" Wells by Underground Injection Control Program. By Linda Boornazian and Steve Heare. Washington D.C., 2008.

Ventura Countywide Stormwater Quality Management Program. Land Development Guidelines Biofilter Fact Sheet. Ventura, CA, 2001.

Ventura Countywide Stormwater Quality Management Program. Technical Guidance Manual for Stormwater Quality Control Measures. Ventura, CA, 2002.

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

JURUPA VALLEY
EASTVALE
NORCO
RIVERSIDE
CORONA
PRADO DAM
SITE
LAKE MATHEWS
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 5
ZONE 7
CALIMESA
BEAUMONT
BANNING
MORENO VALLEY
MYSTIC LAKE
SAN JACINTO
HEMET
PERRIS
MENIFEE
CANYON LAKE
LAKE ELSINORE
WILDOMAR
MURRIETA

Legend

Stream Type
- Not Susceptible Stream Channels
- Potentially Susceptible Stream Channels
- Large River (Not Susceptible)
- Santa Ana River
- Adequate Sump

Watershed Areas
- Not Applicable Area
- Applicable Area
- Applicable Area Watershed Boundaries

- Flood Control and Water Conservation District Boundary
- Study Area
- County Boundary

0 1 2 3 4 Miles

HCOC Applicability Map

Hydromodification Susceptibility Documentation Report and Mapping
Riverside County Flood Control and Water Conservation District

Map 2

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☒ **A. On-site storm drain inlets**	☒ Locations of inlets.	☒ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar.	☒ Maintain and periodically repaint or replace inlet markings. ☒ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☒ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☒ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☐ **B. Interior floor drains and elevator shaft sump pumps**		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ **C. Interior parking garages**		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☒ **D1. Need for future indoor & structural pest control**		☒ **Note building design features that discourage entry of pests.**	☒ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ **D2. Landscape/ Outdoor Pesticide Use**	☒ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☒ **Show self-retaining landscape areas, if any.** ☒ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	☒**State that final landscape plans will accomplish all of the following.** ☒ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** ☒ **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater/Downloads/LandscapeGardenBrochure.pdf** ☒ **Provide IPM information to new owners, lessees and operators.**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ **E. Pools, spas, ponds, decorative fountains, and other water features.**	`	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☒ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☒ **F. Food service**	☐ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☒ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☒ Describe the location and features of the designated cleaning area. ☒ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	☒ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
☒ **G. Refuse areas**	☒ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☒ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ☒ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☒ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☒ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	State how the following will be implemented: ☒ Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ H. Industrial processes.	☐ Show process area.	☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☒ I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ☐ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ☐ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: • Hazardous Waste Generation • Hazardous Materials Release Response and Inventory • California Accidental Release (CalARP) • Aboveground Storage Tank • Uniform Fire Code Article 80 Section 103(b) & (c) 1991 • Underground Storage Tank www.cchealth.org/groups/hazmat /	☐ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ **J. Vehicle and Equipment Cleaning**	☐ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shutoff to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	☐ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ☐ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/** ☐**Car dealerships and similar may rinse cars with water only.**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ **K. Vehicle/Equipment Repair and Maintenance**	☐ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ☐ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ☐ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	☐ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ☐ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ☐ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ☐ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ☐ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ☐ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☒ **L. Fuel Dispensing Areas**	☒ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ☒ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		☒ **The property owner shall dry sweep the fueling area routinely.** ☒ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

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

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☐ **M. Loading Docks**	☐ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ☐ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ☐ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		☐ **Move loaded and unloaded items indoors as soon as possible.** ☐ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☒ **N. Fire Sprinkler Test Water**		☒ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☒ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
☒ **O. Miscellaneous Drain or Wash Water or Other Sources** ☐ Boiler drain lines ☐ Condensate drain lines ☒ Rooftop equipment ☐ Drainage sumps ☒ Roofing, gutters, and trim. ☐ Other sources		☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☐ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ☒ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ☐ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☒ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. ☐ Include controls for other sources as specified by local reviewer.	

STORMWATER POLLUTANT SOURCES / SOURCE CONTROL CHECKLIST

1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Shown on WQMP Drawings	3 Permanent Controls—Listed in WQMP Table and Narrative	4 Operational BMPs—Included in WQMP Table and Narrative
☒ **P. Plazas, sidewalks, and parking lots.**			☒ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

To be a part of the FINAL WQMP.

