Project Specific Water Quality Management Plan

*A Template for preparing Project Specific WQMPs for Priority Development Projects located within the **Santa Margarita Region** of **Riverside County**. This template does not apply to projects in other watersheds within Riverside County. It does not apply to projects in San Diego or Orange County.*

Attention: This submittal package only applies to "Priority Development Projects" and does not apply to "Other Development Projects". Proceed only if the Applicabilty Checklist completed for your project categorizes project activities as a "Priority Development Project."

Project Title: 26501 Madison Avenue

Development No: Insert text here

Design Review/Case No: DP 2020-2140

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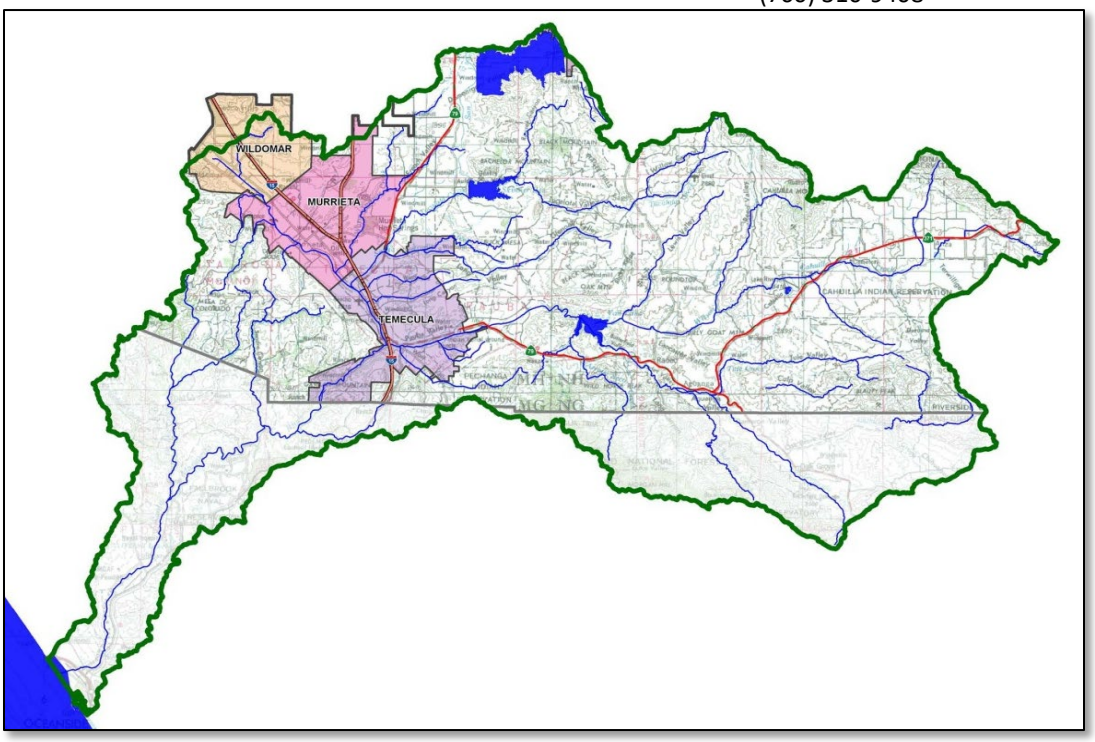

☒ **Preliminary**
☐ **Final**

Original Date Prepared: February 28, 2020

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Prepared for Compliance with Regional Board Order No. **R9-2013-0001** *as amended by Order No.* **R9-2015-0001** *and Order No.* **R9-2015-0100**

A Brief Introduction

The Regional Municipal Separate Stormwater Sewer System (MS4) Permit[1] requires that a Project-Specific WQMP be prepared for all development projects within the Santa Margarita Region (SMR) that meet the 'Priority Development Project' categories and thresholds listed in the SMR Water Quality Management Plan (WQPM). This Project-Specific WQMP Template for Development Projects in the **Santa Margarita Region** has been prepared to help document compliance and prepare a WQMP submittal. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.

[1] Order No. R9-2013-0001 as amended by Order Nos. R9-2015-0001 and R9-2015-0100, NPDES No. CAS0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the MS4s Draining the Watersheds within the San Diego Region, California Regional Water Quality Control Board, May 8, 2013.

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for Todd Sheller, W. M. Lyles Co. by Kristin L. Greene, P.E., dk Greene Consulting, Inc. for the 26501 Madison Avenue project.

This WQMP is intended to comply with the requirements of City of Murrieta Stormwater and Runoff Management and Discharge Controls Municipal Code Section 8.36.320, Water Quality Management Plan, 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 Best Management Practices 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 Murrieta Stormwater and Runoff Management and Discharge Controls (Municipal Code Section 8.36).

"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."

Owner's Signature	Date
Todd Sheller	
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control Best Management Practices in this plan meet the requirements of Regional Water Quality Control Board Order No. **R9-2013-0001** as amended by Order Nos. **R9-2015-0001 and R9-2015-0100**."

	10/20/2020
Preparer's Signature	Date
Kristin L. Greene, P.E.	Eng. of Work, Pres., dk Greene Cons. Inc.
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: C57860

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Section A: Project and Site Information

Use the table below to compile and summarize basic site information that will be important for completing subsequent steps. Subsections A.1 through A.4 provide additional detail on documentation of additional project and site information.

PROJECT INFORMATION	
Type of PDP:	New Development
Type of Project:	Commercial
Planning Area:	Business Park General Plan Land Use Designation
Community Name:	Murrieta, Business Park
Development Name:	26501 Madison Avenue
PROJECT LOCATION	
Latitude & Longitude (DMS):	LAT 33°32'02 LONG 117°10'29
Project Watershed and Sub-Watershed:	Santa Margarita River, Warm Springs Creek
24-Hour 85th Percentile Storm Depth (inches):	0.85
Is project subject to Hydromodification requirements?	☒ Y ☐ N (Select based on Section A.3)
APN(s):	910-230-003
Map Book and Page No.:	Parcel 2, Parcel Map 7065, Book 26, Page 50S
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Commercial
Proposed or Potential SIC Code(s)	Insert text here
Existing Impervious Area of Project Footprint (SF)	0 sq. ft.
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	63,738 sq. ft.
Total Project Area (ac)	5.38 ac.
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
Is the project exempt from Hydromodification Performance Standards?	☐ Y ☒ N
Does the project propose the use of Alternative Compliance to satisfy BMP requirements? (note, alternative compliance is not allowed for coarse sediment performance standards)	☐ Y ☒ N
Has preparation of Project-Specific WQMP included coordination with other site plans?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Is the project located within any Multi-Species Habitat Conservation Plan area (MSHCP Criteria Cell?)	☒ Y ☐ N 6525
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 Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)	Soil Type C in Development area

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the Project vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Vicinity and location maps
- Parcel Boundary and Project Footprint
- Existing and Proposed Topography
- Drainage Management Areas (DMAs)
- Proposed Structural Best Management Practices (BMPs)
- Drainage Paths
- Drainage infrastructure, inlets, overflows
- Source Control BMPs
- Site Design BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Pervious Surfaces (i.e. Landscaping)
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Copermittee plan reviewer must be able to easily analyze your Project utilizing this template and its associated site plans and maps. Complete the checklists in Appendix 1 to verify that all exhibits and components are included.

A.2 Identify Receiving Waters

Using Table A-1 below, list in order of upstream to downstream, the Receiving Waters that the Project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated Beneficial Uses, and proximity, if any, to a RARE Beneficial Use. Include a map of the Receiving Waters in Appendix 1. This map should identify the path of the stormwater discharged from the site all the way to the outlet of the Santa Margarita River to the Pacific Ocean. Use the most recent 303(d) list available from the State Water Resources Control Board Website.
(http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)

Table A-1 Identification of Receiving Waters

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Warm Springs Creek	Chlorpyrifos, Indicator Bacteria, Iron, Manganese, Nitrogen, Phosphorus	MUN, AGR, IND, PROC, REC2, WARM, WILD	Miles
Murietta Creek	Indicator Bacteria, Iron, Manganese, Nitrogen, Phosphorus, Toxicity	MUN, AGR, IND, PROC, REC2, WARM, WILD	Miles
Santa Margarita River (upper)	Indicator Bacteria, Iron, Manganese, Nitrogen, Phosphorus, Toxicity	MUN, AGR, IND, PROC, REC2, WARM, WILD	Miles
Santa Margarita River (lower)	Benthic Community Effects, Chlorpyrifos, Indicator Bacteria, Nitrogen, Phosphorus, Toxicity	MUN, AGR, INC, REC1, REC2, WARM, COLD, WILD, RARE	RARE (feet)
Pacific Ocean			

A.3 Drainage System Susceptibility to Hydromodification

Using Table A-2 below, list in order of the point of discharge at the project site down to the Santa Margarita River[2], each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the material of the drainage system, and any exemption (if applicable). Based on the results, summarize the applicable hydromodification performance standards that will be documented in Section E. Exempted categories of receiving waters include:

- Existing storm drains that discharge directly to water storage reservoirs, lakes, or enclosed embayments, or
- Conveyance channels whose bed and bank are concrete lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- Other water bodies identified in an approved WMAA (See Exhibit G to the WQMP)

Include a map exhibiting each drainage system and the associated susceptibility in Appendix 1.

Table A-2 Identification of Susceptibility to Hydromodification

Drainage System	Drainage System Material	Hydromodification Exemption	Hydromodification Exempt
Drains directly to Warm Springs Creek	Identify either (1) the type of material of bed and bank for open channels; or (2) the material of storm drain pipes and conduits	Insert exemption justification for the 1st receiving water may qualify for. If none, insert NONE.	☐ Y ☒ N
Insert name and length (in miles) of 2nd drainage system	Identify either (1) the type of material of bed and bank for open channels; or (2) the material of storm drain pipes and conduits	Insert exemption justification for the 2nd receiving water may qualify for. If none, insert NONE.	☐ Y ☐ N
Insert name and length (in miles) of 3rd drainage system	Identify either (1) the type of material of bed and bank for open channels; or (2) the material of storm drain pipes and conduits	Insert exemption justification for the 3rd receiving water may qualify for. If none, insert NONE.	☐ Y ☐ N
Summary of Performance Standards			
☐ **Hydromodification Exempt** – Select if "Y" is selected in the Hydromodification Exempt column above, project is exempt from hydromodification requirements.			
☒ **Not Exempt**-Select if "N" is selected in any row of the Hydromodification Exempt column above. Project is subject to hydrologic control requirements and may be subject to sediment supply requirements.			

A.4 Additional Permits/Approvals required for the Project:

Table A-3 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 Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N

[2] Refer to Exhibit G of the WQMP for a map of exempt and potentially exempt areas. These maps are from the Draft SMR WMAA as of January 5, 2018 and will be replaced upon acceptance of the SMR WMAA.

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)*	☐ Y	☒ N

If yes is answered to any of the questions above, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for LID Bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your Low Impact Development (LID) design and explain your design decisions to others.

Apply the following LID Principles to the layout of the PDP to the extent they are applicable and feasible. Putting thought upfront about how best to organize the various elements of a site can help to significantly reduce the PDP's potential impact on the environment and reduce the number and size of Structural LID BMPs that must be implemented. Integrate opportunities to accommodate the following LID Principles within the preliminary PDP site layout to maximize implementation of LID Principles.

Site Optimization

Complete checklist below to determine applicable Site Design BMPs for your site.

Project- Specific WQMP Site Design BMP Checklist

The following questions below are based upon Section 3.2 of the SMR WQMP will help you determine how to best optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

SITE DESIGN REQUIREMENTS

Answer the following questions below by indicating "Yes," "No," or "N/A" (Not Applicable). Justify all "No" and "N/A" answers by inserting a narrative at the end of the section. The narrative should include identification and justification of any constraints that would prevent the use of those categories of LID BMPs. Upon identifying Site Design BMP opportunities, include these on your WQMP Site plan in Appendix 1.

☒ Yes ☐ No ☐ N/A

Did you identify and preserve existing drainage patterns?

Integrating existing drainage patterns into the site plan helps to maintain the time of concentration and infiltration rates of runoff, decreasing peak flows, and may also help preserve the contribution of Critical Coarse Sediment (i.e., Bed Sediment Supply) from the PDP to the Receiving Water. Preserve existing drainage patterns by:

- Minimizing unnecessary site grading that would eliminate small depressions, where appropriate add additional "micro" storage throughout the site landscaping.
- Where possible conform the PDP site layout along natural landforms, avoid excessive grading and disturbance of vegetation and soils, preserve or replicate the sites natural drainage features and patterns.
- Set back PDP improvements from creeks, wetlands, riparian habitats and any other natural water bodies.
- Use existing and proposed site drainage patterns as a natural design element, rather than using expensive impervious conveyance systems. Use depressed landscaped areas, vegetated buffers, and bioretention areas as amenities and focal points within the site and landscape design.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.
Drainage path is maintained; pervious area has been distributed within site.

☒ Yes ☐ No ☐ N/A

Did you identify and protect existing vegetation?

Identify any areas containing dense native vegetation or well-established trees, and try to avoid disturbing these areas. Soils with thick, undisturbed vegetation have a much higher capacity to store and infiltrate runoff than do disturbed soils. Reestablishment of a mature vegetative community may take decades. Sensitive areas, such as streams and floodplains should also be avoided.

- Define the development envelope and protected areas, identifying areas that are most suitable for development and areas that should be left undisturbed.
- Establish setbacks and buffer zones surrounding sensitive areas.
- Preserve significant trees and other natural vegetation where possible.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. ***There are currently no areas containing dense native vegetation or well-established trees except within Warm Springs Creek. The entire creek is outside the development area.***

Project- Specific WQMP Site Design BMP Checklist	
☒ Yes ☐ No ☐ N/A	**Did you identify and preserve natural infiltration capacity?** A key component of LID is taking advantage of a site's natural infiltration and storage capacity. A site survey and geotechnical investigation can help define areas with high potential for infiltration and surface storage. • Identify opportunities to locate LID Principles and Structural BMPs in highly pervious areas. Doing so will maximize infiltration and limit the amount of runoff generated. • Concentrate development on portions of the site with less permeable soils, and preserve areas that can promote infiltration.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. ***Within the Warm Springs Creek area, Soil Type "A" exists. No development will take place near the Creek allowing the natural infiltration to exist.*** ***The area to be developed is Soil Type C. Natural infiltration is limited due to soil type. In the developed state, the pad areas are not be appropriate for infiltration not possible within this area because the grading depths. (see p. 46 and 47 of the WQMP).***	
☒ Yes ☐ No ☐ N/A	**Did you minimize impervious area?** Look for opportunities to limit impervious cover through identification of the smallest possible land area that can be practically impacted or disturbed during site development. • Limit overall coverage of paving and roofs. This can be accomplished by designing compact, taller structures, narrower and shorter streets and sidewalks, clustering buildings and sharing driveways, smaller parking lots (fewer stalls, smaller stalls, and more efficient lanes), and indoor or underground parking. • Inventory planned impervious areas on your preliminary site plan. Identify where permeable pavements, or other permeable materials, such as crushed aggregate, turf block, permeable modular blocks, pervious concrete or pervious asphalt could be substituted for impervious concrete or asphalt paving. This will help reduce the amount of Runoff that may need to be addressed through Structural BMPs. • Examine site layout and circulation patterns and identify areas where landscaping can be substituted for pavement, such as for overflow parking. • Consider green roofs. Green roofs are roofing systems that provide a layer of soil/vegetative cover over a waterproofing membrane. A green roof mimics pre-development conditions by filtering, absorbing, and evapotranspiring precipitation to help manage the effects of an otherwise impervious rooftop.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Impervious area will be minimized by using pervious pavers, gravel areas, and landscaping.* ***Parking spaces are limited and pervious paving will be used in the parking stall areas.*** ***Building roofs are limited by constructing two story office building.*** ***Green roofs are not possible for this project due to the cost.***	

Project- Specific WQMP Site Design BMP Checklist	
☒ Yes ☐ No ☐ N/A	**Did you identify and disperse runoff to adjacent pervious areas or small collection areas?** Look for opportunities to direct runoff from impervious areas to adjacent landscaping, other pervious areas, or small collection areas where such runoff may be retained. This is sometimes referred to as reducing Directly Connected Impervious Areas. • Direct roof runoff into landscaped areas such as medians, parking islands, planter boxes, etc., and/or areas of pervious paving. Instead of having landscaped areas raised above the surrounding impervious areas, design them as depressed areas that can receive Runoff from adjacent impervious pavement. For example, a lawn or garden depressed 3"-4" below surrounding walkways or driveways provides a simple but quite functional landscape design element. • Detain and retain runoff throughout the site. On flatter sites, smaller Structural BMPs may be interspersed in landscaped areas among the buildings and paving. • On hillside sites, drainage from upper areas may be collected in conventional catch basins and piped to landscaped areas and LID BMPs and/or Hydrologic Control BMPs in lower areas. Low retaining walls may also be used to create terraces that can accommodate LID BMPs. Wherever possible, direct drainage from landscaped slopes offsite and not to impervious surfaces like parking lots. • Reduce curb maintenance and provide for allowances for curb cuts. • Design landscaped areas or other pervious areas to receive and infiltrate runoff from nearby impervious areas. • Use Tree Wells to intercept, infiltrate, and evapotranspire precipitation and runoff before it reaches structural BMPs. Tree wells can be used to limit the size of Drainage Management Areas that must be treated by structural BMPs. Guidelines for Tree Wells are included in the Tree Well Fact Sheet in the LID BMP Design Handbook.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. ***Roof runoff is directed to pervious paving. Asphalt paving is directed to gravel areas.***	
☒ Yes ☐ No ☐ N/A	**Did you utilize native or drought tolerant species in site landscaping?** Wherever possible, use native or drought tolerant species within site landscaping instead of alternatives. These plants are uniquely suited to local soils and climate and can reduce the overall demands for potable water use associated with irrigation.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. ***Native and drought tolerant plants will be included in Landscape areas.***	

Project- Specific WQMP Site Design BMP Checklist	
☐ Yes ☐ No ☒ N/A	**Did implement harvest and use of runoff?** Under the Regional MS4 Permit, Harvest and Use BMPs must be employed to reduce runoff on any site where they are applicable and feasible. However, Harvest and Use BMPs are effective for retention of stormwater runoff only when there is adequate demand for non-potable water during the wet season. If demand for non-potable water is not sufficiently large, the actual retention of stormwater runoff will be diminished during larger storms or during back-to-back storms. For the purposes of planning level Harvest and Use BMP feasibility screening, Harvest and Use is only considered to be a feasible if the total average wet season demand for non-potable water is sufficiently large to use the entire DCV within 72 hours. If the average wet season demand for non-potable water is not sufficiently large to use the entire DCV within 72 hours, then Harvest and Use is not considered to be feasible and need not be considered further. The general feasibility and applicability of Harvest and Use BMPs should consider: • Any downstream impacts related to water rights that could arise from capturing stormwater (not common). • Conflicts with recycled water used – where the project is conditioned to use recycled water for irrigation, this should be given priority over stormwater capture as it is a year-round supply of water. • Code Compliance - If a particular use of captured stormwater, and/or available methods for storage of captured stormwater would be contrary to building codes in effect at the time of approval of the preliminary Project-Specific WQMP, then an evaluation of harvesting and use for that use would not be required. • Wet season demand – the applicant shall demonstrate, to the acceptance of the [Insert Jurisdiction], that there is adequate demand for harvested water during the wet season to drain the system in a reasonable amount of time.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. ***Harvesting and reuse of precipitation cannot be accomplished on this site as there are not enough landscape areas and toilet use to facilitate using the runoff within 36 hours.***	
☒ Yes ☐ No ☐ N/A	**Did you keep the runoff from sediment producing pervious area hydrologically separate from developed areas that require treatment?** Pervious area that qualify as self-treating areas or off-site open space should be kept separate from drainage to structural BMPs whenever possible. This helps limit the required size of structural BMPs, helps avoid impacts to sediment supply, and helps reduce clogging risk to BMPs.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. ***Slope areas along the westerly boundary are considered self-treatment areas. These areas will be hydraulically disconnected from the DMAs that flow to the Biofiltration basin.***	

Section C: Delineate Drainage Management Areas (DMAs)

This section provides streamlined guidance and documentation of the DMA delineation and categorization process, for additional information refer to the procedure in Section 3.3 of the SMR WQMP which discusses the methods of delineating and mapping your project site into individual DMAs. Complete Steps 1 to 4 to successfully delineate and categorize DMAs.

Step 1: Identify Surface Types and Drainage Pathways

Carefully delineate pervious areas and impervious areas (including roofs) throughout site and identify overland flow paths and above ground and below ground conveyances. Also identify common points (such as BMPs) that these areas drain to.

Step 2: DMA Delineation

Use the information in Step 1 to divide the entire PDP site into individual, discrete DMAs. Typically, lines delineating DMAs follow grade breaks and roof ridge lines. Where possible, establish separate DMAs for each surface type (e.g., landscaping, pervious paving, or roofs). Assign each DMA a unique code and determine its size in square feet. The total area of your site should total the sum of all of your DMAs (unless water from outside the project limits comingles with water from inside the project limits, i.e. run-on). Complete Table C-1

Table C-1 DMA Identification

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
1-A	Impervious - Roof	13,760	To be Determined in Step 3
1-B	Impervious - Asphalt	49,978	
1-C	Pervious - Compacted soil	31,258	
1-D	Pervious - Gravel	22,671	
1-E	Pervious - Porous asphalt	7,694	
1-F	Pervious - Landscaping	5,425	
1-G	Pervious – Natural C	42,512	

Add Columns as Needed

Step 3: DMA Classification

Determine how drainage from each DMA will be handled by using information from Steps 1 and 2 and by completing Steps 3.A to 3.C. Each DMA will be classified as one of the following four types:

- Type 'A': Self-Treating Areas:
- Type 'B': Self-Retaining Areas
- Type 'C': Areas Draining to Self-Retaining Areas
- Type 'D': Areas Draining to BMPs

Step 3.A – Identify Type 'A' Self-Treating Area

Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☒ Yes ☐ No — Area is undisturbed from their natural condition OR restored with Native and/or California Friendly vegetative covers.

☒ Yes ☐ No — Area is irrigated, if at all, with appropriate low water use irrigation systems to prevent irrigation runoff.

☒ Yes ☐ No — Runoff from the area will not comingle with runoff from the developed portion of the site, or across other landscaped areas that do not meet the above criteria.

If all answers indicate "Yes," complete Table C-2 to document the DMAs that are classified as Self-Treating Areas.

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

DMA Name or Identification	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
1-G	42,512	Native vegetative cover	Low water use

Step 3.B – Identify Type 'B' Self-Retaining Area and Type 'C' Areas Draining to Self-Retaining Areas

Type 'B' Self-Retaining Area: A Self-Retaining Area is shallowly depressed 'micro infiltration' areas designed to retain the Design Storm rainfall that reaches the area, without producing any Runoff.

Indicate if the DMAs meet the following criteria by answering "Yes," "No," or "N/A".

☐ Yes ☒ No ☐ N/A — Slopes will be graded toward the center of the pervious area.

☐ Yes ☒ No ☐ N/A — Soils will be freely draining to not create vector or nuisance conditions.

☐ Yes ☒ No ☐ N/A — Inlet elevations of area/overflow drains, if any, should be clearly specified to be three inches or more above the low point to promote ponding.

☐ Yes ☒ No ☐ N/A — Pervious pavements (e.g., crushed stone, porous asphalt, pervious concrete, or permeable pavers) can be self-retaining when constructed with a gravel base course four or more inches deep below any underdrain discharge elevation.

If all answers indicate "Yes," DMAs may be categorized as Type 'B', proceed to identify Type 'C' Areas Draining to Self-Retaining Areas.

Type 'C' Areas Draining to Self-Retaining Areas: Runoff from impervious or partially pervious areas can be managed by routing it to Self-Retaining Areas consistent with the LID Principle discussed in SMR WQMP Section 3.2.5 for 'Dispersing Runoff to Adjacent Pervious Areas'.
Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☐ Yes ☒ No — The drainage from the tributary area must be directed to and dispersed within the Self-Retaining Area.

☐ Yes ☒ No — Area must be designed to retain the entire Design Storm runoff without flowing offsite.

If all answers indicate "Yes," DMAs may be categorized as Type 'C'.

Complete Table C-3 and Table C-4 to identify Type 'B' Self-Retaining Areas and Type 'C' Areas Draining to Self-Retaining Areas.

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

Self-Retaining Area				Type 'C' DMAs that are draining to the Self-Retaining Area		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C-4= [C]	Required Retention Depth (inches) [D] = $[B] + \frac{[B]\cdot[C]}{[A]}$
DMA 1			.85			
DMA 2						
DMA 3						

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

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]

<u>Note:</u> (See Section 3.3 of SMR WQMP) Ensure that partially pervious areas draining to a Self-Retaining area do not exceed the following ratio:

$$\left(\frac{\mathbf{2}}{\boldsymbol{Impervious\ Fraction}}\right) : \mathbf{1}$$

(Tributary Area**:** Self-Retaining Area)

Step 3.C – Identify Type 'D' Areas Draining to BMPs

Areas draining to BMPs are those that could not be fully managed through LID Principles (DMA Types A through C) and will instead drain to an LID BMP and/or a Conventional Treatment BMP designed to manage water quality impacts from that area, and Hydromodification where necessary.

Complete Table C-5 to document which DMAs are classified as Areas Draining to BMPs

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

DMA Name or ID	BMP Name or ID Receiving Runoff from DMA
1-A	**PCBMP #1**
1-B	**PCBMP #1**
1-C	**PCBMP #1**
1-D	**PCBMP #1**
1-E	**PCBMP #1**
1-F	**PCBMP #1**

Note: More than one DMA may drain to a single LID BMP; however, one DMA may not drain to more than one BMP.

Section D: Implement LID BMPs

The Regional MS4 Permit requires the use of LID BMPs to provide retention or treatment of the DCV and includes a BMP hierarchy which requires Full Retention BMPs (Priority 1) to be considered before Biofiltration BMPs (Priority 2) and Flow-Through Treatment BMPs and Alternative Compliance BMPs (Priority 3). LID BMP selection must be based on technical feasibility and should be considered early in the site planning and design process. Use this section to document the selection of LID BMPs for each DMA. Note that feasibility is based on the DMA scale and may vary between DMAs based on site conditions.

D.1 Full Infiltration Applicability

An assessment of the feasibility of utilizing full infiltration BMPs is required for all projects, *except where it can be shown that site design LID principals fully retain the DCV (i.e., all DMAs are Type A, B, or C), or where Harvest and Use BMPs fully retain the DCV. Check the following box if applicable:*

☐ Site design LID principals fully retain the DCV (i.e., all DMAs are Type A, B, or C), (Proceed to Section E).

If the above box remains unchecked, perform a site-specific evaluation of the feasibility of Infiltration BMPs using each of the applicable criteria identified in Chapter 2.3.3 of the SMR WQMP and complete the remainder of Section D.1.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Copermittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the SMR WQMP. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

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 SMR WQMP in Chapter 2.3.3. 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

Downstream Impacts (SMR WQMP Section 2.3.3.a)		
Does the project site…	**YES**	**NO**
…have any DMAs where infiltration would negatively impact downstream water rights or other Beneficial Uses[3]?		X
If Yes, list affected DMAs:		
Groundwater Protection (SMR WQMP Section 2.3.3.b)		
Does the project site…	**YES**	**NO**
…have any DMAs with industrial, and other land uses that pose a high threat to water quality, which cannot be treated by Bioretention BMPs? Or have DMAs with active industrial process areas?		X
If Yes, list affected DMAs:		
…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 horizontally of a water supply well?		X
If Yes, list affected DMAs:		
…have any DMAs that would restrict BMP locations to within a 2:1 (horizontal: vertical) influence line extending from any septic leach line?		X
If Yes, list affected DMAs:		
…have any DMAs been evaluated by a licensed Geotechnical Engineer, Hydrogeologist, or Environmental Engineer, who has concluded that the soils do not have adequate physical and chemical characteristics for the protection of groundwater, and has treatment provided by amended media layers in Bioretention BMPs been considered in evaluating this factor?		X
If Yes, list affected DMAs:		
Public Safety and Offsite Improvements (SMR WQMP Section 2.3.3.c)		
Does the project site…	**YES**	**NO**
…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: DMA 1A-1F drain to PCBMP #1 near sewer line.		
Infiltration Characteristics For LID BMPs (SMR WQMP Section 2.3.3.d)		
Does the project site…	**YES**	**NO**
…have factored infiltration rates of less than 0.8 inches / hour? (Note: on a case-by-case basis, the Local Jurisdiction may allow a factor of safety as low as 1.0 to support selection of full infiltration BMPs. Therefore, measured infiltration rates could be as low as 0.8 in/hr to support full infiltration. A higher factor of safety would be required for design in accordance with the LID BMP Deign Handbook).		X
If Yes, list affected DMAs:		
Cut/Fill Conditions (SMR WQMP Section 2.3.3.e)		
Does the project site…	**YES**	**NO**
…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: DMAs 1A-1F		
Other Site-Specific Factors (SMR WQMP Section 2.3.3.f)		
Does the project site…	**YES**	**NO**
…have DMAs where the geotechnical investigation discovered other site-specific factors that would preclude effective and/or safe infiltration?		X
Describe here: Will be done, if required.		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs that rely solely on infiltration should not be used for those DMAs and you should proceed to the assessment for Biofiltration BMPs below. Biofiltration BMPs that provide partial infiltration may still be feasible and should be

[3] Such a condition must be substantiated by sufficient modeling to demonstrate an impact and would be subject to [Insert Jurisdiction] discretion. There is not a standardized method for assessing this criterion. Water rights evaluations should be site-specific.

assessed in Section D.2. Summarize concerns identified in the Geotechnical Report, if any, that resulted in a "YES" response above in the table below.

Table D-2 Geotechnical Concerns for Onsite Infiltration

Type of Geotechnical Concern	DMAs Feasible (By Name or ID)	DMAs Infeasible (By Name or ID)
Collapsible Soil		
Expansive Soil		
Slopes		
Liquefaction		
Other		

D.2 Biofiltration Applicability

This section should document the applicability of biofiltration BMPs for Type D DMAs that are not feasible for full infiltration BMPs. The key decisions to be documented in this section include:

1. Are biofiltration BMPs with partial infiltration feasible?
    a. Biofiltration BMPs must be designed to maximize incidental infiltration via a partial infiltration design unless it is demonstrated that this design is not feasible.
    b. These designs can be used at sites with low infiltration rates where other feasibility factors do not preclude incidental infiltration.

    Document summary in Table D-3.
2. If not, what are the factors that require the use of biofiltration with no infiltration? This may include:
    a. Geotechnical hazards
    b. Water rights issues
    c. Water balance issues
    d. Soil contamination or groundwater quality issues
    e. Very low infiltration rates (factored rates < 0.1 in/hr)
    f. Other factors, demonstrated to the acceptance of the local jurisdiction

    If this applies to any DMAs, then rationale must be documented in Table D-3.
3. Are biofiltration BMPs infeasible?
    a. If yes, then provide 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 with jurisdiction over the Project site to discuss this option. Proceed to Section F to document your alternative compliance measures.

Table D-3 Evaluation of Biofiltration BMP Feasibility

DMA ID	Is Partial/ Incidental Infiltration Allowable? (Y/N)	Basis for Infeasibility of Partial Infiltration (provide summary and include supporting basis if partial infiltration not feasible)
PCBMP #1	N	Sewer line trench could become saturated.

Proprietary Biofiltration BMP Approval Criteria

If the project will use proprietary BMPs as biofiltration BMPs, then this section is completed to document that the proprietary BMPs are selected in accordance with Section 2.3.7 of the SMR WQMP. Proprietary Biofiltration BMPs must meet both of the following approval criteria:

1. Approval Criteria for All Proprietary BMPs, and
2. Acceptance Criteria for Proprietary Biofiltration BMPs.

When the use of proprietary biofiltration BMPs is proposed to meet the Pollutant Control performance standards, use Table D-4 to document that appropriate approval criteria have been met for the proposed BMPs. Add additional rows to document approval criteria are met for each type of BMP proposed.

Table D-4 Proprietary BMP Approval Requirement Summary

Proposed Proprietary Biofiltration BMP	Approval Criteria	Notes/Comments
Insert BMP Name and Manufacturer Here	☐ Proposed BMP has an active TAPE GULD Certification for the project pollutants of concern[4] or equivalent 3rd party demonstrated performance.	Insert text here
	☐ The BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification.	Insert text here
	☐ The BMP includes biological features including vegetation supported by engineered or other growing media.	Describe features here.
	☐ The BMP is designed to maximize infiltration, or supplemental infiltration is provided to achieve retention equivalent to Biofiltration with Partial Infiltration BMPs if factored infiltration rate is between 0.1 and 0.8 inches/hour.	Describe supplemental retention practices if applicable.

[4] Use Table F-1 and F-2 to identify and document the pollutants of concern and include these tables in Appendix 5.

	☐ The BMP is sized using one of two Biofiltration LID sizing options in Section 2.3.2 of the SRM WQMP.	List sizing method used, resulting size (i.e. volume or flow), and provided size (for proposed unit)

D.3 Feasibility Assessment Summaries

From the Infiltration, Biofiltration with Partial Infiltration and Biofiltration with No Infiltration Sections above, complete Table D-5 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D-5 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy			No LID (Alternative Compliance)
	1. Infiltration	2. Biofiltration with Partial Infiltration	3. Biofiltration with No Infiltration	
PCBMP #1	☐	☐	☒	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a narrative in Table D-6 below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section F below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

This is based on the clarification letter titled "San Diego Water Board's Expectations of Documentation to Support a Determination of Priority Development Project Infiltration Infeasibility" (April 28, 2017, Via email from San Diego Regional Water Quality Control Board to San Diego County Municipal Storm Water Copermittees[5]).

Table D-6 Summary of Infeasibility Documentation

Question	Narrative Summary (include reference to applicable appendix/attachment/report, as applicable)
a) When in the entitlement process did a geotechnical engineer analyze the site for infiltration feasibility?	A soils report was prepared. However, no infiltration testing was performed. Because the majority of the site will be in compacted fill, it is unlikely that there will be infiltration proposed for the site design BMPs. Once the location of the hydromodification basins are finalized, infiltration testing may be deemed appropriate. (per p. 46 and 47 of WQMP).
b) When in the entitlement process were other investigations conducted	NA

[5] http://www.projectcleanwater.org/download/pdp-infiltration-infeasibility/

(e.g., groundwater quality, water rights) to evaluate infiltration feasibility?	
c) What was the scope and results of testing, if conducted, or rationale for why testing was not needed to reach findings?	To construct a buildable pad for the development of this commercial site, excavation and compaction must support a large building envelope. Compaction of the site will dis-allow the building for infiltration to occur. (See p. 46 and 47 of the WQMP.) Testing will be performed in the area of the basin if the finalized location of the basin is appropriate for infiltration.
d) What public health and safety requirements affected infiltration locations?	NA
e) What were the conclusions and recommendations of the geotechnical engineer and/or other professional responsible for other investigations?	NA
f) What was the history of design discussions between the permittee and applicant for the proposed project, resulting in the final design determination related locations feasible for infiltration?	NA
g) What site design alternatives were considered to achieve infiltration or partial infiltration on site?	NA
h) What physical impairments (i.e., fire road egress, public safety considerations, utilities) and public safety concerns influenced site layout and infiltration feasibility?	NA
i) What LID Principles (site design BMPs) were included in the project site design?	NA

D.4 LID BMP Sizing

Each LID BMP must be designed to ensure that the DCV will be captured by the selected BMPs with no discharge to the storm drain or surface waters during the DCV size storm. Infiltration BMPs must at minimum be sized to capture the DCV to achieve pollutant control requirements.

Biofiltration BMPs must at a minimum be sized to:

- Treat 1.5 times the DCV not reliably retained on site using a volume-base or flow-based sizing method, or
- Include static storage volume, including pore spaces and pre-filter detention volume, at least 0.75 times the portion of the DCV not reliably retained on site.

First**,** calculate the DCV for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using the methods included in Section 3 of the LID BMP Design Handbook. Utilize the worksheets found in the LID BMP Design Handbook or consult with the Copermittee to assist you in correctly sizing your LID BMPs. Use Table D-7 below to document the DCV each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D-7 DCV Calculations for LID BMPs

DMA Type/ID	**DMA (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]			
						Design Storm Depth (in)	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{12}$	[G]

[B], [C] is obtained as described in Section 2.6.1.b of the SMR WQMP

[E] is obtained from Exhibit A in the SMR WQMP

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

Complete Table D-8 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. You can add rows to the table as needed. Alternatively, the Santa Margarita Hydrology Model (SMRHM) can be used to size LID BMPs to address the DCV and, if applicable, to size Hydrologic Control BMPs to meet the Hydrologic Performance Standard described in the SMR WQMP, as identified in Section E.

Table D-8 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)

If bioretention will include a capped underdrain, then include sizing calculations demonstrating that the BMP will meet infiltration sizing requirements with the underdrain capped and also meet biofiltration sizing requirements if the underdrain is uncapped.

Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs

If a completed Table 1.2 demonstrates that the project is exempt from Hydromodification Performance Standards, specify N/A and proceed to Section G.

☐ N/A Project is Exempt from Hydromodification Performance Standards.

If a PDP is not exempt from hydromodification requirements than the PDP must satisfy the requirements of the performance standards for hydrologic control BMPs and Sediment Supply BMPs. The PDP may choose to satisfy hydrologic control requirements using onsite or offsite BMPs (i.e. Alternative Compliance). Sediment supply requirements cannot be met via alternative compliance. If N/A is not selected above, select one of the two options below and complete the applicable sections.

☒ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control and Sediment Supply BMPs Onsite (complete Section E).

☐ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control Requirements using Alternative Compliance (complete Section F). Selection of this option must be approved by the Copermittee.

E.1 Hydrologic Control BMP Selection

Capture of the DCV and achievement of the Hydrologic Performance Standard may be met by combined and/or separate structural BMPs. The user should consider the full suite of Hydrologic Control BMPs to manage runoff from the post-development condition and meet the Hydrologic Performance Standard identified in this section.

The Hydrologic Performance Standard consists of matching or reducing the flow duration curve of post-development conditions to that of pre-existing, naturally occurring conditions, for the range of geomorphically significant flows (10% of the 2-year runoff event up to the 10-year runoff event). Select each of the hydrologic control BMP types that are applied to meet the above performance standard on the site.

☐ LID principles as defined in Section 3.2 of the SMR WQMP.

☒ Structural LID BMPs that may be modified or enlarged, if necessary, beyond the DCV.

☒ Structural Hydrologic Control BMPs that are distinct from the LID BMPs above. The LID BMP Design Handbook provides information not only on Hydrologic Control BMP design, but also on BMP design to meet the combined LID requirement and Hydrologic Performance Standard. The Handbook specifies the type of BMPs that can be used to meet the Hydrologic Performance Standard.

E.2 Hydrologic Control BMP Sizing

Hydrologic Control BMPs must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA for the range of geomorphically significant flows. Using SMRHM, (or another acceptable continuous simulation model if approved by the Copermittee) the applicant shall demonstrate that the performance of the Hydrologic Control BMPs complies with the Hydrologic Performance Standard. Complete Table E-1 below and identify, for each DMA, the type of Hydrologic Control BMP, if the SMRHM model confirmed the management (Identified as "passed" in SMRHM), the total volume capacity of the Hydrologic Control BMP, the Hydrologic Control BMP footprint at top floor elevation, and the drawdown time of the Hydrologic Control BMP. SMRHM summary reports should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table E-1 Hydrologic Control BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
PCBMP #1	1A-1F	Biofiltration Basin	☒	0.18	0.06 ac	< 24hrs.
			☐			
			☐			
			☐			

If a bioretention BMP with capped underdrain is used and hydromodification requirements apply, then sizing calculations must demonstrate that the BMP meets flow duration control criteria with the underdrain capped and uncapped. Both calculations must be included.

E.3 Implement Sediment Supply BMPs

The sediment supply performance standard applies to PDPs for which hydromodification applied that have the potential to impact Potential Critical Coarse Sediment Yield Areas. Refer to Exhibit G of the WQMP to determine if there are onsite Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas. Select one of the two options below and include the Potential Critical Coarse Sediment Yield Area Exhibit showing your project location in Appendix 7.

☒ There are no mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site. The Sediment Supply Performance Standard is met with no further action.

☐ There are mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site, the Sediment Supply Performance Standard will be met through Option 1 or Option 2 below.

The applicant may refer to Section 3.6.4 of the SMR WQMP for a description of the methodology to meet the Sediment Supply Performance Standard. Select the applicable compliance pathway and complete the appropriate sections to demonstrate compliance with the Sediment Supply Performance Standard if the second box is selected above:

☐ Avoid impacts related to any PDP activities to Potential Critical Coarse Sediment Yield Areas. Proceed to Section E.3.1.

☐ Complete a Site-Specific Critical Coarse Sediment Analysis. Proceed to Section E.3.2.

E.3.1 Option 1: Avoid Potential Critical Coarse Sediment Yield Areas and Potential Sediment Source Areas

The simplest approach for complying with the Sediment Supply Performance Standard is to avoid impacts to areas identified as Potential Critical Coarse Sediment Yield Areas or Potential Sediment Supply Areas. If a portion of PDP is identified as a Potential Critical Coarse Sediment Yield Area or a Potential Sediment Source Area, that PDP may still achieve compliance with the Sediment Supply Performance Standards if Potential Critical Coarse Sediment Yield Areas and Potential Sediment Supply Areas are avoided, i.e. areas are not developed and thereby delivery of Critical Coarse Sediment to the receiving waters is not impeded by site developments.

Provide a narrative describing how the PDP has avoided impacts to Potential Critical Coarse Sediment Yield Areas and/or Potential Sediment Source Areas below.

If it is not feasible to avoid these areas, proceed to Option 2 to complete a Site-Specific Critical Coarse Sediment Analysis.

E.3.2 Option 2: Site-Specific Critical Coarse Sediment Analysis

Perform a stepwise assessment to ensure the maintenance of the pre-project source(s) of Critical Coarse Sediment (i.e., Bed Sediment Supply):

1. Determine whether the site or a portion of the site is a Significant Source of Bed Sediment Supply to the Receiving Channel (i.e., an actual verified Critical Coarse Sediment Yield Area);
2. Avoid areas identified as actual verified Critical Coarse Sediment Yield Areas in the PDP design and maintain pathways for discharge of Bed Sediment Supply from these areas to receiving waters.

Step 1: Identify if the site is an actual verified Critical Coarse Sediment Yield Area supplying Bed Sediment Supply to the receiving channel

☐ **Step 1.A** – Is the Bed Sediment of onsite streams similar to that of receiving streams?

Rate the similarity: ☐ High
☐ Medium
☐ Low

Results from the geotechnical and sieve analysis to be performed both onsite and in the receiving channel should be documented in Appendix 7. Of particular interest, the results of the sieve analysis, the soil erodibility factor, a description of the topographic relief of the project area, and the lithology of onsite soils should be reported in Appendix 7.

☐ **Step 1.B** – Are onsite streams capable of delivering Bed Sediment Supply from the site, if any, to the receiving channel?

Rate the potential: ☐ High
☐ Medium
☐ Low

Results from the analyses of the sediment delivery potential to the receiving channel should be documented in Appendix 7 and identify, at a minimum, the Sediment Source, the distance to the receiving channel, the onsite channel density, the project watershed area, the slope, length, land use, and rainfall intensity.

☐ **Step 1.C** – Will the receiving channel adversely respond to a change in Bed Sediment Load?

Rate the need for bed sediment supply:

☐ High
☐ Medium
☐ Low

Results from the in-stream analysis to be performed both onsite should be documented in Appendix 7. The analysis should, at a minimum, quantify the bank stability and the degree of incision, provide a gradation of the Bed Sediment within the receiving channel, and identify if the channel is sediment supply-limited.

☐ **Step 1.D** – Summary of Step 1

Summarize in Table E.3 the findings of Step 1 and associate a score (in parenthesis) to each step. The sum of the three individual scores determines if a stream is a significant contributor to the receiving stream.

- Sum is equal to or greater than eight - Site is a significant source of sediment bed material – all on-site streams must be preserved or by-passed within the site plan. The applicant shall proceed to Step 2 for all onsite streams.
- Sum is greater than five but lower than eight. Site is a source of sediment bed material – some of the on-site streams must be preserved (with identified streams noted). The applicant shall proceed to Step 2 for the identified streams only.
- Sum is equal to or lower than five. Site is not a significant source of sediment bed material. The applicant may advance to Section F.

Table E-2 Triad Assessment Summary

Step	Rating			Total Score
1.A	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.B	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.C	☐ High (3)	☐ Medium (2)	☐ Low (1)	
Significant Source Rating of Bed Sediment to the receiving channel(s)				

Step 2: Avoid Development of Critical Coarse Sediment Yield Areas, Potential Sediment Sources Areas, and Preserve Pathways for Transport of Bed Sediment Supply to Receiving Waters

Onsite streams identified as a actual verified Critical Coarse Sediment Yield Areas should be avoided in the site design and transport pathways for Critical Coarse Sediment should be preserved

Check those that apply:

☐ The site design does avoid all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas

AND

☐ The drainage design bypasses flow and sediment from onsite upstream drainages identified as actual verified Critical Coarse Sediment Yield Areas to maintain Critical Coarse Sediment supply to receiving waters

(If both are yes, the applicant may disregard subsequent steps of Section E.3 and directly advance directly to Section G).

- *Or* -

☐ The site design **does NOT avoid** all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas

OR

☐ The project impacts transport pathways of Critical Coarse Sediment from onsite upstream drainages.

(If either of these are the case, the applicant may proceed with the subsequent steps of Section E.3).

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment. The site map shall demonstrate, if feasible, that the site design avoids those onsite channels identified as a Significant Source of Bed Sediment. In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment. If the design plan cannot avoid the onsite channels, please provide a rationale for each channel individually.

The site map shall demonstrate that the drainage design bypasses those onsite channels that supply Critical Coarse Sediment to the receiving channel(s). In addition, the applicant shall describe the characteristics of each onsite channel identified as an actual verified Critical Coarse Sediment Yield Area.

Identified Channel #1 - Insert narrative description here

Identified Channel #2 - Insert narrative description here

Identified Channel #3 - Insert narrative description here

E.3.3 Sediment Supply BMPs to Result in No Net Impact to Downstream Receiving Waters

If impacts to Critical Coarse Sediment Yield Areas cannot be avoided, sediment supply BMPs must be implemented such there is no net impact to receiving waters. Sediment supply BMPs may consist of approaches that permit flux of bed sediment supply from Critical Coarse Sediment Yield Areas within the

project boundary. This approach is subject to acceptance by the [Insert Jurisdiction]. It may require extensive documentation and analysis by qualified professionals to support this demonstration.

Appendix H of the San Diego Model BMP Design Manual provides additional information on site-specific investigation of Critical Coarse Sediment Supply areas.

http://www.projectcleanwater.org/download/2018-model-bmp-design-manual/

If applicable, insert narrative description here

Documentation of sediment supply BMPs should be detailed in Appendix 7.

Section F: Alternative Compliance

Alternative Compliance may be used to achieve compliance with pollutant control and/or hydromodification requirements for a given PDP. Alternative Compliance may be used under two scenarios, check the applicable box if the PDP is proposing to use Alternative Compliance to satisfy all or a portion of the Pollutant Control and/or Hydrologic Control requirements (but not sediment supply requirements)

☐ If it is not feasible to fully implement Infiltration or Biofiltration BMPs at a PDP site, Flow-Through Treatment Control BMPs may be used to treat pollutants contained in the portion of DCV not reliably retained on site and Alternative Compliance measures must also be implemented to mitigate for those pollutants in the DCV that are not retained or removed on site prior to discharging to a receiving water.

☐ Alternative Compliance is selected to comply with either pollutant control or hydromodification flow control requirements even if complying with these requirements is potentially feasible on-site. If such voluntary Alternative Compliance is implemented, Flow-Through Treatment Control BMPs must still be used to treat those pollutants in the portion of the DCV not reliably retained on site prior to discharging to a receiving water.

Refer to Section 2.7 of the SMR WQMP and consult the Local Jurisdiction for currently available Alternative Compliance pathways. Coordinate with the Copermittee if electing to participate in Alternative Compliance and complete the sections below to document implementation of the Flow-Through BMP component of the program.

F.1 Identify Pollutants of Concern

The purpose of this section is to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs and to document compliance and.

Utilize Table A-1 from Section A, which noted your project's Receiving Waters, to identify impairments for Receiving Waters (including downstream receiving waters) by completing Table F-1. Table F-1 includes the watersheds identified as impaired in the Approved 2010 303(d) list; check box corresponding with the PDP's receiving water. The most recent 303(d) lists are available from the State Water Resources Control Board website:
https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml).https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml.

Table F-1 Summary of Approved 2010 303(d) listed waterbodies and associated pollutants of concern for the Riverside County SMR Region and downstream waterbodies.

	Water Body	Nutrients[1]	Metals[2]	Toxicity	Bacteria and Pathogens	Pesticides and Herbicides	Sulfate	Total Dissolved Solids
☐	De Luz Creek	X	X				X	
☐	Long Canyon Creek		X		X	X		
☐	Murrieta Creek	X	X	X		X		
☐	Redhawk Channel	X	X		X	X		X
☐	Santa Gertudis Creek	X	X		X	X		
☐	Santa Margarita Estuary	X						
☐	Santa Margarita River (Lower)	X			X			
☐	Santa Margarita River (Upper)	X		X				
☐	Temecula Creek	X	X	X		X		X
☐	Warm Springs Creek	X	X		X	X		

[1] Nutrients include nitrogen, phosphorus and eutrophic conditions caused by excess nutrients.

[2] Metals includes copper, iron, and manganese.

Use Table F-2 to identify the pollutants identified with the project site. Indicate the applicable PDP Categories and/or Project Features by checking the boxes that apply. If the identified General Pollutant Categories are the same as those listed for your Receiving Waters, then these will be your Pollutants of Concern; check the appropriate box or boxes in the last row.

Table F-2 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)		General Pollutant Categories									
		Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease	Total Dissolved Solids	Sulfate
☐	Detached Residential Development	P	N	P	P	N	P	P	P	N	N
☐	Attached Residential Development	P	N	P	P	N	P	P	P[(2)]	N	N
☐	Commercial/Industrial Development	P[(3)]	P[(7)]	P[(1)]	P[(1)]	P	P[(1)]	P	P	N	N
☐	Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P	N	N
☐	Restaurants (>5,000 ft^2)	P	N	N	P[(1)]	N	N	P	P	N	N
☐	Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P	N	N
☐	Parking Lots (>5,000 ft^2)	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Streets, Highways, and Freeways	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Retail Gasoline Outlets	N	P[(7)]	N	N	P[(4)]	N	P	P	N	N
Project Priority Pollutant(s) of Concern		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste products; otherwise not expected

(4) Including petroleum hydrocarbons

(5) Including solvents

(6) Bacterial indicators are routinely detected in pavement runoff

(7) A potential source of metals, primarily copper and zinc. Iron, magnesium, and aluminum are commonly found in the environment and are commonly associated with soils, but are not primarily of anthropogenic stormwater origin in the municipal environment.

F.2 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential Pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must be selected to address the Project Priority Pollutants of Concern (identified above) and meet the acceptance criteria described in Section 2.3.7 of the SMR WQMP. Documentation of acceptance criteria must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table F-3 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Copermittee Approved Study and provided in Appendix 6.

F.3 Sizing Criteria

Utilize Table F-4 below to appropriately size flow-through BMPs to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.1 of the SMR WQMP for further information.

Table F-4 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
						Design Storm (in)	*Design Flow Rate (cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[E] either 0.2 inches or 2 times the 85th percentile hourly rainfall intensity
[G] = 43,560,.

F.4 Hydrologic Performance Standard – Alternative Compliance Approach

Alternative compliance options are only available if the governing Copermittee has acknowledged the infeasibility of onsite Hydrologic Control BMPs and approved an alternative compliance approach. See Section 3.5 and 3.6 of the SMR WQMP.

Select the pursued alternative and describe the specifics of the alternative:

☐ Offsite Hydrologic Control Management within the same channel system

Insert narrative description here

☐ In-Stream Restoration Project

Insert narrative description here

For Offsite Hydrologic Control BMP Option

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP is equivalent with the Hydrologic Performance Standard for onsite conditions. Complete Table F-5 below and identify, for each Hydrologic Control BMP, the equivalent DMA the Hydrologic Control BMP mitigates, that the SMRHM model passed, the total volume capacity of the BMP, the BMP footprint at top floor elevation, and the drawdown time of the BMP. SMRHM summary reports for the alternative approach should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table F-5 Offsite Hydrologic Control BMP Sizing

BMP Name / Type	Equivalent DMA (ac)	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
		☐			
		☐			
		☐			
		☐			

For Instream Restoration Option

Attach to Appendix 7 the technical report detailing the condition of the receiving channel subject to the proposed hydrologic and sediment regimes. Provide the full design plans for the in-stream restoration project that have been approved by the Copermittee. Utilize the San Diego Regional Water Quality Equivalency Guidance Document.

Section G: Implement Trash Capture BMPs

The Local Jurisdiction may require full trash capture BMPs to be installed as part of the project. Consult with the Local Jurisdiction to determine applicability.

Trash Capture BMPs may be applicable to Type 'D' DMAs, as defined in Section 2.3.4 of the SMR WQMP. Trash Capture BMPs are designed to treat Q_{TRASH}, the runoff flow rate generated during the 1-year 1-hour precipitation depth. Utilize Table G-1 to size Trash Capture BMP. Refer to Table G-2 to determine the Trash Capture Design Storm Intensity (E).

Table G-1 Sizing Trash Capture 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	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
						Trash Capture Design Storm Intensity (in)	*Trash Capture Design Flow Rate (cubic feet or cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[G] = 43,560

Table G-2 Approximate precipitation depth/intensity values for calculation of the Trash Capture Design Storm

City	1-year 1-hour Precipitation Depth/Intensity (inches/hr)
Murrieta	0.47
Temecula	0.50
Wildomar	0.37

Use Table G-3 to summarize and document the selection and sizing of Trash Capture BMPs.

Table G-3 Trash Capture BMPs

BMP Name / ID	DMA No(s)	BMP Type / Description	Required Trash Capture Flowrate (cfs)	Provided Trash Capture Flowrate (cfs)

Section H: Source Control BMPs

Source Control BMPs include permanent, structural features that may be required in your Project plans, such as roofs over and berms around trash and recycling areas, and Operational BMPs, such as regular sweeping and "housekeeping," that must be implemented by the site's occupant or user. The Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational Source Control BMPs cannot be substituted for a feasible and effective Structural Source Control BMP. Complete checklist below to determine applicable Source Control BMPs for your site.

Project-Specific WQMP Source Control BMP Checklist

All development projects must implement Source Control BMPs. Source Control BMPs are used to minimize pollutants that may discharge to the MS4. Refer to Chapter 3 (Section 3.8) of the SMR WQMP for additional information. Complete Steps 1 and 2 below to identify Source Control BMPs for the project site.

STEP 1: IDENTIFY POLLUTANT SOURCES

Review project site plans and identify the applicable pollutant sources. "Yes" indicates that the pollutant source is applicable to project site. "No" indicates that the pollutant source is not applicable to project site.

☒ Yes ☐ No	Storm Drain Inlets		☒ Yes ☐ No	Outdoor storage areas	
☐ Yes ☒ No	Floor Drains		☒ Yes ☐ No	Material storage areas	
☐ Yes ☒ No	Sump Pumps		☐ Yes ☒ No	Fueling areas	
☐ Yes ☒ No	Pets Control/Herbicide Application		☐ Yes ☒ No	Loading Docks	
☐ Yes ☒ No	Food Service Areas		☒ Yes ☐ No	Fire Sprinkler Test/Maintenance water	
☒ Yes ☐ No	Trash Storage Areas		☒ Yes ☐ No	Plazas, Sidewalks and Parking Lots	
☐ Yes ☒ No	Industrial Processes		☐ Yes ☒ No	Pools, Spas, Fountains and other water features	
☒ Yes ☐ No	Vehicle and Equipment Cleaning and Maintenance/Repair Areas				

STEP 2: REQUIRED SOURCE CONTROL BMPS

List each Pollutant source identified above in column 1 and fill in the corresponding Structural Source Control BMPs and Operational Control BMPs by referring to the Stormwater Pollutant Sources/Source Control Checklist included in Appendix 8. The resulting list of structural and operational source control BMPs must be implemented as long as the associated sources are present on the project site. Add additional rows as needed.

Pollutant Source	Structural Source Control BMP	Operational Source Control BMP
On-site storm drains	Private drains – will show markers if possible.	Maintain markers and provide information to maintenance personnel.
Trash Storage Areas	Show areas that are covered and paved and will prevent runoff.	Inspect trash areas regularly. Prevent spills. Refer to CASQA Fact Sheet SC-34 (see Appendix 10).
Vehicle and Equipment Cleaning Areas	Washing of vehicles will be performed indoors.	Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.

Vehicle and Equipment Maintenance/Repair Areas	No vehicle repair or maintenance will be done outdoors. There are no floor drains. There are no tanks, containers or sinks to be used for parts cleaning or rinsing.	The following restrictions apply to use this 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.
Outdoor Storage Areas	Maintain a detailed description of materials that are stored and provide structural features to prevent pollutants from entering storm drains.	Refer to CASQA Fact Sheet SC-31 (see Appendix 10).
Material Storage Areas	Maintain a detailed description of materials that are stored and provide 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/	Refer to CASQA Fact Sheets SC-31 and SC-33 (see Appendix 10).

Fire Sprinkler Test/Maintenance Water	A means will be provided to drain the fire sprinkler test water to the sanitary water.	See CASQA Fact Sheet SC-41 (see Appendix 10).
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.

Section I: Coordinate Submittal with Other Site Plans

Populate Table I-1 below to assist the plan checker in an expeditious review of your project. During construction and at completion, [Insert Jurisdiction] inspectors will verify the installation of BMPs against the approved plans. 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 I-1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
Insert text here	Insert text here	Insert text here
Insert text here	Insert text here	Insert text here
Insert text here	Insert text here	Insert text here
Insert text here	Insert text here	Insert text here
Insert text here	Insert text here	Insert text here

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. The Copermittee with jurisdiction over the Project site can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Use Table I-2 to identify other applicable permits that may impact design of the site. If yes is answered to any of the items below, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Table I-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 Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act 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)*	☐ Y	☐ N

Section J: Operation, Maintenance and Funding

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

1. A means to finance and implement maintenance of BMPs 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 Operations and Maintenance or inspections but will require typical landscape maintenance as noted in Chapter 5, in the SMR WQMP. Include a brief description of typical landscape maintenance for these areas.

The Copermittee with jurisdiction over the Project site will also require that you prepare and submit a detailed BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the 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 BMP Operation and Maintenance Plan are in Chapter 5 of the SMR WQMP.

Maintenance Mechanism: Private funding by single owner of project - WM LYLES.

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

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Section K: Acronyms, Abbreviations and Definitions

Regional MS4 Permit	Order No. R9-2013-0001 as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100 an NPDES Permit issued by the San Diego Regional Water Quality Control Board.
Applicant	Public or private entity seeking the discretionary approval of new or replaced improvements from the Copermittee with jurisdiction over the project site. The Applicant has overall responsibility for the implementation and the approval of a Priority Development Project. The WQMP uses consistently the term "user" to refer to the applicant such as developer or project proponent. The WQMP employs also the designation "user" to identify the Registered Professional Civil Engineer responsible for submitting the Project-Specific WQMP, and designing the required BMPs.
Best Management Practice (BMP)	Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of municipal storm water permits, BMPs are typically used in place of numeric effluent limits.
BMP Fact Sheets	BMP Fact Sheets are available in the LID BMP Design Handbook. Individual BMP Fact Sheets include sitting considerations, and design and sizing guidelines for seven types of structural BMPs (infiltration basin, infiltration trench, permeable pavement, harvest-and-use, bioretention, extended detention basin, and sand filter).
California Stormwater Quality Association (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com.
Conventional Treatment Control BMP	A type of BMP that provides treatment of stormwater runoff. Conventional treatment control BMPs, while designed to treat particular Pollutants, typically do not provide the same level of volume reduction as LID BMPs, and commonly require more specialized maintenance than LID BMPs. As such, the Regional MS4 Permit and this WQMP require the use of LID BMPs wherever feasible, before Conventional Treatment BMPs can be considered or implemented.
Copermittees	The Regional MS4 Permit identifies the Cities of Murrieta, Temecula, and Wildomar, the County, and the District, as Copermittees for the SMR.

County	The abbreviation refers to the County of Riverside in this document.
CEQA	California Environmental Quality Act - a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
CIMIS	California Irrigation Management Information System - an integrated network of 118 automated active weather stations all over California managed by the California Department of Water Resources.
CWA	Clean Water Act - is the primary federal law governing water pollution. Passed in 1972, the CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983. CWA Section 402(p) is the federal statute requiring NPDES permits for discharges from MS4s.
CWA Section 303(d) Waterbody	Impaired water in which water quality does not meet applicable water quality standards and/or is not expected to meet water quality standards, even after the application of technology based pollution controls required by the CWA. The discharge of urban runoff to these water bodies by the Copermittees is significant because these discharges can cause or contribute to violations of applicable water quality standards.
Design Storm	The Regional MS4 Permit has established the 85th percentile, 24-hour storm event as the "Design Storm". The applicant may refer to Exhibit A to identify the applicable Design Storm Depth (D85) to the project.
DCV	Design Capture Volume (DCV) is the volume of runoff produced from the Design Storm to be mitigated through LID Retention BMPs, Other LID BMPs and Volume Based Conventional Treatment BMPs, as appropriate.
Design Flow Rate	The design flow rate represents the minimum flow rate capacity that flow-based conventional treatment control BMPs should treat to the MEP, when considered.
DCIA	Directly Connected Impervious Areas - those impervious areas that are hydraulically connected to the MS4 (i.e. street curbs, catch basins, storm drains, etc.) and thence to the structural BMP without flowing over pervious areas.
Discretionary Approval	A decision in which a Copermittee uses its judgment in deciding whether and how to carry out or approve a project.
District	Riverside County Flood Control and Water Conservation District.

DMA	A Drainage Management Area - a delineated portion of a project site that is hydraulically connected to a common structural BMP or conveyance point. The Applicant may refer to Section 3.3 for further guidelines on how to delineate DMAs.
Drawdown Time	Refers to the amount of time the design volume takes to pass through the BMP. The specified or incorporated drawdown times are to ensure that adequate contact or detention time has occurred for treatment, while not creating vector or other nuisance issues. It is important to abide by the drawdown time requirements stated in the fact sheet for each specific BMP.
Effective Area	Area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.
ESA	An Environmental Sensitive Area (ESA) designates an area "in which plants or animals life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments". (Reference: California Public Resources Code § 30107.5).
ET	Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is also an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity
FAR	The Floor Area Ratio (FAR) is the total square feet of a building divided by the total square feet of the lot the building is located on.
Flow-Based BMP	Flow-based BMPs are conventional treatment control BMPs that are sized to treat the design flow rate.
FPPP	Facility Pollution Prevention Plan
HCOC	Hydrologic Condition of Concern - Exists when the alteration of a site's hydrologic regime caused by development would cause significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects.
HMP	Hydromodification Management Plan – Plan defining Performance Standards for PDPs to manage increases in runoff discharge rates and durations.
Hydrologic Control BMP	BMP to mitigate the increases in runoff discharge rates and durations and meet the Performance Standards set forth in the HMP.
HSG	Hydrologic Soil Groups – soil classification to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are A (very low runoff potential/high infiltration rate), B, C, and D (high runoff potential/very low infiltration rate)

Hydromodification	The Regional MS4 Permit identifies that increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses.
JRMP	A separate Jurisdictional Runoff Management Plan (JRMP) has been developed by each Copermittee and identifies the local programs and activities that the Copermittee is implementing to meet the Regional MS4 Permit requirements.
LID	Low Impact Development (LID) is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques. LID site design BMPs help preserve and restore the natural hydrologic cycle of the site, allowing for filtration and infiltration which can greatly reduce the volume, peak flow rate, velocity, and pollutant loads of storm water runoff.
LID BMP	A type of stormwater BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of stormwater runoff, but also yield potentially significant reductions in runoff volume – helping to mimic the pre-project hydrologic regime, and also require less ongoing maintenance than Treatment Control BMPs. The applicant may refer to Chapter 2.
LID BMP Design Handbook	The LID BMP Design Handbook was developed by the Copermittees to provide guidance for the planning, design and maintenance of LID BMPs which may be used to mitigate the water quality impacts of PDPs within the County.
LID Bioretention BMP	LID Bioretention BMPs are bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. In bioretention areas, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants use soil moisture and promote the drying of the soil through transpiration. The Regional MS4 Permit defines "retain" as to keep or hold in a particular place, condition, or position without discharge to surface waters.
LID Biofiltration BMP	BMPs that reduce stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration, and other biological and chemical processes. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, and collected through an underdrain.

LID Harvest and Reuse BMP	BMPs used to facilitate capturing Stormwater Runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.
LID Infiltration BMP	BMPs to reduce stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
LID Retention BMP	BMPs to ensure full onsite retention without runoff of the DCV such as infiltration basins, bioretention, chambers, trenches, permeable pavement and pavers, harvest and reuse.
LID Principles	Site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
MEP	Maximum Extent Practicable - standard established by the 1987 amendments to the CWA for the reduction of Pollutant discharges from MS4s. Refer to Attachment C of the Regional MS4 Permit for a complete definition of MEP.
MF	Multi-family – zoning classification for parcels having 2 or more living residential units.
MS4	Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designated or used for collecting or conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.26.
New Development Project	Defined by the Regional MS4 Permit as 'Priority Development Projects' if the project, or a component of the project meets the categories and thresholds described in Section 1.1.1.
NPDES	National Pollution Discharge Elimination System - Federal program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of the CWA.
NRCS	Natural Resources Conservation Service

PDP	Priority Development Project - Includes New Development and Redevelopment project categories listed in Provision E.3.b of the Regional MS4 Permit.
Priority Pollutants of Concern	Pollutants expected to be present on the project site and for which a downstream water body is also listed as Impaired under the CWA Section 303(d) list or by a TMDL.
Project-Specific WQMP	A plan specifying and documenting permanent LID Principles and Stormwater BMPs to control post-construction Pollutants and stormwater runoff for the life of the PDP, and the plans for operation and maintenance of those BMPs for the life of the project.
Receiving Waters	Waters of the United States.
Redevelopment Project	The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair. Project that meets the criteria described in Section 1.
Runoff Fund	Runoff Funds have not been established by the Copermittees and are not available to the Applicant. If established, a Runoff Fund will develop regional mitigation projects where PDPs will be able to buy mitigation credits if it is determined that implementing onsite controls is infeasible.
San Diego Regional Board	San Diego Regional Water Quality Control Board - The term "Regional Board", as defined in Water Code section 13050(b), is intended to refer to the California Regional Water Quality Control Board for the San Diego Region as specified in Water Code Section 13200. State agency responsible for managing and regulating water quality in the SMR.
SCCWRP	Southern California Coastal Water Research Project
Site Design BMP	Site design BMPs prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
SF	Parcels with a zoning classification for a single residential unit.
SMC	Southern California Stormwater Monitoring Coalition
SMR	The Santa Margarita Region (SMR) represents the portion of the Santa Margarita Watershed that is included within the County of Riverside.

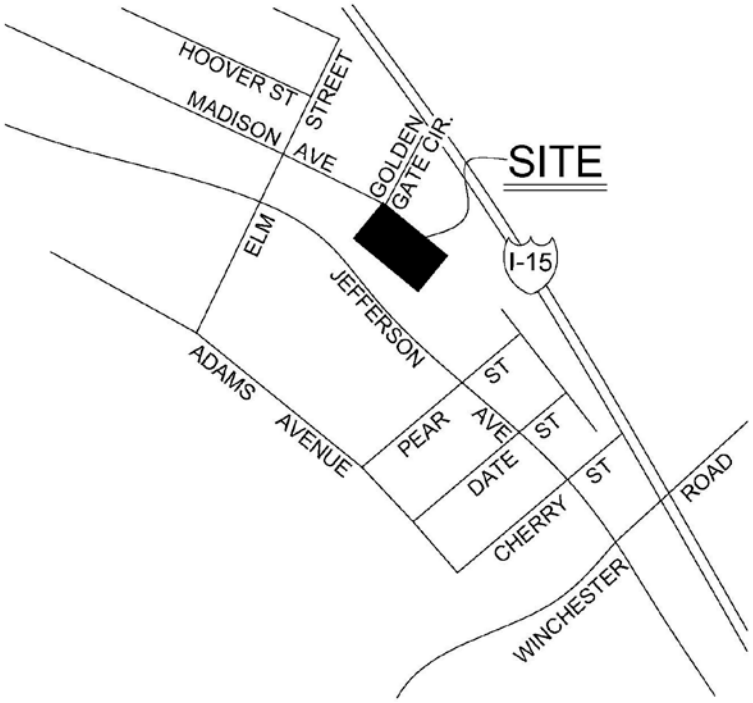
Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Structural BMP	Structures designed to remove pollutants from stormwater runoff and mitigate hydromodification impacts.
SWPPP	Storm Water Pollution Prevention Plan
Tentative Tract Map	Tentative Tract Maps are required for all subdivision creating five (5) or more parcels, five (5) or more condominiums as defined in Section 783 of the California Civil Code, a community apartment project containing five (5) or more parcels, or for the conversion of a dwelling to a stock cooperative containing five (5) or more dwelling units.
TMDL	Total Maximum Daily Load - the maximum amount of a Pollutant that can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.
USEPA	United States Environmental Protection Agency
Volume-Based BMP	Volume-Based BMPs applies to BMPs where the primary mode of pollutant removal depends upon the volumetric capacity such as detention, retention, and infiltration systems.
WQMP	Water Quality Management Plan
Wet Season	The Regional MS4 Permit defines the wet season from October 1 through April 30.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

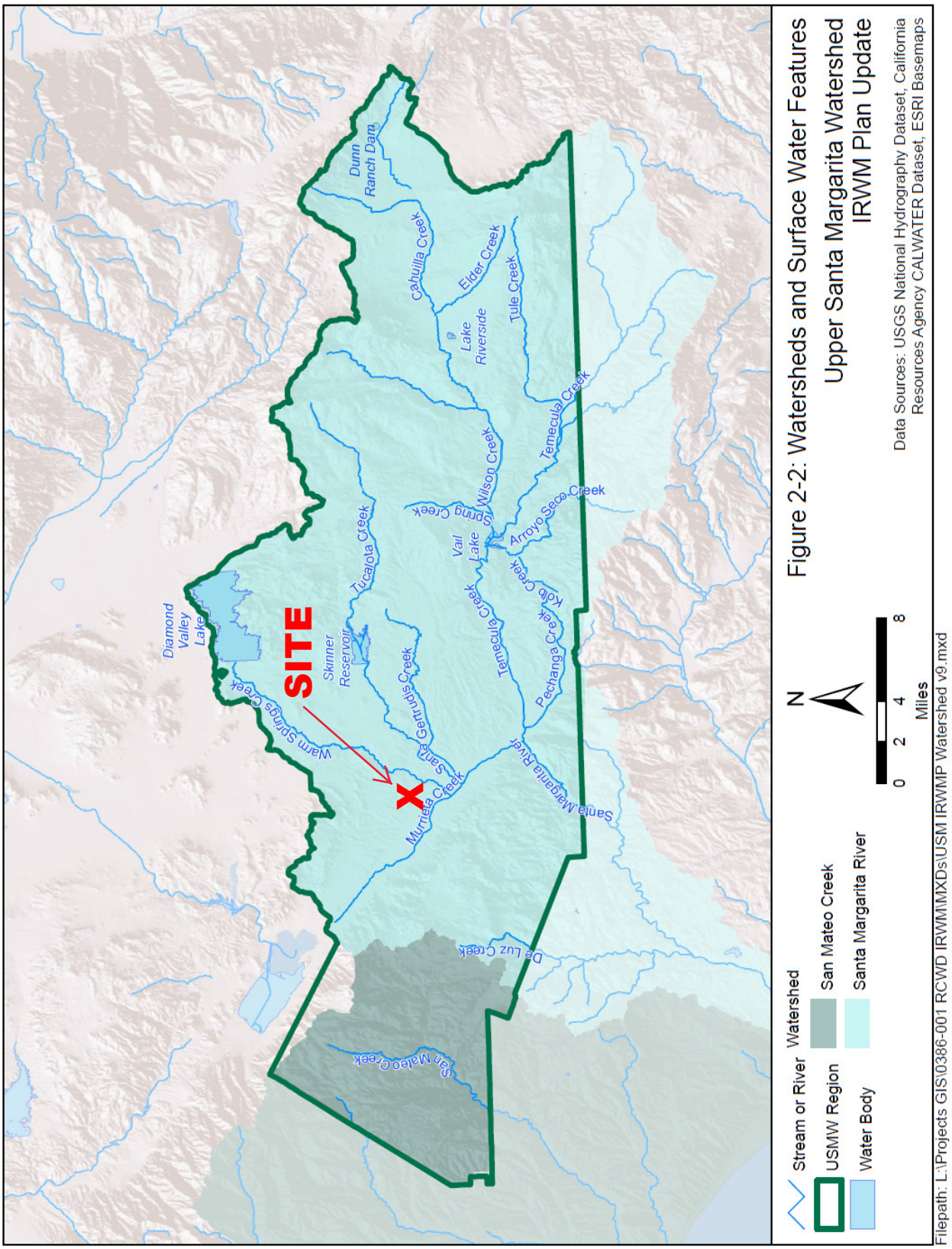
Complete the checklist below to verify all exhibits and components are included in the Project-Specific WQMP. Refer Section 4 of the SMR WQMP and Section D of this Template.

Map and Site Plan Checklist
Indicate all Maps and Site Plans are included in your Project-Specific WQMP by checking the boxes below.
☒ Vicinity and Location Map
☒ Existing Site Map (unless exiting conditions are included in WQMP Site Plan)
☒ WQMP Site Plan
☒ Parcel Boundary and Project Footprint
☒ Existing and Proposed Topography
☒ Drainage Management Areas (DMAs)
☒ Proposed Structural Best Management Practices (BMPs)
☒ Drainage Paths
☒ Drainage infrastructure, inlets, overflows
☒ Source Control BMPs
☒ Site Design BMPs
☒ Buildings, Roof Lines, Downspouts
☒ Impervious Surfaces
☒ Pervious Surfaces (i.e. Landscaping)
☒ Standard Labeling

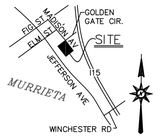


VICINITY MAP

NTS


SITE
Diamond Valley Lake
Skinner Reservoir
Dunn Ranch Dam
Cahuilla Creek
Elder Creek
Lake Riverside
Tule Creek
Temecula Creek
Wilson Creek
Spring Creek
Tucalota Creek
Vail Lake
Arroyo Seco Creek
Kolb Creek
Pechanga Creek
Temecula Creek
Warm Springs Creek
San Gertrudis Creek
Murrieta Creek
Santa Margarita River
De Luz Creek
San Mateo Creek
Figure 2-2: Watersheds and Surface Water Features
Upper Santa Margarita Watershed
IRWM Plan Update
Data Sources: USGS National Hydrography Dataset, California Resources Agency CALWATER Dataset, ESRI Basemaps
N
0 2 4 8
Miles
Stream or River
USMW Region
Water Body
Watershed
San Mateo Creek
Santa Margarita River
Filepath: L:\Projects GIS\0386-001 RCWD IRWM\MXDs\USM IRWMP Watershed v9.mxd

WQMP SITE PLAN



VICINITY MAP
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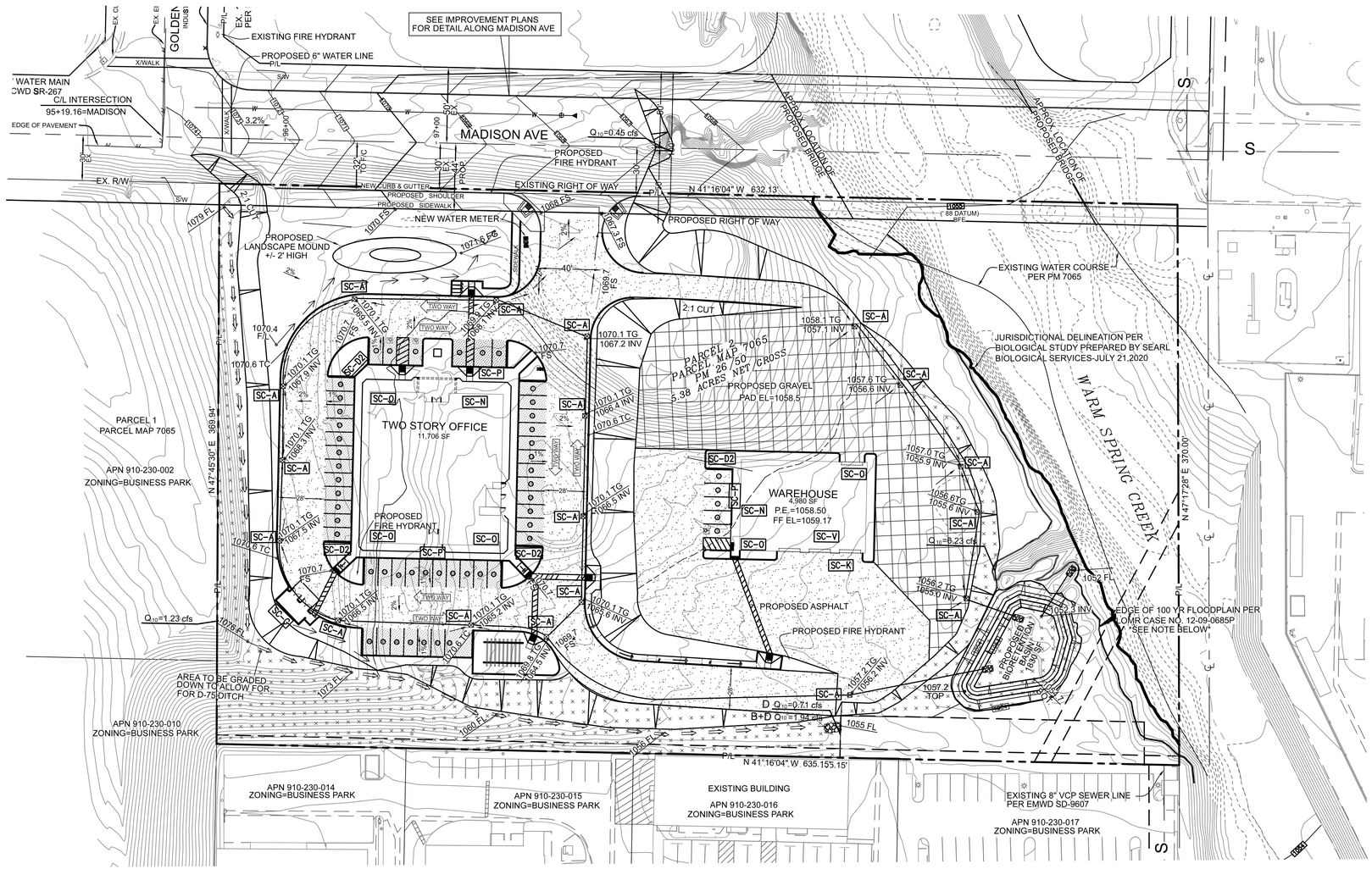


LEGEND

PROPERTY LINE	
EASEMENT	
EXISTING CONTOUR	180
PROPOSED CONTOUR	180
DIRECTION OF FLOW	2%
FLOW LINE	
FLOWLINE GRADE	190.0 FL
FINISHED SURFACE	189.6 FS
PROPOSED PERVIOUS PAVING	
PROPOSED CONCRETE	
PROPOSED ASPHALT	
PROPOSED GRAVEL	
SELF MITIGATING AREAS	
EDGE OF PAVEMENT	
6" PVC DRAIN PIPE	
18" NDS TRAFFIC RATED BROOKS BOXES	

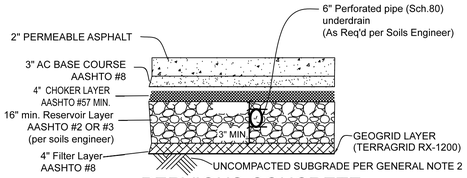
NOTES:
TOTAL SITE AREA=5.38 AC. NET/GROSS
DEVELOPED AREA=3.77 AC.

SOURCE CONTROL LEGEND

DESCRIPTION		LOCATION
ON-SITE STORM DRAIN INLETS	SC-A	AS INDICATED
LANDSCAPE/OUTDOOR PESTICIDE USE	SC-D2	AS INDICATED
REFUSE AREAS	SC-G	AS INDICATED
VEHICLE/EQUIPMENT REPAIR AND MAINTENANCE	SC-K	AS INDICATED
FIRE SPRINKLER TEST WATER	SC-N	AS INDICATED
ROOFING, GUTTERS, AND TRIM	SC-O	AS INDICATED
PLAZAS, SIDEWALKS, AND PARKING LOTS	SC-P	AS INDICATED
VEHICLE AND EQUIPMENT CLEANING AREAS	SC-V	AS INDICATED

PCBMP#1 PROPOSED IMPERVIOUS AREAS

DMA NAME	AREA (SF)	SURFACE TYPE	RUNOFF FACTOR	DMA TYPE
1-A	13,760	ROOF	1.0	BIOFILTRATION BASIN
1-B	49,978	CONC/ASPHALT	1.0	BIOFILTRATION BASIN
1-C	31,258	COMPACTED SOIL	0.4	BIOFILTRATION BASIN
1-D	22,671	GRAVEL	0.1	BIOFILTRATION BASIN
1-E	7,694	PERVIOUS CONC	0.1	BIOFILTRATION BASIN
1-F	5,425	LANDSCAPING	0.1	BIOFILTRATION BASIN
	130,786	PCBMP #1=1830 SF SURFACE AREA ORIFICE SIZE=		



PERVIOUS CONCRETE
Per Modified Drawing GS-5.2a

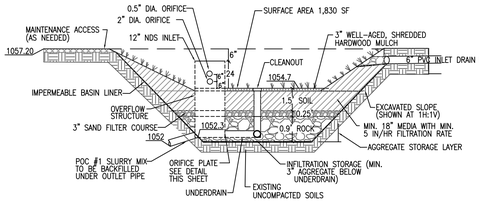
N.T.S.

NOTES:
REGULAR MAINTENANCE AND UPKEEP OF PERVIOUS SERVICES WILL BE REQUIRED TO ENSURE THAT SURFACE REMAINS PERVIOUS.

DO NOT SEAL PERVIOUS SURFACE AFTER INSTALLATION.
PERVIOUS SURFACE SLOPE NOT TO EXCEED 5%.
DEPTH OF RESERVOIR LAYER SHALL BE CALCULATED ON THE GRADING PLANS AND WILL BE SIZED TO ADDRESS STORMWATER CONVEYANCE REQUIREMENTS AND PAVEMENT STRUCTURAL DESIGN.

SELF MITIGATING AREAS

DMA NAME	AREA (SF)	SURFACE TYPE
SM-1	9288 SF	NATURAL VEG./PLANTED SLOPES
SM-2	23,947 SF	NATURAL VEG./PLANTED SLOPES
TOTAL	33,235 SF	



PCBMP #1
BIOFILTRATION BASIN
NOT TO SCALE

0 40 80 120

Underground Service Alert
Call: TOLL FREE 1-800 422-4133
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
DESCRIPTION:
LOCATION:
RECORDED:
ELEVATION: DATUM:

APPROVED FOR SIGNATURE
PLAN CHECK ENGR. NAME TYPED
PLAN CHECK FIRM
R.C.E. NO.

HORIZONTAL: AS NOTED
VERTICAL: AS NOTED

REGISTERED PROFESSIONAL ENGINEER KRISTIN LYNSA GREENE NO. C57860 CIVIL STATE OF CALIFORNIA

dk Greene Consulting, Inc.
P. O. BOX 143
BONSALL, CA 92003

PREPARED BY: DATE 10/08/20
KRISTIN L. GREENE
PE NO. C 57860 EXP. 6/30/2022

DATE	INITIAL	REVISION DESCRIPTION
		ENGINEER OF WORK

SHT. NO.	DATE	INITIAL
		CITY APPROVAL

SHEET 1 | CITY OF MURRIETA ENGINEERING DEPARTMENT | SHEETS 1

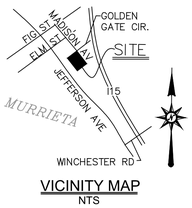
WQMP SITE PLAN
W.M. LYLES CO.
26501 MADISON AVE
PARCEL 2, P.M. 7065, BK 26, PG 50

APPROVED
ROBERT K. MOEHLING DATE
CITY ENGINEER

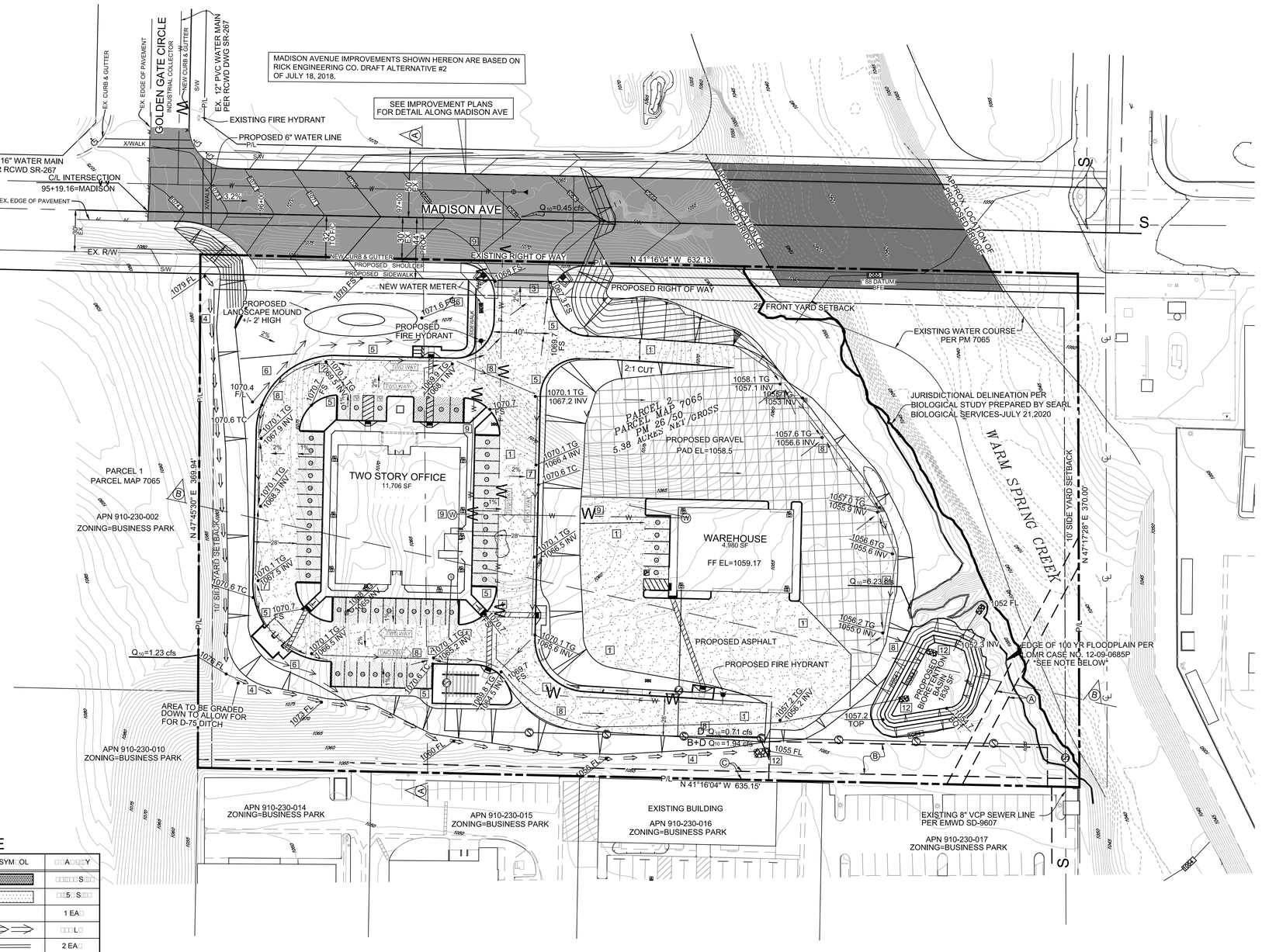
DWN BY:
CHKD BY:
FIELD BK:

DRAWING NO.

JOB NO. 2019-23 JAN 5, 2021



VICINITY MAP
NTS



GENERAL NOTES

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2:1 □LL SLOPE	2:1 □LL
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0 40 80 120

ADD 2.4' TO '29 DATUM TO OBTAIN '88 DATUM

Underground Service Alert
Call: TOLL FREE
1-800
422-4133
TWO WORKING DAYS BEFORE YOU DIG

BENCH MARK
DESCRIPTION: 3 1/4" ALUM. DISC IN TOP OF CURB
LOCATION: E'LY CORNER OF JEFFERSON AVE AND DATE ST. 38' NE'LY OF JEFFERSON AVE AND 65' SE'LY OF DATE ST.
RECORDED: BENCHMARK NO. "600-10-68"
ELEVATION: 1039.286 DATUM: NGVD '29

APPROVED FOR SIGNATURE
PLAN CHECK ENGR. NAME TYPED
PLAN CHECK FIRM
R.C.E. NO.

HORIZONTAL: AS NOTED
VERTICAL: AS NOTED

REGISTERED PROFESSIONAL ENGINEER KRISTIN L. TIPSKA GREENE No. C57860 CIVIL STATE OF CALIFORNIA

dk Greene Consulting, Inc.
P□O□□OX 1□□
□O□SALL□CA □2□□□

PREPARED BY
KRISTIN L. GREENE
PE NO. C 57860 EXP. 6/30/2022
DATE 10/13/20

DATE	INITIAL	REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL
		ENGINEER OF WORK		CITY APPROVAL	

SHEET 1 | CITY OF MURRIETA ENGINEERING DEPARTMENT | SHEETS 2

CONCEPTUAL GRADING
W.M. LYLES CO.
26501 MADISON AVE
PARCEL 2, P.M. 7065, BK 26, PG 50

APPROVED
ROBERT K. MOEHLING _____ DATE _____
CITY ENGINEER

DWN BY: _____
CHKD BY: _____
FIELD BK: _____

DRAWING NO.