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

1. "A citizen's guide to understanding Stormwater" from EPA 833-B-00-002.
2. Stormwater pollution what you should know for "Outdoor Cleaning Activities and Non-point Source Discharges" from CRFC
3. Guidelines for maintaining your swimming pool, Jacuzzi and garden fountain.
4. CASQA Handouts

SC-10 Non-Stormwater Discharges

SC-34 Waste Handling and Disposal

SC-41 Building and Grounds Maintenance

SC-43 Parking/Storage Area Maintenance

SC-44 Drainage System Maintenance

SD-10 Site Design & Landscape Planning

SD-11 Roof Runoff Controls

SD-12 Efficient Irrigation

SD-30 Fueling Areas

SD-32 Trash Storage Areas

After the Storm

A Citizen's Guide to Understanding Stormwater

EPA 833-B-03-002

January 2003

For more information contact:

or visit
www.epa.gov/npdes/stormwater
www.epa.gov/nps

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

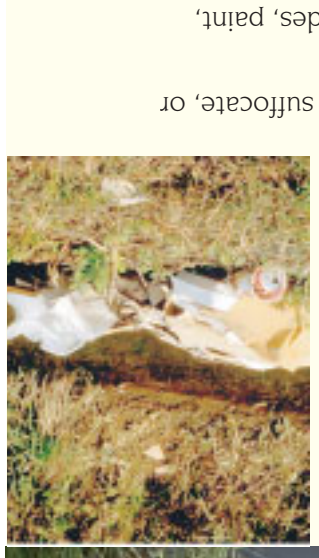
Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

Why is stormwater runoff a problem?

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.



Stormwater Pollution Solutions

Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Commercial

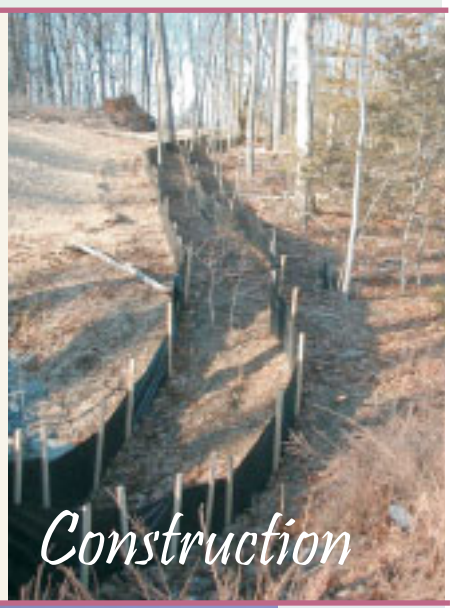
Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Construction

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



Agriculture

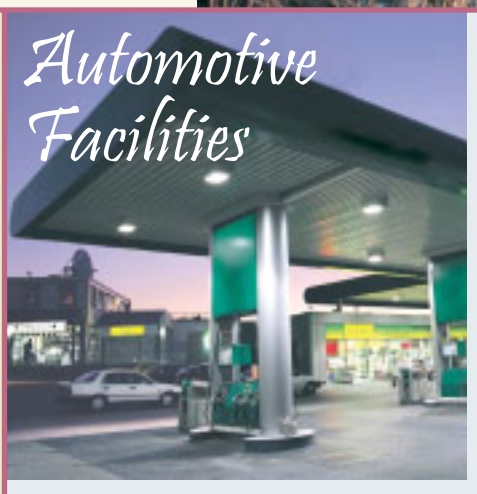
Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.



Automotive Facilities

Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers

Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

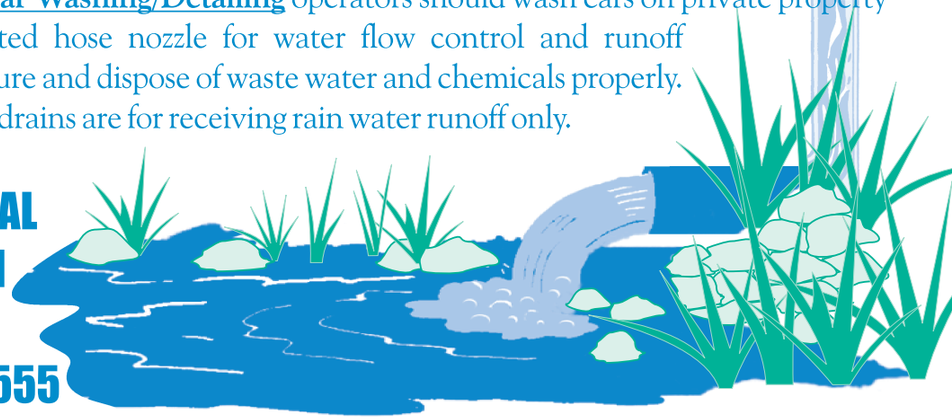
Do you know where street flows actually go?

Storm drains are NOT connected to sanitary sewer systems and treatment plants!

The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.

Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.

When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

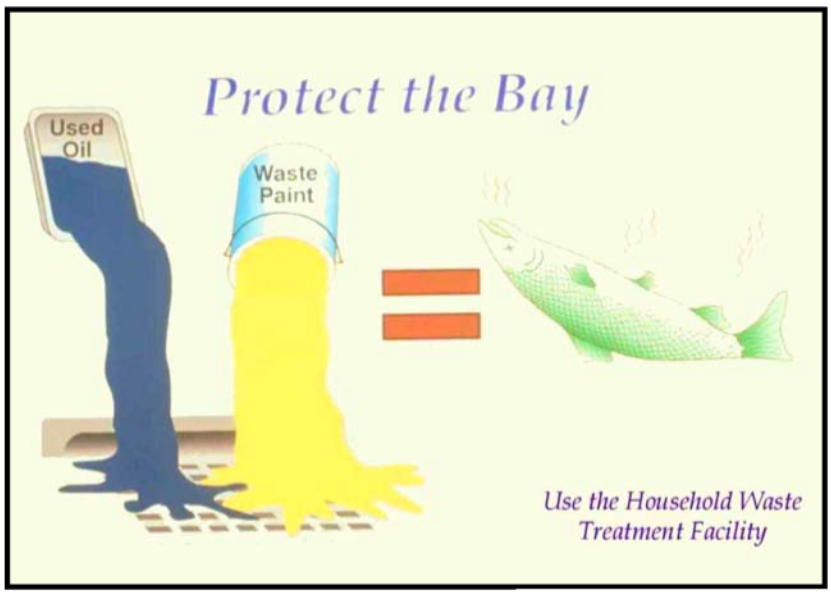
Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

Non-Stormwater Discharges SC-10



Graphic by: Margie Winter

Objectives

- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. For municipalities non-stormwater discharges present themselves in two situations. One is from fixed facilities owned and/or operated by the municipality. The other situation is non-stormwater discharges that are discovered during the normal operation of a field program. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, and surface cleaning. However, there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances (such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants) into storm drains. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges.

Approach

The municipality must address non-stormwater discharges from its fixed facilities by assessing the types of non-stormwater discharges and implementing BMPs for the discharges determined to pose environmental concern. For field programs

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the field staff must be trained to now what to look for regarding non-stormwater discharges and the procedures to follow in investigating the detected discharges.

Suggested Protocols

Fixed Facility

General

- Post "No Dumping" signs with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Landscaping and beautification efforts of hot spots might also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.

Illicit Connections

- Locate discharges from the fixed facility drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Use techniques such as smoke testing, dye testing and television camera inspection (as noted below) to verify physical connections.
- Isolate problem areas and plug illicit discharge points.

Visual Inspection and Inventory

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for several days following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping

- Review the "as-built" piping schematic as a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.

- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

Dye Testing

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Storm Sewer

- TV Cameras can be employed to visually identify illicit connections to the fixed facility storm drain system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Clean up spills on paved surfaces with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.
- See fact sheet SC-11 Spill Prevention, Control, and Clean Up.

Field Program

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially ones that involve more than one jurisdiction and those that are not classified as hazardous, which are often not responded to as effectively as they need to be.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- See SC-74 Stormwater Drainage System Maintenance for additional information.

Field Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- During routine field program maintenance field staff should look for evidence of illegal discharges or illicit connection:
  - Is there evidence of spills such as paints, discoloring, etc.
  - Are there any odors associated with the drainage system
  - Record locations of apparent illegal discharges/illicit connections and notify appropriate investigating agency.
- If trained, conduct field investigation of non-stormwater discharges to determine whether they pose a threat to water quality.