JOB NO. 2019-23 October 14, 2020

Appendix 2: Construction Plans

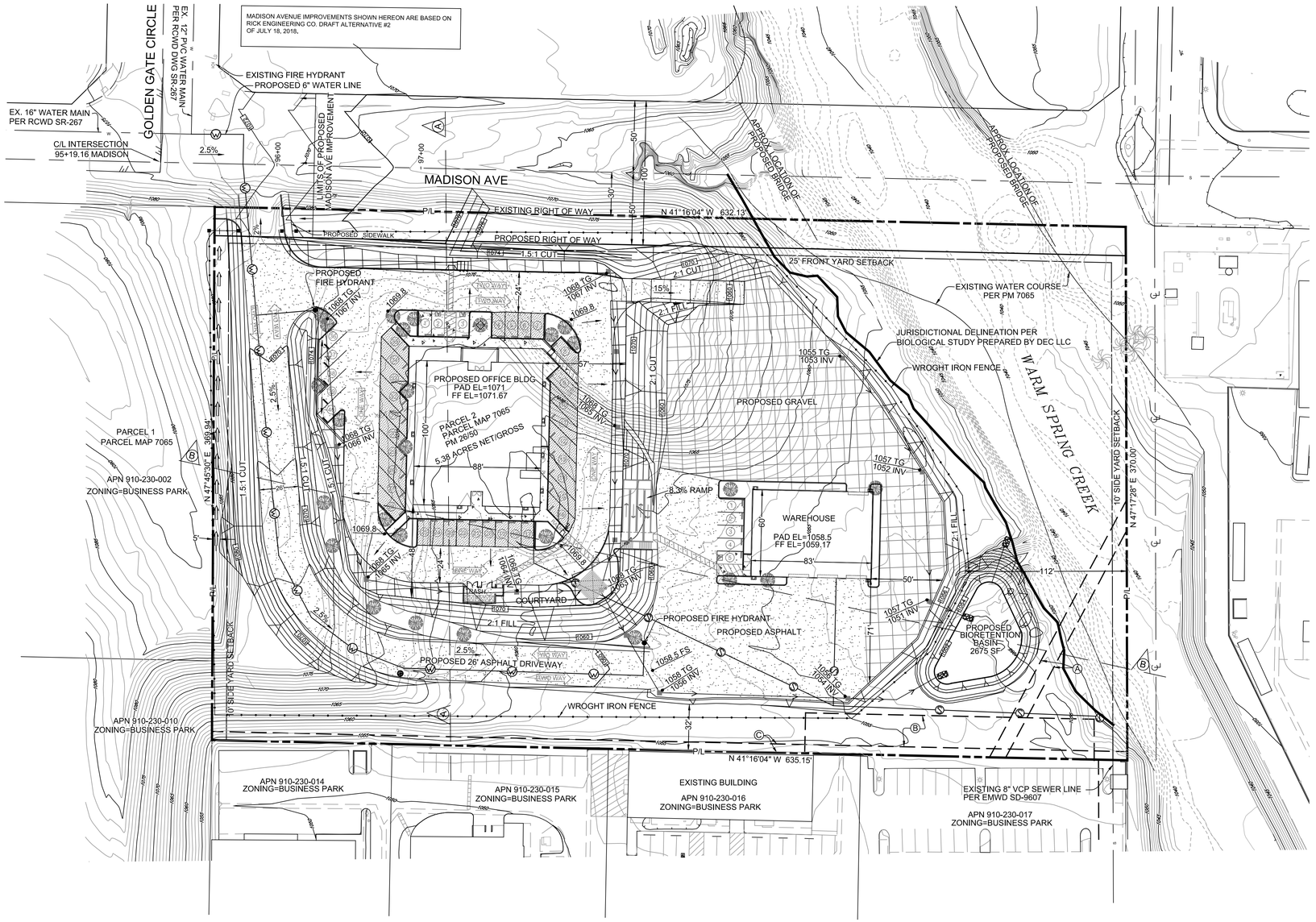
Grading and Drainage Plans

Examples of material to provide in Appendix 2 may include but are not limited to the following:

- Site grading plans from the Project's Civil Plan Set,
- Drainage plans showing the existing condition and proposed drainage system from the project's drainage report,
- Other plan sheets containing elements that impact site grading and drainage.

Refer to Section 4 of the SMR WQMP and Section I of this Template.

VICINITY MAP
NTS



GENERAL NOTES

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VERTICAL: AS NOTED

REGISTERED PROFESSIONAL ENGINEER
KRISTIN LIPSKA GREENE
NO. C57860
CIVIL
STATE OF CALIFORNIA

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P□O□□OX 1□□
□O□SALL□CA □2□□□

PREPARED BY _____ DATE 3/1/20
KRISTIN L. GREENE
PE NO. C 57860 EXP. 6/30/2020

DATE	INITIAL	ENGINEER OF WORK

REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL CITY APPROVAL

SHEET 1 | SHEETS 2

CITY OF MURRIETA
ENGINEERING DEPARTMENT

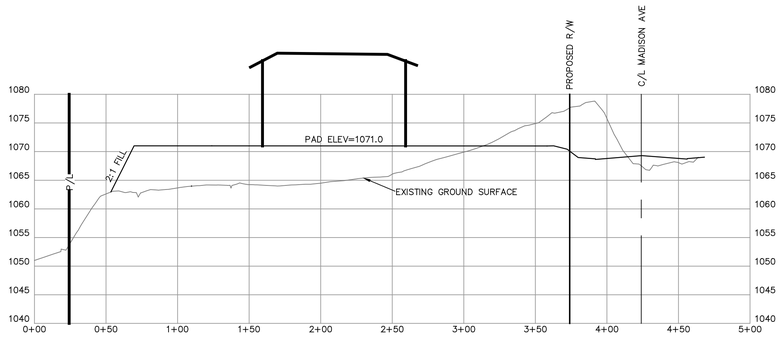
CONCEPTUAL GRADING
W.M. LYLES CO.
26501 MADISON AVE
PARCEL 2, P.M. 7065, BK 26, PG 50

APPROVED
ROBERT K. MOEHLING _____ DATE _____
CITY ENGINEER

DWN BY: _____
CHKD BY: _____
FIELD BK: _____

DRAWING NO.

JOB NO. 2019-23 MARCH 1, 2020



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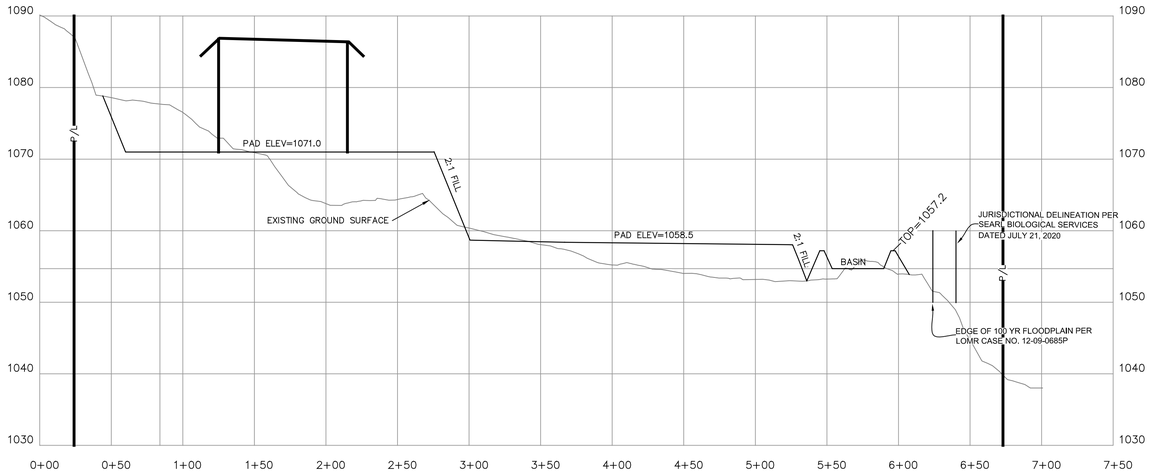

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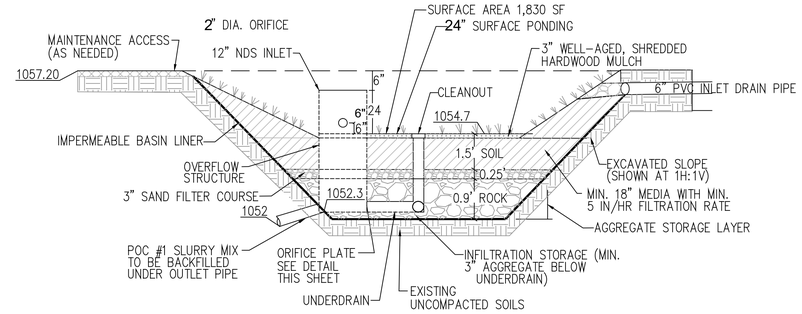

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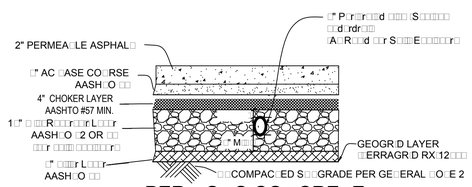

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PLAN CHECK FIRM
R.C.E. NO.

HORIZONTAL
AS NOTED
VERTICAL
AS NOTED

REGISTERED PROFESSIONAL ENGINEER
KRISTIN L. GREENE
No. C57860
CIVIL
STATE OF CALIFORNIA

dk Greene Consulting, Inc.
P□O□□OX 1□□
□O□SALL□CA □2□□□

PREPARED BY _____ DATE 10/13/20
KRISTIN L. GREENE
PE NO. C 57860 EXP. 6/30/2022

DATE	INITIAL	ENGINEER OF WORK	REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL	CITY APPROVAL

SHEET 2 | CITY OF MURRIETA | SHEETS 2
ENGINEERING DEPARTMENT

CONCEPTUAL GRADING
W.M. LYLES CO.
26501 MADISON AVE.
PARCEL 2, P.M. 7065, BK 26, PG 50

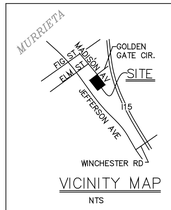
APPROVED
ROBERT K. MOEHLING _____ DATE _____
CITY ENGINEER

DWN BY: _____
CHKD BY: _____
FIELD BK: _____

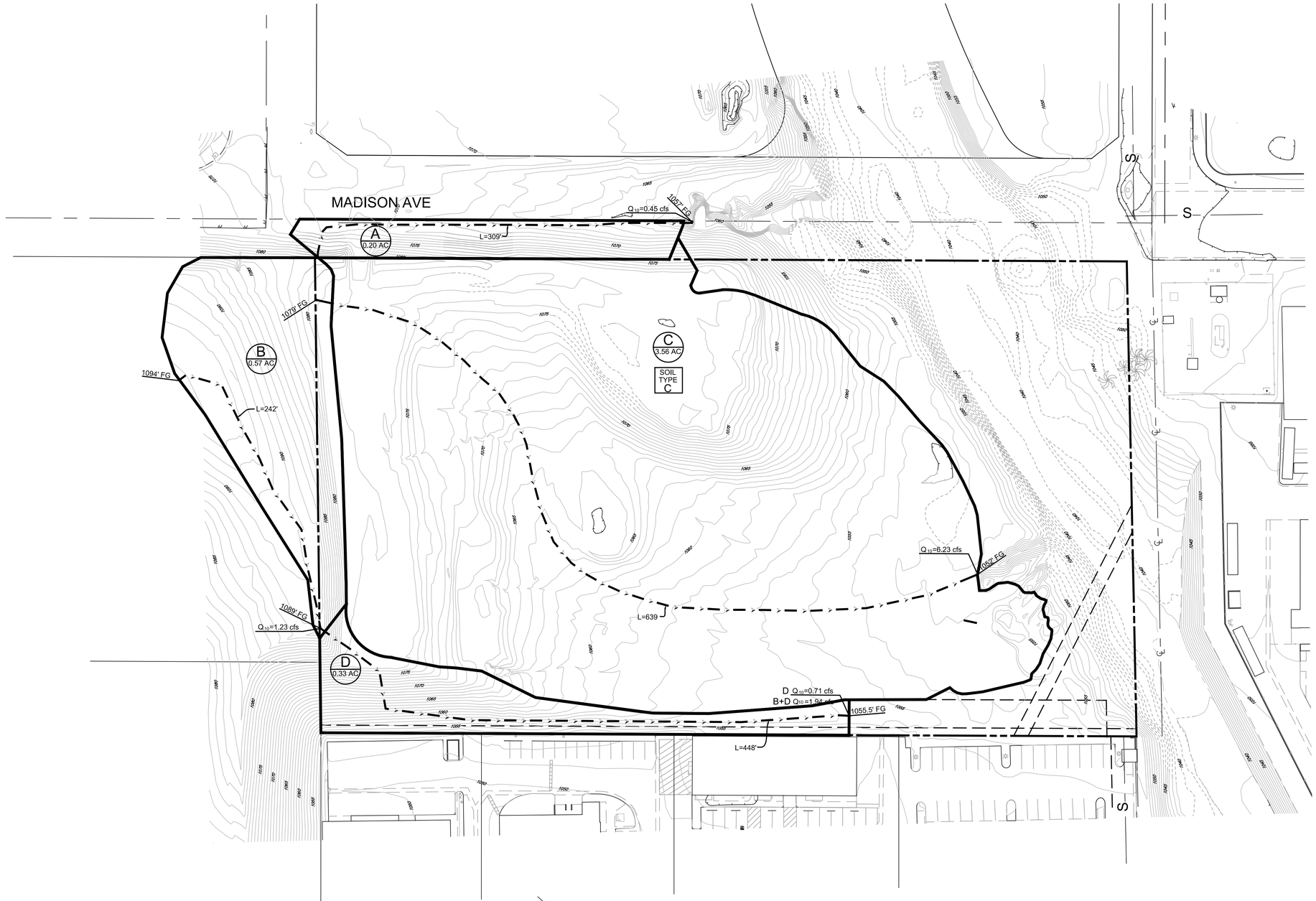
DRAWING NO.

JOB NO. 2019-23 October 14, 2020

EXISTING HYDROLOGY



VICINITY MAP
NTS



DRAINAGE LEGEND

FLOW PATH	
DRAINAGE BOUNDARY	
PROPERTY LINE	
OUTFALL 1 FLOW LENGTH	L=215
SUB AREA I.D.	A
SUB AREA SIZE (IN ACRES)	XX AC

NOTES:

UNDERLYING HYDROLOGIC SOIL GROUP=C

APPROXIMATE DEPTH TO GROUND WATER=GREATER THAN 20'

PROPERTY OWNER

W.M. LYLES CO
1210 WEST OLIVE AVENUE
FRESNO, CA 93728

APN

910-230-003

LEGAL DESCRIPTION

PARCEL 2 OF PARCEL MAP NO. 7065, IN THE CITY OF MURRIETA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 26, PAGE 50 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

0 40 80 120

SCALE: 1" = 40'

SEAL: REGISTERED PROFESSIONAL ENGINEER KRISTIN L. GREENE NO. C57860 CIVIL STATE OF CALIFORNIA

SCALE	
HORIZONTAL	1"=40'
VERTICAL	
	N/A

dk Greene Consulting, Inc.
P.O. BOX 143
BONSALL, CA 92003
(760) 310-9408

PREPARED BY: DATE 10/13/20

KRISTIN L. GREENE
C NO. 57860 EXP. DATE 6/30/22

DATE	INITIAL	REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL

ENGINEER OF WORK — CITY APPROVAL

SHEET 1 | CITY OF MURRIETA, ENGINEERING DEPARTMENT | SHEETS 1

EXISTING HYDROLOGY
W.M. LYLES CO.
26501 MADISON AVE
PARCEL 2, P.M. 7065, BK 26, PG 50

APPROVED
ROBERT K. MOEHLING _____ DATE _____
CITY ENGINEER RCE 63056

DWN BY: _____
CHKD BY: _____
FIELD BK: _____

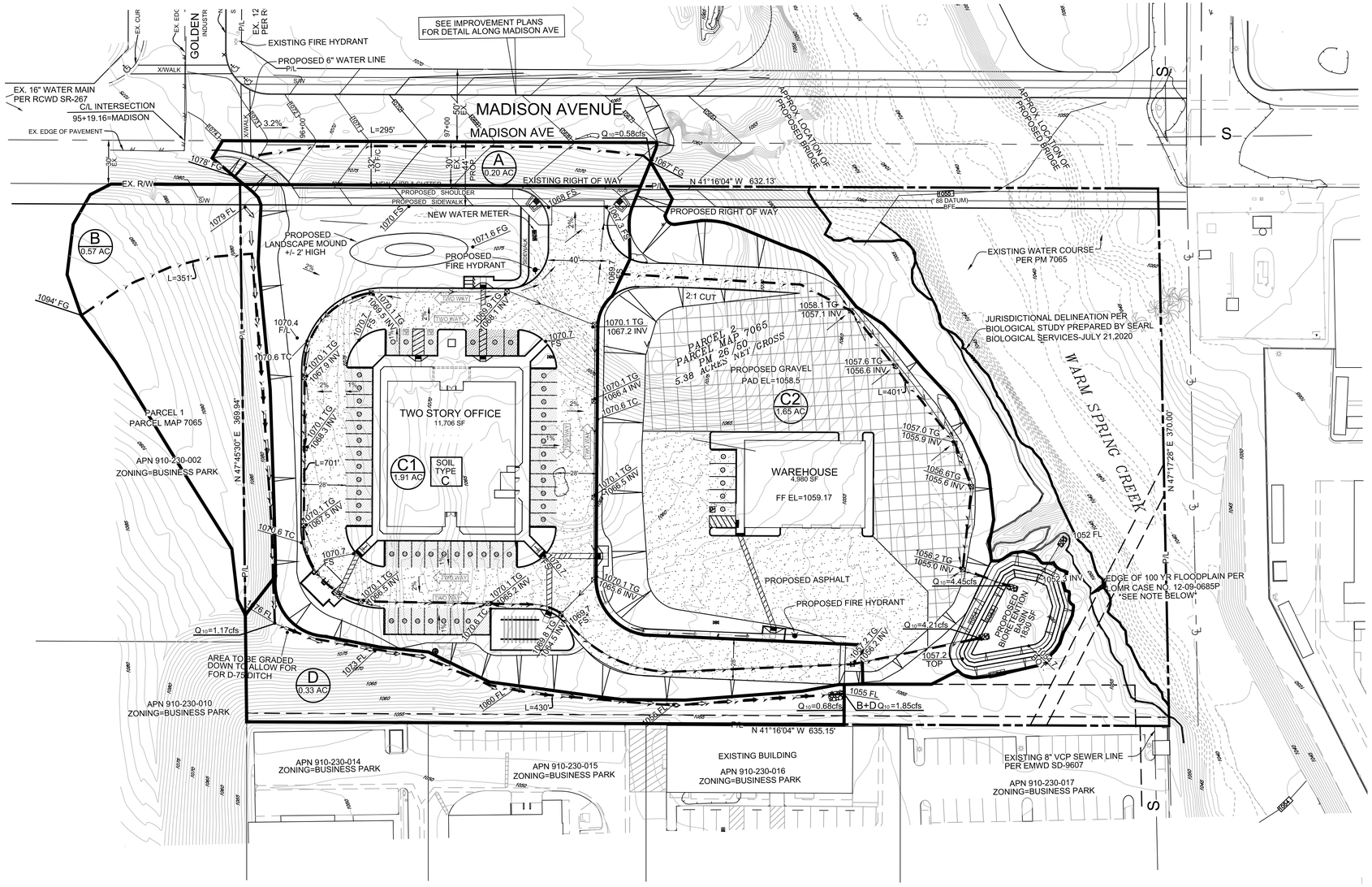
PROJECT NO.

DRAWING NO.

JOB NO. 19-23

PROPOSED HYDROLOGY

VICINITY MAP
NTS



DRAINAGE LEGEND

FLOW PATH
DRAINAGE BOUNDARY
PROPERTY LINE
OUTFALL 1 FLOW LENGTH L=215
SUB AREA I.D. A
SUB AREA SIZE (IN ACRES) XX AC

NOTES:

UNDERLYING HYDROLOGIC SOIL GROUP=C

APPROXIMATE DEPTH TO GROUND WATER=GREATER THAN 20'

PROPERTY OWNER

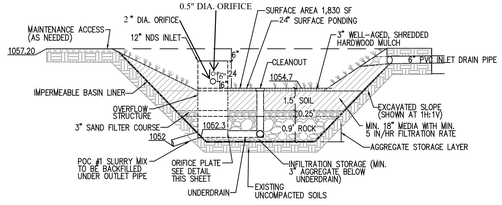
W.M. LYLES CO
1210 WEST OLIVE AVENUE
FRESNO, CA 93728

APN

910-230-003

LEGAL DESCRIPTION

PARCEL 2 OF PARCEL MAP NO. 7065, IN THE CITY OF MURRIETA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 26, PAGE 50 OF PARCEL MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.



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BIOFILTRATION BASIN
NOT TO SCALE

SEAL: REGISTERED PROFESSIONAL ENGINEER KRISTIN L. GREENE NO. 057860 CIVIL STATE OF CALIFORNIA

dk Greene Consulting, Inc.
P.O. BOX 143
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(760) 310-9408

SCALE
HORIZONTAL
1"=40'
VERTICAL
N/A

PREPARED BY: DATE 10/13/20
KRISTIN L. GREENE
C NO. 57860 EXP. DATE 6/30/22

DATE	INITIAL	REVISION DESCRIPTION	SHT. NO.	DATE	INITIAL
ENGINEER OF WORK				CITY APPROVAL	

SHEET 1 | CITY OF MURRIETA ENGINEERING DEPARTMENT | SHEETS 1

PROPOSED HYDROLOGY
W.M. LYLES CO.
26501 MADISON AVE
PARCEL 2, P.M. 7065, BK 26, PG 50

APPROVED
ROBERT K. MOEHLING _____ DATE _____
CITY ENGINEER RCE 63056

DWN BY: _____ CHKD BY: _____ FIELD BK: _____
PROJECT NO.
DRAWING NO.

JOB NO. 19-23

Appendix 3: Soils Information

Geotechnical Study, Other Infiltration Testing Data, and/or Other Documentation

Examples of material to provide in Appendix 3 may include but are not limited to the following:

- Geotechnical Study/Report prepared for the project,
- Additional soils testing data (if not included in the Geotechnical Study),
- Exhibits/Maps/Other Documentation of the Hydrologic Soils Groups (HSG)s at the project site.

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections A and D of this Template.

LGC GEO-ENVIRONMENTAL, INC.

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT,
PROPOSED OFFICE BUILDING AND WORKSHOP, 26501 MADISON AVENUE,
CITY OF MURRIETA, RIVERSIDE COUNTY, CALIFORNIA, APN: 910-230-003.

Dated: April 25, 2019
Project No. G19-1706-10

Prepared For:

Mr. Todd R. Sheller
Lyles Diversified, Inc.
1210 West Olive Avenue
Fresno, California 93728

27570 COMMERCE CENTER DRIVE, SUITE. 128, TEMECULA, CALIFORNIA 92590
PHONE: 951.297.2450 I FAX: 951.719.2998 I WWW.LGCGEOENV.COM

LGC GEO-ENVIRONMENTAL, INC.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING • SWPPP

April 25, 2019

Project No. G19-1706-10

Mr. Todd R. Sheller,
Assistant Vice President
Lyles Diversified, Inc.
1210 West Olive Avenue
Fresno, California 93728

Subject: ***Preliminary Geotechnical Investigation Report, Proposed Office Building and Workshop, 26501 Madison Avenue, City of Murrieta, Riverside County, California, APN: 910-230-003.***

LGC Geo-Environmental, Inc. (LGC) is pleased to submit herewith our preliminary geotechnical investigation report regarding proposed office building and workshop development of the subject property (the site), which is located at 26501 Madison Avenue, City of Murrieta, Riverside County, California. The site is identified as Assessor's Parcel Number 910-230-003.

This report presents the results of our research of published geologic/geotechnical reports and maps, geologic mapping and review of aerial imagery, field exploration and laboratory testing; in addition to our geotechnical and geologic judgment, opinions, conclusions and preliminary recommendations associated with the proposed office building and workshop development.

Based on the results of our field exploration, geologic mapping, field and laboratory testing, geologic and geotechnical engineering evaluations, along with our review of published literature and the referenced Site Plan it is our opinion that the subject site is suitable for the proposed office building and workshop development provided that the recommendations presented herein are utilized during the design, grading, and construction. LGC should review any grading plans, as well as any foundation/structural plans when they become available, and revise the recommendations presented herein, if necessary.

It has been a pleasure to be of service to you during the design stages of this project. If you have any questions regarding the contents of this report or should you require additional information, please do not hesitate to contact us.

Respectfully submitted,

LGC GEO-ENVIRONMENTAL, INC.

Duncan Walker, CEG 1395
Certified Engineering Geologist

DW/RLG/LDC

Distribution: (4) Addressee

PROFESSIONAL GEOLOGIST
DUNCAN WALKER
No. EG 1395
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Larry D. Cooley, RCE 54037
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
LARRY DWAIN COOLEY
No. C54037
Exp. 12/31/19
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STATE OF CALIFORNIA

27570 COMMERCE CENTER DR., #128, TEMECULA, CALIFORNIA 92590
PHONE: (951) 297-2450 • FAX: (951) 719-2998 • WWW.LGCGEOENV.COM

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Figures & Plates

Appendices

1.0 INTRODUCTION

1.1 Purpose

This report presents the results of LGC Geo-Environmental, Inc.'s (LGC's) preliminary geotechnical investigation regarding proposed office building and workshop development of the subject property (the site), which is located at 26501 Madison Avenue, City of Murrieta, Riverside County, California. The site is identified as Assessor's Parcel Number (APN) 910-230-003.

In February 2019, LGC conducted a phase I environmental site assessment for the subject site, the results of which are documented in the referenced *Phase I Environmental Site Assessment* by LGC dated February 28, 2019.

The purpose of this preliminary geotechnical investigation is to determine the nature of surface and subsurface soil conditions, evaluate their characteristics, and provide geotechnical recommendations with respect to grading, construction, foundation design and other aspects relative to the proposed office building and workshop development of the subject site. The referenced 40-scale Site Plan by dk Greene Consulting, Inc. (undated), which depicts the site, was utilized as the base map for our Geotechnical Map for the site (Plate 1).

1.2 Scope of Services

Our scope of services included the following:

- Review of previous preliminary geotechnical and geologic reports for the site, as well as readily available published geologic maps, recent aerial imagery, and pertinent documents regarding the anticipated geologic and geotechnical conditions at the site (Appendix A).
- Geologic observations and mapping of the existing surface conditions on the site.
- Field exploration consisting of excavating nine exploratory trenches (TR-1 through TR-9) to determine existing subsurface geological conditions using a wheeled backhoe.
- Laboratory testing of selected representative samples of soil for characterization of the engineering properties of onsite soil.
- Geotechnical engineering and geologic analysis of the data with respect to the proposed office building and workshop development.
- Preparation of this report presenting our findings, conclusions, and preliminary geotechnical design recommendations for the proposed office building and workshop development.

1.3 Site Description and Topography

Located along the southwest side of Madison Avenue at its intersection with Golden Gate Circle, the subject site is approximately rectangular and comprises approximately 5.83 acres (Site Location Map, Figure 1). The site is vacant and unfenced. In the northwest there is an inactive water well which was installed in 2017; the well has a steel standpipe with a welded cap. During the 1980s and early 1990s, there was apparently a single-family residence (SFR) and another structure on the northeast part of the site along Madison Avenue. The former SFR was probably served by an onsite wastewater treatment system (OWTS). If there is or was an OWTS on the site, its location is unknown.

The regional surface slope for the site and surrounding area is generally toward the southwest. Ground surface elevations on the site range from approximately 1,088 feet above mean sea level (msl) along the northwest property line to approximately 1,040 feet above msl in the channel of Warm Springs Creek near the south property corner, based on the referenced 30-scale *Non-Specific Rough Grading Plan* by Saxon Engineering Services, Inc. (Saxon). An existing 2:1 (h:v) cut slope up to approximately 20 feet high descends southwest from the northwest part of the site toward an offsite parking area. There is an elevated L-shaped area in the northwest and northeast, which is partially underlain by undocumented artificial fill. The northwest portion is a bench; a cut slope ascends northwest from the bench toward higher ground offsite. The bench and a small adjoining pad, together with the access road from Madison Avenue in the northeast, were graded in 2017 for equipment access to drill and install the onsite water well. The northeast portion consists of an arcuate pad which includes the site of the former SFR; graded slopes descend southwest, southeast and northeast from the pad. The south portion of the site is apparently ungraded natural ground, including the steeply-sloped, incised channel of Warm Springs Creek. Most onsite stormwater, together with tributary runoff from the elevated offsite area to the northwest, apparently flows into Warm Springs Creek.

0 ft. 50 ft. 100 ft. 200 ft.

Map distances are approximate

Map base reproduced from Google Earth photo (08/13/2018).

Legend

Approximate Site boundary

FIGURE 1
SITE LOCATION MAP

Project Name	Lyles Diversified – Murrieta
Project No.	G19-1706-10
Geol./Eng.	DW/LDC
Scale	1" = 100'
Date	April 2019

1.4 Previous Preliminary Geotechnical Investigation

In 2017, a previous preliminary geotechnical investigation was conducted on the subject site, the results of which are documented in *Geotechnical Investigation, Proposed Covered Outdoor Storage Facility, 26501 Madison Avenue, Murrieta, California* by Global Geo-Engineering, Inc. (Global), dated November 17, 2017 (Appendix B). Nine exploratory borings were drilled, logged and sampled to depths ranging from approximately 8.0 feet to 18.5 feet below ground surface (bgs). Groundwater was not encountered in any of the nine borings. Limited soil testing was conducted using soil samples from the borings. Global placed a perforated pipe for future percolation testing in its boring P-1 in the south part of the site (Figure 1). Global reportedly did not perform percolation testing in boring P-1, but the pipe remains.

1.5 Proposed Development and Grading

The referenced 30-scale *Non-Specific Rough Grading Plan* by Saxon indicates that the following grading is proposed for the site. Most of the site will consist of a proposed cut/fill pad that will slope gently toward the south at approximately 2.7 percent grade. At the perimeters of the pad, proposed 2:1 (h:v) cut and fill slopes, as well as the existing 2:1 cut slope in the northwest part of the site, will transition from the proposed pad to adjoining offsite and onsite grade. Surface water flow will be directed toward a proposed infiltration device which will be located in the southwest area of the site. The proposed development will consist of an office building with an asphalt-paved parking area in the northwest and a workshop building with a gravel parking area in the southeast, together with two driveways extending from Madison Avenue, landscaped areas and hardscape areas. It is anticipated that the proposed structures will be constructed of wood and/or steel framing, with concrete footings and floor slabs constructed on-grade. The currently unimproved portion of Madison Avenue, which adjoins the site to the northeast, will be improved/paved extending northwest to the existing end of pavement.

1.6 Historical Aerial Photograph and Topographic Map Evaluation

Historical aerial photographs of the site dating back to 1938, as well as historical topographic maps dating back to 1901, were reviewed as part of LGC's prior Phase I ESA. In addition, Google Earth Pro imagery (from 1994 to 2018) for the site and surrounding area was evaluated. Information from these sources, as it pertains to the geologic and geotechnical issues of the proposed development, is included herein.

2.0 FIELD EXPLORATION

2.1 Surface Reconnaissance

Surface reconnaissance of the subject site and accessible surrounding areas was accomplished by an LGC geologist during February and March 2019 to document existing surface geological conditions using the referenced Site Plan for plotting geologic units. This information has been plotted on the enclosed Geotechnical Map (Plate 1)

2.2 Field Exploration

Prior to subsurface work, underground utilities clearance was obtained from Underground Service Alert of Southern California. Subsurface exploration at the subject site was performed on March 15, 2019 and involved excavating nine exploratory trenches (TR-1 through TR-9) to depths ranging from approximately 4.5 feet to 10.5 feet bgs using the backhoe.

Earth materials encountered within the exploratory trenches were classified and logged by an LGC geologist in accordance with the visual-manual procedures of the Unified Soil Classification System (USCS). At the conclusion of the subsurface exploration, all trenches were backfilled with excavated soil, using minor compactive effort. Minor settlement of the backfill soil may occur over time. The approximate locations of the exploratory trenches are shown on the Geotechnical Map (Plate 1).

2.3 Laboratory Testing

During our subsurface exploration, representative samples of earth materials were collected for laboratory testing. Laboratory testing was performed on selected representative samples of onsite earth materials and included in-situ and maximum density and optimum moisture content, chloride content, sulfate content,

minimum resistivity and pH, expansion index, atterburg limits, consolidation, direct shear, and R-value. Laboratory test data are presented in Appendix D, together with brief descriptions of the test criteria.

3.0 FINDINGS

3.1 Regional Geologic Setting

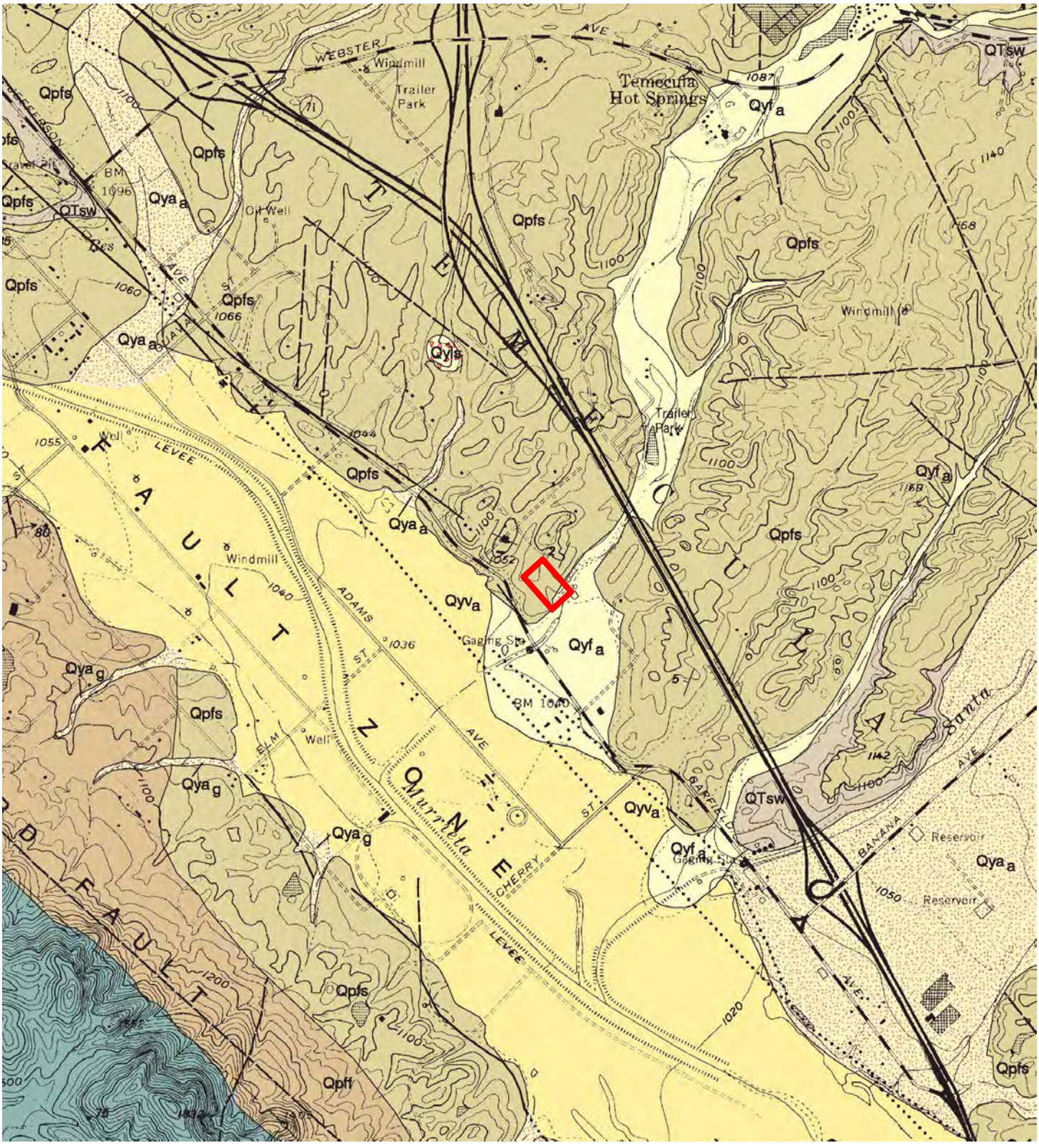
Regionally, the site is within the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by steep, elongated valleys and mountain ranges that trend west and northwest. The mountainous areas are underlain by Pre-Cretaceous metasedimentary and metavolcanic rocks and Cretaceous plutonic rocks of the Southern California Batholith. The valleys are underlain by young alluvial deposits followed by Quaternary and Tertiary bedrock units (sandstones, mudstones and conglomerates, as well as volcanics). The site and surrounding area are primarily underlain by sandstone bedrock of Pauba formation (Pleistocene). Young alluvial fan deposits (Holocene and late Pleistocene) overlie Pauba formation bedrock in the southwest and south parts of the site including in Warm Springs Creek (U.S. Geologic Survey (USGS), 2003). Regional geology is presented on the Regional Geologic Map (Figure 2).

The northwest-southeast trending topography for the area is controlled by the Elsinore fault zone (EFZ), which extends northwesterly approximately 190 miles from San Diego County through Riverside County to southeastern Los Angeles County. The EFZ separates the Perris Block on the northeast, which includes the site, from the Santa Ana Mountains Block on the southwest. The subject site is not underlain by active faults. A short trace of the Wildomar fault, which is not designated an active fault, is located approximately 0.10 mile southwest of the site. The nearest active fault is the Wildomar fault, which is part of the EFZ and is located approximately 0.19 mile southwest of site. A narrow portion of the site along the southwest property line is within the County Fault Zone, which has been established by Riverside County regarding the Wildomar fault (California Geologic Survey (CGS), 2018b and Riverside County, 2018).

3.2 Local Geology and Soil Conditions

Based on our review of available geological and geotechnical literature, together with field mapping and LGC's nine exploratory backhoe trenches, the subject site is primarily underlain by topsoil and bedrock of the Pauba formation (Sandstone member). In Warm Springs Creek and the southwest-center area, young alluvial-fan deposits (Holocene and late Pleistocene) overlie Pauba formation bedrock. The subsurface geological contacts are described in greater detail below and presented in the logs of the exploratory trenches (Appendix C). The observed geologic units and contacts are depicted on the Geotechnical Map (Plate 1).

- **Artificial Fill (Undocumented) (Afu):** There are apparently areas of undocumented artificial fill on downslope portions of the former SFR site and the bench/pad for the water well. The undocumented fill was encountered in several of LGC's exploratory trenches and ranges up to an estimated 8.0 feet thick. The undocumented fill is generally composed of silty to clayey sand, which are various shades of brown, damp to moist, loose to medium dense, very fine- to medium-grained, with roots and roothairs.
- **Topsoil:** Topsoil was encountered in LGC's exploratory trenches and ranges from approximately 0.5 foot to 1.0 foot thick. The topsoil is generally composed of silty to clayey sand and sandy clay, which are various shades of brown, damp to very moist, loose, fine- to medium-grained, with pores, roots and roothairs.
- **Young Alluvial Fan Deposits (Qyf):** Holocene and late Pleistocene age young alluvial fan deposits (Qyf) overlie Pauba formation bedrock in the southwest and south parts of the site including in Warm Springs Creek and in an onsite drainage that trends approximately north across the site. The young alluvial fan deposits were encountered in LGC's exploratory trenches generally and range from approximately 2.5 feet to 9.0 feet thick. The young alluvial fan deposits are generally composed of silty to clayey sand and sandy silt and clay, which are various shades of brown, damp to wet, loose to dense, very fine- to coarse-grained, with pores.
- **Pauba Formation (Qpfs):** Pleistocene age bedrock of the Pauba formation (Sandstone member) was encountered underlying the undocumented artificial fill, topsoil and young alluvial fan deposits to the maximum depth of approximately 10.5 feet bgs in LGC's exploratory trenches on the subject site. Approximately the upper 1.0 foot to 2.0 feet are generally weathered to clayey sand, sandy silt and poorly-graded sand. The Pauba formation is generally composed of sandstone (very fine- to coarse-grained and friable) and siltstone, which are various shades of brown, dry to moist, moderately hard to very hard.



0 ft. 1,000 ft. 2,000 ft. 4,000 ft.

Map distances are approximate

N

Legend

Approximate Site boundary

Map base reproduced from *Preliminary Geologic Map of the Murrieta 7.5' Quadrangle* (USGS, 2003).

FIGURE 2
REGIONAL GEOLOGIC MAP

Project Name	Lyles Diversified – Murrieta
Project No.	G19-1706-10
Geol./Eng.	DW/LDC
Scale	1" = 2,000'
Date	April 2019

3.3 Groundwater

Groundwater was not encountered to a maximum depth of approximately 10.0 feet bgs in the nine exploratory trenches on the subject site during this preliminary geotechnical investigation. Groundwater was also not encountered to depths of approximately 8.0 feet to 18.5 feet bgs in any of the nine borings on the site during the previous preliminary geotechnical investigation by Global Geo-Engineering, Inc. in 2017. The California Department of Water Resources (DWR) *Water Data Library* website was reviewed regarding historical groundwater depths in wells near the subject site. The *Water Data Library* indicates State Well Number 335381N1171759W001 is the nearest well that is located on same side of Warm Springs Creek as the site. This well is located approximately 0.21 mile northeast of the site, and the only groundwater depth was recorded at 34 feet below ground surface (bgs) in 1968. In July and August 2017, a public water supply well was drilled and installed onsite in the northwest. This well is inactive (capped), and the recorded groundwater depth was 380 feet bgs on August 2, 2017 (Eric Haley dba Heritage Well Service, 2017).

3.4 Caving

Caving was not encountered within the nine exploratory trenches on the subject site during this investigation. Localized minor caving may occur within low-density portions of undocumented artificial fill and/or topsoil.

3.5 Surface Water

Based on our review of the referenced Site Plan, proposed onsite surface water flow from the proposed office building and adjoining paved parking area will be directed toward a proposed infiltration device which will be located in the southwest area of the site. Onsite surface water flow from the proposed workshop building and adjoining gravel parking area will be directed toward Warm Springs Creek. Surface water runoff relative to project design is the purview of the project civil engineer and should be designed to direct surface water runoff away from the proposed structures and walls. The southeast part of the site is within a 100-year flood zone associated with Warm Springs Creek; the zone extends approximately to the top of the west streambank.

3.6 Faulting

The geologic structure of the Southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. Faults such as the Newport-Inglewood, Whittier, Elsinore, San Jacinto and San Andreas, are major faults in this system and are known to be active and may produce moderate to strong ground shaking during an earthquake. In addition, the San Andreas, Elsinore and San Jacinto faults are known to have ruptured the ground surface in historic times.

The subject site is **not** underlain by active faults. A short trace of the Wildomar fault, which is not designated an active fault, is located approximately 0.10 mile southwest of the site (CGS, 2018b). The nearest active fault is the Wildomar fault, which is part of the EFZ and is located approximately 0.19 mile southwest of site. A narrow portion of the site along the southwest property line is within the County Fault Zone, which has been established by Riverside County regarding the Wildomar fault (CGS, 2018b and Riverside County, 2018).

Table 1 is a list of the significant faults located within 20 miles of the site (site coordinates of 33.5346°N, -117.1768°W). We have also included the Maximum Earthquake Magnitude predicted for each of these faults.

TABLE 1
SIGNIFICANT FAULTS IN PROXIMITY OF THE SITE

FAULT NAME	APPROXIMATE DISTANCE (mi)	MAXIMUM EARTHQUAKE MAGNITUDE (Mw)
Elsinore - Temecula (Wildomar)	0.2	6.8
Elsinore – Glen Ivy	12.6	6.8
Elsinore - Julian	14.5	7.1

Sources: EQFAULT for Windows Version 3.00b and Riverside County *Map My County* GIS Website

3.7 Secondary Seismic Effects

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the Southern California region, which may affect the site, include soil liquefaction and dynamic settlement. Other secondary

seismic effects include shallow ground rupture, lateral spreading, seiches and tsunamis. In general, these secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependent on the distance between the site and causative fault, and the onsite geology. An evaluation of these secondary seismic effects is included herein.

3.8 Liquefaction

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose to medium dense, near surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential.

The site is located within a Riverside County designated liquefaction hazard zone. Groundwater was not encountered in the nine exploratory trenches to a maximum depth of approximately 10.5 feet bgs during this preliminary geotechnical investigation on the subject site. Groundwater was also not encountered in the nine borings to a maximum depth of approximately 18.5 feet bgs during the previous preliminary geotechnical investigation by Global in 2017.

From the exploratory trenches and borings on the subject site, and review of the historic high groundwater data in the area (see section 3.3), a groundwater depth of 34 feet bgs was used for the liquefaction analyses. The analyses of proposed post-graded conditions did not indicate potentially liquefiable soils other than young alluvial fan deposits which extend to a maximum depth of approximately 9.0 feet bgs in the proposed development area. The Pauba formation bedrock that underlies the young alluvial fan deposits are not considered to be potentially liquefiable. Therefore, liquefaction does not present itself as a possible constraint for the proposed development.

3.9 Subsidence

The site is located within a Riverside County designated active subsidence zone. Unfavorable ground subsidence is not anticipated due to: recommended overexcavation associated with proposed structures and improvements and subsurface earth material types including Pauba formation bedrock.

3.10 Landsliding

Landslides or surface failures were not observed at or directly adjacent to the site. As a result, the possibility of the site being affected by land sliding is not anticipated.

3.11 Shallow Ground Rupture

The potential for shallow ground rupture is considered moderate at the site, due to potentially active faults near the site. Cracking because of shaking from nearby or distant seismic events is not considered a significant hazard, although it is a possibility at any site.

3.12 Lateral Spreading

Lateral spreading is the outward and downward movement of soil adjacent to a descending slope that occurs during a seismic event and is usually associated with liquefaction of underlying soils. This typically occurs adjacent to drainage channels as the affected soil moves laterally into the open channel area. The potential for lateral spreading is not considered to be a concern, due to the relatively hard nature of Pauba formation bedrock.

3.13 Tsunamis and Seiches

Based on the elevation and location of the site with respect to sea level and its distance from large open bodies of water, the potential of seiches and/or tsunamis is considered to be a nil possibility.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our geotechnical investigation, it is our opinion that the proposed office building and workshop development as indicated on the referenced Site Plan and *Non-Specific Rough Grading Plan*, is feasible from a

geotechnical and geologic standpoint provided that the following recommendations are incorporated into the design criteria and project specifications. When grading and foundation/structural plans for the proposed development are available, a comprehensive plan review should be performed by LGC. Depending on the results, additional recommendations may be necessary for geotechnical design parameters for both earthwork and foundations. Grading should be conducted in accordance with local and state codes, including the 2016 edition of the California Building Code (CBC), the recommendations within this report, and future geotechnical reports. It is also our opinion that the proposed grading and construction will not adversely impact the geologic stability of adjoining properties.