Recommended Complaint Investigation Equipment

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms.
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms

- Educational materials

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any onsite drainage points observed.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Enforcement

- Educate the responsible party if identified on the impacts of their actions, explain the stormwater requirements, and provide information regarding Best Management Practices (BMP), as appropriate. Initiate follow-up and/or enforcement procedures.
- If an illegal discharge is traced to a commercial, residential or industrial source, conduct the following activities or coordinate the following activities with the appropriate agency:
  - Contact the responsible party to discuss methods of eliminating the non-stormwater discharge, including disposal options, recycling, and possible discharge to the sanitary sewer (if within POTW limits).
  - Provide information regarding BMPs to the responsible party, where appropriate.
  - Begin enforcement procedures, if appropriate.
  - Continue inspection and follow-up activities until the illicit discharge activity has ceased.
- If an illegal discharge is traced to a commercial or industrial activity, coordinate information on the discharge with the jurisdiction's commercial and industrial facility inspection program.

Training

- Train technical staff to identify and document illegal dumping incidents.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Train employees to identify non-stormwater discharges and report them to the appropriate departments.
- Train staff who have the authority to conduct surveillance and inspections, and write citations for those caught illegally dumping.

- Train municipal staff responsible for surveillance and inspection in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).
  - OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and federal OSHA 29 CFR 1910.146).
  - Procedural training (field screening, sampling, smoke/dye testing, TV inspection).
- Educate the identified responsible party on the impacts of his or her actions.

Spill Response and Prevention

- See SC-11 Spill Prevention Control and Clean Up

Other Considerations

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The cost of fees for dumping at a proper waste disposal facility are often more than the fine for an illegal dumping offense, thereby discouraging people from complying with the law. The absence of routine or affordable pickup service for trash and recyclables in some communities also encourages illegal dumping. A lack of understanding regarding applicable laws or the inadequacy of existing laws may also contribute to the problem.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Many facilities do not have accurate, up-to-date schematic drawings.
- Can be difficult to locate illicit connections especially if there is groundwater infiltration.

Requirements

Costs

- Eliminating illicit connections can be expensive especially if structural modifications are required such re-plumbing cross connections under an existing slab.
- Minor cost to train field crews regarding the identification of non-stormwater discharges. The primary cost is for a fully integrated program to identify and eliminate illicit connections and illegal dumping. However, by combining with other municipal programs (i.e. pretreatment program) cost may be lowered.
- Municipal cost for containment and disposal may be borne by the discharger.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges are discharges not made up entirely of stormwater and include water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, landscape irrigation, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Current municipal NPDES permits require municipalities to effectively prohibit non-stormwater discharges unless authorized by a separate NPDES permit or allowed in accordance with the current NPDES permit conditions. Typically the current permits allow certain non-stormwater discharges in the storm drain system as long as the discharges are not significant sources of pollutants. In this context the following non-stormwater discharges are typically allowed:
  - Diverted stream flows;
  - Rising found waters;
  - Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20));
  - Uncontaminated pumped ground water;
  - Foundation drains;
  - Springs;
  - Water from crawl space pumps;
  - Footing drains;
  - Air conditioning condensation;
  - Flows from riparian habitats and wetlands;
  - Water line and hydrant flushing ;
  - Landscape irrigation;
  - Planned and unplanned discharges from potable water sources;
  - Irrigation water;
  - Individual residential car washing; and
  - Lawn watering.

Municipal facilities subject to industrial general permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The state's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

Illegal Dumping

- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties

Outreach

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people on the street who are aware of the problem and who have the tools to at least identify the incident, if not correct it. There we a number of ways of accomplishing this:

- Train municipal staff from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report the incidents.
- Deputize municipal staff who may come into contact with illegal dumping with the authority to write illegal dumping tickets for offenders caught in the act (see below).
- Educate the public. As many as 3 out of 4 people do not understand that in most communities the storm drain does not go to the wastewater treatment plant. Unfortunately, with the heavy emphasis in recent years on public education about solid waste management, including recycling and household hazardous waste, the sewer system (both storm and sanitary) has been the likely recipient of cross-media transfers of waste.
- Provide the public with a mechanism for reporting incidents such as a hot line and/or door hanger (see below).
- Help areas where incidents occur more frequently set up environmental watch programs (like crime watch programs).
- Train volunteers to notice and report the presence and suspected source of an observed pollutant to the appropriate public agency.

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of non-stormwater discharges. The state's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

Storm Drain Stenciling

- Stencil storm drain inlets with a message to prohibit illegal dumpings, especially in areas with waste handling facilities.
- Encourage public reporting of improper waste disposal by a HOTLINE number stenciled onto the storm drain inlet.
- See Supplemental Information section of this fact sheet for further detail on stenciling program approach.

Oil Recycling

- Contract collection and hauling of used oil to a private licensed used oil hauler/recycler.
- Comply with all applicable state and federal regulations regarding storage, handling, and transport of petroleum products.
- Create procedures for collection such as; collection locations and schedule, acceptable containers, and maximum amounts accepted.
- The California Integrated Waste Management Board has a Recycling Hotline, (800) 553-2962, that provides information and recycling locations for used oil.

Household Hazardous Waste

- Provide household hazardous waste (HHW) collection facilities. Several types of collection approaches are available including permanent, periodic, or mobile centers, curbside collection, or a combination of these systems.

Training

- Train municipal employees and contractors in proper and consistent methods for waste disposal.
- Train municipal employees to recognize and report illegal dumping.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Federal Regulations (RCRA, SARA, CERCLA) and state regulations exist regarding the disposal of hazardous waste.
- Municipalities are required to have a used oil recycling element and a HHW element within their integrated waste management plan.
- Significant liability issues are involved with the collection, handling, and disposal of HHW.

Examples

The City of Palo Alto has developed a public participation program for reporting dumping violations. When a concerned citizen or public employee encounters evidence of illegal dumping, a door hanger (similar in format to hotel "Do Not Disturb" signs) is placed on the front doors in the neighborhood. The door hanger notes that a violation has occurred in the neighborhood, informs the reader why illegal dumping is a problem, and notes that illegal dumping carries a significant financial penalty. Information is also provided on what citizens can do as well as contact numbers for more information or to report a violation.

The Port of Long Beach has a state of the art database incorporating storm drain infrastructure, potential pollutant sources, facility management practices, and a pollutant tracking system.

The State Department of Fish and Game has a hotline for reporting violations called CalTIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).

The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

References and Resources

http://www.stormwatercenter.net/

California's Nonpoint Source Program Plan http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program,
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program
(http://www.projectcleanwater.org)

Santa Clara Valley Urban Runoff Pollution Prevention Program
http://www.scvurppp-w2k.com/pdf%20documents/PS_ICID.PDF

Waste Handling & Disposal SC-34

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, re-use, and recycling; and preventing runon and runoff.

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Approach

Pollution Prevention

- Reduction in the amount of waste generated can be accomplished using the following source controls such as:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

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Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater runon and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.
- Inspect solid waste containers for structural damage or leaks regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Place waste containers under cover if possible.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc. may not be

disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g. sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.
- Stencil storm drains on the facility's property with prohibitive message regarding waste disposal.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers protected from vandalism, and in compliance with fire and hazardous waste codes.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

Runon/Runoff Prevention

- Prevent stormwater runon from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent the waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.
- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training

- Train staff pollution prevention measures and proper disposal methods.
- Train employees and contractors proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.
- Vehicles transporting waste should have spill prevention equipment that can prevent spills during transport. The spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations

- Hazardous waste cannot be re-used or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs

- Capital and operation and maintenance costs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance

- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP

Land Treatment System

- Minimize the runoff of polluted stormwater from land application of municipal waste on-site by:
  - Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, there is a closed drainage system.
  - Avoiding application of waste to the site when it is raining or when the ground is saturated with water.
  - Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site.
  - Maintaining adequate barriers between the land application site and the receiving waters. Planted strips are particularly good.
  - Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins.
  - Performing routine maintenance to ensure the erosion control or site stabilization measures are working.

References and Resources

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Associations (BASMAA). On-line: http://www.basmaa.org

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, and abnormal pH. Utilizing the following protocols will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.
- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

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Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a waste water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash water runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in he catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement. Ensure that this practice does not kill grass.

Landscaping Activities

- Do not apply any chemicals (insecticide, herbicide, or fertilizer) directly to surface waters, unless the application is approved and permitted by the state.
- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.
- Check irrigation schedules so pesticides will not be washed away and to minimize non-stormwater discharge.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.
- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. In which case you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover with secondary containment during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water; do not put it in the storm drain, pour over landscaped areas.
- Use hand or mechanical weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Follow manufacturers' recommendations and label directions. Pesticides must never be applied if precipitation is occuring or predicted. Do not apply insecticides within 100 feet of surface waters such as lakes, ponds, wetlands, and streams.
- Use less toxic pesticides that will do the job, whenever possible. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.