The following is a summary of the primary geotechnical factors, as determined from our geotechnical evaluation of the data, published/unpublished literature, and geotechnical reports:

- Based on our subsurface exploration, the site is underlain by topsoil, young alluvial fan deposits, and Pauba formation bedrock, as well as localized undocumented artificial fill associated with former structures and previous grading.
- Groundwater is not considered a constraint for the proposed development.
- Active or potentially active faults are not known to exist on the site.
- There are no known landslides impacting the site.
- Laboratory test results of the upper soil on the site indicate a **VERY LOW** to **LOW** expansion potential. For the site, earth materials are considered to have a **LOW** expansion potential.
- Laboratory test results of the upper soil indicate a **MEDIUM** plasticity index and liquid limit.
- Laboratory test results of the upper soil indicate a **negligible** potential for soluble sulfate attack on normal concrete and **negligible** chloride effects on reinforcing steel.
- Laboratory test results of the upper soil encountered indicated a **moderate** corrosion potential to buried metals.
- The site is underlain by approximately 3 feet to 9 feet of potentially-compressible topsoil, young alluvial fan deposits and weathered Pauba formation bedrock, as well as localized undocumented artificial fill, which may be prone to potential intolerable post-grading settlement and/or hydroconsolidation, under the surcharge of the future proposed structural loads and/or fill loads. These materials should be overexcavated to underlying competent bedrock and/or young alluvial fan deposits.
- From a geotechnical perspective, the existing onsite soil appears to be suitable material for use as fill, provided that the onsite soil is relatively free from rocks (larger than 8 inches in maximum dimension), construction debris, and organic material. It is anticipated that the onsite soil and bedrock may be excavated with conventional heavy-duty construction equipment.

5.0 SEISMIC DESIGN CONSIDERATIONS

5.1 Ground Motion

The site will probably experience ground shaking from moderate- to large-size earthquakes during the life of the proposed development. Furthermore, it should be recognized that the Southern California region is an area of high seismic risk, and that it is not considered feasible to make structures totally resistant to seismic-related hazards.

Proposed structures on the site should be designed and constructed to resist the effects of seismic ground motions as provided in the 2016 CBC Sections 1613 and 1616, and 2010 ASCE 7. The method of design is dependent on the seismic zoning, site characterizations, occupancy category, building configuration, type of structural system, and building height.

Table 2 presents the seismic design parameters, which were developed based on the CBC 2016 and should be used for the proposed structures. Site coordinates of 33.5346°N, -117.1768°W were used to derive the seismic parameters in Table 2.

TABLE 2
SEISMIC DESIGN SOIL PARAMETERS

SEISMIC DESIGN SOIL PARAMETERS (2016 CBC Section 1613 and 2010 ASCE 7)	
Site Class Definition (ASCE 7; Chapter 20)	C
Mapped Spectral Response Acceleration Parameter S_s (for 0.2 second)	1.58
Mapped Spectral Response Acceleration Parameter, S_1 (for 1.0 second)	0.59
Site Coefficient F_a (0.2-second period)	1.20
Site Coefficient F_v (1-second period)	1.41
Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameter S_{MS} (0.2-second period)	1.89
Adjusted Maximum Considered Earthquake (MCE) Spectral Response Acceleration Parameter S_{M1} (1-second period)	0.83
Design Spectral Response Acceleration Parameter, S_{DS} (0.2-second period)	1.26
Design Spectral Response Acceleration Parameter, S_{D1} (1-second period)	0.55
Mean Peak Ground Acceleration, PGA_m	0.84

Source: *ATC (Applied Technology Council) Hazards by Location* Website (Structural Engineers Association of California)

6.0 GEOTECHNICAL DESIGN PARAMETERS

6.1 Shrinkage/Bulking and Subsidence

Volumetric changes in earth quantities will occur when excavated onsite soils are replaced as properly compacted fill. Table 3 contains an estimate of the shrinkage and bulking factors for the various geologic units present onsite. These estimates are based on in-place densities of the various materials and on the estimated average degree of relative compaction that will be achieved during grading.

TABLE 3
ESTIMATED SHRINKAGE/BULKING

GEOLOGIC UNIT	***SHRINKAGE/BULKING***
Undocumented Artificial Fill	10% to 15% (Shrinkage)
Topsoil	5% to 10% (Shrinkage)
Young Alluvial Fan Deposits (Qyf)	5% to 10% (Shrinkage)
Pauba Formation Bedrock (Qpfs)	2% to 7% (Shrinkage)

Subsidence due to recompaction of exposed overexcavation bottom prior to fill placement, and placement of proposed fills, is estimated to be about 0.15 foot to 0.20 foot.

The above estimates of shrinkage and subsidence are intended as an aid for project engineers in determining earthwork quantities. These are preliminary rough estimates which may vary with depth of removal, stripping losses, field conditions at the time of grading, etc. However, these estimates should be used with some caution since they are not absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that occurs during the grading operations.

6.2 Cut/Fill Transition and Fill Differentials

To mitigate distress to structures related to the potential adverse effects of excessive differential settlement, cut/fill transitions should be eliminated from all building areas where the depth of fill placed within the "fill" portion exceeds proposed footing depths. The entire structure should be founded on a uniform bearing material. This should be accomplished by overexcavating the "cut" portion and replacing the excavated materials as properly compacted fill, so that all footings for structures and walls are founded into engineered fill

with a minimum of 2 feet of fill below footings for proposed structures and 2 feet below footings for proposed walls. Recommended depths of overexcavation are provided in the following table:

TABLE 4
CUT/FILL TRANSITION

DEPTH OF FILL ("fill" portion)	***DEPTH OF OVEREXCAVATION ("cut" portion)***
Up to 4 feet	Equal Depth
4 to 12 feet	4 feet
Greater than 12 feet	One-third the maximum thickness of fill placed on the "fill" portion (20 feet maximum)

Overexcavation of the "cut" portion should extend beyond the perimeter building lines to a horizontal distance equal to the depth of overexcavation or to a minimum distance of 5 feet, whichever is greater.

6.3 Excavation Characteristics

It is anticipated that the onsite soil may be excavated with conventional heavy-duty construction equipment, based on our subsurface exploration and experience with these materials in the area.

6.4 Compressible/Collapsible Soils

The results of laboratory testing, together with field observations, indicate that the upper 3 feet to 9 feet of surficial materials are susceptible to varying degrees of intolerable settlement and/or hydro-consolidation (collapse) when a load is applied, or the soil is saturated. Consequently, these materials should be overexcavated to underlying competent Pauba formation bedrock and replaced as engineered fill.

7.0 SITE EARTHWORK

7.1 General Earthwork and Grading Specifications

Earthwork and grading should be performed in accordance with applicable requirements of the grading code of the County of Riverside, and in accordance with the following recommendations prepared by this firm. Grading should also be performed in accordance with the applicable provisions of the attached "General Earthwork and Grading Specifications for Rough Grading" (Appendix E) prepared by LGC, unless specifically revised or amended herein.

7.2 Geotechnical Observations and Testing

Prior to the start of grading, a meeting should be held at the site with the owner, developer, grading contractor, civil engineer and LGC to discuss the work schedule and geotechnical aspects of the grading. Rough grading, which includes clearing, overexcavation, scarification/processing and fill placement, should be accomplished under the full-time observation and testing of LGC. Fills should not be placed without prior approval from the geotechnical consultant.

A representative of LGC should also be present onsite during grading operations to document proper placement and compaction of fills, as well as to document excavations and compliance with the other recommendations presented herein.

7.3 Clearing and Grubbing

Weeds and grass in areas to be graded should be stripped and hauled offsite. Trees to be removed should be grubbed so that their stumps and major-root systems are also removed, and the organic materials hauled offsite. During site grading, laborers should clear from fills, roots and other deleterious materials missed during clearing and grubbing operations.

LGC or a qualified representative should be notified at the appropriate times to provide observation and testing services during clearing and grubbing operations to observe and document compliance with the above recommendations. In addition, buried structures, and any unusual or adverse soil conditions encountered that are not described or anticipated herein, should be brought to the immediate attention of LGC.

7.4 Onsite Wastewater Treatment System Abandonment

There is no information available regarding the former SFR that was located on the northeast part the site, but it was probably served by an OWTS. If there is or was an OWTS on the site, its location is unknown. If an OWTS is encountered during future grading and development onsite, then it should be removed and/or properly abandoned under permit from the Riverside County Department of Environmental Health (RCDEH).

7.5 Water-Supply Well Abandonment

An inactive (capped) water well was observed on the northwest part of the site (Figure 1). If the well is not intended to be used in the future, then it should be properly abandoned (destroyed) under permit from the RCDEH.

7.6 Overexcavation and Ground Preparation

The site is underlain by up to approximately 3 feet to 9 feet of potentially compressible topsoil and weathered bedrock, as well as localized undocumented artificial fill. These potentially compressible materials are considered unsuitable for support of proposed fills, structures, and/or improvements and should be overexcavated to expose underlying competent Pauba formation bedrock. Within the shallow fill or cut areas of the proposed building pads, overexcavations should also be 4 feet below proposed grade or a minimum of 2 feet below the proposed footings in the building pad areas, whichever is deeper. The overexcavation should also extend at least 5 feet outside the proposed building footprints (or a 1:1 projection away from the footing to the approved removal bottom, whichever is greater). Groundwater is not anticipated to be encountered during site grading. Actual depths of overexcavation should be evaluated upon review of final grading and foundation plans on the basis of observations and testing during grading by LGC.

Prior to placing engineered fill, exposed bottom surfaces in each overexcavated area should first be scarified to a depth of approximately 6 inches, watered or air-dried as necessary to achieve a uniform moisture content of optimum or higher and then compacted in place to a relative compaction of 90 percent or more (based on American Society for Testing and Materials (ASTM) Test Method D1557).

The estimated locations, extent and approximate depths for overexcavation of unsuitable materials are indicated on the enclosed Geotechnical Map (Plate 1). LGC should be provided with appropriate survey staking during grading to document that depths and/or locations of recommended overexcavation are adequate.

Sidewalls for overexcavations greater than 5 feet in height should be no steeper than 1:1 (h:v) and should be periodically slope-boarded during their excavation to remove loose surficial debris and facilitate mapping. Flatter excavations may be necessary for stability.

The grading contractor will need to consider appropriate measures necessary to excavate adjacent existing improvements adjacent to the site without endangering them due to caving or sloughing.

7.7 Fill Suitability

Earth materials excavated during grading are generally considered suitable for use as compacted fill provided they do not contain significant amounts of trash, vegetation, construction debris and oversize material. It will be necessary to blend the excavated soil to mitigate the high expansion potential of some of the upper soil.

7.8 Oversized Material

Oversized material that may be encountered during grading, greater than 8 inches, should be reduced in size or removed from the site.

7.9 Benching

Where compacted fills are to be placed on natural slope surfaces inclining at 5:1 (h:v) or greater, the ground should be excavated to create a series of level benches, which are at least a minimum height of 4 feet, excavated into competent bedrock.

7.10 Fill Placement

Fills should be placed in uncompacted lifts having a maximum 8-inch thickness, watered or air-dried as necessary to achieve a uniform moisture content of at least optimum moisture content, and then compacted in

place to relative compaction of 90 percent or more. Fills should be maintained in a relatively level condition. The laboratory maximum dry density and optimum moisture content for each change in soil type should be determined in accordance with ASTM Test Method D1557.

7.11 Inclement Weather

Inclement weather may cause rapid erosion during mass grading and/or construction. Proper erosion and drainage control measures should be taken during periods of inclement weather in accordance with County of Riverside and California State requirements.

8.0 SLOPE CONSTRUCTION

8.1 Slope Stability

The full scope of proposed grading is not known at this time. The referenced *Non-Specific Rough Grading Plan* indicates that the following grading is proposed for the site, including the adjoining northeast site. Most of site (approximately 4 acres) will consist of a cut/fill pad at elevations ranging from approximately 1,058 feet to 1,073 feet above msl. At the perimeters of the pad, proposed 2:1 (h:v) cut and fill slopes up to approximately 15 feet high, as well as the existing 2:1 cut slope in the northwest, will transition from the proposed pad to adjoining offsite and onsite grade. The proposed and existing 2:1 cut and fill slopes should be grossly and surficially stable.

8.2 Fill Slopes

Following overexcavation of unsuitable soils, a 15-foot wide fill key excavated into competent bedrock should be provided at the toe of fill and fill over cut slopes. The bottom of the fill keys should be tilted at 2 percent back into the slope.

8.3 Cut Slopes

Proposed cut slopes may expose low-density, dry and/or cohesionless soils, which will likely require stabilization by overexcavation and replacement with compacted fill.

8.4 Temporary Excavations

Based on the physical properties of the onsite soils, temporary excavations exceeding 5 feet in height should be cut back at a ratio of 1:1 (h:v) or flatter, for the duration of the overexcavation and recompaction of unsuitable soil material. Temporary slopes excavated at the above slope configurations are expected to remain stable during grading operations. However, the temporary excavations should be observed by a representative of LGC for any evidence of potential instability. Depending on the results of these observations, revised slope configurations may be necessary.

Other factors which should be considered with respect to the stability of the temporary slopes include construction traffic and storage of materials on or near the tops of the slopes; construction scheduling; presence of nearby walls or structures on adjacent properties; drainage; and weather conditions at the time of construction. Applicable requirements of the California Construction and General Industry Safety Orders; the Occupational Safety and Health Act of 1970; and the Construction Safety Act should also be followed.

9.0 POST-GRADING CONSIDERATIONS

9.1 Control of Surface Water and Drainage Control

Positive-drainage device, such as sloping sidewalks, graded-swales and/or area drains, should be provided to collect and direct water away from the structure and slopes. Neither rain nor excess irrigation water should be allowed to collect or pond against building foundations. Roof gutters and downspouts should be provided on the sides of structures. Drainage should be directed to adjacent driveways, adjacent streets or storm-drain facilities. The ground surface adjacent to the structures should be sloped at a gradient of at least 5 percent for a distance of at least 10 feet, and further maintained by a swale or drainage path at a gradient of at least 2 percent. Where necessary, drainage paths may be shortened by use of area drains and collector pipes. The civil engineer is responsible for designing drain control devices on the site.

Planters with open bottoms adjacent to buildings should be avoided. Planters should not be designed adjacent to buildings unless provisions for drainage, such as catch basins, liners, and/or area drains, are made. Over watering must be avoided.

9.2 Utility Trenches

Utility-trench backfill within roadways, utility easements, under walls, sidewalks, driveways, floor slabs and any other structures or improvements should be compacted. The onsite soils should generally be suitable as trench backfill provided they are screened of rocks and other material over 3 inches in diameter and organic matter. Trench backfill should be compacted in uniform lifts (generally not exceeding 6 inches to 8 inches in uncompacted thickness) by mechanical means to at least 90 percent relative density (per ASTM Test Method D1557).

Where onsite soils are utilized as backfill, mechanical compaction should be used. Density testing, along with probing, should be performed by LGC or its representative, to document proper compaction.

If trenches are shallow and the use of conventional equipment may result in damage to the utilities; clean sand, having sand equivalent (SE) of 30 or greater, should be used to bed and shade the utilities. Sand backfill should be densified. The densification may be accomplished by jetting or flooding and then tamping to ensure adequate compaction. A representative from LGC should observe, probe, and test the backfill to verify compliance with the project specifications.

Utility-trench sidewalls deeper than 5 feet should be laid back at a ratio of 1:1 (h:v) or flatter or braced. A trench box may be used in lieu of shoring. If shoring is anticipated, LGC should be contacted to provide design parameters.

To avoid point-loads and subsequent distress to clay, cement or plastic pipe, imported sand bedding should be placed 1 foot or more above pipe in areas where excavated trench materials contain significant cobbles. Sand-bedding materials should be compacted and tested prior to placement of backfill.

Where utility trenches are proposed parallel to building footings (interior and/or exterior trenches), the bottom of the trench should not be located within a 1:1 (h:v) plane projected downward from the outside bottom edge of the adjacent footing.

10.0 PRELIMINARY FOUNDATION DESIGN RECOMMENDATIONS

10.1 General

Provided that site grading is performed in accordance with the recommendations of this report, conventional shallow foundations are still considered feasible for support of the proposed structures. Tentative foundation recommendations are provided herein. However, these recommendations may require modification depending on as-graded conditions within the building pad areas upon completion of grading.

10.2 Allowable-Bearing Values

An allowable-bearing value of 1,500 pounds per square foot (psf) may be used for 24-inch square pad footings and 12-inch or more wide continuous footings founded in compacted fill or competent native soil/material at a depth of 12 inches or more below the lowest adjacent final grade. This value may be increased by 20 percent for each additional foot of width and depth, to a value no greater than 1,800 psf.

10.3 Settlement

Based on the general settlement characteristics of compacted fill, as well as the aforementioned overexcavation recommendations and anticipated loading, it is estimated that the total settlement of conventional footings will be approximately 0.50 inch. Differential settlement is expected to be 0.25-inch over 30 feet. It is anticipated that the majority of the static settlement will occur during construction or shortly thereafter as building loads are applied.

The above settlement estimates are based on the assumption that the grading will be performed in accordance with the grading recommendations presented in this report and that LGC will observe or test the soil conditions in the footing excavations.

10.4 Lateral Resistance

A passive earth pressure of 250 psf per foot of depth, to a maximum value of 450 psf may be used to determine lateral-bearing resistance for footings. The passive earth pressure incorporates a minimum factor of safety of 1.5. Where structures are planned in or near descending slopes, the passive earth pressure should be reduced to 150 psf per foot of depth to a maximum value of 300 psf. In addition, a coefficient of friction of 0.35 times the dead-load forces may be used between concrete and the supporting soils to determine lateral sliding resistance. When combining passive and friction for lateral resistance, the passive component should be reduced by one third.

The above values are based on footings placed directly against engineered compacted fill. In the case where footing sides are formed, backfill placed against the footings should be compacted to 90 percent or more of maximum dry density as determined by ASTM D1557.

10.5 Footing Setbacks from Descending Slopes

Where structures are proposed near the tops of descending graded or natural slopes, the footing setbacks from the slope face should conform to the 2016 CBC, Figure 1808.7.1. The required setback is H/3 (one-third the slope height) measured along a horizontal line projected from the lower outside face of the footing to the slope face. The footing setbacks should be 5 feet where the slope height is 15 feet or less and up to a maximum of 40 feet where the slope height exceeds 15 feet.

10.6 Building Clearances from Ascending Slopes

Building setbacks from ascending graded or natural slopes should conform with the 2016 CBC, Figure 1808.7.1, which requires a building clearance of H/2 (one-half the slope height) varying from 5 to 15 feet. The building clearance is measured along a horizontal line projected from the toe of the slope to the face of the building. A retaining wall may be constructed at the base of the slope to achieve the required building clearance.

10.7 Footing Observations

Footing excavations should be observed by LGC to document that they have been excavated into competent bearing soils. The foundation excavations should be observed prior to the placement of forms, reinforcement or concrete. The excavations should be trimmed neat, level and square. Loose, sloughed or moisture-softened soil should be removed prior to concrete placement.

Excavated materials from footing excavations should not be placed in slab-on-ground areas unless the soils are compacted to 90 percent or more of maximum dry density as determined by ASTM D1557.

10.8 Expansive Soil Considerations

The results of laboratory testing indicate that onsite earth materials exhibit an overall expansion potential of **LOW** in accordance with 2016 CBC, Chapter 18. However, expansive soil conditions should be evaluated for the building pads during and at the completion of rough grading to observe and document the actual as-graded conditions. It will be necessary to blend the excavated soil to mitigate the high expansion potential of some of the upper soil. The design and construction details presented herein are intended to provide recommendations for the levels of expansion potential which may be evident at the completion of rough grading. Furthermore, it should be noted that additional slab thickness, footing sizes and/or reinforcement more stringent than the recommendations that follow should be provided as recommended by the project architect or structural engineer.

10.9 Footings/Floor Slabs – Low Expansion Potential

The following are our recommendations where foundation soils exhibit **LOW** expansion potential as classified in accordance with 2016 CBC. However, expansive soil conditions should be evaluated for the building pads during and at the completion of rough grading to observe and document the actual as-graded conditions. For this condition, it is recommended that footings and floors be constructed and reinforced in accordance with the following criteria. However, additional slab thickness, footing sizes and/or reinforcement may be required by the project architect or structural engineer. We recommend using a Plasticity Index of 14 per our Atterberg limits test results (Appendix D).

Footings

- Exterior continuous footings should be founded into compacted engineered fill below the lowest adjacent final grade at minimum depths of 12 inches and 18 inches deep for one-story and two-story construction, respectively. Interior continuous footings may be founded at a depth of 12 inches or greater into compacted engineered fill below the lowest adjacent final grade. Continuous footings should have a minimum width of 12 inches for one-story and 15 inches for two-story structures.
- Continuous footings should be reinforced with two (2) No. 4 bars, one near top and one at bottom.
- Interior isolated pad footings should be 24 inches or more square and founded at a depth of 12 inches or more below the lowest adjacent grade. Footings should be reinforced in accordance with the structural engineer's recommendation.
- Exterior pad footings should be 24 inches square or greater and founded at a depth of 18 inches or more below the lowest adjacent grade; and if isolated, interconnected and connected to the main foundation by in-grade beams. Exterior footings should be reinforced in accordance with the structural engineer's recommendations.

Floor Slabs

- Concrete foundation floor slabs should be 4 inches or more thick and reinforced with No. 3 bars spaced 24 inches or less on-centers, both ways. Slab reinforcement should be supported on concrete chairs so that the desired placement is properly placed per the design engineer.
- Concrete floors should be underlain with a moisture-vapor retarder consisting of a 15-mil thick vapor barrier. Laps within the membrane should be sealed and overlapped 12 inches. Two inches or more of clean sand should be placed above and below the membrane. These recommendations must be confirmed (and/or modified) by the foundation engineer with our concurrence, based upon the performance expectations of the foundation. It is the responsibility of the contractor to ensure that the moisture/vapor barrier systems are placed in accordance with the project plans and specifications, and that the moisture/vapor retarder materials are free of tears and punctures prior to concrete placement. Additional moisture reduction and/or prevention measures may be needed, depending on the performance requirements of future interior floor coverings.
- Garage area floor slabs should be 4 inches thick and should be reinforced in a similar manner as concrete floor slabs. Garage area floor slabs should also be placed separately from adjacent wall footings with a positive separation maintained with 3/8-inch minimum felt expansion joint materials and quartered with weakened-plane joints. A 12-inch wide grade beam founded at the same depth as adjacent footings should be provided across garage entrances. The grade beam should be reinforced with a minimum of two No. 4 bars, one top and one bottom.
- Prior to placing concrete, the subgrade soils below all floor slabs should be pre-watered to achieve a moisture content that is equal to 120 percent of the optimum moisture content of the subgrade soils. The moisture content should penetrate to a minimum depth of 18 inches. This will promote uniform curing of the concrete and minimize the development of shrinkage cracks.

10.10 Nonstructural Concrete Flatwork

Concrete flatwork (such as walkways, driveways, patios, bicycle trails, etc.) has a high potential for cracking due to changes in soil volume related to soil-moisture fluctuations. To reduce the potential for excessive cracking and lifting, concrete should be designed in accordance with the minimum guidelines outlined in Table 5. These guidelines will reduce the potential for irregular cracking and promote cracking along construction joints but will not eliminate all cracking or lifting. Thickening the concrete and/or adding additional reinforcement will further reduce cosmetic distress.

TABLE 5
NONSTRUCTURAL CONCRETE FLATWORK FOR LOW EXPANSIVE SOILS

	Private Sidewalks	***Private Drives***	***Patios/Entryways***	***City Sidewalk Curb and Gutters***
Minimum Thickness (in.)	4 (nominal)	4 (full)	4 (full)	City/Agency Standard
Presaturation	Presoak to 18 inches	Presoak to 18 inches	Presoak to 18 inches	City/Agency Standard
Reinforcement	—	No. 3 at 24 inches on center	No. 3 at 24 inches on center	City/Agency Standard
Thickened Edge	—	8″ x 8″	8″ x 8″	City/Agency Standard
Crack Control	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	City/Agency Standard
Maximum Joint Spacing	5 feet	10 feet or quarter cut whichever is closer	6 feet	City/Agency Standard

11.0 SOIL CORROSIVITY

The National Association of Corrosion Engineers (NACE) defines corrosion as "a deterioration of a substance or its properties because of a reaction with its environment". From a geotechnical viewpoint, the "environment" is the prevailing foundation soils and the "substances" are the reinforced concrete foundations or various buried metallic elements such as rebar, piles, pipes, etc., which are in direct contact with or within close vicinity of the foundation soil.

In general, soil environments that are detrimental to concrete have high concentrations of soluble sulfates. ACI 318R-05, Table 4.3.1 provides specific guidelines for the concrete mix design based on different amount of soluble sulfate content. The minimum amount of chloride ions in the soil environment that are corrosive to steel, either in the form of reinforcement protected by concrete cover, or plain steel substructures such as steel pipes or piles, is 500 ppm per California Test 532 and ACI 318R-05, Table 4.4.1.

The corrosion potential of the onsite materials was evaluated for its effect on steel and concrete. The corrosion potential was evaluated using the results of laboratory tests performed on representative samples obtained during the subsurface exploration. Laboratory testing was performed to evaluate pH, resistivity, chloride content, and soluble sulfate content. Based on the laboratory testing performed, the onsite soils are classified as having a **negligible** sulfate exposure condition in accordance with ACI 318R-05, Table 4.3.1, and **negligible** chloride exposure condition in accordance with ACI 318R-05, Table 4.4.1. Based on laboratory testing of onsite soil, it is also our opinion that onsite soil should be considered to have a **moderate** corrosion risk to buried metals due to the moderate resistivity. Metal piping should be corrosion-protected or consideration should be given to using plastic piping instead of metal or plastic sleeves around the pipe.

Despite the minimum recommendation above, LGC is not a corrosion-engineering firm. Therefore, we recommend that you consult with a competent corrosion engineer and conduct additional testing (if required) to evaluate the actual corrosion potential of the site and to provide recommendations to reduce the corrosion potential with respect to the proposed improvements. The recommendations of the corrosion engineer may supersede the above recommendations.

These recommendations are based on representative samples of the near-surface engineered fill soils. The initiation of grading at the site could blend various soil types and import soils may be used locally. These changes made to the foundation soils could alter sulfate-content levels. Accordingly, it is recommended that additional testing may be performed at the completion of grading.

12.0 RETAINING WALLS

12.1 Lateral Earth Pressures and Retaining Wall Design Parameters

Conventional foundations for retaining walls within properly compacted fill within competent bedrock should be embedded at least 18 inches below lowest adjacent grade. At this depth, an allowable bearing capacity of 1,500 psf may be assumed for retaining walls founded in competent compacted fill.

The following lateral earth pressures are recommended for retaining walls that may be proposed. The recommended lateral pressures for approved onsite soils or import material (with an expansion index of **20** or less and phi angle of internal friction of at least **30** degrees), for level or sloping backfill are presented in Table 6. **Onsite fill soil with an expansion index of greater than 20 should not be used as backfill due to the expansive nature.** Onsite soil should be screened of rocks and other material over 3 inches in diameter.

TABLE 6
LATERAL EARTH PRESSURES

CONDITIONS	*EQUIVALENT FLUID WEIGHT (pcf)*			
	Level Backfill (up to 6 feet)	*Level Backfill Dynamic (>6 feet to10 feet)*	*2:1 Backfill Ascending (up to 6 feet)*	*2:1 Backfill Ascending-Dynamic (>6 feet to 10 feet)*
Active	45	45	80	55
At-Rest	70	70	100	95
Seismic	0	45	0	95
Passive	250	250	120	120

Notes:
1. Applicable to retaining walls only.
2. Active force applied a 1/3 wall height.
3. Seismic force applied to at 1/2 to 3/5 wall height.
4. Lateral pressure acts normally to vertical stem.

For sliding resistance, the friction coefficient of 0.35 may be used at the concrete and soil interface. Wall footings should be designed in accordance with structural considerations.

Restrained structural walls should include design for at rest conditions, if applicable. The magnitude of those pressures depends on the amount of deformation that the wall can yield under load. If the wall can yield enough to mobilize the full shear strength of the soil, it can be designed for "active" pressure. If the wall cannot yield under the applied load, the shear strength of the retained soil cannot be mobilized and the earth pressure will be higher. Such walls should be designed for "at-rest" conditions.

The equivalent fluid pressure values assume free-draining conditions and a soil expansion index of 20 or less. If conditions other than those assumed above are anticipated, revised equivalent fluid pressure values should be provided on an individual-case basis by the geotechnical engineer.

Surcharge loading effects from the adjacent structures should be evaluated by the geotechnical and structural engineers.

12.2 Footing Embedments

The base of retaining wall footings constructed on level ground may be founded at a depth of 12 inches or more below the lowest adjacent final grade. Where retaining walls are proposed on or within 15 feet from the top of an adjacent descending fill slope, the footings should be deepened such that a minimum horizontal clearance of H/3 (one-third the slope height) is maintained between the outside bottom edges of the footings and the face of the slope but not to exceed 15 feet or be less than 5 feet. The above recommended footing setbacks are preliminary and may be revised based on site-specific soil conditions. Footing or pier excavations should be observed by the project geotechnical representative to document that the footing trenches have been excavated into competent bearing soils and to the embedments recommended above. These observations should be performed prior to placing forms or reinforcing steel.

12.3 Drainage

All retaining wall structures should be provided with appropriate drainage and appropriately waterproofed. The outlet pipe should be sloped to drain to a suitable outlet. It should be noted that that recommended subdrains does not provide protection against seepage through the face of the wall and/or efflorescence. If such seepage or efflorescence is undesirable, retaining walls should be waterproofed to reduce this potential.

Weep holes or open vertical masonry joints should be provided in retaining walls 3 feet or less in height to reduce the likelihood of entrapment of water in the backfill. Weep holes, if used, should be 3 inches or more in diameter and provided at intervals of 6 feet or less along the wall. Open vertical masonry joints, if used, should be provided at 32-inch or less intervals. A continuous gravel fill, 12 inches by 12 inches, should be placed behind the weep holes or open masonry joints. The gravel should be wrapped in filter fabric to reduce infiltration of fines and subsequent clogging of the gravel. Filter fabric may consist of Mirafi 140N or equivalent.

In lieu of weep holes or open joints, for retaining walls less than 3 feet, a perforated pipe and gravel subdrain may be used. Perforated pipe should consist of 4-inch or more diameter PVC Schedule 40 or ABS SDR-35, with the perforations laid down. The pipe should be embedded in 1.5 cubic feet per foot of 0.75 or 1.5-inch open graded gravel wrapped in filter fabric. Filter fabric may consist of Mirafi 140N equivalent.

Retaining walls greater than 3 feet high should be provided with a continuous backdrain for the full height of the wall. This drain could consist of geosynthetic drainage composite, such as Miradrain 6000 or equivalent, or a permeable drain material, placed against the entire backside of the wall. If a permeable drain material is used, the backdrain should be 1 or more feet thick. Caltrans Class II permeable material or open graded gravel or crushed stone (described above) may be used as permeable drain material. If gravel or crushed stone is used, it should have less than 5 percent material passing the No. 200 sieve. The drain should be separated from the backfill with a geofabric. The upper 1 foot of the backdrain should be covered with compacted fill. A drainage pipe consisting of 4-inch diameter perforated pipe (described above) surrounded by 1 cubic foot per foot of gravel or crushed rock wrapped in a filter fabric should be provided along the back of the wall. The pipe should be placed with perforations down, sloped at 2 percent or more and discharge to an appropriate outlet through a solid pipe. The pipe should outlet away from structures and slopes. The outside portions of retaining walls supporting backfill should be coated with an approved waterproofing compound to inhibit infiltration of moisture through the walls.

12.4 Temporary Excavations

Retaining walls, if any are proposed, should be constructed and backfilled as soon as possible after backcut excavations are constructed. Prolonged exposure of backcut slopes may result in some localized slope instability. To facilitate retaining wall construction, the lower 5 feet of temporary slopes may be cut vertical and the upper portions exceeding a height of 5 feet should be cut back at a gradient of 1:1 (h:v) or flatter for the duration of construction. However, temporary slopes should be observed by LGC for evidence of potential instability. Depending on the results of these observations, flatter slopes may be necessary. The potential effects of various parameters such as weather, heavy equipment travel, storage near the tops of the temporary excavations and construction scheduling should also be considered in the stability of temporary slopes. Water should not be permitted to drain away from the slope. Surcharges, due to equipment, spoil piles, etc., should not be allowed within 10 feet of the top of the slope.

All excavations should be made in accordance with Cal/OSHA. Excavation safety is the sole responsibility of the contractor.

12.5 Retaining Wall Backfill

Any retaining wall backfill soils (with an expansion index of 20 or less) should be placed in 6-inch to 8-inch loose lifts, watered or air-dried as necessary to achieve near optimum moisture conditions and compacted to at least 90 percent relative density (based on ASTM Test Methods D2922 and D3017).

13.0 PRELIMINARY PAVEMENT DESIGN

Structural pavement section design recommendations presented herein are based on a soil sample from our preliminary geotechnical investigation, as well as a soil sample from our previous preliminary geotechnical investigation for the adjoining northeast site. However, it should be understood that the soil material exposed during grading may differ

from the materials sampled and tested during this investigation. Therefore, these preliminary pavement recommendations are subject to verification and possible revision based on any revised Traffic Indices (TI's), as well as sampling and testing of subgrade soils that exist after rough grading.

For planning and design purposes, we have prepared the following preliminary pavement sections based on R-value testing results. The R-value is 68 for a soil sample collected on the site, which has been used in Table 7 below for preliminary pavement section recommendations. Table 7 presents recommended preliminary pavement designs for a TI of 5.0 for Driveways & Parking Lots (Local Roads) and a TI of 6.0 for Residential Collectors, based on the design R-value of 68 and City of Murrieta pavement sections.

TABLE 7
PRELIMINARY PAVEMENT DESIGN

AREA	*ASSUMED TRAFFIC INDEX*	*DESIGN (AVERAGE) R-VALUE*	*ASPHALTIC CONCRETE (AC) (inches)*	*AGGREGATE BASE (AB) (inches)*
Driveways & Parking Lots (Local Roads)	5.0	68	3.0	6.0
Residential Collectors	6.0	68	4.0	6.0

Subgrade soil immediately below the aggregate base (base) should be compacted to a minimum of 95 percent relative compaction based on ASTM Test Method D1557 to a minimum depth of 12 inches. Final subgrade compaction should be performed prior to placing base or asphaltic concrete and after all utility trench backfills have been compacted and tested.

Base materials should consist of crushed aggregate base conforming to Section 200-2 of Greenbook. The upper 12 inches of all aggregate base materials should be compacted to at least 95 percent of the laboratory maximum dry density determined in accordance with ASTM D1557.

Our preliminary pavement recommendations should be considered as minimum, per City of Murrieta requirements.

14.0 PLAN REVIEWS AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **Lyles Diversified, Inc.** to assist the project engineer and architect in the design of the proposed office building and workshop development. It is recommended that LGC be engaged to review the rough grading plans, storm-drain/storm water mitigation plans, structural plans and the final design drawings and specifications prior to construction. This is to document that the recommendations contained in this report have been properly interpreted are incorporated into the project specifications. LGC's review of the rough grading plan may indicate that additional subsurface exploration, laboratory testing and analysis should be performed to address areas of concern. If LGC is not accorded the opportunity to review these documents, we can take no responsibility for misinterpretation of our recommendations.

We recommend that LGC be retained to provide geotechnical engineering services during both the rough grading and construction phases of the work. This is to document compliance with the design, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

If the project plans change significantly (e.g., building loads or type of structures), we should be retained to review our original design recommendations and their applicability to the revised construction. If conditions are encountered during construction that appears to be different than those indicated in this report, this office should be notified immediately. Design and construction revisions may be required.

15.0 LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report. The subsurface observations and information contained herein are believed representative of the entire project; however, soil and geologic conditions

revealed by excavation may be different than our preliminary findings. If this occurs, the changed conditions must be evaluated by the project geotechnical engineer and engineering geologist and design(s) adjusted as required or alternate design(s) recommended.

The findings of this report may be modified upon performing future geotechnical/geologic evaluations. However, changes in the conditions of a property can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties.

This report is issued with the understanding that it is the responsibility of the owner, or of his/her representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and/or project engineer and incorporated into the plans, and the necessary steps are taken to see that the contractor and/or subcontractor properly implements the recommendations in the field. The contractor and/or subcontractor should notify the owner if they consider any of the recommendations presented herein to be unsafe.

The conclusions and opinions contained in this report are based on the results of the described geotechnical evaluations and represent our professional judgment. The findings, conclusions and recommendations contained in this report are to be considered tentative only and subject to confirmation by LGC during the construction process. Without this confirmation, this report is to be considered incomplete and LGC will not assume any responsibility for its use.

The conclusions and opinions contained in this report are valid up to a period of 1 year from the date of this report or adopted changes within the California Building Code, whichever occurs first. Changes in the conditions of a site can and do occur with the passage of time, whether those be because of natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate codes or standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside LGC's control. Therefore, if any of the above-mentioned situations occur, an update of this report must be completed.

This report has not been prepared for use by parties or projects other than those named or designed above. It may not contain sufficient information for other parties or other purposes.

The opportunity to be of service is appreciated. Should you have any questions regarding the content of this report, or should you require additional information, please do not hesitate to contact this office at your earliest convenience.

APPENDIX A

REFERENCES

APPENDIX A

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APPENDIX B

GEOTECHNICAL INVESTIGATION
GLOBAL GEO-ENGINEERING, INC.

GLOBAL GEO-ENGINEERING, INC.

November 15, 2017
Project 7355-04

Guardian Real Estate Services, Inc.
41606 Date Street, Suite 203A
Murrieta, California 92562

Attention: Mr. Darrell Clendenen

Subject: Geotechnical Investigation
Proposed Covered Outdoor Storage Facility
26501 Madison Avenue
Murrieta, California

References: *See Appendix A*

Dear Mr. Clendenen:

1. INTRODUCTION

a) In accordance with your request, we have conducted a geotechnical investigation for the proposed improvements to be constructed on the above referenced property located in Murrieta, California.

b) We reviewed the preliminary Site Plan *Sheet A-1.0* provided to us. We understand covered outdoor storage facility is proposed to be constructed on a 4.38 acre vacant lot. The exact configuration of which has not yet been determined. CMU block walls are also planned to be constructed on the northern area of the property. The entire lot will be covered with Asphalt Concrete (AC) paving. Madison Avenue will also be extended along the northeastern side of the site.

c) We have reviewed a preliminary earthwork estimate plan prepared for the project site. A 4- to 19-foot high, 2:1 (horizontal:vertical) gradient cut slope is planned along the northwestern side of the property. The remaining area of the site is proposed to be graded to generally descend at a 2.71 percent gradient toward the southwestern corner of the property. The grading will consist of cuts and fills to achieve the proposed grades.

3 Corporate Park, Suite 270, Irvine, California 92606
Office (949) 221-0900 Fax (949) 221-0091
e-mail: global@globalgeo.net

2. PURPOSE

The purpose of our investigation was to obtain and analyze subsurface information in order to provide site-specific recommendations pertaining to the following:

a) grading;

b) processing of soils;

c) foundation types;

d) foundation depths;

e) bearing capacity;

f) expansivity;

g) sulphate content and cement type;

h) shrinkage factor;

i) settlement;

j) seismicity.

3. SCOPE

The scope of services we provided was as follows:

a) Preliminary planning and evaluations, and review of geotechnical reports related to the project site and nearby surrounding area *(see References - Appendix A)*;

b) Field exploration, consisting of drilling nine exploratory borings to a maximum depth of 18.5 feet below existing grade. One of the borings (Boring P-1) was used to conduct a percolation test;

c) Logging of the borings by our Engineering Geologist;

d) Obtaining in-situ and bulk samples for classification and laboratory testing;

e) Laboratory testing of selected samples considered representative of site conditions, in order to derive relevant engineering properties;

f) Geologic and engineering analyses of the field and laboratory data;

g) Preparation of a report presenting our findings, conclusions and recommendations.

4. FIELD EXPLORATION AND LABORATORY TESTING

The field exploration program is given in *Appendix B*, which includes the Logs of Borings. The results of the laboratory testing are included in *Appendix C*.

5. SITE DESCRIPTION

5.1 Location

a) The 4.38 acre site is located just southwest of the intersection of Madison Avenue and Golden Gate Circle in the city of Murrieta, California.

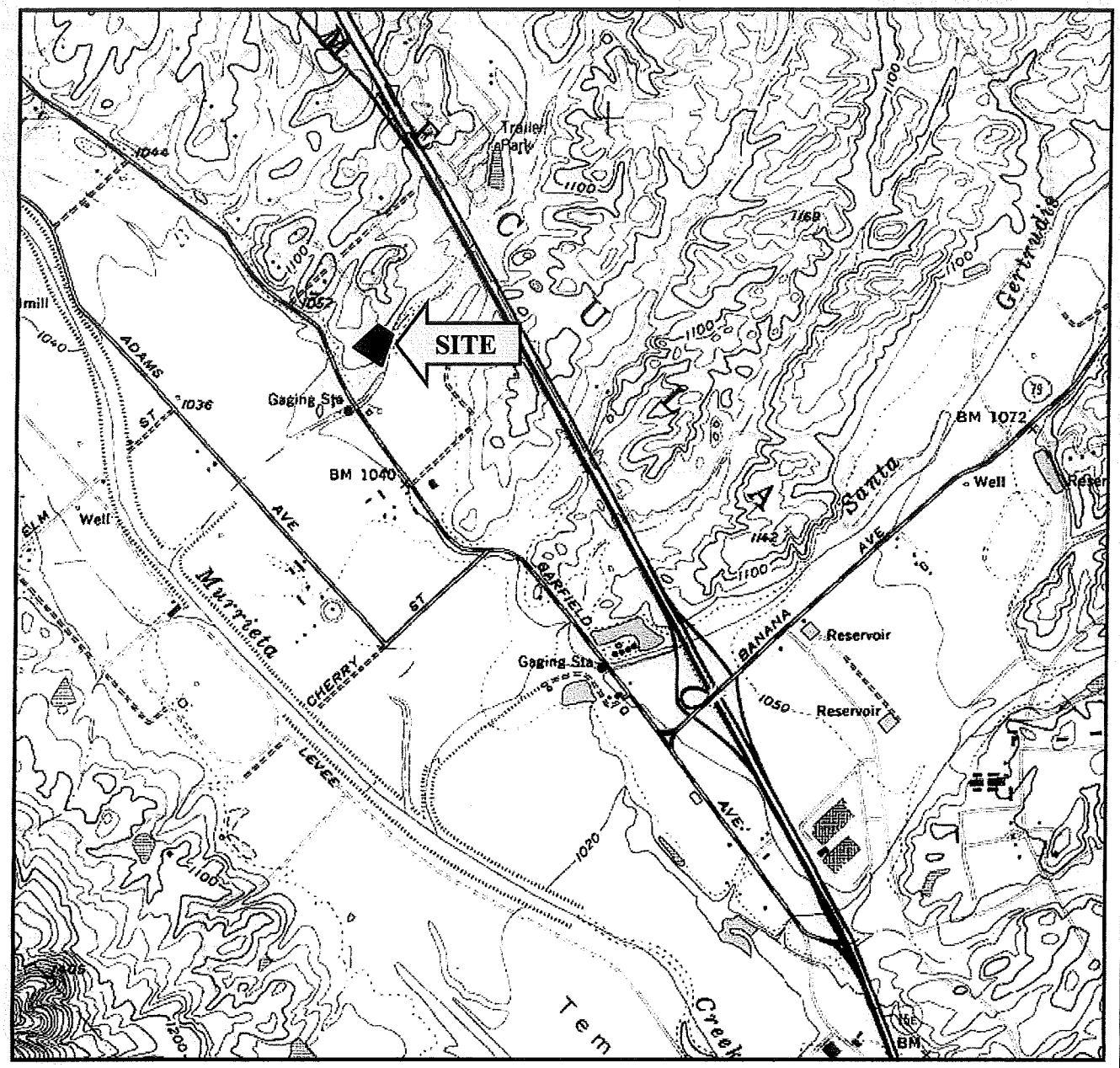
b) The approximate site location is shown on the *Location Map, Figure 1.*

5.2 Surface Conditions

a) The ground surface within the northern part of the site generally slopes to the south, southwest and southeast at gradients ranging from 2:1 (horizontal:vertical) to 6:1 (h:v). A relatively level plateau exists within the central part of the northeast-lying property line. The ground surface within the southern part of the property generally descends to the south/southeast at a 3 to 4 percent gradient. A creek channel (Warm Springs Creek) crosses through the eastern corner of the property. Ground surface elevations range from approximately 1089 feet above Mean Sea Level (MSL) along the northwestern edge of the site to about 1038 feet above MSL along the bottom of the creek channel.

b) Surface drainage consists of sheet flow runoff of incident rainfall water derived primarily within the property boundaries and adjacent properties. The nearest primary drainage feature is Warm Springs Creek, located along the eastern edge of the property.

LOCATION MAP



BASE MAP: USGS 7.5-Minute Topographic Map,
Murrieta Quadrangle, 1979

2000 0 2000 4000

SCALE FEET

NORTH

GLOBAL GEO-ENGINEERING, INC. GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA	26501 Madison Avenue Murrieta, California	
	Date: November 2017	**Figure No:**
	Project No.: 7355-04	1

5.3 Geology

5.3.1 Regional Geologic Setting

a) The project site is situated in the southern Temescal Valley area of Riverside County, which forms part of the Peninsular Ranges Geomorphic Province of California. Geologic structures within this province are characterized by a northwest-trending topographic range that terminates directly against the Transverse Ranges to the north. The inland portions of the province include several high mountain ranges, underlain by igneous, metasedimentary and metavolcanic rock of the Paleozoic and Mesozoic age.

b) The coastal portion is defined by clastic marine and non-marine terraces of the upper Cretaceous, Tertiary, and Quaternary age. Structurally, the province is regarded as an uplifted and westward tilted range, which has been faulted and broken up into several smaller sub-parallel blocks. The Peninsular Ranges province is both bounded and transected by several major fault zones. Principal faults include the San Andreas, San Jacinto, Newport-Inglewood and the Whittier-Elsinore Fault Zones.

5.3.2 Local Geologic Setting

In general, the project site is underlain by Holocene-age alluvium and Pleistocene-age SANDSTONE and SILTSTONE, belonging to the Pauba Formation.

5.4 Subsurface Conditions

The subsurface conditions, as encountered in our explorations, are described in the following sections. Our boring logs are enclosed as *Figures B-2* through *B-10*. The boring locations are shown on our *Geotechnical Plan, Plate 1*. The subsurface conditions are also depicted on *Geotechnical Cross Section, Plate 2*

5.4.1 Alluvium

a) Holocene-age alluvial deposits were encountered in Borings B-1, B-3, B-4 and P-1.

b) The alluvium was found to consist of Sandy to Clayey SILT and Silty SAND

c) The Sandy to Clayey SILT was generally found to be grayish brown to olive brown, slightly moist to moist, soft to medium stiff and porous.

d) The Silty SAND was generally observed to be fine grained, light olive brown to dark brown and loose to medium dense.

e) The depths of alluvium encountered in our excavations were found to range from 5 feet in Boring B-4 to 7 feet in Boring B-1.

5.4.2 Pauba Formation

a) Pleistocene-age bedrock, belonging to the Pauba Formation, was encountered in all of our borings to the maximum depths excavated.

b) The bedrock encountered in our excavations was generally observed to consist of fine to coarse grained, yellowish brown to olive brown, and medium dense SANDSTONE/Silty SANDSTONE with olive brown and medium stiff to stiff Sandy SILTSTONE.

5.4.3 Groundwater

a) No free groundwater or seepage zones were encountered in our exploratory borings.

b) In direct proximity of the property, shallow ground water is not expected to be present, due to the relatively impermeable nature of the underlying Pauba Formation.

c) Intermittent water migrating through fracture zones as seepage may, however, occur within the underlying formation. The amount of seepage is primarily dependent on seasonal precipitation and irrigation use from the higher elevated properties.

6. SEISMICITY

6.1 General

a) The property is located in the general proximity of several active and potentially active faults, which is typical for sites in the Southern California region. Earthquakes occurring on active faults within a 70-mile radius are capable of generating ground shaking of engineering significance to the proposed construction.

b) In Southern California, most of the seismic damage to manmade structures results from ground shaking and, to a lesser degree, from liquefaction and ground rupture caused by earthquakes along active fault zones. In general, the greater the magnitude of the earthquake, the greater is the potential damage.

6.2 Ground Surface Rupture

a) The project site is not located within a State of California delineated Earthquake Fault Zone (previously referred to as the Alquist-Priolo Special Studies Zone).

b) The closest known active fault is the Wildomar Fault, mapped to be located at a distance of about 800 feet southwest of the project site.

c) Other known active faults include the Elsinore Fault (Glen Ivy Segment) and the San Jacinto Fault, located at distances of about 12.4 miles and 20.6 miles, respectively, from the subject property.

d) Due to the distance of the closest active fault to the site, ground rupture is not considered a significant hazard at the site.

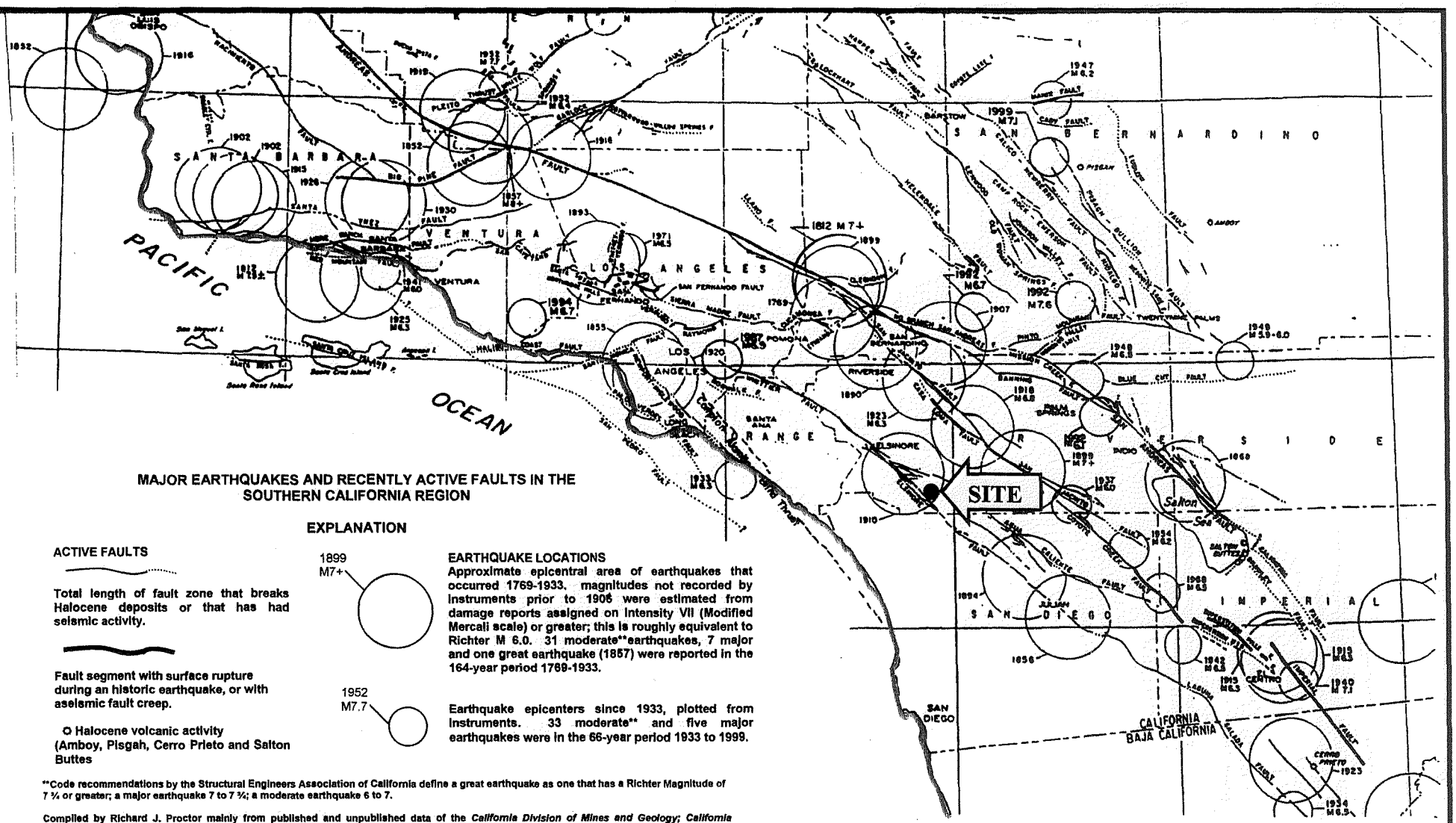
6.3 Ground Shaking

a) We utilized the *U.S. Seismic Design Maps* internet program provided by the U.S. Geological Survey to calculate the peak ground acceleration (PGA) at the project site location. The PGA at the subject property resulted to be 0.842g.

b) *Figure 2* shows the geographical relationships among the site locations, nearby faults and the epicenters of significant occurrences. From the seismic history of the region and proximity, the Wildomar Fault has the greatest potential for causing earthquake damage related to ground shaking at this site.

6.4 Liquefaction

a) Liquefaction is the phenomenon where saturated soils develop high pore water pressures during seismic shaking and behave like a fluid.



MAJOR EARTHQUAKES AND RECENTLY ACTIVE FAULTS IN THE SOUTHERN CALIFORNIA REGION

EXPLANATION

ACTIVE FAULTS

Total length of fault zone that breaks Holocene deposits or that has had seismic activity.

Fault segment with surface rupture during an historic earthquake, or with aseismic fault creep.

O Holocene volcanic activity (Amboy, Pisgah, Cerro Prieto and Salton Buttes

1899 M7+

1952 M7.7

EARTHQUAKE LOCATIONS

Approximate epicentral area of earthquakes that occurred 1769-1933. magnitudes not recorded by instruments prior to 1906 were estimated from damage reports assigned on Intensity VII (Modified Mercali scale) or greater; this is roughly equivalent to Richter M 6.0. 31 moderate** earthquakes, 7 major and one great earthquake (1857) were reported in the 164-year period 1769-1933.

Earthquake epicenters since 1933, plotted from instruments. 33 moderate** and five major earthquakes were in the 66-year period 1933 to 1999.

**Code recommendations by the Structural Engineers Association of California define a great earthquake as one that has a Richter Magnitude of 7 ½ or greater; a major earthquake 7 to 7 ¾; a moderate earthquake 6 to 7.

Compiled by Richard J. Proctor mainly from published and unpublished data of the *California Division of Mines and Geology; California Department of Water Resources Bulletin 116-2* (1964); selections from bulletins of the *Geological* and *Seismological Societies of America*; from C.F. Richter, *Elementary Seismology* (1958); and the *National Atlas*, p. 66, and from Working Group on California Earthquake Probabilities- SSA Bulletin V 85.

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING
IRVINE, CALIFORNIA

26501 Madison Avenue
Murrieta, California

Date: November 2017

Project No: 7355-04

Figure No: 2

b) The eastern corner of the property is located within a State of California delineated *Seismic Hazard Zone* for liquefaction (along the alignment of Warm Springs Creek). The proposed development, however, does not encroach into the delineated liquefaction zone. The site is underlain by shallow bedrock. The ground water is not anticipated due to the impermeable nature of the bedrock. The potential for liquefaction within the proposed development area is considered to be low.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

a) It is our opinion that the site will be suitable for the proposed development from a geotechnical aspect, assuming that our recommendations are incorporated in the project plan designs and specifications, and are implemented during construction.

b) We are of the opinion that the proposed lightly loaded structures may be supported on spread footings founded on the competent native material or compacted fill.

c) We are also of the opinion that with due and reasonable precautions, the required grading will not endanger adjacent property nor will grading be affected adversely by adjoining property.

d) The design recommendations in the report should be reviewed during the grading phase when soil conditions in the excavations become exposed.

e) The final grading plans and foundation plans/design loads should be reviewed by the Geotechnical Engineer.

7.2 Grading

7.2.1 Processing of On-Site Soils

a) The site is proposed to be graded by cutting and filling. Prior to placing the fill, any unsuitable soils exposed at the bottom of the excavation should be removed to the competent soils.

b) It is recommended that for any proposed structure, the entire footings should be embedded in to one type of material.

c) No overexcavation below any foundation is recommended provided the footings are excavated entirely in the competent native soils or entirely in the compacted fill soils.

d) In the event a transition is encountered exposing two different types of materials, the material should be overexcavated to provide at least one foot of compacted fill below the bottom of the footings.

e) The subgrade soils below the asphalt paving should be overexcavated to a depth of one foot. The excavation may be backfilled using the onsite soils.

f) Prior to placing any fill, the subgrade soils should be scarified to a depth 6 to 8 inches or to the depth as recommended by the geotechnical engineer. The exposed bottom should be approved by a geotechnical engineer.

g) Any loosening of reworked or native material, consequent to the passage of construction traffic, weathering, etc., should be made re-rolled to further construction.

h) The depths of overexcavation, if any, should be reviewed by the Geotechnical Engineer during construction. Any surface or subsurface obstructions, or any variation of site materials or conditions encountered during grading should be brought immediately to the attention of the Geotechnical Engineer for proper exposure, removal or processing, as directed. No underground obstructions or facilities should remain in any structural areas. Depressions and/or cavities created as a result of the removal of obstructions should be backfilled properly with suitable materials, and compacted.

7.2.2 Material Selection

After the site has been stripped of any debris, vegetation and organic soils, excavated on-site soils are considered satisfactory for reuse in the construction of on-site fills, with the following provisions:

a) No organic contents are permitted in the fill;

b) Large size rocks or concrete pieces greater than 8 inches in diameter should not be incorporated in compacted fill;

c) Rocks or concrete pieces greater than 4 inches in diameter should not be incorporated in compacted fill to within 1 foot of the underside of the footings and slabs.

7.2.3 Compaction Requirements

a) Reworking/compaction shall include significant moisture conditioning as needed to bring the soils to slightly above the optimum moisture content. All reworked soils and structural fills should be densified to achieve at least **90 percent relative compaction** with reference to laboratory compaction standard. The optimum moisture content and maximum dry density should be determined in the laboratory in accordance with ASTM Test Designation D1557.

b) Fill should be compacted in lifts not exceeding 8 inches (loose).

7.2.4 Excavating Conditions

a) Excavation of on-site materials may be accomplished with standard earthmoving or trenching equipment.

b) Groundwater was not encountered to the depths explored. Dewatering is not anticipated.

7.2.5 Shrinkage

For preliminary earthwork calculation, an average shrinkage factor of 10 percent is recommended for the native soils (this does not include handling losses).

7.2.6 Expansion Potential

a) Based upon visual observation, the expansivity of the site soils is considered to be *Low*.

b) The soil expansion potential for subgrade soils should be determined during the final stages of rough grading for the area of proposed slab-on-grade.

7.2.7 Sulphate Content

a) The sulphate content of a representative sample of the subgrade soil was less than 0.1 percent. The sulphate exposure is considered *negligible* in accordance with the building code.

b) The fill materials should be tested for their sulphate content during the final stage of rough grading.

7.2.8 Utility Trenching

a) The walls of temporary construction trenches in fill should stand nearly vertical, with only minor sloughing, provided the total depth does not exceed 3 feet (approximately). Shoring of excavation walls or flattening of slopes may be required, if greater depths are necessary.

b) Trenches should be located so as not to impair the bearing capacity or to cause settlement under foundations. As a guide, trenches should be clear of a 45-degree plane, extending outward and downward from the edge of foundations. Shoring should comply with Cal-OSHA regulations.

c) Existing soils may be utilized for trenching backfill, provided they are free of organic materials.

d) All work associated with trench shoring must conform to the state and federal safety codes.

7.2.9 Surface Drainage Provisions

Positive surface gradients should be provided adjacent to the buildings to direct surface water run-off away from structural foundations and to suitable discharge facilities.

7.2.10 Grading Control

All grading and earthwork should be performed under the observation of a Geotechnical Engineer in order to achieve proper subgrade preparation, selection of satisfactory materials, placement and compaction of structural fill. Sufficient notification prior to stripping and earthwork construction is essential to make certain that the work will be adequately observed and tested.

7.3 Slab-on-Grade (if any)

a) Concrete floor slabs may be founded on the reworked existing soils or compacted fill.

b) The slab-on-grade should be underlain by 4-inch thick SAND. A plastic vapor barrier should be placed below the SAND.

c) It is recommended that #3 bars on 18-inch center, both ways, or equivalent be provided as minimum reinforcement in slabs-on-grade. Joints should be provided and slabs should be at least 4 inches thick.

d) The FFL should be at least 6 inches above highest adjacent grade.

e) The subgrade should be kept moist prior to the concrete pour.

7.4 Spread Foundations

The proposed structures can be founded on shallow spread footings supported by the competent native materials or compacted fill soils. The minimum criteria presented below should be adopted:

7.4.1 Dimensions/Embedment Depths

	Minimum Width (ft)	**Minimum Embedment Below Lowest Finished Surface (ft)**
Square Column Footings to 50 kip	-	2.0

7.4.2 Allowable Bearing Capacity

Embedment Depth (ft)	**Allowable Bearing Capacity (lb/ft^2)**
1.0	1,600

(Notes:

- The allowable bearing capacity may be increased by 600 lb/ft^2 for each additional foot increase in depth or by 200 lb/ft^2 for each additional foot increase in width, to a maximum value of 3,500 lb/ft^2;
- These values may be increased by one-third in the case of short-duration loads, such as induced by wind or seismic forces;
- At least 4x#4 bars should be provided in wall footings, two on top and two at the bottom;
- Footings for any structures adjacent to the descending slope should be sited such that horizontal distance from the lower outer edge of the footings to the competent slope should be 1/3 x the slope height; minimum 10 feet and need not exceed 40 feet;

- In the event that footings are founded in structural fills consisting of imported materials, the allowable bearing capacities will depend on the type of these materials, and should be re-evaluated;
- Bearing capacities should be re-evaluated when loads have been obtained and footings sized during the preliminary design;
- Planter areas should not be sited adjacent to walls;
- Footing excavations should be observed by the Geotechnical Engineer;
- Footing excavations should be kept moist prior to the concrete pour;
- It should be insured that the embedment depths do not become reduced or adversely affected by erosion, softening, planting, digging, etc.)

7.4.3 Settlements

Total and differential settlements under spread footings are expected to be within tolerable limits and are not expected to exceed 1 and ¾ inches over a horizontal distance of 40 feet, respectively.

7.5 Lateral Forces

a) The following lateral pressures are recommended for the design of retaining structures.

Lateral Force	Soil Profile	Pressure (lb/ft^2/ft depth)	
		Unrestrained Wall	Rigidly Supported Wall
Active Pressure	Level	34	-
At-Rest Pressure	Level	-	56
Passive Resistance (ignore upper 1.5 ft.)	Level	275	-

b) Friction coefficient: 0.37 (includes a Factor of Safety of 1.5). While combining friction with passive resistance, reduce passive by 1/3.

c) These values apply to the existing soil, and to compacted backfill generated from in-situ material. Imported material should be evaluated separately. It is recommended that where feasible, imported granular backfill be utilized, for a width equal to approximately one-quarter the wall height, and not less than 1.5 feet.

d) Backfill should be placed under engineering control.

e) Subdrains should be provided behind retaining walls. The subdrain should consist of 4-inch perforated (holes facing down) Schedule 40 or SDR-35 pipe, embedded in at least 1 cubic ft/ft of gravel, wrapped in a geofabric, such as Mirafi 140N.

7.6 Seismic Coefficients

The table on the following page provides seismic design parameter values from 2015 NEHRP Recommended Seismic Provisions which are being adopted into 2016 ASCE 7 Standard and the 2018 International Building Code.

7.7 Slopes

a) Any fill slopes, no steeper than 2: (horizontal:vertical) should be overbuilt and cut back to design profiles, so as to achieve proper compaction on the slope faces. Overbuilding is usually on the order of 2 to 4 feet, depending on the soil, equipment, etc. Compaction efforts may be achieved by backrolling and gridrolling the slope as fill progresses, instead of overbuilding. Whatever means or widths of overbuilding are adopted, it should be ensured that the slopes are compacted to a minimum 90 percent relative compaction at the finished slope surface.

ITEM	VALUE
Site Longitude (Decimal-degrees)	-117.1769
Site Latitude (Decimal-degrees)	33.5346
Site Class	D
Seismic Design Category	D
Mapped Spectral Response Acceleration-Short Period (0.2 Sec) - S_S	1.577
Mapped Spectral Response Acceleration-1 Second Period – S_1	0.590
Short Period Site Coefficient-F_a	1.200
Long Period Site Coefficient F_v	1.710
Adjusted Spectral Response Acceleration @ 0.2 Sec. Period (Sms)	1.892
Adjusted Spectral Response Acceleration @ 1Sec.Period (S_{m1})	1.008
Design Spectral Response Acceleration @ 0.2 Sec. Period (S_{Ds})	1.261
Design Spectral Response Acceleration @ 1-Sec. Period (S_{D1})	0.672

b) The proposed fill slopes should be properly benched and keyed. Keys, in general, should be constructed at a minimum of 12 feet wide and 2 to 3 feet deep with the bottom inclined away from the toe of the slope at 2 percent. The proposed fill should be interlocked (benched) into competent material. (Typical benching dimensions: 5 to 10 feet wide x 4 feet high.)

c) Subdrains must be provided in all keyway excavations. Subdrain pipe shall consist of perforated, 4-inch diameter PVC, Schedule 40 or SDR-35, embedded in gravel rock and wrapped in Mirafi 140N (or equivalent). All subdrain shall be inspected prior to covering with the fabric and rock.

d) The cut slopes should be cut to the proposed grades no steeper than 2:1 (horizontal:vertical). The cut should be observed by an engineering geologist to determine the need of any stabilization to reduce the potential for any surficial instability.

7.8 Pavement

7.8.1 Asphalt Pavement Section

a) Based on Traffic Indices (T.I.) and on the anticipated "R"-Value of 42, the following tentative structural pavement sections are recommended.

Location	T.I.	Asphaltic Concrete (inches)	Aggregate Base (inches)
Parking	5.0	3	4
Access Road – Light Traffic	6.0	3	6
Access Road – Heavy Traffic	7.0	4	7

b) Appropriate traffic index should be selected based on the traffic count.

c) At the conclusion of grading operations, the subgrade soils should be tested to verify the R-Value.

7.8.2 Subgrade Preparation

All pavement areas shall be inspected, tested for compaction requirements, reworked where required and approved immediately prior to the placement of aggregate base. Subgrade soils within the upper 12 inches of finished grade shall be moisture-conditioned where necessary, shall be compacted to at least 90 percent relative compaction per ASTM D1557, and shall be free of any loose or soft areas.

7.8.3 Base Preparation

Unless otherwise specified, the base shall consist of Class II ¾-inch aggregate base or Crushed Miscellaneous Base (CMB). The base shall be compacted to a minimum of 95 percent relative compaction in accordance with the procedures described in ASTM Test Method D1557.

7.8 Soil Corrosion Potential

a) Soil Corrosion potential for metal and concrete was estimated by performing water-soluble sulfate, chloride, pH, and electrical resistivity tests during this investigation.

b) Electrical resistivity is a measure of soil resistance to the flow of corrosion currents. Corrosion currents are generally high in low resistivity soils. The electrical resistivity of a soil decreases primarily with an increase in its chemical and moisture contents. A commonly accepted correlation between electrical resistivity and corrosivity for buried ferrous metals is presented below:

Electrical Resistivity, Ohm-cm	Corrosion Potential
Less than 1,000	Severe
1,000-2,000	Corrosive
2,000-10,000	Moderate
Greater than 10,000	Mild

c) Results of electrical resistivity tests indicated a minimum resistivity ranging between 1,400 and 3,952 ohm-cm. Based on this data, it is our opinion that, in general, on-site soils have a *moderate* corrosion potential. This potential should be considered in design of underground metal pipes.

8. LIMITATIONS

a) Soils and bedrock over an area show variations in geological structure, type, strength and other properties from what can be observed sampled and tested from specimens extracted from necessarily limited exploratory borings. Therefore, there are natural limitations inherent in making geologic and soil engineering studies and analyses. Our findings, interpretations, analyses and recommendations are based on observation, laboratory data and our professional experience; and the projections we make are professional judgments conforming to the usual standards of the profession. No other warranty is herein expressed or implied.

b) In the event, that during construction, conditions are exposed which is significantly different from those described in this report, they should be brought to the attention of the Geotechnical Engineer.

c) The recommendations provided in this report are intended to minimize the potential of distress to the structures caused by the subgrade soils. However, it should be noted that certain amount of distress to the existing and proposed improvements of the slab is unavoidable and should be anticipated during the lifetime of the existing and the proposed structures.

The opportunity to be of service is sincerely appreciated. If you have any questions or if we can be of further assistance, please call.

Very truly yours,

GLOBAL GEO-ENGINEERING, INC.

Mohan B. Upasani
Principal Geotechnical Engineer
RGE 2301
(Exp. March 31, 2019)

Kevin B. Young
Principal Engineering Geologist
CEG 2253
(Exp. October 31, 2019)

MBU/KBY: fdg

Enclosures:

Location Map	- Figure 1
Seismicity Map	- Figure 2
Terms and Conditions	
References	- Appendix A
Field Exploration	- Appendix B
Unified Soils Classification System	Figure B-1
Logs of Borings	Figures B-2 through B-10
Laboratory Testing	- Appendix C
Geotechnical Plan	- Plate 1
Geotechnical Cross Section	- Plate 2

TERMS AND CONDITIONS OF AUTHORIZATION

Consultant shall serve Client by providing professional counsel and technical advice regarding subsurface conditions consistent with the scope of services agreed-to between the parties. Consultant will use his professional judgment and will perform his services using that degree of care and skill ordinarily exercised under similar circumstances, by reputable foundation engineers and/or engineering geologists practicing in this or similar localities.

- In assisting Client, the Consultant may include or rely on information and drawings prepared by others for the purpose of clarification, reference or bidding; however, by including the same, the Consultant assumes no responsibility for the information shown thereon and Client agrees that Consultant is not responsible for any defects in its services that result from reliance on the information and drawings prepared by others. Consultant shall not be liable for any incorrect advice; judgment or decision based on any inaccurate information furnished by the Client or any third party, and Client will indemnify Consultant against claims, demands, or liability arising out of, or contribute to, by such information.

- Unless otherwise negotiated in writing, Client agrees to limit any and all liability, claim for damages, cost of defense, or expenses to be levied against Consultant on account of design defect, error, omission, or professional negligence to a sum **not to exceed ten thousand dollars or charged fees whichever is less**. Further, Client agrees to notify any construction contractor or subcontractor who may perform work in connection with any design, report, or study prepared by Consultant of such limitation of liability for design defects, errors, omissions, or professional negligence, and require as a condition precedent to their performing the work a like limitation of liability on their part as against the Consultant. In the event the Client fails to obtain a like limitation of liability provision as to design defects, errors, omissions or professional negligence, any liability of the Client and Consultant to such contractor or subcontractor arising out of a negligence shall be allocated between Client and Consultant in such a manner that the aggregate liability of Consultant for such design defects to all parties, including the Client shall **not exceed ten thousand dollars or charged fees whichever is less**. No warranty, expressed or implied of merchantability or fitness, is made or intended in connection with the work to be performed by Consultant or by the proposal for consulting or other services or by the furnishing of oral or written reports or findings made by Consultant.

- The Client agrees, to the fullest extent permitted by law, to indemnify, defend and hold harmless the Consultant, its officers, directors, employees, agents and subconsultants from and against all claims, damages, liabilities or costs, including reasonable attorney's fees and defense costs, of any nature whatsoever arising from or in connection with the Project to the extent that said claims, damages, liabilities or costs arise out of the work, services, or conduct of Client or Client's contractors, subconsultants, or other third party not under Consultant's control. Client further agrees that the duty to defend set forth herein arises immediately and is not contingent on a finding of fault against Client or Client's contractors, subconsultants, or other third parties. Client shall not be obligated under this provision to indemnify Consultant for Consultant's sole negligence or willful misconduct.

- Client shall grant free access to the site for all necessary equipment and personnel and Client shall notify any and all possessors of the project site that Client has granted Consultant free access to the project site at no charge to Consultant unless expressly agreed to otherwise in writing.

- If Client is not the property owner for the subject Project, Client agrees that it will notify the property owner of the terms of this agreement and obtain said property owner's approval to the terms and conditions herein. Should Client fail to obtain the property owner's agreement as required herein, Client agrees to be solely responsible to Consultant for all damages, liabilities, costs, including litigation fees and costs, arising from such failure that exceed that limitation of Consultant's liability herein.

- Client shall locate for Consultant and shall assume responsibility for the accuracy of his representations as to the locations of all underground utilities and installations. Consultant will not be responsible for damage to any such utilities or installation not so located.

- Client and Consultant agree to waive claims against each other for consequential damages arising out of or relating to this agreement. Neither party to this agreement shall assign the contract without the express, written consent of the other party.

- Consultant agrees to cover all open test holes and place a cover to carry a 200-pound load on each hole prior to leaving project site unattended. Consultant agrees that all test holes will be backfilled upon completion of the job. However, Client may request test holes to remain open after completion of Consultants work. In the event Client agrees to pay for all costs associated with covering and backfilling said test holes at a later date, and Client shall indemnify, defend and hold harmless Consultant for all claims, demands and liabilities arising from his request, except for the sole negligence of the Consultant, to the extent permitted by law.

- Consultant shall not be responsible for the general safety on the job or for the work of Client, other contractors and third parties.

- Consultant shall be excused for any delay in completion of the contract caused by acts of God, acts of the Client or Client's agent and/or contractors, inclement weather, labor trouble, acts of public utilities, public bodies, or inspectors, extra work, failure of Client to make payments promptly, or other contingencies unforeseen by Consultant and beyond reasonable control of the Consultant.

- In the event that either party desires to terminate this contract prior to completion of the project, written notification of such intention to terminate must be tendered to the other party. In the event Client notifies Consultant of such intention to terminate Consultant's services prior to completion of the contract, Consultant reserves the right to complete such analysis and records as are necessary to place files in order, to dispose of samples, put equipment in order, and (where considered necessary to protect his professional reputation) to complete a report on the work performed to date. In the event that Consultant incurs cost in Client's termination of this Agreement, a termination charge to cover such cost shall be paid by Client.

- If the Client is a corporation, the individual or individuals who sign or initial this Contract, on behalf of the Client, guarantee that Client will perform its duties under this Contract. The individual or individuals so signing or initialing this Contract warrant that they are duly authorized agents of the Client.

- Any notice required or permitted under this Contract may be given by ordinary mail at the address contained in this Contract, but such address may be changed by written notice given by one party to the other from time to time. Notice shall be deemed received in the ordinary course of the mail. This agreement shall be deemed to have been entered into the County of Orange, State of California.

LIMITATIONS

Our findings, interpretations, analyses, and recommendations are professional opinions, prepared and presented in accordance with generally accepted professional practices and are based on observation, laboratory data and our professional experience. Consultant does not assume responsibility for the proper execution of the work by others by undertaking the services being provided to Client under this agreement and shall in no way be responsible for the deficiencies or defects in the work performed by others not under Consultant's direct control. No other warranty herein is expressed or implied.

APPENDIX A

References

1. Blake, T. F., 2000, *EQFAULT, A Computer Program for the Deterministic Prediction of Peak Horizontal Acceleration from Digitized California Fault* Users Manual and Program, 79pp;

2. California Division of Mines and Geology, 2000, *Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones, Southern Region*;

3. California Division of Mines and Geology, *January 1, 1990, Special Studies Zones, Murrieta Quadrangle, Revised Official Map*;

4. California Geological Survey, December 5, 2007, *Seismic Hazard Zones, Murrieta Quadrangle, Official Map*;

5. California Geological Survey, 2007, *Seismic Hazard Zone Report for the Murrieta 7.5-Minute Quadrangle, Riverside County, California*: Seismic Hazard Zone Report 115;

6. Hart, Eart W., Revised 1994, *Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps*: California Division of Mines and Geology Special Publication 42;

7. Kennedy, M.P. and Morton, D.M., *Preliminary Geologic Map of the Murrieta 7.5' Quadrangle, Riverside County, California*: California Geological Survey Open File Report 03-189;

8. Miller, Russell V. et. al., 1991, *Mineral Land Classification of the Temescal Valley Area, Riverside County, California,* California Division of Mines and Geology Special Report 165;

9. United States Geological Survey, 1953 photorevised 1979, *Murrieta Quadrangle, 7.5 Minute Topographic Series.*

APPENDIX B

Field Exploration

a) The site was explored on July 17 and 18, 2017, utilizing a hollow stem drill rig to excavate nine borings to a maximum depth of 18.5 feet below the existing ground surface. The borings were subsequently backfilled.

b) The soils encountered in the excavations were logged and sampled by our Engineering Geologist. The soils were classified in accordance with the Unified Soil Classification System described in *Figure B-1*. The Logs of Borings are presented as *Figures B-2 through B-10*. The logs, as presented, are based on the field logs, modified as required from the results of the laboratory tests. Driven ring and bulk samples were obtained from the excavations for laboratory inspection and testing. The depths at which the samples were obtained are indicated on the logs.

c) The number of blows of the driving weight during sampling was recorded, together with the depth of penetration, the driving weight and the height of fall. The blows required per foot of penetration for given samples was then calculated and shown on the logs.

d) No groundwater or seepage was encountered within any of the boring excavations.

e) Caving occurred in all of the borings to the depths noted on the logs.

UNIFIED SOILS CLASSIFICATION (ASTM D-2487)

PRIMARY DIVISION			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of materials is larger than #200 sieve size	GRAVELS More than half of coarse fraction is larger than #4 sieve	Clean Gravels (<5% fines)	GW	Well graded gravels, gravel-sand mixture, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		Gravel with Fines	GM	Silty gravels, gravel-sand-silt mixture. Non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures. Plastic fines
	SANDS More than half of coarse fraction is smaller than #4 sieve	Clean Sands (<5% fines)	SW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		Sands with Fines	SM	Silty sands, sand-silt mixtures. Non-Plastic fines.
			SC	Clayey sands, sand-clay mixtures. Plastic fines.
FINE GRAINED SOILS More than half of material is smaller than #200 sieve size	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts, with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
	Highly Organic Soils		PT	Peat and other highly organic soils.

CLASSIFICATION BASED ON FIELD TESTS

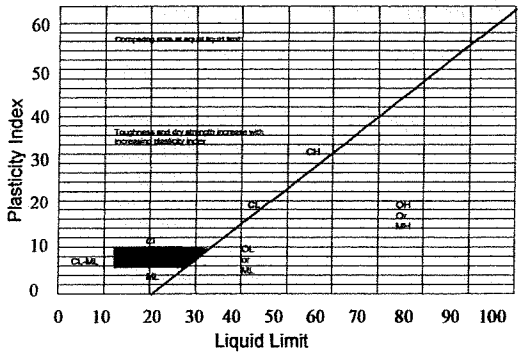
PENETRATION RESISTANCE (PR)	
Sands and Gravels	
Relative Density	Blows/foot
Very loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Clays and Silts		
Consistency	Blows/foot*	Strength**
Very Soft	0-2	0-½
Soft	2-4	¼-½
Firm	4-8	½-1
Stiff	8-15	1-2
Very Stiff	15-30	2-4
Hard	Over 30	Over 4

*Numbers of blows of 140 lb hammer falling 30 inches to drive a 2-inch O.D. (1 3/8 in. I.D.) Split Barrel sampler (ASTM-1568 Standard Penetration Test)

**Unconfined Compressive strength in tons/sq. ft. Read from pocket penetrometer

CLASSIFICATION CRITERIA BASED ON LAB TESTS



Plasticity chart for laboratory Classification of Fine-grained soils

GW and SW – $C_u = D_{60}/D_{10}$ greater than 4 for GW and 6 for SW; $C_c = (D_{30})^2/D_{10} \times D_{60}$ between 1 and 3

GP and SP – Clean gravel or sand not meeting requirement for GW and SW

GM and SM – Atterberg limit below "A" line or P.I. less than 4

GC and SC – Atterberg limit above "A" line P.I. greater than 7

CLASSIFICATION OF EARTH MATERIAL IS BASED ON FIELD INSPECTION AND SHOULD NOT BE CONSTRUED TO IMPLY LABORATORY ANALYSIS UNLESS SO STATED.

Fines (Silty or Clay)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobbles	Boulders
Sieve Sizes	200	40	10	4	¾"	3"	10"

GLOBAL GEO-ENGINEERING, INC.
GEOLOGIC AND SOILS ENGINEERING, IRVINE, CALIFORNIA

26501 Madison Avenue
Murrieta, California

Date: November 2017 | **Figure No.:** B-1

Project No.: 7355-04

Global Geo-Engineering, Inc. GEOLOGIC AND SOILS TESTING Irvine, California	LOG OF BORING B-1	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Weight (lbs) : 140 Hammer Drop (in.) : 30
26501 Madison Avenue Murrieta, California	Date : July 17, 2017 Logged By : KBY Diameter of Boring : 8" Drilling Company : Cal Pac Drilling Rig : Mobile B-61	
Project 7355-04		

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
		5.3	102.2	16			ML		Sandy SILT: grayish brown, slightly moist, soft to firm, porous
5		10.1	106.6	9			ML		Sandy Clayey SILT: olive brown, slightly moist to moist, soft ALLUVIUM
		6.4	108.9	24			SL		Sandy SILTSTONE: olive brown, slightly moist to moist, medium stiff
10		5.1	120.3	31					@12' light olive brown, slightly more sandy, medium stiff to stiff
15		4.9	107.3	34			SS		SANDSTONE: medium to coarse grained, yellow brown, slightly moist, medium dense with Silty SANDSTONE interbeds PAUBA FORMATION
20									Bottom of Boring at 18 feet: Notes: 1. Caving to 9 feet after augers were removed 2. No groundwater or seepage encountered 3. Boring backfilled
25									

Figure B-2

Global Geo-Engineering, Inc. GEOLOGIC AND SOILS TESTING Irvine, California	LOG OF BORING B-2	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Weight (lbs) : 140 Hammer Drop (in.) : 30
26501 Madison Avenue Murrieta, California	Date : July 17, 2017 Logged By : KBY Diameter of Boring : 8" Drilling Company : Cal Pac Drilling Rig : Mobile B-61	
Project 7355-04		

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
		4.2	109.2	46			SS		Silty SANDSTONE: fine to medium grained, yellow brown, slightly moist, medium dense
5		1.6	101.1	22			SS		SANDSTONE: medium grained, yellow brown, slighlty moist, medium dense
		7.0	111.3	27					
10		9.5	113.9	23					@12' more Silty with Silty SANDSTONE interbeds ALLUVIUM
15		6.5	110.3	28			SS		Silty SANDSTONE: fine grained, olive brown, moist, medium dense PAUBA FORMATION
20									Bottom of Boring at 18 feet: Notes: 1. Caving to 14 feet after augers were removed 2. No groundwater or seepage encountered 3. Boring backfilled
25									

Figure B-3

Global Geo-Engineering, Inc.
GEOLOGIC AND SOILS TESTING
Irvine, California

26501 Madison Avenue
Murrieta, California

Project 7355-04

LOG OF BORING B-3

Date : July 17, 2017
Logged By : KBY
Diameter of Boring : 8"
Drilling Company : Cal Pac
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in.) : 30

Sample Type: Ring, Bulk, Standard Penetration Testing
Water Levels: Groundwater Encountered, Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
	☒	4.6	104.8	18			ML		Sandy SILT: olive brown, slightly moist, medium stiff, porous
5	☒	7.1	116.4	25					@5' slight CLAY content, less porous ALLUVIUM
							SS		Silty SANDSTONE: fine to medium grained, yellow brown, slightly moist, medium dense
10	☒	8.3	114.4	22					
	☒	5.9	106.9	45					PAUBA FORMATION
15									Bottom of Boring at 15 feet:
20									
25									

Notes:
1. Caving to 12 feet after augers were removed
2. No groundwater or seepage encountered
3. Boring backfilled

Figure B-4

Global Geo-Engineering, Inc.
GEOLOGIC AND SOILS TESTING
Irvine, California

26501 Madison Avenue
Murrieta, California

Project 7355-04

LOG OF BORING B-4

Date : July 17, 2017
Logged By : KBY
Diameter of Boring : 8"
Drilling Company : Cal Pac
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in.) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
	☒	4.4	101.2	18			ML		Sandy SILT: olive brown, slightly moist, medium stiff, porous ALLUVIUM
5	☒	4.8	122.4	45			SL		Sandy SILTSTONE: olive brown to olive gray, slightly moist to moist, medium dense with Silty SANDSTONE interbeds
10	☒	6.3	118.9	26			SS		Silty SANDSTONE: fine grained, light olive brown to dark yellow brown, slightly moist, medium dense
15	☒	7.3	108.8	36			SS		SANDSTONE: medium to coarse grained, yellow brown, slightly moist, medium dense PAUBA FORMATION
									Bottom of Boring at 15 feet:
20									Notes: 1. Caving to 12 feet after augers were removed 2. No groundwater or seepage encountered 3. Boring backfilled
25									

Figure B-5

Global Geo-Engineering, Inc.
GEOLOGIC AND SOILS TESTING
Irvine, California

26501 Madison Avenue
Murrieta, California

Project 7355-04

LOG OF BORING B-5

Date : July 17, 2017
Logged By : KBY
Diameter of Boring : 8"
Drilling Company : Cal Pac
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in.) : 30

Sample Type
- Ring
- Bulk
- Standard Penetration Testing

Water Levels
- Groundwater Encountered
- Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
	☒	3.7	116.7	34			SS		Silty SANDSTONE: fine to medium grained, olive gray to yellow brown, slightly moist, medium dense
5	☒	3.7	101.6	17					
	☒	6.8	102.2	26			SS		SANDSTONE: medium to coarse grained, yellow brown, slightly moist to moist, medium dense
10									
	■			N=25					PAUBA FORMATION
15									Bottom of Boring at 15.5 feet:
									Notes: 1. Caving to 12 feet after augers were removed 2. No groundwater or seepage encountered 3. Boring backfilled
20									
25									

Figure B-6

Global Geo-Engineering, Inc. GEOLOGIC AND SOILS TESTING Irvine, California	LOG OF BORING B-6	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Weight (lbs) : 140 Hammer Drop (in.) : 30
26501 Madison Avenue Murrieta, California	Date : July 17, 2017 Logged By : KBY Diameter of Boring : 8" Drilling Company : Cal Pac Drilling Rig : Mobile B-61	
Project 7355-04		

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									Silty SANDSTONE: fine grained, olive gray to yellow brown, slightly moist, medium dense
	⊠	9.7	106.9	26					
5									
	⊠	7.7	119.7	24					@7' more Silty
							SS		
10									
	⊠	6.5	113.5	30					
15									
	■			N=22					PAUBA FORMATION
									Bottom of Boring at 18.5 feet:
20									Notes: 1. Caving to 14 feet after augers were removed 2. No groundwater or seepage encountered 3. Boring backfilled
25									

Figure B-7

Global Geo-Engineering, Inc. GEOLOGIC AND SOILS TESTING Irvine, California	LOG OF BORING B-7	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Weight (lbs) : 140 Hammer Drop (in.) : 30
26501 Madison Avenue Murrieta, California	Date : July 17, 2017 Logged By : KBY Diameter of Boring : 8" Drilling Company : Cal Pac Drilling Rig : Mobile B-61	
Project 7355-04		

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
		17.5	112.7	32			SL		Sandy SILTSTONE: olive gray, slightly moist to moist, medium stiff to stiff
5		8.4	108.4	28			SS		Silty SANDSTONE: fine grained, olive gray, slightly moist, medium dense
		15.6	108.2	39					PAUBA FORMATION
10									Bottom of Boring at 10 feet:
15									
20									
25									

Notes:
1. Caving to 7 feet after augers were removed
2. No groundwater or seepage encountered
3. Boring backfilled

Figure B-8

Global Geo-Engineering, Inc.
GEOLOGIC AND SOILS TESTING
Irvine, California

26501 Madison Avenue
Murrieta, California

Project 7355-04

LOG OF BORING B-8

Date : July 17, 2017
Logged By : KBY
Diameter of Boring : 8"
Drilling Company : Cal Pac
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in.) : 30

Sample Type
- Ring
- Bulk
- Standard Penetration Testing

Water Levels
- Groundwater Encountered
- Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
	☒	6.1	109.6	28			SL		Sandy SILTSTONE: olive gray, slightly moist, medium stiff to stiff
5							SS		Silty SANDSTONE: fine grained, olive gray, slightly moist, medium dense
	☒	7.1	115.0	31					PAUBA FORMATION
									Bottom of Boring at 8 feet:
10									Notes: 1. Caving to 6 feet after augers were removed 2. No groundwater or seepage encountered 3. Boring backfilled
15									
20									
25									

Figure B-9

Global Geo-Engineering, Inc.
GEOLOGIC AND SOILS TESTING
Irvine, California

26501 Madison Avenue
Murrieta, California

Project 7355-04

LOG OF BORING P-1

Date : July 17, 2017
Logged By : KBY
Diameter of Boring : 8"
Drilling Company : Cal Pac
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in.) : 30

Sample Type
- Ring
- Bulk
- Standard Penetration Testing

Water Levels
- Groundwater Encountered
- Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
	☒	6.7	120.9	30			SM		Silty SAND: fine grained, light olive brown, medium dense
5	☒	6.6	107.8	15					@5' dark brown, loose to medium dense
	☒	6.5	121.0	32			SS		Silty SANDSTONE: fine grained, olive brown, medium dense PAUBA FORMATION
10									Bottom of Boring at 8.5 feet:
15									Notes: 1. Pipe and gravel installed for futured percolation testing 2. No groundwater or seepage encountered
20									
25									

Figure B-10

APPENDIX C

Laboratory Testing Program

The laboratory-testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested as described below.

a) Moisture-Density

Moisture-density information usually provides a gross indication of soil consistency. Local variations at the time of the investigation can be delineated, and a correlation obtained between soils found on this site and nearby sites. The dry unit weights and field moisture contents were determined for selected samples. The results are shown on the Logs of Borings.

b) Compaction

A representative soil sample was tested in the laboratory to determine the maximum dry density and optimum moisture content, using the ASTM D1557 compaction test method. This test procedure requires 25 blows of a 10-pound hammer falling a height of 18 inches on each of five layers, in a 1/30 cubic foot cylinder. The results of the tests are presented below:

Boring No.	Sample Depth (ft)	Soil Description	Optimum Moisture Content (%)	Maximum Dry Density (lb/ft^3)
B-1	1-3	Sandy SILT	8.5	128.1

c) Direct Shear

Direct shear tests were conducted on relatively undisturbed, using a direct shear machine at a constant rate of strain. Variable normal or confining loads are applied vertically and the soil shear strengths are obtained at these loads. The angle of internal friction and the cohesion are then evaluated. The samples were tested at saturated moisture contents. The test results are shown in terms of the Coulomb shear strength parameters, as shown below:

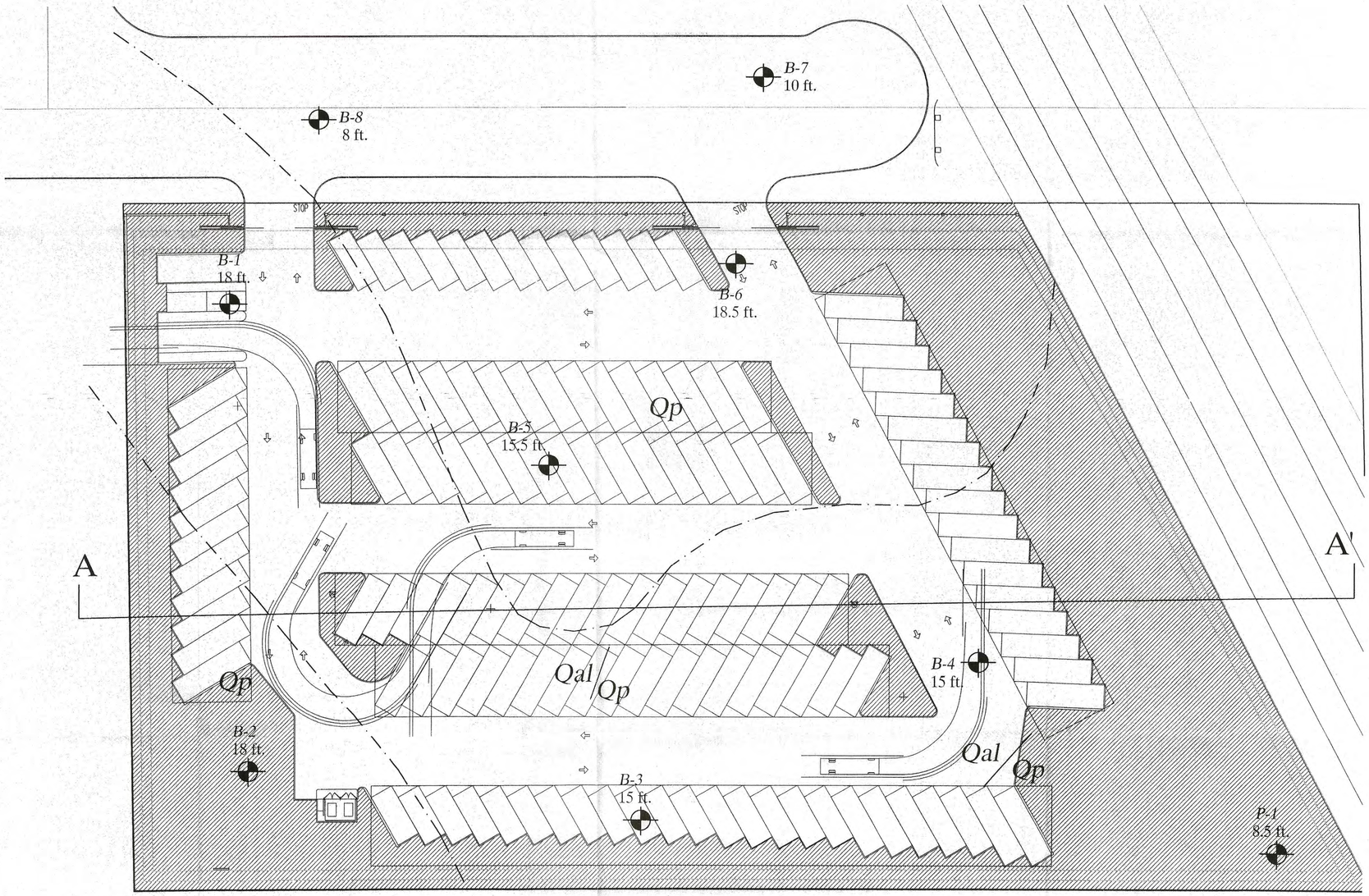
Boring No.	Sample Depth (ft)	Soil Description	Coulomb Cohesion (lb/ft^2)	Angle of Internal Friction (°)	Peak/ Residual
B-2	2	Silty SANDSTONE	200 150	36 31	Peak Residual
B-4	2	Sandy SILT	150 150	29 29	Peak Residual

d) Corrosivity Series Tests

Corrosivity Tests were performed on a representative sample. Soluble sulphate was obtained in accordance with California State Standard Test No. 417A and minimum resistivity was obtained per California State Standard Test No. 643C. The results are given on the following page:

Boring No.	Sample Depth (ft)	Soil Description	pH	Sulphate Content (%)	Soluble Chlorides (%)	Minimum Resistivity (ohm-cm)
B-1	1-3	Sandy SILT	7.6	0.0046	0.0048	2,246
B-2	1-3	Silty SANDSTONE	7.3	0.0037	0.0043	3,952
B-7	1-3	Sandy SILTSTONE	7.6	0.0038	0.0131	1,400

GEOTECHNICAL PLAN



KEY

B-8 8 ft.	APPROXIMATE BORING LOCATION, SHOWING TOTAL DEPTH
Qal	ALLUVIUM
Qp	PAUBA FORMATION
	GEOLOGIC CONTACT
A A'	GEOTECHNICAL CROSS SECTION

30 0 30 60
SCALE FEET

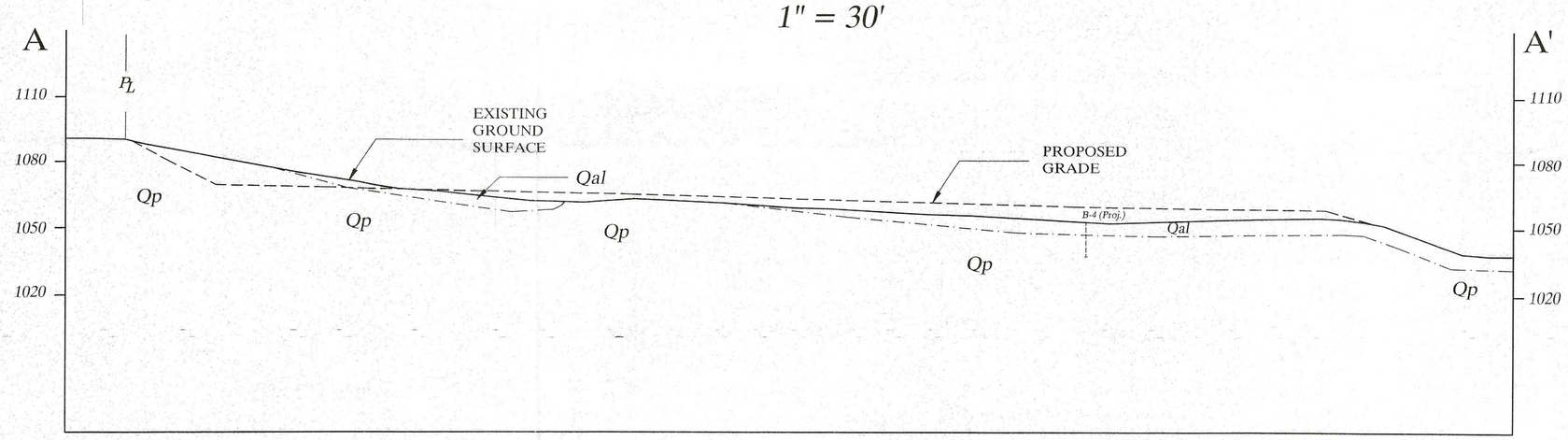
GEOTECHNICAL PLAN

26501 MADISON AVENUE
MURRIETA, CALIFORNIA

GLOBAL GEO-ENGINEERING, INC

PROJECT NO.: 7355-04	DATE: NOVEMBER 2017	PLATE NO.: 1

GEOTECHNICAL CROSS SECTION



GEOTECHNICAL CROSS SECTION

26501 MADISON AVENUE
MURRIETA, CALIFORNIA

GLOBAL GEO-ENGINEERING, INC

PROJECT NO.: 7355-04	DATE: NOVEMBER 2017	PLATE NO.: 2

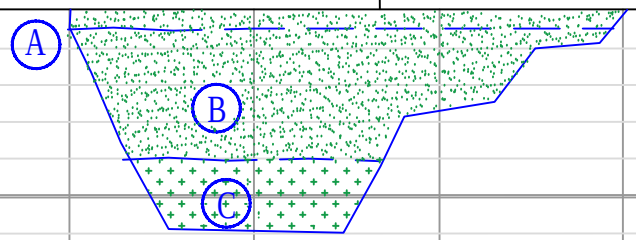
APPENDIX C

LOGS OF EXPLORATORY TRENCHES

Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-1
Project Number: G19-1706-10	Elevation: 1078'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE PLATE 1	

Depth	Date: 3-15-19 Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
0-1'	A TOPSOIL SILTY SAND, dark brown, moist, loose, fine grained, abundant roots and rootlets		SM			
1-2'	B WEATHERED PALEOALLUVIUM Clayey Silty Sand, dark brown, moist, medium dense, fine grained, abundant roots and rootlets		SC		12%	110
2+	C BEDROCK (PALEOALLUVIUM) Sandstone, light brown, moist, hard, fine grained, abundant roots and rootlets					

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N25E

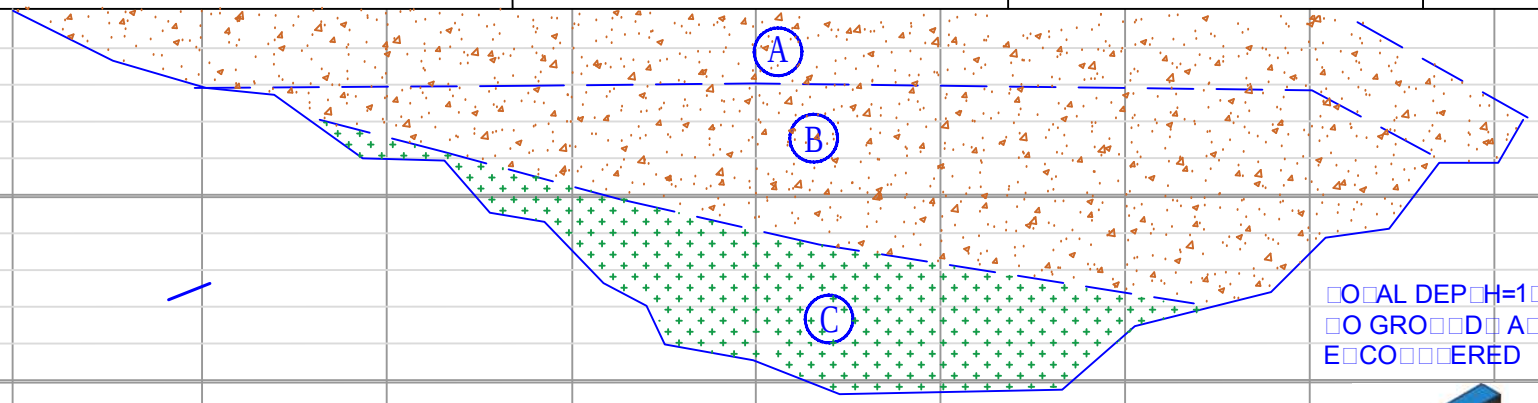


TOTAL DEPTH= 2 FEET
NO GROUNDWATER ENCOUNTERED

Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-2	
Project Number: G19-1706-10	Elevation: 1077'	Engineering Properties	
Equipment: BACKHOE	Location/Grid: SEE PLATE 1		

Depth	Date: 3-15-19 Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
	A AR□□□C□AL □LL □□DOC□ME□□ED□□ C□□□□□SA□D□d□r□ r□□□ □□□□ □□□□□□□□□□□ □□ □ □d□□□ d□□□□□□ □□r□ □□□□ □□	A□□	SC	□□□□ □ 2□5□		
				□□□□ □ 2□	11□5	11□2
□□□□1□□5□	□ S□□□ SA□D□□r□□ □□d□□ □ □□ □ □□□□□□□□□ □□ □ □d□□□ □r□□□□d□□ □d□□□ d□□□□□□□□□□□□□□□□□□□□r□□□□□ □□d □□□□□□□□□		SM	□□□□ □ □□	11□□	11□□□
				□□□□ □ □□	11□□	11□□□
	C □EDROC□ □PA□□A □ORMA□□O□□□ S□□d□□□□□□□□□□□□□□ □□□ □r□□ □□dr□ □□ d□□ □□□□□rd□□□□□ □□ □□□r□□ □r□□□□d□ □□d□□□□□ □□□□□□□□□□ □ □d□r□□□□□ □ □□□□□□r□d□r□□□□□	□ □□□		□□□□ □ □□	□□□	11□□□

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N20E



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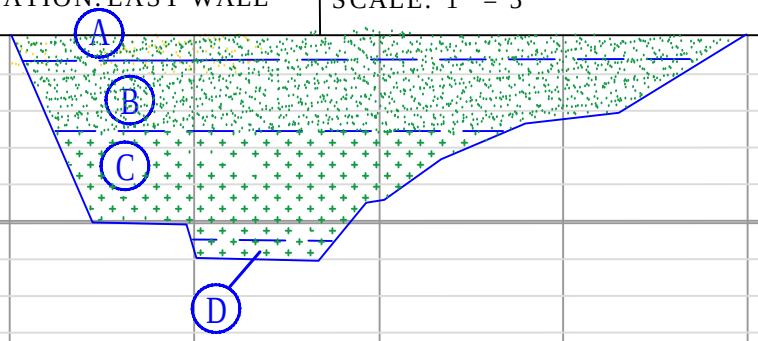
□O GRO□□D□ A□ER
E□CO□□□ERED

Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-3
Project Number: G19-1706-10	Elevation: 1080'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE PLATE 1	

Depth	Date: 3-15-19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
□□□□□□□□□□	A	□OPSO□L□ C□□□□□□SA□D□d□r□ □r□□ □□d□□ □ □□ □ □□□□□□□□□□□□ □□□□ □□ □ □d□□□ □r□□□□d□ r□□□□□□□r□ □□d r□□□□		SC	□□□□1□□□□		
□□□□□2□5□	□	□ EA□HERED PA□□A □ORMA□□O□□ P□□r□□ Gr□d□d SA□D□□r□□ □□d□□ □□□□ □d□□□ d□□□□ □□ d□□□□□□□ □d□□□ □□ □□□r□□ □r□□□□d□□□□r□□□□□r□□□□		SP	□□□□ □ 2□	5□2	12□□2
2□5□□□□□□□	C	□EDROC□ PA□□A □ORMA□□O□□ SA□DS□O□E□□r□□□□□ □r□□ □□dr□□□□rd □□ □□r□ □□rd□□ □d□□□ □□ □□□r□□	□ □□□				
□□□□□□□5□	D	S□LS□O□E□□r□□□□□□ □r□□ □□dr□□□□r□ □□rd□□□□□□□□ □ □□□□□r□d					

GRAPHICAL REPRESENTATION: EAST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: S8E



□O□AL DEP□H= □5 □EE□
□O GRO□□D□ A□ER
E□CO□□□ERED

Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-4
Project Number: G19-1706-10	Elevation: 1070'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE PLATE 1	

Depth	Date: 3-15-19 Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
□□□□□5□	A AR□□□C□AL □□LL □□□DOC□ME□□ED□□ C□□□□SA□D□d□r□r□dd□□ □r□□□□d□□ □ □□ □ □□□□□□□□□ □□ □ □d□□ d□□□□□□□□ □□ □ □d□□ □r□□□d□r□□□□ □□d r□□□□□r□		SC			
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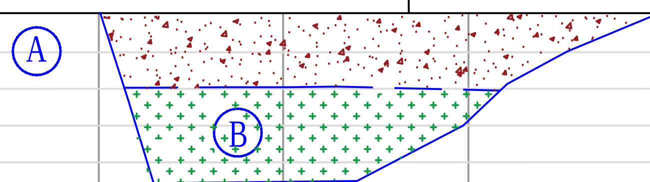
GRAPHICAL REPRESENTATION: WEST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: S10E



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Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-5
Project Number: G19-1706-10	Elevation: 1075'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE PLATE 1	

Depth	Date: 3-15-19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
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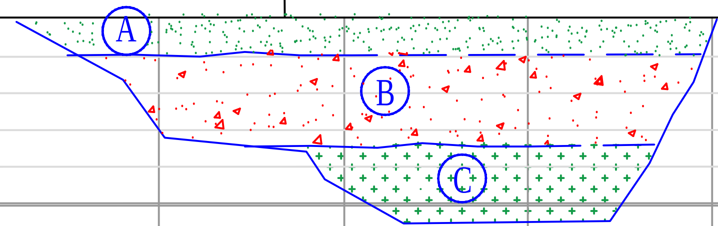
GRAPHICAL REPRESENTATION: WEST WALL | SCALE: 1" = 5' | SURFACE SLOPE: LEVEL | TREND: S2W



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Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-6
Project Number: G19-1706-10	Elevation: 1065'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE PLATE 1	

Depth	Date: 3-15-19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
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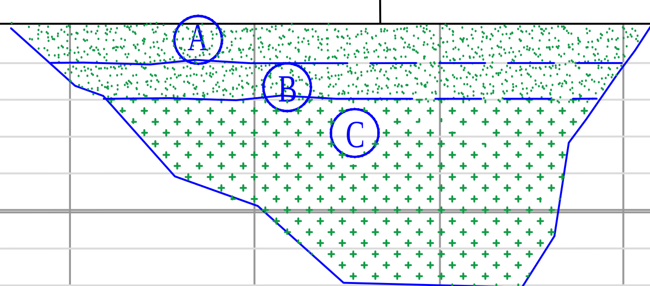
GRAPHICAL REPRESENTATION: WEST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N7W



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Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-7			
Project Number: G19-1706-10	Elevation: 1057'	Engineering Properties			
Equipment: BACKHOE	Location/Grid: SEE PLATE 1				

Depth	Date: 3-15-19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
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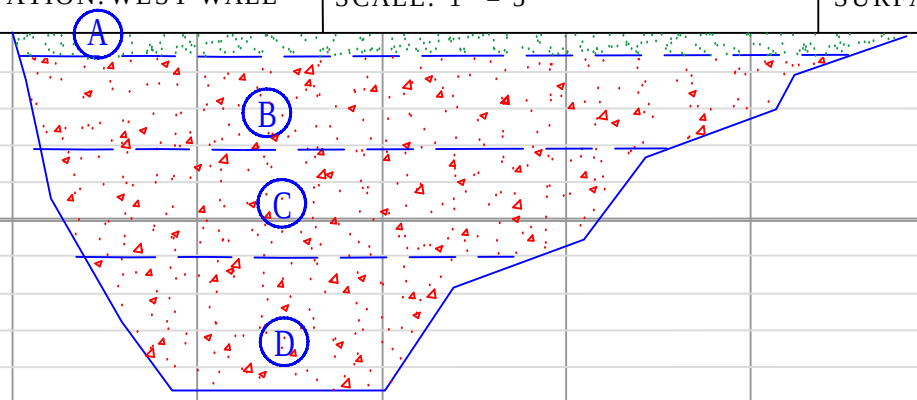
GRAPHICAL REPRESENTATION: WEST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N10W



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Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-8	
Project Number: G19-1706-10	Elevation: 1058'	Engineering Properties	
Equipment: BACKHOE	Location/Grid: SEE PLATE 1		

Depth	Date: 3-15-19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
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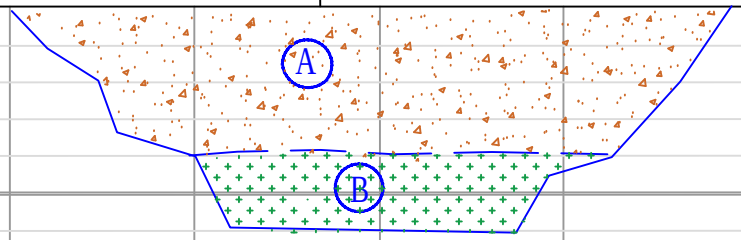
GRAPHICAL REPRESENTATION: WEST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N2E



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Project Name: Lyles Diversified-Murrieta	Logged by: RS	LOG OF TRENCH TR-9
Project Number: G19-1706-10	Elevation: 1053.5'	Engineering Properties
Equipment: BACKHOE	Location/Grid: SEE PLATE 1	

Depth	Date: 3-15-19	Description:	Geologic Unit	USCS	Sample No.	Moisture (%)	Dry Density (pcf)
□□□□1□□□	A	□OPSO□L□ S□□□SA□D□r□dd□□□ □r□□ □□□□r□ □ □□□□□□□□□ □□□□□□□□r□ □□□ □□ □ □d□□□ □r□□□□d□ □r□□□ □□ □□□□□ □□□□□□□□□□ □ □□r□□□r□□□□ □□d r□□□□□r□□□		SM			
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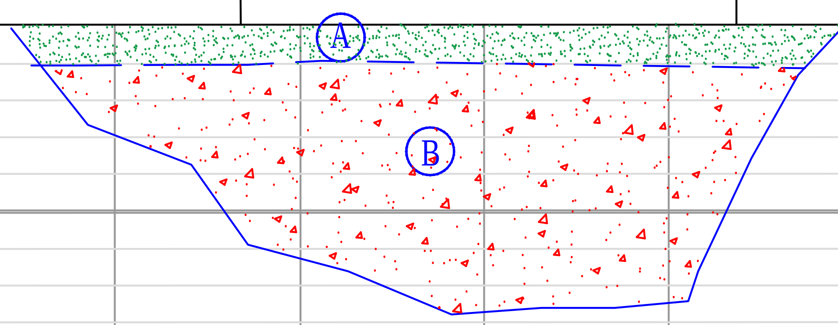
GRAPHICAL REPRESENTATION: WEST WALL	SCALE: 1" = 5'	SURFACE SLOPE: LEVEL	TREND: N5W



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APPENDIX D

LABORATORY TESTING PROCEDURES AND TEST RESULTS

APPENDIX D

Laboratory Testing Procedures and Test Results

The laboratory testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of each test type and a table summarizing the test results.

Soil Classification: Soil types were classified according the Unified Soil Classification System (USCS) in accordance with ASTM Test Methods D2487 and D2488. The USCS is based on the Atterberg Limits and grain-size distribution of a soil. The soil classifications (and/or group symbol) are shown on the laboratory test data and the logs.

Maximum Dry Density and Optimum Moisture Content Tests: The maximum dry density and optimum moisture content tests were performed in accordance with ASTM D1557. The test results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION (USCS)*	*MAXIMUM DRY DENSITY (% by weight)*	*OPTIMUM MOISTURE CONTENT (%)*
TR-3 @ 1.0'-3.0'	Silty Fine-Coarse SAND (SM)	131.7	8.0
TR-5 @ 1.0'-3.5'	Clayey Fine SAND (SC)	130.9	9.0

Soluble Sulfate Content: The soluble sulfate content testing was performed in accordance with CTM 417. The test results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION (USCS)*	*SULFATE CONTENT (ppm)*	*SULFATE EXPOSURE*
TR-3 @ 1.0'-3.0'	Silty Fine-Coarse SAND (SM)	Non-Detect	Negligible
TR-5 @ 1.0'-3.5'	Clayey Fine SAND (SC)	61	Negligible

Chloride Content: Chloride content testing was performed in accordance with CTM 422. The test results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION (USCS)*	*CHLORIDE CONTENT (ppm)*
TR-3 @ 1.0'-3.0'	Silty Fine-Coarse SAND (SM)	63
TR-5 @ 1.0'-3.5'	Clayey Fine SAND (SC)	32

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in accordance with CTM 643. The test results are presented in the table below:

SAMPLE LOCATION	*SAMPLE DESCRIPTION (USCS)*	*pH*	*MINIMUM RESISTIVITY (ohm-cm)*
TR-3 @ 1.0'-3.0'	Silty Fine-Coarse SAND (SM)	8.4	5,800

Direct Shear: Direct shear testing was performed in accordance with ASTM D3080 on a selected remolded sample, which was soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample into the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The sample was tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of about 0.005 inch per minute (depending upon the soil/bedrock type). The test results are presented in the table below:

SAMPLE LOCATION	SAMPLE DESCRIPTION (USCS)	ANGLE OF INTERNAL FRICTION (degrees)	COHESION (pcf)
TR-5 @ 1.0'-3.5'	Clayey Fine SAND (SC)	29	1,010

Atterberg Limits: The liquid and plastic limits and plasticity index (Atterberg Limits) tests were performed in accordance with ASTM D4318. The test results are presented in the table below:

SAMPLE LOCATION	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SOIL SYMBOL
TR-2 @ 8.0'	28	14	14	CL or OL
TR-5 @ 1.0'-3.5'	26	13	13	CL or OL

Expansion Index Tests: Expansion Index testing was performed in accordance with ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch thick by 4-inch diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The test results are presented in the table below:

SAMPLE LOCATION	SAMPLE DESCRIPTION (USCS)	EXPANSION INDEX	EXPANSION POTENTIAL
TR-3 @ 1.0'-3.0'	Silty Fine-Coarse SAND (SM)	0	Very Low
TR-5 @ 1.0'-3.5'	Clayey Fine SAND (SC)	37	Low

R-Value: The resistance R-values was determined by the ASTM D2844 soils test: The sample was prepared, and the exudation pressure and R-value were determined. These results were used for preliminary asphaltic concrete pavement design purposes.

SAMPLE LOCATION	SAMPLE DESCRIPTION	R-VALUE
TR-3 @ 1.0'-3.0'	Silty Fine-Coarse SAND (SM)	68

APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

APPENDIX E

LGC Geo-Environmental, Inc.

General Earthwork and Grading Specifications for Rough Grading

1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record: Prior to commencement of work, the owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the project plans and specifications. The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "equipment" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading.

The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified. It is the contractor's sole responsibility to provide proper fill compaction.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 10 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental consultant.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 (h:v) shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by

compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet all the requirements of this section. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined, and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society for Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

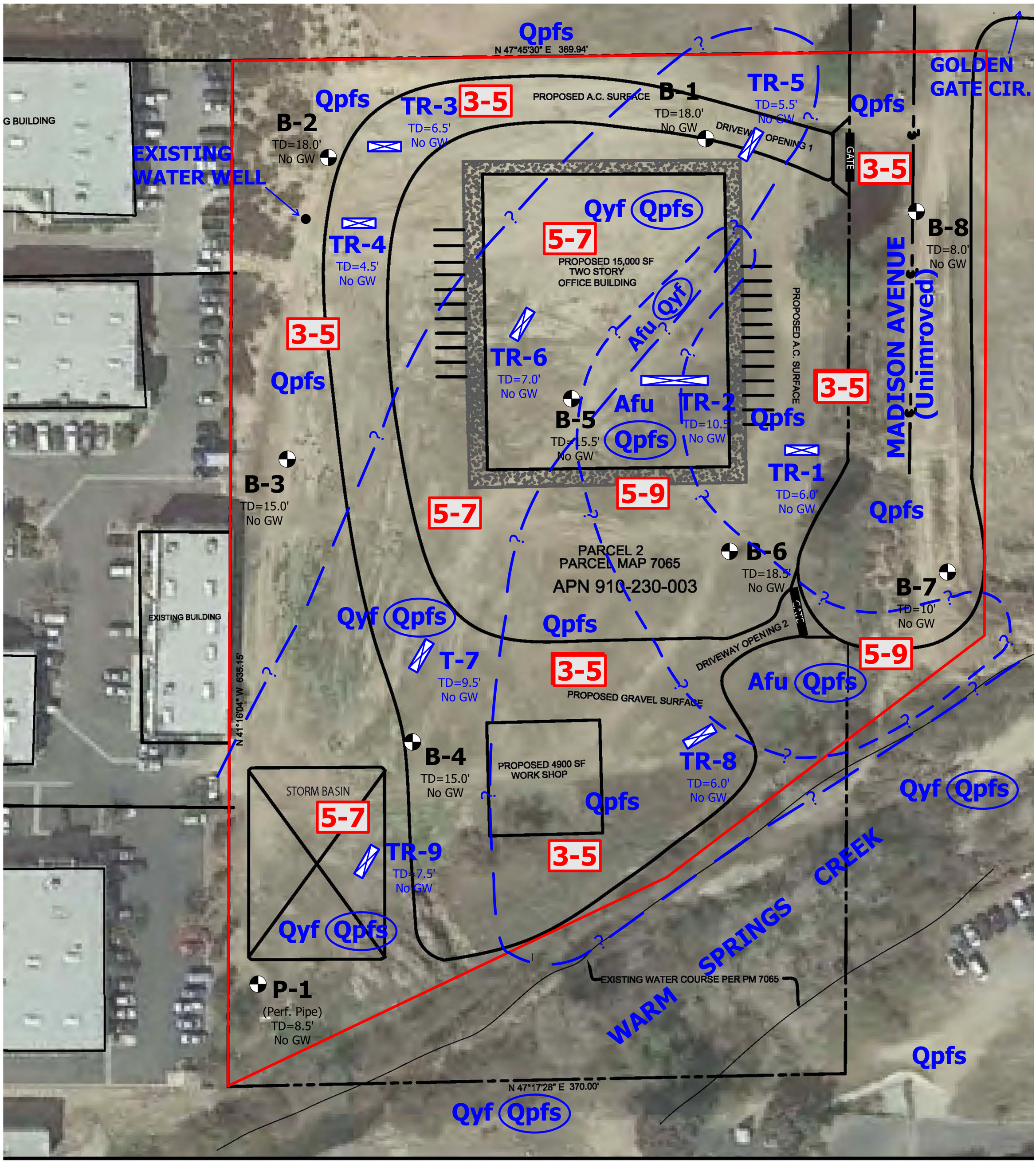
4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one (1) test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two (2) grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and City requirements and standards. The Geotechnical Consultant may recommend additional subdrain and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.



LEGEND

(Map Locations Are Approximate)

Geologic Units

Afu - Artificial fill, undocumented, existing

Qyf - Young alluvial fan deposits (Holocene-late Pleistocene)

Qpfs - Pauba Formation, Sandstone Member (Pleistocene) - Circled Where Buried by Qyf

Map Symbols

Limits of This Report

Geologic Contact – Queried Where Approximate

3-5 Approximate Depths of Overexcavation Below Existing Grade (ft.)

TR-9 TD=7.5' No GW — Exploratory Trench Location (LGC)

B-8 TD=8.0' No GW — Exploratory Boring Location (Global - 2017)

0 ft. 15 ft. 30 ft. 60 ft.

Map distances are approximate

LGC Geo-Environmental, Inc.

Geotechnical • Environmental • Materials Testing • SWPPP

27570 Commerce Center Dr., #128, Temecula, California 92590

Phone: (951) 297-2450 Fax: (951) 719-2998

www.lgcgeoenv.com

PLATE 1
GEOTECHNICAL MAP
Proposed Commercial Development
26501 Madison Avenue, City Of Murrieta,
Riverside County, California

Project Name	Lyles Diversified – Murrieta
Project Number	G19-1706-10
Client	Lyles Diversified
Scale	1" = 30'
Date	April 2019
Reference	dk Greene Consulting, Inc., Site Plan, undated
Plate Number	1 of 1

Appendix 4: Historical Site Conditions

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

Examples of material to provide in Appendix 4 may include but are not limited to the following:

- Environmental Site Assessments conducted for the project,
- Other information on Past Site Use that impacts the feasibility of LID BMP implementation on the site.

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections D of this Template.

LGC GEO-ENVIRONMENTAL, INC.

PHASE I ENVIRONMENTAL SITE ASSESSMENT, PROPOSED OFFICE BUILDING AND WORKSHOP, 26501 MADISON AVENUE, CITY OF MURRIETA, RIVERSIDE COUNTY, CALIFORNIA, APN: 910-230-003.

Dated: February 28, 2019
Project No. G19-1706-15

Prepared For:

Mr. Todd R. Sheller
Lyles Diversified, Inc.
1210 West Olive Avenue
Fresno, California 93728

27570 COMMERCE CENTER DRIVE, SUITE. 128, TEMECULA, CALIFORNIA 92590
PHONE: 951.297.2450 I FAX: 951.719.2998 I WWW.LGCGEOENV.COM

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LIST OF APPENDICES

February 28, 2019

Project No. G19-1706-15

Mr. Todd R. Sheller,
Assistant Vice President
Lyles Diversified, Inc.
1210 West Olive Avenue
Fresno, California 93728

Subject: ***Phase I Environmental Site Assessment, Proposed Office Building and Workshop, 26501 Madison Avenue, City of Murrieta, Riverside County, California, APN: 910-230-003.***

INTRODUCTION

LGC Geo-Environmental, Inc. (LGC) is pleased to submit herewith our Phase I Environmental Site Assessment (ESA) report regarding proposed office building and workshop development of the subject property (the Property), which is located at 26501 Madison Avenue, City of Murrieta, Riverside County, California. The Property is identified as Assessor's Parcel Number (APN) 910-230-003. Our Phase I ESA was performed in accordance with American Society for Testing and Materials (ASTM) Standard E1257-13.

This report also presents and evaluates the results of LGC's site reconnaissance, review of previous reports, historical review, regulatory records review, and other information and documentation.

This Phase I ESA have been performed for the exclusive use and benefit of the addressee identified on the cover of this report, or agents directly specified by the addressee, for the transaction at issue concerning the Property described in this report. This Phase I ESA shall not be used or relied upon by others without the prior written consent of LGC, and of the addressee identified on the cover of this report.

I declare that, to the best of my professional knowledge and belief, I meet the definition of *Environmental Professional* as defined in 40 CFR §312.10. I have the specific qualifications based on education, training and experience to assess a *property* of the nature, history, and setting of the *subject property.* I have developed and performed the All Appropriate Inquiries in conformance with the standard and practices set forth in 40 CFR Part 312.

The objective of this Phase I ESA was to ascertain the potential presence or absence of recognized environmental conditions that could impact the Property, as delineated in the scope of services and limitations identified in this report and in the service agreement. The procedure was to perform reasonable steps in accordance with the existing regulations, currently available technology, and generally accepted environmental consulting practices, to accomplish the stated objective.

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report. The surface observations made by LGC are believed representative of the entire project. Sub-surface soil and geologic conditions, however, may be different from our preliminary findings. If this occurs, the changed conditions must be evaluated by the project soils engineer and geologist for alternative recommendations.

The findings of this report are valid as of the present date. Changes in the conditions of a property, however, can and do occur with the passage of time, whether due to natural and/or manmade processes on the Property or adjacent properties.

In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control.

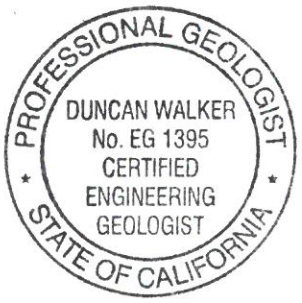
CLOSING

It has been a pleasure to be of service to you on this project. Should you have any questions, regarding the contents of this report or should you require additional information, please contact this office at your earliest convenience.

Respectfully submitted,

LGC GEO-ENVIRONMENTAL, INC.

Duncan Walker, CEG 1395
Environmental Professional/Certified Engineering Geologist



DW/MB

Distribution: (4) Addressee

EXECUTIVE SUMMARY

Overview – LGC Geo-Environmental, Inc. (LGC) was retained by Lyles Diversified, Inc. to perform a Phase I Environmental Site Assessment (ESA) regarding the proposed office building and workshop development located at 26501 Madison Avenue, City of Murrieta, Riverside County, California (the Property). The Property is identified as Assessor's Parcel Number (APN) 910-230-003.

This Phase I ESA was performed in accordance with the scope and limitations of the *American Society for Testing and Materials (ASTM) Standard E1527-13.* The following summarizes LGC's independent conclusions and best professional judgment based upon information available to us during this Phase I ESA.

The purpose and scope of this Phase I ESA are to make preliminary conclusions regarding potential presence of recognized environmental conditions (RECs), including controlled RECs (CRECs), on, at, in, or to the Property. ASTM defines RECs as the presence or likely presence of hazardous substance or petroleum products on, at, in, or to a property. Historical RECs (HRECs) and de minimis conditions are not considered RECs.

When making any decisions concerning the findings of this Phase I ESA, please also refer to the remainder of this report, which may provide additional information regarding the items below and/or present other items of interest that are not discussed in this Executive Summary.

Property Description – Located along the southwest side of Madison Avenue at its intersection with Golden Gate Circle, the Property is approximately rectangular and comprises approximately 5.83 acres. The Property is vacant and unfenced. The paved portion of Madison Avenue ends at its intersection with Golden Gate Circle north of the Property. The Property is bounded on the northwest by a vacant parcel, on the northeast by Madison Avenue (dirt road) followed by a vacant parcel, on the southwest by commercial parcels and on the southeast by commercial parcels and Warm Springs Creek. Warm Springs Creek (a blueline stream) also crosses the southeast portion of the Property. The southeast part of the Property is within a 100-year flood zone associated with Warm Springs Creek; the flood zone extends approximately to the top of the west streambank.

Property Observations – At the time of our site reconnaissance on February 13, 2019, the Property was vacant. Vehicular access to the Property is via: 1) an onsite dirt road in the north extending from Madison Avenue, and 2) an onsite dirt road in the southwest extending from an adjoining commercial development. Dirt roads and trails crisscross most of the Property, which is covered with patchy annual grasses/weeds and scattered bushes and trees. The area along Warm Springs Creek in the southeast is heavily vegetated with numerous trees and bushes. In the northwest there is a steel standpipe with a welded cap which protects an unused water well which was installed in 2017. Along the upper bank of Warm Springs Creek in the south portion there are a number of wood chipper waste piles, which were apparently imported from unknown source(s). Scattered pieces of concrete, asphalt, and wood are visible on the surfaces of the chipper waste piles, but no stained areas and no chemical/petroleum odors were noted. There is also a pile of concrete slab pieces along the upper bank of Warm Springs Creek and other scattered trash (apparently non-hazardous solid waste) along the upper bank and near the north property corner. No stressed vegetation was observed.

Property Background – Historical aerial photographs of the Property dating back to 1938, as well as historical topographic maps dating back to 1901, were reviewed as part of this Phase I ESA. During the 1980s and early 1990s, there was apparently a single-family residence (SFR) and another structure on the northeast part the Property along Madison Avenue. Rural/agricultural development of surrounding area apparently began in the late 1800s, with rural residential development and most of the current major streets dating back to the 1940s. The area began transitioning from rural residential to mixed residential/commercial during the 1970s.

Potable Water Source – Potable water service provided by Rancho California Water District (RCWD is available to the Property, and there is a water main in the intersection of Madison Avenue and Golden Gate Circle. RCWD records indicate that the Property would have to apply to RCWD for annexation to get water service. The RCWD 2017 *Consumer Confidence Report* states that its drinking water is in compliance with federal health-based drinking water standards.

Onsite Wastewater Treatment Systems – Public sewer service provided by East Municipal Water District (EMWD) is available to the Property, and there is a sewer main in the intersection of Madison Avenue and Golden Gate Circle. EMWD records indicate that the Property is not connected to the public sewer service. The former SFR that was located on the northeast part the Property was probably served by an onsite wastewater treatment system (OWTS). If there is or was an OWTS on the Property, its location is unknown.

Environmental Data Resources Report – LGC utilized Environmental Data Resources, Inc. (EDR) to conduct a search of available environmental databases, records and resources regarding the Property. EDR searched the databases for sites surrounding the Property to meet the requirements of *ASTM Standard E1527-13*. The results of EDR's research are contained in *The EDR Radius Map™ Report with GeoCheck®, Inquiry 5547658.2s*, dated January 29, 2019. To supplement the EDR Report, LGC additionally reviewed online databases for four environmental agencies.

The Property and adjoining properties are not listed in any of the databases searched by EDR or in the four additional online databases reviewed by LGC. The EDR Report also lists and describes 15 sites (14 sites after combining apparent duplicate listings) located within ASTM-specified search radii surrounding the Property, some of which were also listed in the four additional online databases reviewed by LGC. None of sites identified by EDR and/or in the four additional online databases is considered to a concern as regards the Property.

Findings – A summary of our findings is provided below. Details are not included or fully developed in this section, and the Phase I ESA report must be read in its entirety for a comprehensive understanding of these findings.

- The Property is located along the southwest side of Madison Avenue southeast of its intersection with Golden Gate Circle and consists of a rectangular parcel comprising approximately 5.83 acres. The Property is vacant and unfenced.
- The southeast part of the Property is within a 100-year flood zone associated with Warm Springs Creek; the flood zone extends approximately to the top of the west streambank.
- Historical aerial photographs of the Property dating back to 1938, as well as historical topographic maps dating back to 1901, were reviewed as part of this Phase I ESA. During the 1980s and early 1990s, there was apparently an SFR and another structure on the northeast part the Property adjacent to Madison Avenue.
- The former SFR that was located on the northeast part the Property was probably served by an OWTS. If there is or was an OWTS on the Property, its location is unknown.
- The Property and adjoining properties were not identified in the databases in the EDR Report or in the four additional online databases reviewed by LGC.
- No evidence of pesticides or herbicides spills was observed on the Property during our site reconnaissance. Other than incidental residential use associated with the former SFR, possibly including application of termiticides around and/or under former structures, there is no indication that pesticides or herbicides were used on the Property.
- No evidence of current or past storage or use of hazardous materials or petroleum products was identified on the Property during our site reconnaissance and records review.
- Along the upper bank of Warm Springs Creek in the south portion there are a number of wood chipper waste piles, which were apparently imported from unknown source(s). Scattered pieces of concrete, asphalt, and wood are visible on the surfaces of the chipper waste piles, but no stained areas and no chemical/petroleum odors were noted.
- There is also a pile of concrete slab pieces along the upper bank of Warm Springs Creek and other scattered trash (apparently non-hazardous solid waste) along the upper bank and near the north property corner.
- In the northwest there is an inactive public water supply well (drilled and installed in 2017) with a steel standpipe and a welded cap.
- No stained surface soil or other visible evidence of petroleum products or hazardous materials spills was observed on the Property. No stressed vegetation was observed.
- No evidence of aboveground storage tanks was observed on the Property during our site reconnaissance or identified during record review.
- No evidence of underground storage tanks, sumps, clarifiers, or other storage or treatment structures for hazardous materials or petroleum products was observed on the Property during our site reconnaissance or identified during record review.
- No evidence of known regulatory actions, regarding hazardous materials or petroleum products cleanup that have been issued or are being issued for the Property, was identified during our records review.

Opinions – A summary of our opinions is provided below. Details are not included or fully developed in this section, and the Phase I ESA report must be read in its entirety for a comprehensive understanding of these opinions.

- No apparent or potential threat of past or present hazardous material releases exists regarding the Property based on the EDR Report and the Agency Contact and Database Search, including the 14 sites identified within the ASTM-specified search radii surrounding the Property.
- A Vapor Encroachment Condition does not exist or is not likely to exist in connection with the Property.
- No RECs, including CRECs, were identified on, at, in, or to the Property.
- No significant data gaps were identified that affect the ability of the Environmental Professional to identify RECs.
- There are no unusual circumstances where greater certainty is required regarding RECs.

Conclusions and Recommendations – LGC has performed a Phase I ESA of the Property in conformance with the scope and limitations of *ASTM E1527-13*. There were no exceptions to, or deletions from *ASTM E1527-13* in conducting this Phase I ESA. This Phase I ESA has revealed no evidence of RECs in connection with the Property.

LGC recommends the following, based on the results of this Phase I ESA:

- The wood chipper waste piles along the upper bank of Warm Springs Creek, which were apparently imported from unknown source(s), should be removed and properly disposed of offsite.
- The pile of concrete slab pieces along the upper bank of Warm Springs Creek and other scattered trash (apparently non-hazardous solid waste) along the upper bank and near the north property corner should be removed and properly disposed of offsite.
- If an OWTS (associated with the former SFR) is encountered during future grading and development onsite, then it should be removed in accordance with applicable city and/or county regulations.

Non-Scope Issues – The following Non-Scope Issues, which are outside the scope of *ASTM E1527-13*, were assessed in connection with this Phase I ESA of the Property.

Building construction materials that could contain hazardous materials, including asbestos-containing building materials (ACBMs) and lead-based paint (LBP), were considered during this Phase I ESA. There are no structures on the Property. No trash or debris indicative of potential ACBMs and/or LBP related to the former structures were observed on the Property. Therefore, ACBMs and LBP are not considered to be concerns regarding the Property.

Indoor radon levels on the Property were considered during this Phase I ESA. Available information indicates that the Property is in Radon Zone 2 and has a predicted average indoor radon screening level which is less than or equal to the USEPA's radon action level. Radon is therefore not a concern regarding the Property.

Natural occurrences of asbestos near the Property were considered during this Phase I ESA. Available information indicates that there are no reported natural asbestos occurrences or historic asbestos/prospects mines located within 1 mile of the Property. Natural asbestos occurrences and historic asbestos mines/prospects are therefore not concerns regarding the Property.

1.0 INTRODUCTION

1.1 Purpose

LGC Geo-Environmental, Inc. (LGC) was retained by Lyles Diversified, Inc. to perform a Phase I Environmental Site Assessment (ESA) regarding the proposed office building and workshop development located at 26501 Madison Avenue, City of Murrieta, Riverside County, California (the Property). The Property is identified as Assessor's Parcel Number (APN) 910-230-003.

This Phase I ESA was performed in accordance with the scope and limitations of *American Society for Testing and Materials (ASTM) E1527-13: Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.* This Phase I ESA report summarizes LGC's independent conclusions and best professional judgment based upon information available to us during this Phase I ESA.

The purpose and scope of this Phase I ESA are to make preliminary conclusions regarding the potential presence of recognized environmental conditions (RECs), including controlled RECs (CRECs), on, at, in, or to the Property. Historical RECs (HRECs) are not considered RECs. ASTM defines REC as "the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. de minimis conditions are not recognized environmental conditions."

1.2 Scope of Services

LGC's Scope of Services included the following:

- Reconnaissance of the Property to visually assess current conditions on the Property and adjoining properties.
- Locate and document the potential onsite presence and possible use or storage of hazardous materials or petroleum products, in addition to any signs of surface or subsurface contamination.
- Review of historical aerial photographs and topographic maps.
- Review of available reports and documents previously prepared for the Property.
- Review of the soil and groundwater conditions on the Property.
- Review of available environmental and geologic maps which may have been prepared for the Property.
- Review of state and federal environmental databases regarding the Property and surrounding area.
- Environmental analysis of data to address environmental issues relative to hazardous wastes associated with the Property.
- Review of available regulatory agency files.
- Access to the current purchase price and the fair market value of the Property.