- Apply pesticides only when wind speeds are low.
- Work fertilizers into the soil rather than dumping or broadcasting them onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.
- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Overall costs should be low in comparison to other BMPs.

Maintenance

- Sweep paved areas regularly to collect loose particles, and wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping but it is subject to rusting and results in lower quality water. Initially the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time, typically a year, between flushes and may accumulate iron, manganese, lead, copper, nickel and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

King County - ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

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Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) http://www.basmaa.org/

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) -
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The following protocols are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook).
- Keep accurate maintenance logs to evaluate BMP implementation.

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.

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- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel and dispose of litter in the trash.

Surface cleaning

- Use dry cleaning methods (e.g. sweeping or vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- If water is used follow the procedures below:
  - Block the storm drain or contain runoff.
  - Wash water should be collected and pumped to the sanitary sewer or discharged to a pervious surface, do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- When cleaning heavy oily deposits:
  - Use absorbent materials on oily spots prior to sweeping or washing.
  - Dispose of used absorbents appropriately.

Surface Repair

- Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff.
- Cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc., where applicable. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of the parking facilities and stormwater conveyance systems associated with them on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, nad implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large, construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities on a regular basis to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

SC-43 Parking/Storage Area Maintenance

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Use only as much water as necessary for dust control, to avoid runoff.

References and Resources

http://www.stormwatercenter.net/

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

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http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) http://www.basma.org

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

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Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

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United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Site Design & Landscape Planning SD-10

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Fueling Areas SD-30

Photo Credit: Geoff Brosseau

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- ☑ Collect and Convey

Description

Fueling areas have the potential to contribute oil and grease, solvents, car battery acid, coolant and gasoline to the stormwater conveyance system. Spills at vehicle and equipment fueling areas can be a significant source of pollution because fuels contain toxic materials and heavy metals that are not easily removed by stormwater treatment devices.

Approach

Project plans must be developed for cleaning near fuel dispensers, emergency spill cleanup, containment, and leak prevention.

Suitable Applications

Appropriate applications include commercial, industrial, and any other areas planned to have fuel dispensing equipment, including retail gasoline outlets, automotive repair shops, and major non-retail dispensing areas.

Design Considerations

Design requirements for fueling areas are governed by Building and Fire Codes and by current local agency ordinances and zoning requirements. Design requirements described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements.

Designing New Installations

Covering

Fuel dispensing areas should provide an overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area should drain to the project's treatment control BMP(s) prior to discharging to the stormwater conveyance system. Note - If fueling large equipment or vehicles that would prohibit the use of covers or roofs, the fueling island should be designed to sufficiently accommodate the larger vehicles and equipment and to prevent stormwater run-on and runoff. Grade to direct stormwater to a dead-end sump.

Surfacing

Fuel dispensing areas should be paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete should be prohibited. Use asphalt sealant to protect asphalt paved areas surrounding the fueling area. This provision may be made to sites that have pre-existing asphalt surfaces.

The concrete fuel dispensing area should be extended a minimum of 6.5 ft from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 ft, whichever is less.

Grading/Contouring

Dispensing areas should have an appropriate slope to prevent ponding, and be separated from the rest of the site by a grade break that prevents run-on of urban runoff. (Slope is required to be 2 to 4% in some jurisdictions' stormwater management and mitigation plans.)

Fueling areas should be graded to drain toward a dead-end sump. Runoff from downspouts/roofs should be directed away from fueling areas. Do not locate storm drains in the immediate vicinity of the fueling area.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

- In the case of an emergency, provide storm drain seals, such as isolation valves, drain plugs, or drain covers, to prevent spills or contaminated stormwater from entering the stormwater conveyance system.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Infiltration Trench TC-10

Maintenance Concerns, Objectives, and Goals

- Accumulation of Metals
- Clogged Soil Outlet Structures
- Vegetation/Landscape Maintenance

General Description

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

Targeted Constituents

✓	Sediment	■
✓	Nutrients	■
✓	Trash	■
✓	Metals	■
✓	Bacteria	■
✓	Oil and Grease	■
✓	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Inspection/Maintenance Considerations

Frequency of clogging is dependant on effectiveness of pretreatment, such as vegetated buffer strips, at removing sediments. See appropriate maintenance factsheets for associated pretreatment. If the trench clogs, it may be necessary to remove and replace all or part of the filter fabric and possibly the coarse aggregate. Clogged infiltration trenches with surface standing water can become a nuisance due to mosquito breeding. Maintenance efforts associated with infiltration trenches should include frequent inspections to ensure that water infiltrates into the subsurface completely at a recommended infiltration rate of 72 hours or less to prevent creating mosquito and other vector habitats. Most of the maintenance should be concentrated on the pretreatment practices, such as buffer strips and swales upstream of the trench to ensure that sediment does not reach the infiltration trench. Regular inspection should determine if the sediment removal structures require routine maintenance. Infiltration trenches should not be put into operation until the upstream tributary area is stabilized.