There are no data gaps to *ASTM Standard E1527-13* which affect the ability of the Environmental Professional to identify conditions indicative of releases or threatened releases of hazardous substances on, at, in, or to the Property.

1.3 User Questionnaire

A *User Questionnaire* was completed by Charley Black of Lee & Associates on behalf of Lyles Diversified, Inc. (the User of this Phase I ESA) and returned to LGC (Appendix F). Charley Black indicated that: 1) the purchase price/loan amount for the Property reasonably reflects the fair market of the Property, and 2) he had geotechnical studies and reports regarding hydrogeologic conditions on the Property or surrounding area. He also indicated that he had no other information or documents regarding the Property, including no information regarding recorded environmental cleanup liens or recorded Activity and Use Limitations (AULs). LGC was not provided with a preliminary title report for the Property.

1.4 Interviews

LGC interviewed the following, an Interview Log (Appendix F) summarizes these interviews:

- Todd R. Sheller (Lyles Diversified, Inc.) regarding the *User Questionnaire* and general information about the Property.
- Charley Black (Lee & Associates) regarding the *User Questionnaire* and general information about the Property.

- Bryan Clendenen (Clendenen Development Co.) regarding the *User Questionnaire*.
- East Municipal Water District (EMWD) Engineering Department regarding water and sewer service to the Property.
- Rancho California Water District (RCWD) Engineering Services Department regarding water and sewer service to the Property.

2.0 PROPERTY OVERVIEW

2.1 Location and Property Description

Located along the southwest side of Madison Avenue at its intersection with Golden Gate Circle, the Property is approximately rectangular and comprises approximately 5.83 acres (Property Location Map, Figure 1). The Property is vacant and unfenced. The paved portion of Madison Avenue ends at its intersection with Golden Gate Circle north of the Property. The Property is bounded on the northwest by a vacant parcel, on the northeast by Madison Avenue (dirt road) followed by a vacant parcel, on the southwest by commercial parcels and on the southeast by commercial parcels and Warm Springs Creek. Warm Springs Creek (a blueline stream flowing toward the west-southwest) also crosses the southeast portion of the Property. The southeast part of the Property is within a 100-year flood zone associated with Warm Springs Creek; the flood zone extends approximately to the top of the west streambank.

2.2 Existing Improvements and Vegetation

At the time of our site reconnaissance on February 13, 2019, the Property was vacant. Vehicular access to the Property is via: 1) an onsite dirt road in the north extending from Madison Avenue, and 2) an onsite dirt road in the southwest extending from an adjoining commercial development. A number of dirt roads and trails crisscross most of the Property, which is covered with patchy annual grasses/weeds and scattered bushes and trees. The area along Warm Springs Creek in the southeast is heavily vegetated with numerous trees and bushes. In the northwest there is a steel standpipe with a welded cap which protects an unused water well which was installed in 2017. Along the upper bank of Warm Springs Creek in the south portion there are a number of wood chipper waste piles, which were apparently imported from unknown source(s). Scattered pieces of concrete, asphalt, and wood are visible on the surfaces of the chipper waste piles, but no stained areas and no chemical/petroleum odors were noted. There is also a pile of concrete slab pieces along the upper bank of Warm Springs Creek and other scattered trash (apparently non-hazardous solid waste) along the upper bank and near the north property corner. No stressed vegetation was observed.

2.3 Historical Property Description

Historical aerial photographs of the Property dating back to 1938, as well as historical topographic maps dating back to 1901, were reviewed as part of this Phase I ESA. During the 1980s and early 1990s, there was apparently a single-family residence (SFR) and another structure on the northeast part the Property along Madison Avenue. Rural/agricultural development of surrounding area apparently began in the late 1800s, with rural residential development and most of the current major streets dating back to the 1940s. The area began transitioning from rural residential to mixed residential/commercial during the 1970s.

2.4 Topography

The regional surface slope for the Property and surrounding area is toward the southwest. Ground surface elevations on the Property range from approximately 1,086 feet above mean sea level (msl) along the northwest property line to approximately 1,041 feet above msl in the channel of Warm Springs Creek near the south property corner. There is an elevated L-shaped area in the northwest and northeast, which is partially underlain by undocumented artificial fill. The northwest portion is a bench; a cut slope ascends northwest from the bench toward higher ground offsite. The bench and a small adjoining pad, together with the access road from Madison Avenue in the northeast, were graded in 2017 for equipment access to drill and install the onsite water well. A cut slope descends southwest from the end of the bench and pad toward an offsite parking area. The northeast portion consists of an arcuate pad which includes the site of the former SFR; graded slopes descend southwest, southeast and northeast from the pad. The south portion of the Property is apparently ungraded natural ground, including the

0 ft. 50 ft. 100 ft. 200 ft.

Map distances are approximate

Map base reproduced from Google Earth photo (08/13/2018).

Legend

Approximate Property boundary

FIGURE 1
PROPERTY LOCATION MAP

Project Name	Lyles Diversified – Murrieta
Project No.	G19-1706-15
Geologist	DW
Scale	1" = 100'
Date	February 2019

steeply-sloped, incised channel of Warm Springs Creek. Most onsite stormwater, together with tributary runoff from the elevated offsite area to the northwest, apparently flows into Warm Springs Creek.

2.5 Geology

Regionally, the Property is within the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by steep, elongated valleys and mountain ranges that trend west and northwest. The mountainous areas are underlain by Pre-Cretaceous metasedimentary and metavolcanic rocks and Cretaceous plutonic rocks of the Southern California Batholith. The valleys are underlain by young alluvial deposits followed by Quaternary and Tertiary bedrock units (sandstones, mudstones and conglomerates, as well as volcanics). The Property and surrounding area are primarily underlain by sandstone bedrock of Pauba formation (Pleistocene). In Warm Springs Creek, young alluvial fan deposits (Holocene and late Pleistocene) overlie Pauba formation bedrock.

The northwest-southeast trending topography for the area is controlled by the Elsinore fault zone (EFZ), which extends northwesterly approximately 190 miles from San Diego County through Riverside County to southeastern Los Angeles County. The EFZ separates the Perris Block on the northeast, which includes the Property, from the Santa Ana Mountains Block on the southwest. The Property is not underlain by active faults. A short trace of the Wildomar fault, which is not designated an active fault, is located approximately 0.10 mile southwest of the Property. The nearest active fault is the Wildomar fault, which is part of the EFZ and is located approximately 0.19 mile southwest of Property. A narrow portion of the Property along the southwest property line is within the County Fault Zone, which has been established by Riverside County regarding the Wildomar fault (California Geologic Survey (CGS), 2018b and Riverside County, 2018).

2.6 Groundwater

The California Department of Water Resources (DWR) *Water Data Library* was researched online regarding historical groundwater depths in wells near the Property. The *Water Data Library* indicates State Well Number 335381N1171759W001 is the nearest well that is located on same side of Warm Springs Creek as the Property. This well is located approximately 0.21 mile northeast of the Property, and the only groundwater depth was recorded at 34 feet below ground surface (bgs) in 1968. In July and August 2017, a public water supply well was drilled and installed onsite in the northwest. This well is inactive (capped), and the recorded groundwater depth was 380 feet bgs on August 2, 2017 (Eric Haley dba Heritage Well Service, 2017).

2.7 Potable Water Source

Potable water service provided by RCWD is available to the Property, and there is a water main in the intersection of Madison Avenue and Golden Gate Circle. RCWD records indicate that the Property would have to apply to RCWD for annexation to get water service. The RCWD *2017 Consumer Confidence Report* states that its drinking water is in compliance with federal health-based drinking water standards.

2.8 Onsite Wastewater Treatment Systems

Public sewer service provided by EMWD is available to the Property, and there is a sewer main in the intersection of Madison Avenue and Golden Gate Circle. EMWD records indicate that the Property is not connected to the public sewer service. There is no information available regarding the former SFR that was located on the northeast part the Property, but it was probably served by an onsite wastewater treatment system (OWTS). If there is or was an OWTS on the Property, its location is unknown. If an OWTS is encountered during future grading and development onsite, then it should be removed in accordance with applicable city and/or county regulations.

3.0 RECORDS REVIEW

3.1 Historical Aerial Photograph Review

The following table describes the historical aerial photographs provided by Environmental Data Resources, Inc. (EDR) that were reviewed during this Phase I ESA (Appendix C). These historical aerial photographs were reviewed for evidence of potential past usage, storage, and/or disposal of hazardous materials or petroleum products on the Property and vicinity, which include, but are not limited to: landfills, oil wells, storage drums, underground storage tanks (USTs), aboveground storage tanks (ASTs), gas stations, agricultural operations known to use pesticides or herbicides, waste disposal pipes, and waste disposal areas.

HISTORICAL AERIAL PHOTOGRAPH REVIEW

Date	Observations
1938	The Property is vacant. Jefferson Ave. is visible. There are rural SFRs to the east & south & agricultural fields in the surrounding area.
1949	No significant changes since 1938.
1953	There is an unnamed highway to the NE approximately along the current alignment of I-15, & there are more roads in the surrounding area. No other significant changes since 1949.
1961	No significant changes since 1953.
1967	There are more SFRs & agriculture in the surrounding area. No other significant changes since 1961.
1978	There are more SFRs & agriculture in the surrounding area. Madison Ave. (dirt) is NW of the Property. The highway to the NE is now a divided road. No other significant changes since 1967.
1985	There is an SFR & 2nd structure on the Property in the NE. There are more SFRs & less agriculture in the surrounding area. No other significant changes since 1978.
1989	Commercial development has begun to the south & SE, & the former residential area nearby to the south is being regraded. No other significant changes since 1985.
1996	The SFR & structure are gone from the Property. Commercial development has increased to the south & SE, including adjoining SE. Madison Ave. is paved NW of the Property, & many of the current streets are visible. No other significant changes since 1989.
2002	The Property is crisscrossed with dirt roads & trails similar to the present. Commercial development has increased to the south & SE. No other significant changes since 1996.
2006	Commercial development has increased to the south & SE & has begun to the north and NW. No other significant changes since 2002.
2009	Commercial development has increased in the surrounding area. No significant changes since other 2006.
2012	No significant changes since 2009.
2016	The surrounding area are developed in approx. current conditions. No other significant changes since 2012.

3.2 ***Historical Topographic Map Review***

The following table describes the historical topographic maps provided by EDR that were reviewed during this Phase I ESA (Appendix C). These historical topographic maps were reviewed for evidence of potential past usage, storage, and/or disposal of hazardous materials or petroleum products on the Property and vicinity, which include, but are not limited to: landfills, oil wells, storage drums, USTs, ASTs, gas stations, agricultural operations known to use pesticides or herbicides, waste disposal pipes, and waste disposal areas.

HISTORICAL TOPOGRAPHIC MAP REVIEW

Date	Observations
1901	The Property is apparently vacant. Warm Springs Creek is visible, together with Murrieta Creek, Santa Gertrudis Creek & a number of unnamed blueline streams south & west of the Property. Temecula Line railroad is southwest of the Property, and there are a number of unnamed streets in the area.
1942	There are a number of structures (probably SFRs) in the area. Jefferson Ave., Webster Ave. & Banana Ave. are visible, together with many of the other current major streets. The railroad line is gone. No other significant changes since 1901.
1943	No significant changes since 1942.
1947	No significant changes since 1943.
1953	There is an unnamed highway approximately along the current alignment of I-15. There is a levee along Murrieta Creek. There are scattered small orchards & reservoirs in the area No other significant changes since 1947.
1973	The highway is now divided & named US 995 / SR 71; to the north it splits to follow both I-15 & I-215 alignments. There is a trailer park to the NE. No other significant changes since 1953.
1979	The highway now has interchanges & both highways to north are now divided. The Property & surrounding area have a magenta background & have no structural details. No other significant changes since 1973.
2012	The highways are now I-15 & I-215; Webster Ave. & Banana Ave. are now Murrieta Hot Springs Rd. & Winchester Rd. The Property & surrounding area are developed in approx. current conditions. No other significant changes since 1979.

3.3 City Directories

EDR provided the following historical City Directories listings for the 26501 Madison Avenue address related to the Property (Appendix E). In 1990, Teri L. Kelly, Frank McGavran, Steve L. Obrien and Kristi Seguzn were listed; and in 1985, Frank McGavran was listed.

3.4 Sanborn Insurance Maps

No Sanborn Fire Insurance Maps were available for the Property and surrounding area.

3.5 Assessor's Parcel Number

Riverside County Assessor's Office records indicate that the Property consists of APN 910-230-003.

3.6 Prior Environmental Site Assessment Reports

Based on research and data obtained during this Phase I ESA, there are no records of prior ESA Reports regarding the Property. LGC was provided the following documents and plans referenced in Appendix A: *Phase I Cultural Resources Assessment* (Archaeological Associates, 2018), *Geotechnical Investigation* (Global Geo-Engineering, Inc. (Global), 2017), *Preliminary Hydrology and Hydraulics Report* (Saxon Engineering Services, Inc. (Saxon), 2017), *Non-Specific Rough Grading Plan* (Saxon, undated), *Preliminary Street Improvement Plan* (Saxon, undated). The perforated pipe that Global placed in its 2017 boring P-1 remains in the south part of the Property. Review of these documents and plans indicated that they provide no other information of use for this Phase I ESA.

3.7 Environmental Data Resources Report

LGC utilized EDR to conduct a search of available environmental databases, records and resources regarding the Property. EDR searched the databases for sites surrounding the Property to meet the requirements of *ASTM Standard E1527-13*, including ASTM-specified search radii of up to 1.000 mile and data currency. The results of EDR's research are contained in *The EDR Radius Map™ Report with GeoCheck®, Inquiry 5547658.2s*, dated January 29, 2019 (Appendix D). The Government Records Searched and Data Currency Tracking section in EDR's Report describes the databases that were searched, including data currency.

The Property and adjoining properties are not listed in any of the databases searched by EDR. The EDR Report lists and describes 15 sites located within ASTM-specified search radii surrounding the Property. Based on name and address information, two of the 15 sites were combined into one site, resulting in the following 14 sites located within ASTM-specified search radii surrounding the Property:

MAP FINDINGS SUMMARY – EDR REPORT

EDR MAP ID	SITE NAME	SITE ADDRESS	EDR DATABASE ACRONYMS	REL. ELEV.	DIST. (mi), DIR.
1	RANCHO CALIFORNIA WATER DISTRICT WELL#309	26585 MADISON ST	RCRA-LQG	Lower	0.026, ESE
2	OUTDOOR MEDIA GROUP	26525 JEFFERSON AVE	RCRA-SQG, ~~HAZNET~~, ~~FINDS~~, ~~ECHO~~	Lower	0.107, SW
3	HOOD PRECISION INC	41152 NICK LANE	RCRA NONGEN / NLR, ~~HAZNET~~, ~~FINDS~~, ~~ECHO~~	Lower	0.108, ENE
4	A1 MURRIETA AUTO REPAIR	26622 JEFFERSON AVE	EDR HIST AUTO	Lower	0.118, South
5	STERLING JAGUAR	41135 SANDALWOOD CIR UNIT A	RCRA-SQG, ~~FINDS~~, ~~ECHO~~	Lower	0.124, East
6	PRO TEC	41376 PEAR ST	RCRA-SQG, ~~HAZNET~~, ~~FINDS~~, ~~ECHO~~	Lower	0.150, SSE
7	ELEMENTARY SCHOOL NO. 9	EARLY LN/WINCHESTER DR/ HUNTER RD	ENVIROSTOR,SCH	Lower	0.199, WSW
8	ELEMENTARY SCHOOL SITE NO. 10	GREER R D/CLINTON KEITH RD	ENVIROSTOR,SCH	Lower	0.199, WSW

EDR MAP ID	SITE NAME	SITE ADDRESS	EDR DATABASE ACRONYMS	REL. ELEV.	DIST. (mi), DIR.
9	VISTA MURRIETA HIGH	WHITEWOOD RD/ CLINTON KEITH RD	ENVIROSTOR,SCH	Lower	0.199, WSW
10	WATERSTONE	26790 MADISON ST	RCRA-SQG, ~~HAZNET~~, ~~FINDS~~, ~~ECHO~~	Lower	0.226, SE
11	EXPRESS SYSTEMS & ENGINEERING	41357 DATE ST	RCRA-SQG, ~~HAZNET~~, ~~FINDS~~, ~~ECHO~~	Lower	0.241, SSE
12/ 13	JOHNSON RENTAL SERVICES/ JOHNSON MACHINERY RENTALS	41105 RAINTREE CT	AST (2)	Higher	0.244, ESE
14	SA RECYCLING	41400 DATE ST	SWRCY, ~~NPDES~~, ~~CIWQS~~	Lower	0.271, SSE
15	SYKES ELEMENTARY SCHOOL NO. 12	VINEYARD PKWY/DRY CREEK RD	ENVIROSTOR,SCH	Lower	0.561, WSW

Notes: Strike-Through of an EDR database acronym indicates the Site is beyond the search radius for that database.
"(2)" indicates two apparent duplicate EDR database acronym listings for the same Site.

The following is a discussion of the Standard Federal, State, and Tribal Environmental Record Sources (*ASTM Standard E1527-13*), including the above 14 sites listed in the EDR Report.

3.7.1 National Priority List (NPL), Proposed NPL, Delisted NPL, and NPL Liens

The NPL is a USEPA listing of uncontrolled or abandoned hazardous waste sites undergoing long-term remedial action under the Superfund Act. The Proposed NPL is a USEPA listing of sites proposed for the NPL. The Delisted NPL is a USEPA listing of sites which were once considered to be NPL sites but have been reviewed and removed from the NPL. This may be because they have been remediated or reevaluated based on additional information. The NPL Liens is a listing of filed notices of Superfund Liens. No NPL, Proposed NPL or Delisted NPL sites were identified within 1.000 mile of the Property, and no NPL Liens sites were identified within 0.001 mile of the Property.

3.7.2 Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) List

CERCLIS is a USEPA listing of sites that are either proposed or on the NPL and sites that are in the screening and assessment phase for possible inclusion on the NPL. No CERCLIS sites were identified within 0.500 mile of the Property.

3.7.3 CERCLIS No Further Remedial Action Planned (NFRAP) List

CERCLIS-NFRAP is a USEPA listing of CERCLIS sites where following an initial investigation, no contamination was found, contamination was quickly removed, or contamination was not serious enough to require Federal Superfund action or NPL consideration. No CERCLIS-NFRAP sites were identified within 0.500 mile of the Property.

3.7.4 Resource Conservation and Recovery Act (RCRA) Corrective Actions (CORRACTS) List

RCRA CORRACTS is a USEPA listing of RCRA facilities that are undergoing corrective action. Corrective actions may be required beyond the facility's boundary and can be required regardless of when the release occurred. No RCRA CORRACTS sites were identified within 1.000 mile of the Property.

3.7.5 RCRA Non-CORRACTS Treatment, Storage, and Disposal (TSD) Facilities List

USEPA maintains a list of RCRA Non-CORRACTS TSD facilities, which have permits to manage hazardous material. No RCRA Non-CORRACTS TSD facilities were identified within 0.500 mile of the Property.

3.7.6 ***RCRA Generators List***

The RCRA Generators List contains facilities that generate, store, transport, treat, or dispose of hazardous waste. Large Quantity Generator (LQG) facilities generate at least 1,000 kilograms (kg) per month of hazardous waste or 1 kg per month of acutely hazardous waste. Small Quantity Generator (SQG) facilities generate between 100 and 1,000 kg per month of hazardous waste. There are five RCRA-SQGs and one RCRA-LQG within 0.250 mile of the Property (see table above). These five RCRA-SQGs and one RCRA-LQG have "No Violations Found" and are therefore not considered to be concerns regarding the Property.

3.7.7 ***Federal Institutional Control/Engineering Control Registries***

Institutional controls and engineering controls are forms of AULs which are an explicit recognition that residual levels of hazardous substances or petroleum products may be present on the Property and unrestricted use of the Property may not be acceptable. The Property was not identified the Federal Institutional Control/Engineering Control Registries Lists.

3.7.8 ***Emergency Response Notification System (ERNS) List***

ERNS is a USEPA listing of reported Comprehensive Environmental Response Compensation and Liability Act (CERCLA) hazardous substance releases or spills in quantities greater than the reportable quantity, as maintained at the National Response Center (NRC). The Property was not identified on the ERNS List.

3.7.9 ***State- and Tribal-Equivalent NPL (RESPONSE)***

The State- and Tribal-Equivalent NPL (RESPONSE) list identifies confirmed release sites where Department of Toxic Substances Control (DTSC) is involved in remediation, either in a lead or oversight capacity. RESPONSE sites are generally high-priority and high potential risk. No RESPONSE sites were identified within 1.000 mile of the Property.

3.7.10 ***State- and Tribal-Equivalent CERCLIS (ENVIROSTOR)***

The *ENVIROSTOR* database identifies sites that have known contamination or sites for which there may be reasons to investigate further. There are four *ENVIROSTOR* sites within 1.000 mile of the Property (see table above). These four School Investigation sites each have a "No Action Required" or "No Further Action" Status and are also listed in section 3.8.4 with the same Status. Based on their reported statuses, these four School Investigation sites are therefore not considered to be concerns regarding the Property.

3.7.11 ***State and Tribal Landfill and/or Solid Waste Disposal Site Lists***

The Solid Waste Information System (SWIS) list contains Solid Waste Facilities/Landfill (SWF/LF) site records of Active, Closed and Inactive Landfills. There are no SWF/LF sites within 0.500 mile of the Property.

3.7.12 ***State and Tribal Leaking Underground Storage Tank (LUST) Sites***

Lists of LUST sites registered with the state (including *GeoTracker*) and USEPA (tribal). There are no LUST sites within 0.500 mile of the Property.

3.7.13 ***State and Tribal Registered UST Sites***

An inventory of USTs registered with the state (including *GeoTracker*) and USEPA (tribal). There are no UST sites within 0.250 mile of the Property.

3.7.14 ***Registered Aboveground Storage Tank Sites***

A list of AST sites registered with the SWRCB. There is one registered AST site (apparent duplicate database listings for the same site) within 0.250 mile of the Property (see table above). This AST site is not considered to be a concern regarding the Property because no releases or violations were reported.

3.7.15 State and Tribal Voluntary Cleanup Program (VCP) Sites

A listing of low threat level sites with confirmed or unconfirmed releases and the project proponents have requested that DTSC oversee investigation and/or cleanup activities. No VCP sites were identified within 0.500 mile of the Property.

3.7.16 State and Tribal Brownfields Sites

A listing of Brownfields sites which have come to the SWRCB through the Memorandum of Agreement (MOA) Process. No Brownfields sites were identified within 0.500 mile of the Property.

3.7.17 Recycling Facilities in California Database (SWRCY)

A listing of recycling facilities in California. There one SWRCY site within 0.500 mile of the Property (see table above). This SWRCY site has no listed violations and is therefore not considered to be a concern regarding the Property.

3.7.18 RCRA Non-Gen / NLR List

The RCRA NonGen / NLR (RCRA Non-Generators / No Longer Regulated) is a list of sites that do not presently generate hazardous waste. There is one RCRA NonGen / NLR site within 0.250 mile of the Property (see table above). This RCRA NonGen / NLR site is not considered to be a concern regarding the Property because no violations have been reported.

3.7.19 EDR Hist Auto List

The EDR Hist Auto (EDR Historical Auto Station) is a listing of potential gas station/filling station/service station sites based on a review that included, but was not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. There is one EDR Hist Auto site within 0.125 mile of the Property (see table above). This EDR Hist Auto site is not considered to be a concern regarding the Property because reconnaissance revealed no indication of petroleum storage or dispensing activities on the site.

3.8 Agency Contact and Database Search

To supplement the EDR Report, LGC reviewed online databases for the following environmental agencies:

- Department of Conservation, Division of Oil, Gas, and Geothermal Resources (DOGGR).
- SWRCB.
- South Coast Air Quality Management District (AQMD).
- DTSC.

The review results for each online database are summarized below:

3.8.1 Division of Oil, Gas, and Geothermal Resources

The DOGGR *WellFinder* database and map were reviewed online regarding oil and gas wells near the Property. The *WellFinder* map indicates that the nearest oil and gas well is located approximately 0.91 mile north-northwest (upslope) of the Property. The well is identified as API: 0406500124, Well Number 1, Operator: Petroleum Product Engineers. The well is a plugged dry hole. This oil and gas well is not considered to be a concern regarding the Property.

3.8.2 State Water Resources Control Board

The SWRCB *GeoTracker* database and map were reviewed online regarding the Property. The *GeoTracker* database contains information about Permitted USTs, LUST Cleanup Sites, Cleanup Program Sites, Land Disposal Sites, Military Sites, Waste Discharge Requirements (WDR) Sites, and Irrigated Lands Regulatory Program Sites. The *GeoTracker* map indicates the following:

- There are no Permitted USTs within 0.250 mile of the Property and no LUST Cleanup Sites within 0.500 mile of the Property.

- There are no Cleanup Program Sites, Land Disposal Sites, Military Sites, WDR Sites, or Irrigated Lands Regulatory Program Sites within ASTM-specified search radii surrounding the Property.

3.8.3 South Coast Air Quality Management District

The South Coast AQMD *Facility INformation Detail* (*FIND*) database and map were reviewed online regarding the Property. The *FIND* database contains information about facilities having AQMD permits. Based on the *FIND* map, there are 14 AQMD permit sites within 0.250 mile of the Property. Ten of these 14 AQMD permit sites either have no Notices Of Violations (NOVs) or Closed Violations and either have no Notices To Comply (NTCs) or NTCs that are In Compliance. The remaining four AQMD permit sites each has one NOV, but the NOVs involve only recordkeeping and/or permitting. Therefore, these 14 sites are not considered to be concerns regarding the Property.

3.8.4 Department of Toxic Substances Control

The DTSC *ENVIROSTOR* database and map were reviewed online regarding the Property. The *ENVIROSTOR* database identifies sites that have known contamination or sites for which there may be reasons to investigate further. The *ENVIROSTOR* map indicates the following:

- There are no Federal NPL, State NPL, Voluntary Cleanup, School Cleanup, Evaluation, Military Evaluation, Tiered Permit, and Corrective Action sites within ASTM-specified search radii surrounding the Property.
- There are the following four School Investigation sites located within 1.000-mile of the Property: Elementary School No. 9, Elementary School Site No. 10, Vista Murrieta High School, and Sykes Elementary School No. 12. These four School Investigation sites each have a "No Action Required" or "No Further Action" Status. The EDR Report lists the same Status for each of these four School Investigation sites. Based on their reported statuses, these four School Investigation sites are therefore not considered to be concerns regarding the Property.

4.0 SITE RECONNAISSANCE

4.1 Site Reconnaissance Methodology

On February 13, 2019, LGC performed a site reconnaissance of the Property to observe and evaluate its current use and onsite environmental conditions. The site reconnaissance involved walking the Property while observing for evidence of existing and potential environmental concerns. Property photographs are provided in Appendix B.

4.2 Limiting Conditions

LGC encountered no limiting conditions during the site reconnaissance on February 13, 2019.

4.3 Interior Observations of Property

During the site reconnaissance on February 13, 2019, LGC observed no structures on the Property and therefore made no interior observations of the Property.

4.4 Exterior Observations of Property

During the site reconnaissance on February 13, 2019, LGC made the following observations regarding the exterior of the Property:

EXTERIOR OBSERVATIONS OF PROPERTY

Item or Condition	Observed Evidence	No Evidence Observed	Comments
Hazardous Substances & Petroleum Products:	☐	☒	
Storage Tanks & Related Equipment:	☐	☒	
Odors:	☐	☒	

Item or Condition	Observed Evidence	No Evidence Observed	Comments
Standing Surface Water or Other Pools of Liquid:	☐	☒	
Drums of Hazardous Substances, Petroleum Products, or Unidentified Contents:	☐	☒	
Transformers or Equipment containing Polychlorinated Biphenyls (PCBs):	☐	☒	
Pits, Ponds, or Lagoons:	☐	☒	
Drains and Sumps:	☐	☒	
Stained Soil or Pavement:	☐	☒	
Stressed Vegetation (other than from insufficient water):	☐	☒	
Evidence of Mounds, Depressions or Filled or Graded Areas Suggesting Trash or Other Solid Waste Disposal:	☐	☒	
Wastewater or any discharge (including storm water) into a Drain, Ditch, or Stream on or Adjacent to the Property:	☒	☐	Most onsite storm water, together with tributary runoff from the elevated offsite area to the northwest, discharges into Warm Springs Creek on the south portion of the Property.
Wells (active, inactive, or abandoned):	☒	☐	In 2017, a public water supply well was drilled and installed onsite in the northwest. The groundwater depth in this well was 380 feet bgs on 08-02-2017. The well is inactive (capped).
Septic Systems or Cesspools:	☐	☒	If there is or was an OWTS onsite associated with the former SFR, its location is unknown.
Prior Structures:	☒	☐	During the 1980s and early 1990s, there was apparently an SFR and another structure on the northeast part the Property along Madison Ave.
Roads, Tracks, Railroad Tracks or Spurs:	☐	☒	

4.5 ***Adjoining Property Observations***

As defined in *ASTM Standard E1527-13*, an adjoining property is any real property whose border is contiguous or partially contiguous with the Property, or would be contiguous or partially contiguous with the Property if that property were not separated from the Property by a roadway, street or other public thoroughfare.

The Property is bordered by the following:

Northwest: A vacant parcel.

Northeast: Madison Avenue (dirt road) followed by a vacant parcel.

Southeast: Commercial parcels and Warm Springs Creek.

Southwest: Commercial parcels.

5.0 ***FINDINGS***

A summary of our findings is provided below. Details are not included or fully developed in this section, and the Phase I ESA report must be read in its entirety for a comprehensive understanding of these findings.

- The Property is located along the southwest side of Madison Avenue southeast of its intersection with Golden Gate Circle and consists of a rectangular parcel comprising approximately 5.83 acres. The Property is vacant and unfenced.
- The southeast part of the Property is within a 100-year flood zone associated with Warm Springs Creek; the flood zone extends approximately to the top of the west streambank.
- Historical aerial photographs of the Property dating back to 1938, as well as historical topographic maps dating back to 1901, were reviewed as part of this Phase I ESA. During the 1980s and early 1990s, there was apparently an SFR and another structure on the northeast part the Property adjacent to Madison Avenue.
- The former SFR that was located on the northeast part the Property was probably served by an OWTS. If there is or was an OWTS on the Property, its location is unknown.
- The Property and adjoining properties were not identified in the databases in the EDR Report or in the four additional online databases reviewed by LGC.
- No evidence of pesticides or herbicides spills was observed on the Property during our site reconnaissance. Other than incidental residential use associated with the former SFR, possibly including application of termiticides around and/or under former structures, there is no indication that pesticides or herbicides were used on the Property.
- No evidence of current or past storage or use of hazardous materials or petroleum products was identified on the Property during our site reconnaissance and records review.
- Along the upper bank of Warm Springs Creek in the south portion there are a number of wood chipper waste piles, which were apparently imported from unknown source(s). Scattered pieces of concrete, asphalt, and wood are visible on the surfaces of the chipper waste piles, but no stained areas and no chemical/petroleum odors were noted.
- There is also a pile of concrete slab pieces along the upper bank of Warm Springs Creek and other scattered trash (apparently non-hazardous solid waste) along the upper bank and near the north property corner.
- In the northwest there is an inactive public water supply well (drilled and installed in 2017) with a steel standpipe and a welded cap.
- No stained surface soil or other visible evidence of petroleum products or hazardous materials spills was observed on the Property. No stressed vegetation was observed.
- No evidence of ASTs was observed on the Property during our site reconnaissance or identified during record review.
- No evidence of USTs, sumps, clarifiers, or other storage or treatment structures for hazardous materials or petroleum products was observed on the Property during our site reconnaissance or identified during record review.
- No evidence of known regulatory actions, regarding hazardous materials or petroleum products cleanup that have been issued or are being issued for the Property, was identified during our records review.

6.0 OPINIONS

A summary of our opinions is provided below. Details are not included or fully developed in this section, and the Phase I ESA report must be read in its entirety for a comprehensive understanding of these opinions.

- No apparent or potential threat of past or present hazardous material releases exists regarding the Property based on the EDR Report and the Agency Contact and Database Search, including the 14 sites identified within the ASTM-specified search radii surrounding the Property.
- A Vapor Encroachment Condition does not exist or is not likely to exist in connection with the Property.
- No RECs, including CRECs, were identified on, at, in, or to the Property.
- No significant data gaps were identified that affect the ability of the Environmental Professional to identify RECs.
- There are no unusual circumstances where greater certainty is required regarding RECs.

7.0 CONCLUSIONS AND RECOMMENDATIONS

LGC has performed a Phase I ESA of the Property in conformance with the scope and limitations of *ASTM E1527-13*. There were no exceptions to, or deletions from *ASTM E1527-13* in conducting this Phase I ESA. This Phase I ESA has revealed no evidence of RECs in connection with the Property.

LGC recommends the following, based on the results of this Phase I ESA:

- The wood chipper waste piles along the upper bank of Warm Springs Creek, which were apparently imported from unknown source(s), should be removed and properly disposed of offsite.
- The pile of concrete slab pieces along the upper bank of Warm Springs Creek and other scattered trash (apparently non-hazardous solid waste) along the upper bank and near the north property corner should be removed and properly disposed of offsite.
- If an OWTS (associated with the former SFR) is encountered during future grading and development onsite, then it should be removed in accordance with applicable city and/or county regulations.

8.0 NON-SCOPE ISSUES

The following Non-Scope Issues, which are outside the scope of *ASTM E1527-13*, were assessed in connection with this Phase I ESA of the Property.

8.1 Building Construction Materials

Building construction materials that could contain hazardous materials, including asbestos-containing building materials (ACBMs) and lead-based paint (LBP), were considered during this Phase I ESA. There are no structures on the Property. No trash or debris indicative of potential ACBMs and/or LBP related to the former structures were observed on the Property. Therefore, ACBMs and LBP are not considered to be concerns regarding the Property.

8.2 Indoor Radon

The *Map of Radon Zones in California*, based on USEPA data, was reviewed online. The map indicates that Riverside County, including the Property, is in Radon Zone 2 and has a predicted average indoor radon screening level between 2 and 4 picocuries per liter (pCi/L), which is considered "Moderate Potential". This screening level is less than or equal to the USEPA's radon action level of 4 pCi/L, and radon is therefore not a concern regarding the Property.

8.3 Natural Asbestos Occurrences

The map of *Reported Historic Asbestos Mines, Historic Asbestos Prospects, and Other Natural Occurrences of Asbestos in California* by the CGS and USGS was reviewed. The map depicts historic asbestos mines/prospects and natural asbestos occurrences and indicates that there are no reported natural asbestos occurrences or historic asbestos/prospects mines located within 1 mile of the Property. Natural asbestos occurrences and historic asbestos mines/prospects are therefore not concerns regarding the Property.

9.0 LIMITATIONS

This Phase I ESA was performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineers, geologists, and environmental professionals practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report. The current observations made in the field and the review of available records and other documentation are believed to be representative of the entire project. However, soil, geologic and other conditions revealed by excavation may be different from our preliminary findings. If this occurs, the changed conditions must be evaluated by the environmental professional, and the recommendations within this Phase I ESA are subject to change. Changes in the conditions of the Property can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties.

This report is issued with the understanding that it is the responsibility of the owner and/or owner's representative to ensure that the information and recommendations contained herein are adhered to and made clear.

The conclusions, opinions and recommendations contained in this Phase I ESA report represent our professional judgment and are based on the results of the described review of available records and other documentation.

The conclusions, opinions and recommendations contained in this Phase I ESA report are valid up to a period of one (1) year from the date of this report in accordance with the All Appropriate Inquiries (AAI) Final Rule. Changes in the conditions on the Property can and do occur with the passage of time, due to natural processes and/or the works of man. In addition, changes in applicable or appropriate codes, regulation and/or standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this Phase I ESA may be invalidated wholly

or partially by changed conditions outside LGC's control. Therefore, if any of the abovementioned situations occur, then this report must be updated.

This report has been prepared solely for use by the parties and purposes named and/or designed above. It may not contain sufficient and/or applicable information for use by other parties or other purposes. LGC reserves the right to the information, conclusions, recommendations, and findings of this Phase I ESA should the client decide to forfeit their ownership of the Property.

LGC appreciates the opportunity to be of service to you and looks forward to the opportunity to work with you in the future. Should you have any questions, or should you require additional information, regarding the contents of this Phase I ESA please do not hesitate to contact this office at your earliest convenience.

10.0 PREPARERS

Duncan Walker
Environmental Professional and Certified Engineering Geologist

B.S., Geology, California University at Los Angeles, 1980.
California Professional Geologist, #4105
California Certified Engineering Geologist, #1395

Environmental Division Manager and Certified Engineering Geologist at LGC. Mr. Walker has more than 30 years of experience in the fields of Environmental Due Diligence including conducting and managing Phase I and Phase II Environmental Site Assessments, as well as Preliminary Environmental Assessments, Supplemental Site Investigations and Removal Action Work Plans/Implementation. Current duties include business development, client liaison, technical oversight, and review and preparation of proposals and reports.

Principal areas of responsibility for this Phase I ESA: Project Management, Client Point of Contact, Research, Site Reconnaissance, Interviews, and Report Preparation.

APPENDICES OF THIS SITE ASSESSMENT
WILL BE PROVIDED UPON REQUEST

Appendix 5: LID Feasibility Supplemental Information

Information that supports or supplements the determination of LID technical feasibility documented in Section D

Examples of material to provide in Appendix 5 may include but are not limited to the following:

- Technical feasibility criteria for DMAs
- Site specific analysis of technical infeasibility of all LID BMPs (if Alternative Compliance is needed)
- Documentation of Approval criteria for Proprietary Biofiltration BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections D of this Template.

Appendix 6: LID BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation to supplement Section D

Examples of material to provide in Appendix 6 may include but are not limited to the following:

- DCV calculations,
- LID BMP sizing calculations from Exhibit C of the SMR WQMP
- Design details/drawings from manufacturers for proprietary BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 3.4 of the SMR WQMP and Sections D.4 of this Template.

DCV CALCULATIONS FOR LID BMPs

DMA Type/ID	DMA sq. ft.	DMA in acres	Post Project Suface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area Runoff Factor (ac.)	BMP Name / Identifier		
	[A]			[B]	[C]	[A] x [C]			
1-A	13,760	0.32	Roof	1	0.89	0.28177			
1-B	49,978	1.15	Asphalt	1	0.89	1.02342			
1-C	31,258	0.72	Comp soil	0.4	0.28	0.20072			
1-D	22,671	0.52	Gravel	0.1	0.11	0.05749			
1-E	7,694	0.18	Perv Asphalt	0.1	0.11	0.01951			
1-F	5,425	0.12	Land	0.1	0.11	0.01376			
							Design Storm Depth (in)	DCV, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
	130,786					2	0.85	4,926.52	5,800

Self-treating

1-G	42512		Natural C	0.3	0.23	0.21975

Dev. Site Area 173,298 sq. ft.
3.98 ac.

Appendix 7: Hydromodification

Supporting Detail Relating to compliance with the Hydromodification Performance Standards

Examples of material to provide in Appendix 7 may include but are not limited to the following:

- Hydromodification Exemption Exhibit,
- Potential Critical Coarse Sediment Yield Area Mapping
- Hydromodification BMP sizing calculations,
- SMRHM report files,
- Site-Specific Critical Coarse Sediment Analysis,
- Design details/drawings from manufacturers for proprietary BMPs

This information should support the hydromodification exemption (if applicable) and hydrologic control BMP and Sediment Supply BMP sections of this Template. Refer to Section 2.4 and 3.6 of the SMR WQMP and Sections E of this Template.