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Inspection Activities	Suggested Frequency
■ Inspect after every major storm for the first few months to ensure proper functioning. Drain times should be observed to confirm that designed drain times has been achieved.	After construction
■ Inspect facility for signs of wetness or damage to structures, signs of petroleum hydrocarbon contamination, standing water, trash and debris, sediment accumulation, slope stability, standing water, and material buildup. ■ Check for standing water or, if available, check observation wells following 3 days of dry weather to ensure proper drain time. ■ Inspect pretreatment devices and diversion structures for damage, sediment buildup, and structural damage.	Semi-annual and after extreme events
■ Trenches with filter fabric should be inspected for sediment deposits by removing a small section of the top layer. If inspection indicates that the trench is partially or completely clogged, it should be restored to its design condition.	Annual
Maintenance Activities	**Suggested Frequency**
■ Repair undercut and eroded areas at inflow and outflow structures. ■ Remove sediment, debris, and oil/grease from pretreatment devices and overflow structures.	Standard maintenance (as needed)
■ Remove trash, debris, grass clippings, trees, and other large vegetation from the trench perimeter and dispose of properly. ■ Mow and trim vegetation to prevent establishment of woody vegetation, and for aesthetic and vector reasons.	Semi-annual, more often as needed
■ Clean out sediment traps, forebays, inlet/outlet structures, overflow spillway, and trenches if necessary. ■ Remove grass clippings, leaves, and accumulated sediment from the surface of the trench. Replace first layer of aggregate and filter fabric if clogging appears only to be at the surface. ■ Clean trench when loss of infiltrative capacity is observed. If drawdown time is observed to have increased significantly over the design drawdown time, removal of sediment may be necessary. This is an expensive maintenance activity and the need for it can be minimized through prevention of upstream erosion.	Annual
■ If bypass capability is available, it may be possible to regain the infiltration rate in the short term by providing an extended dry period. ■ Seed or sod to restore ground cover.	5-year maintenance
■ Total rehabilitation of the trench should be conducted to maintain storage capacity within 2/3 of the design treatment volume and 72-hour exfiltration rate limit. ■ Trench walls should be excavated to expose clean soil. ■ All of the stone aggregate and filter fabric or media must be removed. Accumulated sediment should be stripped from the trench bottom. At this point the bottom may be scarified or tilled to help induce infiltration. New fabric and clean stone aggregate should be refilled.	Upon failure

Additional Information

Infiltration practices have historically had a high rate of failure compared to other stormwater management practices. One study conducted in Prince George's County, Maryland (Galli, 1992), revealed that less than half of the infiltration trenches investigated (of about 50) were still functioning properly, and less than one-third still functioned properly after 5 years. Many of these practices, however, did not incorporate advanced pretreatment. By carefully selecting the location and improving the design features of infiltration practices, their performance should improve.

It is absolutely critical that settleable particles and floatable organic materials be removed from runoff water before it enters the infiltration trench. The trench will clog and become nonfunctional if excessive particulate matter is allowed to enter the trench.

Cold climate considerations – see http://www.cwp.org/cold-climates.htm

References

EPA, Stormwater Technology Fact Sheet - Infiltration Trench. EPA 832-F-99-019. September, 1999.

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Michigan Department of Environmental Quality. Infiltration Trench Factsheet. Available at: http://www.deq.state.mi.us/documents/deq-swq-nps-it.pdf

Montgomery County Department of Environmental Protection. Maintaining Urban Stormwater Facilities - A Guidebook for Common Ownership Communities. Available at: http://www.montgomerycountymd.gov/mc/services/dep/Stormwater/maintain.htm

Stormwater Managers Resource Center, Manual Builder. Available at: http://www.stormwatercenter.net/intro_manual.htm

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