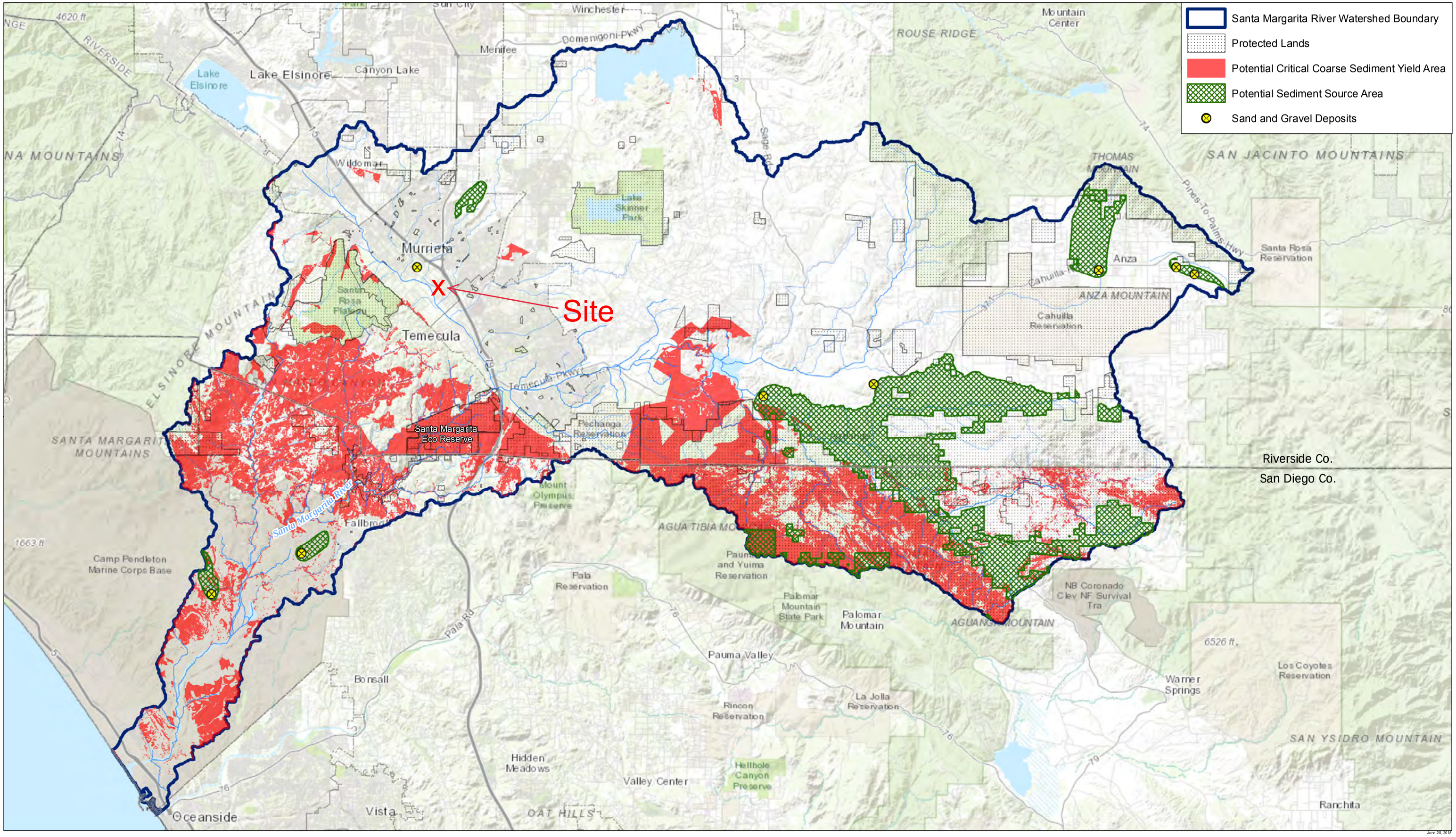


Exhibit G-1

SANTA MARGARITA RIVER WATERSHED

POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS AND POTENTIAL SEDIMENT SOURCE AREAS

SMRHM

PROJECT REPORT

General Model Information

Project Name:	19-23 101420
Site Name:	19-23
Site Address:	
City:	
Report Date:	10/15/2020
Gage:	Temecula Valley
Data Start:	1974/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/12/01

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data

Predeveloped Land Use

DMA 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Urban,Mod(5-10%)	3.01
Pervious Total	3.01
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.01

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Very(>20%)	0.72
C D,Urban,Flat(0-5%)	0.82
Pervious Total	1.54

Impervious Land Use	acre
Roof Area	0.32
Parking,Flat(0-5%)	1.15
Impervious Total	1.47
Basin Total	3.01

Element Flows To:

Surface	Interflow	Groundwater
Surface Bio Swale 1	Surface Bio Swale 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Bio Swale 1

Bottom Length: 42.77 ft.
Bottom Width: 42.77 ft.
Material thickness of first layer: 1.5
Material type for first layer: Amended 5 in/hr
Material thickness of second layer: 0.25
Material type for second layer: Sand
Material thickness of third layer: 0.75
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 0.5
Offset (in.): 3
Flow Through Underdrain (ac-ft.): 22.602
Total Outflow (ac-ft.): 82.248
Percent Through Underdrain: 27.48
Discharge Structure
Riser Height: 2 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 2 in. Elevation:0.5 ft.
Orifice 2 Diameter: 0.5 in. Elevation:1 ft.
Element Flows To:
Outlet 1 Outlet 2

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0469	0.0000	0.0000	0.0000
0.0549	0.0468	0.0010	0.0000	0.0000
0.1099	0.0467	0.0019	0.0000	0.0000
0.1648	0.0466	0.0029	0.0000	0.0000
0.2198	0.0465	0.0039	0.0000	0.0000
0.2747	0.0464	0.0049	0.0000	0.0000
0.3297	0.0463	0.0059	0.0000	0.0000
0.3846	0.0462	0.0068	0.0000	0.0000
0.4396	0.0461	0.0078	0.0000	0.0000
0.4945	0.0460	0.0088	0.0000	0.0000
0.5495	0.0459	0.0098	0.0000	0.0000
0.6044	0.0458	0.0108	0.0000	0.0000
0.6593	0.0457	0.0118	0.0000	0.0000
0.7143	0.0456	0.0128	0.0000	0.0000
0.7692	0.0454	0.0138	0.0000	0.0000
0.8242	0.0453	0.0148	0.0000	0.0000
0.8791	0.0452	0.0158	0.0000	0.0000
0.9341	0.0451	0.0168	0.0000	0.0000
0.9890	0.0450	0.0178	0.0000	0.0000
1.0440	0.0449	0.0189	0.0000	0.0000
1.0989	0.0448	0.0199	0.0000	0.0000
1.1538	0.0447	0.0209	0.0000	0.0000
1.2088	0.0446	0.0219	0.0000	0.0000
1.2637	0.0445	0.0229	0.0000	0.0000
1.3187	0.0444	0.0240	0.0000	0.0000
1.3736	0.0443	0.0250	0.0004	0.0000
1.4286	0.0442	0.0260	0.0007	0.0000

1.4835	0.0440	0.0271	0.0011	0.0000
1.5385	0.0439	0.0281	0.0013	0.0000
1.5934	0.0438	0.0291	0.0015	0.0000
1.6484	0.0437	0.0300	0.0017	0.0000
1.7033	0.0436	0.0310	0.0019	0.0000
1.7582	0.0435	0.0321	0.0020	0.0000
1.8132	0.0434	0.0331	0.0022	0.0000
1.8681	0.0433	0.0342	0.0023	0.0000
1.9231	0.0432	0.0352	0.0025	0.0000
1.9780	0.0431	0.0362	0.0026	0.0000
2.0330	0.0430	0.0373	0.0028	0.0000
2.0879	0.0429	0.0383	0.0028	0.0000
2.1429	0.0427	0.0394	0.0030	0.0000
2.1978	0.0426	0.0404	0.0030	0.0000
2.2527	0.0425	0.0415	0.0031	0.0000
2.3077	0.0424	0.0426	0.0033	0.0000
2.3626	0.0423	0.0436	0.0036	0.0000
2.4176	0.0422	0.0447	0.0039	0.0000
2.4725	0.0421	0.0458	0.0042	0.0000
2.5000	0.0420	0.0463	0.0101	0.0000

Landscape Swale Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0469	0.0463	0.0000	0.2167	0.0000
2.5549	0.0470	0.0489	0.0000	0.2167	0.0000
2.6099	0.0471	0.0515	0.0000	0.2326	0.0000
2.6648	0.0472	0.0540	0.0000	0.2405	0.0000
2.7198	0.0473	0.0566	0.0000	0.2485	0.0000
2.7747	0.0474	0.0592	0.0000	0.2564	0.0000
2.8297	0.0476	0.0619	0.0000	0.2644	0.0000
2.8846	0.0477	0.0645	0.0000	0.2723	0.0000
2.9396	0.0478	0.0671	0.0000	0.2802	0.0000
2.9945	0.0479	0.0697	0.0000	0.2882	0.0000
3.0495	0.0480	0.0724	0.0241	0.2961	0.0000
3.1044	0.0481	0.0750	0.0351	0.3040	0.0000
3.1593	0.0482	0.0776	0.0433	0.3120	0.0000
3.2143	0.0483	0.0803	0.0502	0.3199	0.0000
3.2692	0.0484	0.0830	0.0563	0.3279	0.0000
3.3242	0.0485	0.0856	0.0618	0.3358	0.0000
3.3791	0.0486	0.0883	0.0668	0.3437	0.0000
3.4341	0.0487	0.0910	0.0715	0.3517	0.0000
3.4890	0.0488	0.0936	0.0759	0.3596	0.0000
3.5440	0.0490	0.0963	0.0815	0.3676	0.0000
3.5989	0.0491	0.0990	0.0861	0.3755	0.0000
3.6538	0.0492	0.1017	0.0904	0.3834	0.0000
3.7088	0.0493	0.1044	0.0945	0.3914	0.0000
3.7637	0.0494	0.1071	0.0983	0.3993	0.0000
3.8187	0.0495	0.1098	0.1020	0.4072	0.0000
3.8736	0.0496	0.1126	0.1056	0.4152	0.0000
3.9286	0.0497	0.1153	0.1090	0.4231	0.0000
3.9835	0.0498	0.1180	0.1124	0.4311	0.0000
4.0385	0.0499	0.1208	0.1156	0.4390	0.0000
4.0934	0.0500	0.1235	0.1187	0.4469	0.0000
4.1484	0.0501	0.1263	0.1218	0.4549	0.0000
4.2033	0.0502	0.1290	0.1248	0.4628	0.0000
4.2582	0.0504	0.1318	0.1277	0.4708	0.0000
4.3132	0.0505	0.1346	0.1305	0.4787	0.0000
4.3681	0.0506	0.1373	0.1333	0.4866	0.0000

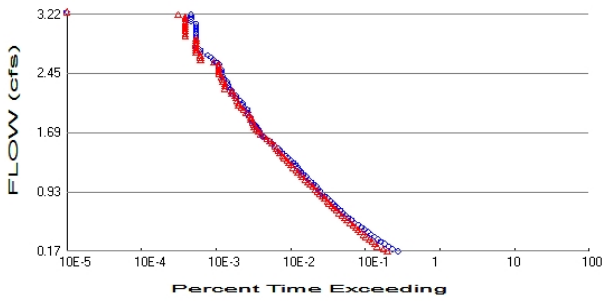
4.4231	0.0507	0.1401	0.1360	0.4946	0.0000
4.4780	0.0508	0.1429	0.1387	0.5025	0.0000
4.5330	0.0509	0.1457	0.2048	0.5104	0.0000
4.5879	0.0510	0.1485	0.4192	0.5184	0.0000
4.6429	0.0511	0.1513	0.7099	0.5263	0.0000
4.6978	0.0512	0.1541	1.0429	0.5343	0.0000
4.7527	0.0513	0.1569	1.3856	0.5422	0.0000
4.8077	0.0514	0.1598	1.7053	0.5501	0.0000
4.8626	0.0515	0.1626	1.9737	0.5581	0.0000
4.9176	0.0517	0.1654	2.1742	0.5660	0.0000
4.9725	0.0518	0.1683	2.3111	0.5740	0.0000
5.0000	0.0518	0.1697	2.4504	0.5779	0.0000

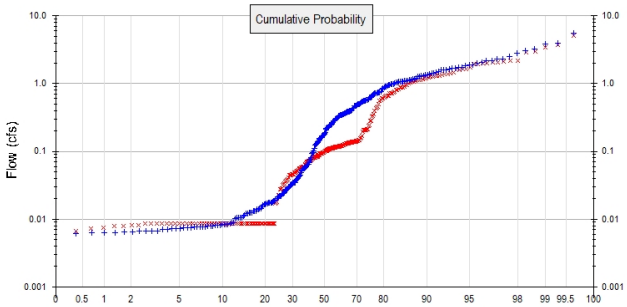
Surface Bio Swale 1

Element Flows To:

Outlet 1	Outlet 2
	Bio Swale 1

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.01
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.54
Total Impervious Area: 1.47

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.704441
5 year	2.328435
10 year	3.216021
25 year	3.982353

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	1.569464
5 year	2.140057
10 year	2.929454
25 year	3.754418

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1704	3535	2573	72	Pass
0.2012	3016	2255	74	Pass
0.2320	2635	1880	71	Pass
0.2627	2330	1744	74	Pass
0.2935	2084	1600	76	Pass
0.3243	1889	1456	77	Pass
0.3550	1712	1330	77	Pass
0.3858	1537	1223	79	Pass
0.4166	1402	1122	80	Pass
0.4473	1269	1031	81	Pass
0.4781	1150	963	83	Pass
0.5088	1047	886	84	Pass
0.5396	929	820	88	Pass
0.5704	847	736	86	Pass
0.6011	767	678	88	Pass
0.6319	708	625	88	Pass
0.6627	654	572	87	Pass
0.6934	597	531	88	Pass
0.7242	544	493	90	Pass
0.7549	506	459	90	Pass
0.7857	481	420	87	Pass
0.8165	442	402	90	Pass
0.8472	403	371	92	Pass
0.8780	371	344	92	Pass
0.9088	344	314	91	Pass
0.9395	324	297	91	Pass
0.9703	303	273	90	Pass
1.0011	284	255	89	Pass
1.0318	263	235	89	Pass
1.0626	244	218	89	Pass
1.0933	224	201	89	Pass
1.1241	208	186	89	Pass
1.1549	192	180	93	Pass
1.1856	180	162	90	Pass
1.2164	169	152	89	Pass
1.2472	162	138	85	Pass
1.2779	151	131	86	Pass
1.3087	141	121	85	Pass
1.3395	130	116	89	Pass
1.3702	119	107	89	Pass
1.4010	111	101	90	Pass
1.4317	100	92	92	Pass
1.4625	93	88	94	Pass
1.4933	88	83	94	Pass
1.5240	80	80	100	Pass
1.5548	72	72	100	Pass
1.5856	68	68	100	Pass
1.6163	60	62	103	Pass
1.6471	55	58	105	Pass
1.6779	53	51	96	Pass
1.7086	49	48	97	Pass
1.7394	47	45	95	Pass
1.7701	45	42	93	Pass

1.8009	43	42	97	Pass
1.8317	40	40	100	Pass
1.8624	38	38	100	Pass
1.8932	37	38	102	Pass
1.9240	35	36	102	Pass
1.9547	35	33	94	Pass
1.9855	34	30	88	Pass
2.0162	30	28	93	Pass
2.0470	29	26	89	Pass
2.0778	29	26	89	Pass
2.1085	27	25	92	Pass
2.1393	24	24	100	Pass
2.1701	24	23	95	Pass
2.2008	21	21	100	Pass
2.2316	21	21	100	Pass
2.2624	20	17	85	Pass
2.2931	19	17	89	Pass
2.3239	18	17	94	Pass
2.3546	18	16	88	Pass
2.3854	17	16	94	Pass
2.4162	16	15	93	Pass
2.4469	15	14	93	Pass
2.4777	15	14	93	Pass
2.5085	15	14	93	Pass
2.5392	14	14	100	Pass
2.5700	14	14	100	Pass
2.6008	13	12	92	Pass
2.6315	12	8	66	Pass
2.6623	11	8	72	Pass
2.6930	10	8	80	Pass
2.7238	8	7	87	Pass
2.7546	8	7	87	Pass
2.7853	7	7	100	Pass
2.8161	7	7	100	Pass
2.8469	7	7	100	Pass
2.8776	7	7	100	Pass
2.9084	7	7	100	Pass
2.9392	7	5	71	Pass
2.9699	7	5	71	Pass
3.0007	7	5	71	Pass
3.0314	7	5	71	Pass
3.0622	7	5	71	Pass
3.0930	7	5	71	Pass
3.1237	6	5	83	Pass
3.1545	6	5	83	Pass
3.1853	6	5	83	Pass
3.2160	6	4	66	Pass

Water Quality

Drawdown Time Results

Pond: Surface Bio Swale 1

Days	Stage(feet)	Percent of Total Run Time
1	N/A	0.0040
2	N/A	0.0040
3	N/A	0.0040
4	N/A	0.0040
5	N/A	0.0040

Maximum Stage: 2.000 Drawdown Time: Less than 1 day

Rational Method

Data for Rational Method is not available.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

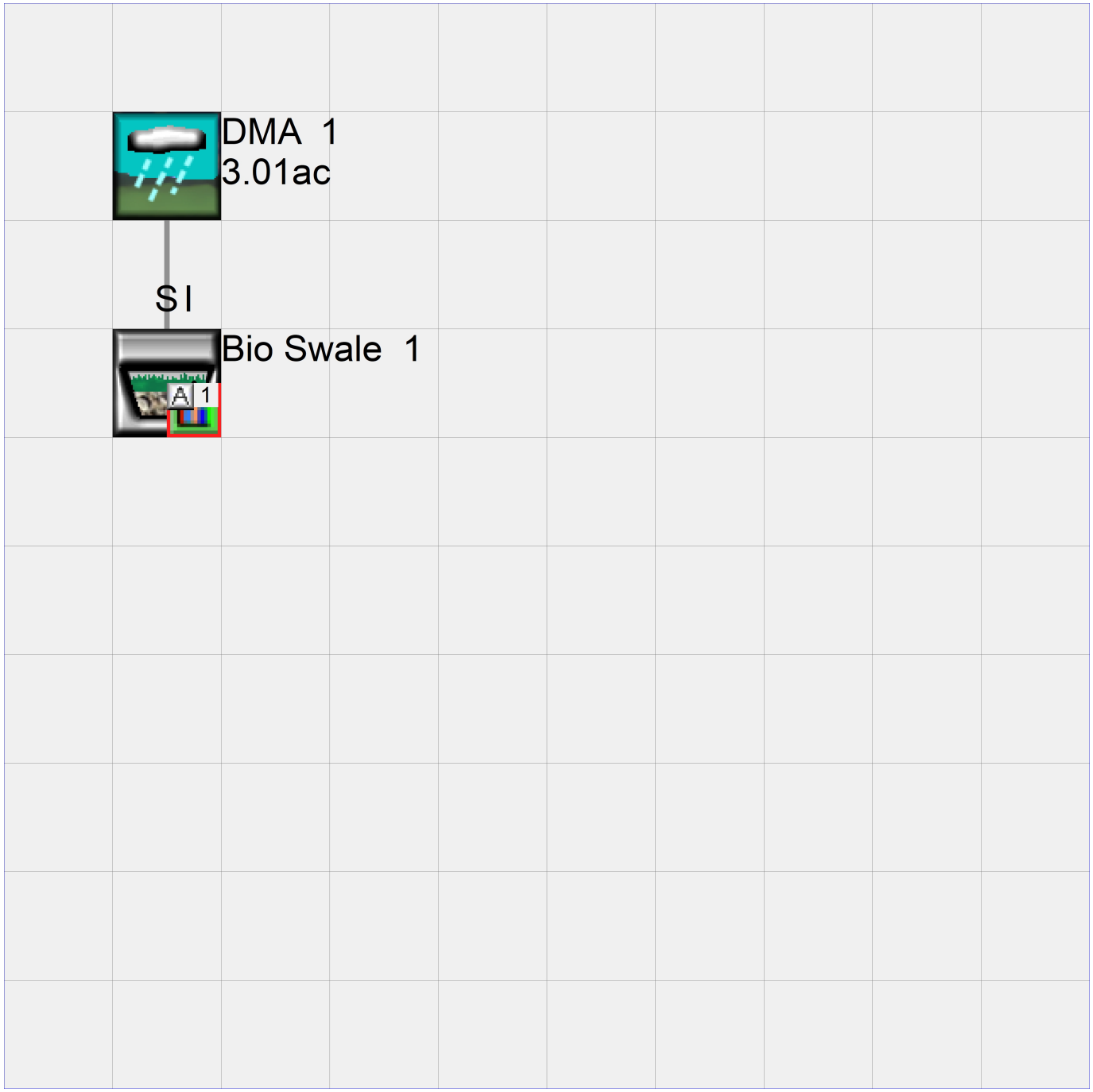
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1974 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
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<-ID->                                                              ***
WDM         26   19-23 101420.wdm
MESSU       25   Pre19-23 101420.MES
            27   Pre19-23 101420.L61
            28   Pre19-23 101420.L62
            30   POC19-23 1014201.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      46
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        DMA  1                     MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
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  501         1    1
  END TIMESERIES
END COPY
GENER
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    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
   46     C/D,Urban,Mod(5-10%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
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  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   46         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   46         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   46             0       4.2      0.03       350       0.1         3     0.995
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   46            40        35         3         2      0.45      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   46             0       0.5      0.25       0.7      0.35         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   46      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   46             0         0      0.01         0       3.5       1.7       0.1
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
DMA  1***
PERLND  46                        3.01     COPY   501     12
PERLND  46                        3.01     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---><--->
  END HYDR-INIT
END RCHRES
```

```
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  46     EXTNL  SURLI

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1974 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   19-23 101420.wdm
MESSU       25   Mit19-23 101420.MES
            27   Mit19-23 101420.L61
            28   Mit19-23 101420.L62
            30   POC19-23 1014201.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      40
      PERLND      45
      IMPLND       5
      IMPLND      14
      GENER        2
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Surface Bio Swale  1        MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
    2        24
  END OPCODE
  PARM
    #    #         K ***
    2             0.
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   40     C/D,Shrub,Very(>20%)    1    1    1    1   27    0
   45     C/D,Urban,Flat(0-5%)    1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   40         0    0    1    0    0    0    0    0    0    0    0    0
   45         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   40         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   40         0    0    0    1    0    0    0    0    1    0    0
   45         0    0    0    1    0    0    0    0    1    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   40              0         4     0.025       200      0.25         2      0.95
   45              0       4.6      0.04       400      0.05         3     0.995
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   40             40        35         3         2      0.15      0.15         0
   45             40        35         3         2      0.45      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                            ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   40              0       0.4       0.3       0.4      0.35         0
   45              0       0.7      0.25         1       0.4         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   40       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
   45       0.5  0.5  0.5  0.6 0.65 0.65 0.65 0.65 0.65 0.65 0.55  0.5
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   40      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
   45      0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11 0.11
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   40              0         0      0.01         0       0.5       0.3      0.01
   45              0         0      0.01         0       3.5       1.7       0.1
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    5     Roof Area                1    1    1   27    0
   14     Parking,Flat(0-5%)       1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***
```

```
  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    5         0    0    1    0    0    0
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    5         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    5         0    0    0    0    0
   14         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    5            100      0.05       0.1       0.1
   14            100      0.05       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    5              0         0
   14              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    5             0         0
   14             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
DMA  1***
PERLND  40                      0.72     RCHRES   1      2
PERLND  40                      0.72     RCHRES   1      3
PERLND  45                      0.82     RCHRES   1      2
PERLND  45                      0.82     RCHRES   1      3
IMPLND   5                      0.32     RCHRES   1      5
IMPLND  14                      1.15     RCHRES   1      5

******Routing******
PERLND  40                      0.72     COPY     1     12
PERLND  45                      0.82     COPY     1     12
IMPLND   5                      0.32     COPY     1     15
IMPLND  14                      1.15     COPY     1     15
PERLND  40                      0.72     COPY     1     13
PERLND  45                      0.82     COPY     1     13
RCHRES   1                         1     RCHRES   2      8
RCHRES   2                         1     COPY   501     16
RCHRES   1                         1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
```

```
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
GENER    2 OUTPUT TIMSER      .0011111     RCHRES   1     EXTNL  OUTDGT 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                        in  out                             ***
    1     Surface Bio Swal-006    2    1    1    1   28    0    1
    2     Bio Swale  1            1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                   ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  5  0  0  0       0  1  0  0  0       2  1  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
    <------><--------><--------><--------><--------><--------><-------->      ***
    1              1      0.01       0.0       0.0       0.0       0.0
    2              2      0.01       0.0       0.0       0.0       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                      ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
    <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---->
    1           0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
***                          addr
***                         <------>
*** kwd  varnam optyp  opn  vari  s1 s2 s3 tp multiply  lc ls ac as agfn ***
  <****> <----> <----> <-> <----><-><-><-><-><--------> <><-> <><-> <--> ***
  UVQUAN vol2   RCHRES   2 VOL              4
  UVQUAN v2m2   GLOBAL     WORKSP  1        3
  UVQUAN vpo2   GLOBAL     WORKSP  2        3
  UVQUAN v2d2   GENER    2 K       1        3
*** User-Defined Target Variable Names
```

```
***                  addr or                       addr or
***                 <------>                      <------>
*** kwd   varnam ct  vari  s1 s2 s3  frac oper     vari  s1 s2 s3  frac oper
  <****>  <----><-> <----><-><-><-> <---> <-->    <----><-><-><-> <---> <-->
  UVNAME  v2m2    1 WORKSP  1         1.0 QUAN
  UVNAME  vpo2    1 WORKSP  2         1.0 QUAN
  UVNAME  v2d2    1 K       1         1.0 QUAN
*** opt foplop dcdts  yr mo dy hr mn d t   vnam  s1 s2 s3 ac quantity  tc  ts rp
  <****><-><--><><-><--> <> <> <> <><><>  <----><-><-><-><-><--------> <> <-><->
  GENER   2                               v2m2            =  2025.47
*** Compute remaining available pore space
  GENER   2                               vpo2            =  v2m2
  GENER   2                               vpo2           -=  vol2
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
  GENER   2                               vpo2            =  0.0
END IF
*** Infiltration volume
  GENER   2                               v2d2            =  vpo2
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   47    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.046904  0.000000  0.000000
  0.054945  0.046850  0.000970  0.000000
  0.109890  0.046742  0.001943  0.000000
  0.164835  0.046634  0.002919  0.000000
  0.219780  0.046526  0.003896  0.000000
  0.274725  0.046418  0.004877  0.000000
  0.329670  0.046310  0.005859  0.000000
  0.384615  0.046202  0.006845  0.000000
  0.439560  0.046094  0.007832  0.000000
  0.494505  0.045987  0.008823  0.000000
  0.549451  0.045879  0.009815  0.000000
  0.604396  0.045771  0.010811  0.000000
  0.659341  0.045663  0.011808  0.000000
  0.714286  0.045555  0.012809  0.000000
  0.769231  0.045447  0.013811  0.000000
  0.824176  0.045339  0.014817  0.000000
  0.879121  0.045231  0.015824  0.000000
  0.934066  0.045123  0.016834  0.000000
  0.989011  0.045015  0.017847  0.000000
  1.043956  0.044908  0.018862  0.000000
  1.098901  0.044800  0.019880  0.000000
  1.153846  0.044692  0.020900  0.000000
  1.208791  0.044584  0.021923  0.000000
  1.263736  0.044476  0.022948  0.000000
  1.318681  0.044368  0.023975  0.000000
  1.373626  0.044260  0.025006  0.000449
  1.428571  0.044152  0.026038  0.000673
  1.483516  0.044044  0.027073  0.001060
  1.538462  0.043936  0.028061  0.001254
  1.593407  0.043829  0.029052  0.001547
  1.648352  0.043721  0.030045  0.001693
  1.703297  0.043613  0.031040  0.001927
  1.758242  0.043505  0.032075  0.002044
  1.813187  0.043397  0.033113  0.002243
  1.868132  0.043289  0.034153  0.002342
  1.923077  0.043181  0.035195  0.002517
  1.978022  0.043073  0.036240  0.002604
  2.032967  0.042965  0.037287  0.002763
  2.087912  0.042858  0.038337  0.002842
  2.142857  0.042750  0.039390  0.002988
  2.197802  0.042642  0.040444  0.002988
  2.252747  0.042534  0.041501  0.003091
  2.307692  0.042426  0.042561  0.003334
  2.362637  0.042318  0.043623  0.003627
  2.417582  0.042210  0.044688  0.003934
```

```
  2.472527  0.042102  0.045755  0.004239
  2.500000  0.041994  0.046498  0.010118
  END FTABLE  2
  FTABLE      1
   47    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.041994  0.000000  0.000000  0.000000
  0.054945  0.047012  0.002580  0.000000  0.216723
  0.109890  0.047119  0.005166  0.000000  0.232600
  0.164835  0.047227  0.007758  0.000000  0.240539
  0.219780  0.047335  0.010356  0.000000  0.248477
  0.274725  0.047443  0.012960  0.000000  0.256416
  0.329670  0.047551  0.015569  0.000000  0.264354
  0.384615  0.047659  0.018185  0.000000  0.272293
  0.439560  0.047767  0.020807  0.000000  0.280231
  0.494505  0.047875  0.023434  0.000000  0.288170
  0.549451  0.047983  0.026068  0.024138  0.296109
  0.604396  0.048091  0.028707  0.035072  0.304047
  0.659341  0.048198  0.031352  0.043329  0.311986
  0.714286  0.048306  0.034004  0.050248  0.319924
  0.769231  0.048414  0.036661  0.056322  0.327863
  0.824176  0.048522  0.039324  0.061803  0.335801
  0.879121  0.048630  0.041993  0.066836  0.343740
  0.934066  0.048738  0.044668  0.071515  0.351678
  0.989011  0.048846  0.047349  0.075906  0.359617
  1.043956  0.048954  0.050035  0.081480  0.367556
  1.098901  0.049062  0.052728  0.086137  0.375494
  1.153846  0.049169  0.055427  0.090433  0.383433
  1.208791  0.049277  0.058131  0.094486  0.391371
  1.263736  0.049385  0.060842  0.098346  0.399310
  1.318681  0.049493  0.063558  0.102044  0.407248
  1.373626  0.049601  0.066281  0.105604  0.415187
  1.428571  0.049709  0.069009  0.109040  0.423126
  1.483516  0.049817  0.071743  0.112366  0.431064
  1.538462  0.049925  0.074483  0.115593  0.439003
  1.593407  0.050033  0.077229  0.118730  0.446941
  1.648352  0.050141  0.079981  0.121783  0.454880
  1.703297  0.050248  0.082739  0.124760  0.462818
  1.758242  0.050356  0.085503  0.127666  0.470757
  1.813187  0.050464  0.088273  0.130507  0.478696
  1.868132  0.050572  0.091049  0.133286  0.486634
  1.923077  0.050680  0.093830  0.136007  0.494573
  1.978022  0.050788  0.096618  0.138674  0.502511
  2.032967  0.050896  0.099412  0.204771  0.510450
  2.087912  0.051004  0.102211  0.419246  0.518388
  2.142857  0.051112  0.105016  0.709918  0.526327
  2.197802  0.051220  0.107828  1.042894  0.534266
  2.252747  0.051327  0.110645  1.385587  0.542204
  2.307692  0.051435  0.113468  1.705266  0.550143
  2.362637  0.051543  0.116297  1.973660  0.558081
  2.417582  0.051651  0.119132  2.174208  0.566020
  2.472527  0.051759  0.121973  2.311081  0.573958
  2.500000  0.051813  0.123396  2.450436  0.577928
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7       SAME PERLND  45     EXTNL  SURLI
WDM      2 PREC     ENGL    1              RCHRES   1     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5            RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7            RCHRES   2     EXTNL  POTEV

END EXT SOURCES
```

```
EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1002 STAG     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1003 FLOW     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1978/ 1/ 4 21:45

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
47 5.3131E+03 5375.1     6051.9
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1978/ 1/ 4 21:45

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
2.3521  4509.2     -5.377E+04   11.851     11.851        3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1978/ 1/ 4 22: 0

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
47 5313.1     5375.1     6536.7
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1978/ 1/ 4 22: 0

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
2.3521  4509.2     -8.906E+04   19.550   1.9550E+01      3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1978/ 1/ 4 22:15

RCHRES:     1
```

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5449.4

ERROR/WARNING ID: 341 5

DATE/TIME: 1978/ 1/ 4 22:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-9.918E+03	2.1970	2.1969E+00	3

ERROR/WARNING ID: 341 6

DATE/TIME: 1980/ 1/29 3:45

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5817.4

ERROR/WARNING ID: 341 5

DATE/TIME: 1980/ 1/29 3:45

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-3.671E+04	8.1057	8.1057	3

ERROR/WARNING ID: 341 6

DATE/TIME: 1980/ 1/29 4: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5313.1	5375.1	5704.1

ERROR/WARNING ID: 341   5

DATE/TIME: 1980/ 1/29 4: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-2.846E+04	6.2898	6.2898E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1980/ 1/29 4:30

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5487.6

ERROR/WARNING ID: 341   5

DATE/TIME: 1980/ 1/29 4:30

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-1.270E+04	2.8122	2.8122E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1982/11/30 9:30

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5585.0

ERROR/WARNING ID: 341   5

DATE/TIME: 1982/11/30 9:30

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).

Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-1.978E+04	4.3773	4.3773E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1993/ 1/ 6 8: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5580.8

ERROR/WARNING ID: 341   5

DATE/TIME: 1993/ 1/ 6 8: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-1.948E+04	4.3102	4.3102E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1993/ 1/ 6 8:15

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5447.4

ERROR/WARNING ID: 341   5

DATE/TIME: 1993/ 1/ 6 8:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-9.775E+03	2.1653	2.1653E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1993/ 1/16 17: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5444.6

ERROR/WARNING ID: 341   5

DATE/TIME: 1993/ 1/16 17: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-9.565E+03	2.1189	2.1189E+00	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1993/ 1/16 19:15

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS	V1	V2	VOL
47	5.3131E+03	5375.1	5430.4

ERROR/WARNING ID: 341   5

DATE/TIME: 1993/ 1/16 19:15

RCHRES: 1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated. If extrapolation was small, no problem.
Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-8.537E+03	1.8913	1.8913	3

ERROR/WARNING ID: 341   6

DATE/TIME: 1993/ 2/ 8 1:15

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB(). To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows. This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

```
NROWS         V1         V2        VOL
47 5313.1     5375.1     5449.6
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1993/ 2/ 8  1:15

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
2.3521  4509.2     -9.935E+03    2.2008     2.2008       3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1993/ 2/ 8  1:30

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
47 5313.1     5375.1     5923.6
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1993/ 2/ 8  1:30

RCHRES:     1

Calculation of relative depth, using Newton's method of successive
approximations, converged to an invalid value (not in range 0.0 to 1.0).
Probably ftable was extrapolated.  If extrapolation was small, no problem.
Remedy; extend ftable.  Relevant data are:

A          B          C      RDEP1      RDEP2  COUNT
2.3521  4509.2     -4.443E+04    9.8032  9.8032E+00       3
```

```
ERROR/WARNING ID:   341   6

DATE/TIME: 1993/ 2/ 8  1:45

RCHRES:     1

The volume of water in this reach/mixed reservoir is greater than the value
in the "volume" column of the last row of RCHTAB().  To continue the
simulation the table has been extrapolated, based on information contained
in the last two rows.  This will usually result in some loss of accuracy.
If depth is being calculated it will also cause an error condition.
Relevant data are:

NROWS         V1         V2        VOL
47 5.3131E+03 5375.1     5433.5
```

```
ERROR/WARNING ID:   341   5

DATE/TIME: 1993/ 2/ 8  1:45

RCHRES:     1
```

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
2.3521	4509.2	-8.760E+03	1.9407	1.9407E+00	3

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Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Include a copy of the completed Pollutant Sources/Source Control Checklist used to document Source Control BMPs in Section H of this Template.

Appendix 8

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section **H** of the 20**18** SMR WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table H.1 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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. 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."**
☐ 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.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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.**	**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://www.rcwatershed.org/about/materials-library/#1450469138395-bb76dd39-d810 ☒ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**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://www.rcwatershed.org/about/materials-library/#1450469201433-f5f358c9-6008
❑ 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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 **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**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9**
☒ 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**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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 shut-off 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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 ❑ **Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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; "Outdoor Cleaning Activities;" and "Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants. Brochures can be found at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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.**	

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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.**

Attachment 1

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section H of the 2018 SMR WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table H.1 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	**… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE**		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include 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. 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."
❑ **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.

Attachment 1

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include 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.	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://www.rcwatershed.org/about/materials-library/#1450469138395-bb76dd39-d810 ❑ Provide IPM information to new owners, lessees and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features.	❑ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	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://www.rcwatershed.org/about/materials-library/#1450469201433-f5f358c9-6008
❑ **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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 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

Appendix 8
STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9
❑ **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

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include 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 shut-off 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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 ❑ Car dealerships and similar may rinse cars with water only.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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; "Outdoor Cleaning Activities;" and "Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants. Brochures can be found at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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.	

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include 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

Include the completed Operation and Maintenance Plan in this Appendix along with additional documentation of Finance and Maintenance Recording Mechanisms for the site. Refer to Sections 3.10 and 5 of the SMR WQMP and Section J of this Template.

Appendix 10: Educational Materials

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

Examples of material to provide in Appendix 10 may include but are not limited to the following:

- BMP Fact Sheets for proposed BMPs form Exhibit C: LID BMP Design Handbook of the SMR WQMP,
- Source control information and training material for site owners and operators,
- O&M training material,
- Other educational/training material related to site drainage and BMPs.

Outdoor Container Storage SC-31

Objectives

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

Description

Accidental releases of materials from above ground liquid storage tanks, drums, and dumpsters present the potential for contaminating stormwaters with many different pollutants. Tanks may store many potential stormwater runoff pollutants, such as gasoline, aviation gas, diesel fuel, ammonia, solvents, syrups, etc. Materials spilled, leaked, or lost from storage tanks may accumulate in soils or on other surfaces and be carried away by rainfall runoff. These source controls apply to containers located outside of a building used to temporarily store liquid materials and include installing safeguards against accidental releases, installing secondary containment, conducting regular inspections, and training employees in standard operating procedures and spill cleanup techniques.

Targeted Constituents

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

Approach

Pollution Prevention

- Educate employees about pollution prevention measures and goals
- Keep an accurate, up-to-date inventory of the materials delivered and stored on-site. Re-evaluate inventory needs and consider purchasing alternative products. Properly dispose of outdated products.
- Try to keep chemicals in their original containers, and keep them well labeled.

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Suggested Protocols

General

- Develop an operations plan that describes procedures for loading and/or unloading. Refer to SC-30 Outdoor Loading/Unloading for more detailed BMP information pertaining to loading and unloading of liquids.
- Protect materials from rainfall, runon, runoff, and wind dispersal:
  - Cover the storage area with a roof.
  - Minimize stormwater runon by enclosing the area or building a berm around it.
  - Use a "doghouse" structure for storage of liquid containers.
  - Use covered dumpsters for waste product containers.
- Employ safeguards against accidental releases:
  - Provide overflow protection devices to warn operator or automatic shut down transfer pumps.
  - Provide protection guards (bollards) around tanks and piping to prevent vehicle or forklift damage, and
  - Provide clear tagging or labeling, and restricting access to valves to reduce human error.
- Berm or surround tank or container with secondary containment system using dikes, liners, vaults, or double walled tanks.
- Contact the appropriate regulatory agency regarding environmental compliance for facilities with "spill ponds" designed to intercept, treat, and/or divert spills.
- Have registered and specifically trained professional engineers can identify and correct potential problems such as loose fittings, poor welding, and improper or poorly fitted gaskets for newly installed tank systems.

Storage Areas

- Provide storage tank piping located below product level with a shut-off valve at the tank; ideally this valve should be an automatic shear valve with the shut-off located inside the tank.
- Provide barriers such as posts or guard rails, where tanks are exposed, to prevent collision damage with vehicles.
- Provide secure storage to prevent vandalism.
- Place tight-fitting lids on all containers.
- Enclose or cover the containers where they are stored.

- Raise the containers off the ground by use of pallet or similar method, with provisions for spill control and secondary containment.
- Contain the material in such a manner that if the container leaks or spills, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters or groundwater.
- Place drip pans or absorbent materials beneath all mounted container taps, and at all potential drip and spill locations during filling and unloading of containers. Drip pans must be cleaned periodically, and all collected liquids and soiled absorbent materials must be reused/recycled or properly disposed.
- Ensure that any underground or aboveground storage tanks shall be designed and managed in accordance with applicable regulations, be identified as a potential pollution source, have secondary containment, such as a berm or dike with an impervious surface.
- Rainfall collected in secondary containment system must not contain pollutants for discharge to storm drain system.

Container Management

- Keep containers in good condition without corrosion or leaky seams.
- Place containers in a lean-to structure or otherwise covered to keep rainfall from reaching the drums.
- Replace containers if they are deteriorating to the point where leakage is occurring. Keep all containers undercover to prevent the entry of stormwater. Employees should be made aware of the importance of keeping the containers free from leaks.
- Keep waste container drums in an area such as a service bay. Drums stored outside must be stored in a lean-to type structure, shed or walk-in container.

Storage of Hazardous Materials

- Storage of reactive, ignitable, or flammable liquids must comply with the fire and hazardous waste codes.
- Place containers in a designated area that is paved, free of cracks and gaps, and impervious in order to contain leaks and spills. The area should also be covered.
- Surround stored hazardous materials and waste with a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain and a dead-end sump should be installed in the drain.

Inspection

- Provide regular inspections:
  - Inspect storage areas regularly for leaks or spills.

- Conduct routine inspections and check for external corrosion of material containers. Also check for structural failure, spills and overfills due to operator error, failure of piping system.

- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installations for loose fittings, poor welding, and improper or poorly fitted gaskets.

- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

- Replace containers that are leaking, corroded, or otherwise deteriorating with ones in good condition. If the liquid chemicals are corrosive, containers made of compatible materials must be used instead of metal drums.

- Label new or secondary containers with the product name and hazards.

Training

- Train employees (e.g. fork lift operators) and contractors in 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 in proper storage measures.

- Use a training log or similar method to document training.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date, and implement accordingly.

- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills.

- Collect all spilled liquids and properly dispose of them.

- Employees trained in emergency spill cleanup procedures should be present when dangerous waste, liquid chemicals, or other wastes are delivered.

- Operator errors can be prevented by using engineering safe guards and thus reducing accidental releases of pollutant.

- Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area.

- See Aboveground Tank Leak and Spill Control section of the Spill Prevention, Control & Cleanup fact sheet (SC-11) for additional information.

Other Considerations

- Storage sheds often must meet building and fire code requirements.
- The local fire district must be consulted for limitations on clearance of roof covers over containers used to store flammable materials.
- All specific standards set by federal and state laws concerning the storage of oil and hazardous materials must be met.
- Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code.
- Storage of oil and hazardous materials must meet specific federal and state standards including:
  - Spill Prevention Control and Countermeasure Plan (SPCC) Plan
  - Secondary containment
  - Integrity and leak detection monitoring
  - Emergency preparedness plans

Requirements

Costs

- Will vary depending on the size of the facility and the necessary controls, such as berms or safeguards against accidental controls.

Maintenance

- Conduct weekly inspection.
- Sweep and clean the storage area regularly if it is paved, do not hose down the area to a storm drain.

Supplemental Information

- The most common causes of unintentional releases are:
  - Installation problems,
  - Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves),
  - External corrosion and structural failure,
  - Spills and overfills due to operator error, and
  - Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Further Detail of the BMP

Dikes

One of the best protective measures against contamination of stormwater is diking. Containment dikes are berms or retaining walls that are designed to hold spills. Diking is an effective pollution prevention measure for above ground storage tanks and railcar or tank truck loading and unloading areas. The dike surrounds the area of concern and holds the spill, keeping spill materials separated from the stormwater side of the dike area. Diking can be used in any industrial or municipal facility, but it is most commonly used for controlling large spills or releases from liquid storage areas and liquid transfer areas.

- For single-wall tanks, containment dikes should be large enough to hold the contents of the storage tank for the facility plus rainwater.
- For trucks, diked areas should be capable of holding an amount equal to the volume of the tank truck compartment. Diked construction material should be strong enough to safely hold spilled materials.
- Dike materials can consist of earth, concrete, synthetic materials, metal, or other impervious materials.
- Strong acids or bases may react with metal containers, concrete, and some plastics.
- Where strong acids or bases or stored, alternative dike materials should be considered. More active organic chemicals may need certain special liners for dikes.
- Dikes may also be designed with impermeable materials to increase containment capabilities.
- Dikes should be inspected during or after significant storms or spills to check for washouts or overflows.
- Regular checks of containment dikes to insure the dikes are capable of holding spills should be conducted.
- Inability of a structure to retain stormwater, dike erosion, soggy areas, or changes in vegetation indicate problems with dike structures. Damaged areas should be patched and stabilized immediately.
- Accumulated stormwater in the containment are should be analyzed for pollutants before it is released to surface waters. If pollutants are found or if stormwater quality is not determined, then methods other than discharging to surface waters should be employed (e.g., discharge to sanitary sewer if allowed).
- Earthen dikes may require special maintenance of vegetation such as mulching and irrigation.

Curbing

Curbing is a barrier that surrounds an area of concern. Curbing is similar to containment diking in the way that it prevents spills and leaks from being released into the environment. The curbing is usually small scaled and does not contain large spills like diking. Curbing is common at many facilities in small areas where handling and transfer liquid materials occur. Curbing can redirect stormwater away from the storage area. It is useful in areas where liquid materials are transferred from one container to another. Asphalt is a common material used for curbing; however, curbing materials include earth, concrete, synthetic materials, metal, or other impenetrable materials.

- Spilled materials should be removed immediately from curbed areas to allow space for future spills.
- Curbs should have manually-controlled pump systems rather than common drainage systems for collection of spilled materials.
- The curbed area should be inspected regularly to clear clogging debris.
- Maintenance should also be conducted frequently to prevent overflow of any spilled materials as curbed areas are designed only for smaller spills.
- Curbing has the following advantages:
  - Excellent runon control,
  - Inexpensive,
  - Ease of installment,
  - Provides option to recycle materials spilled in curb areas, and
  - Common industry practice.

Examples

The “doghouse” design has been used to store small liquid containers. The roof and flooring design prevent contact with direct rain or runoff. The doghouse has two solid structural walls and two canvas covered walls. The flooring is wire mesh about secondary containment. The unit has been used successfully at Lockheed Missile and Space Company in Sunnyvale.

References and Resources

British Columbia Lake Stewardship Society. Best Management Practices to Protect Water Quality from Non-Point Source Pollution. March 2000
http://www.nalms.org/bclss/storage.html

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

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

Outdoor Storage of Raw Materials SC-33

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

Raw materials, by-products, finished products, containers, and material storage areas exposed to rain and/or runoff can pollute stormwater. Stormwater can become contaminated when materials wash off or dissolve into water or are added to runoff by spills and leaks. Improper storage of these materials can result in accidental spills and the release of materials. To prevent or reduce the discharge of pollutants to stormwater from material delivery and storage, pollution prevention and source control measures, such as minimizing the storage of hazardous materials on-site, enclosing or covering materials, storing materials in a designated area, installing secondary containment, conducting regular inspections, preventing stormwater runon and runoff, and training employees and subcontractors must be implemented.

Targeted Constituents

Sediment
Nutrients
Trash
Metals
Bacteria
Oil and Grease
Organics
Oxygen Demanding

Approach

Pollution Prevention

- Employee education is paramount for successful BMP implementation.
- Minimize inventory of raw materials.
- Keep an accurate, up-to-date inventory of the materials delivered and stored on-site.
- Try to keep chemicals in their original containers, and keep them well labeled.

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SC-33 Outdoor Storage of Raw Materials

Suggested Protocols

General

- Store all materials inside. If this is not feasible, then all outside storage areas should be covered with a roof, and bermed, or enclosed to prevent stormwater contact. At the very minimum, a temporary waterproof covering made of polyethylene, polypropylene or hypalon should be used over all materials stored outside.
- Cover and contain the stockpiles of raw materials to prevent stormwater from running into the covered piles. The covers must be in place at all times when work with the stockpiles is not occurring. (applicable to small stockpiles only).
- If the stockpiles are so large that they cannot feasibly be covered and contained, implement erosion control practices at the perimeter of your site and at any catch basins to prevent erosion of the stockpiled material off site,
- Keep liquids in a designated area on a paved impervious surface within a secondary containment.
- Keep outdoor storage containers in good condition.
- Keep storage areas clean and dry.
- Design paved areas to be sloped in a manner that minimizes the pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5 percent is recommended.
- Secure drums stored in an area where unauthorized persons may gain access to prevent accidental spillage, pilferage, or any unauthorized use.
- Cover wood products treated with chromated copper arsenate, ammonical copper zinc arsenate, creosote, or pentachlorophenol with tarps or store indoors.

Raw Material Containment

- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items in secondary containers if applicable.
- Prevent the run-on of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the stockpile areas, by placing a curb along the perimeter of the area. The area inside the curb should slope to a drain. Liquids should be drained to the sanitary sewer if allowed. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Tanks should be bermed or surrounded by a secondary containment system.
- Release accumulated stormwater in petroleum storage areas prior to the next storm. At a minimum, water should pass through an oil/water separator and, if allowed, discharged to a sanitary sewer.

Inspection

- Conduct regular inspections of storage areas so that leaks and spills are detected as soon as possible.
- Conduct routine inspections and check for external corrosion of material containers. Also check for structural failure, spills and overfills due to operator error, failure of piping system.
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
- Visually inspect new tank or container installations for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

Training

- Employees should be well trained in proper material storage.
- 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, 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.
- Have employees trained in spill containment and cleanup present during loading/unloading of dangerous waste, liquid chemicals and other potentially hazardous materials.

Other Considerations

- Storage sheds often must meet building and fire code requirements. Storage of reactive, ignitable, or flammable liquids must comply with the Uniform Fire Code and the National Electric Code.
- Space limitations may preclude storing some materials indoors.
- Some municipalities require that secondary containment areas (regardless of size) be connected to the sanitary sewer, prohibiting any hard connections to the storm drain. Storage sheds often must meet building and fire code requirements.
- The local fire district must be consulted for limitations on clearance of roof covers over containers used to store flammable materials.

SC-33 Outdoor Storage of Raw Materials

Requirements

Costs

- Costs will vary depending on the size of the facility and the necessary controls. They should be low except where large areas may have to be covered.

Maintenance

- Accurate and up-to-date inventories should be kept of all stored materials.
- Berms and curbs may require periodic repair and patching.
- Parking lots or other surfaces near bulk materials storage areas should be swept periodically to remove debris blown or washed from storage area.
- Sweep paved storage areas regularly for collection and disposal of loose solid materials, do not hose down the area to a storm drain or conveyance ditch.
- Keep outdoor storage areas in good condition (e.g. repair roofs, floors, etc. to limit releases to runoff).

Supplemental Information

Further Detail of the BMP

Raw Material Containment

Paved areas should be sloped in a manner that minimize the pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5 percent is recommended.

- Curbing should be placed along the perimeter of the area to prevent the runon of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the stockpile areas.
- The storm drainage system should be designed to minimize the use of catch basins in the interior of the area as they tend to rapidly fill with manufacturing material.
- The area should be sloped to drain stormwater to the perimeter where it can be collected or to internal drainage alleyways where material is not stockpiled.
- If the raw material, by-product, or product is a liquid, more information for outside storage of liquids can be found under SC-31, Outdoor Container Storage.

Examples

The "doghouse" design has been used to store small liquid containers. The roof and flooring design prevent contact with direct rain or runoff. The doghouse has two solid structural walls and two canvas covered walls. The flooring is wire mesh about secondary containment. The unit has been used successively at Lockheed Missile and Space Company in Sunnyvale.

References and Resources

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

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).

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

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

Waste Handling & Disposal SC-34

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, reuse, and recycling; and preventing run-on and runoff.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

General Pollution Prevention Protocols

- ☐ Accomplish reduction in the amount of waste generated using the following source controls:
  - ✓ Production planning and sequencing;
  - ✓ Process or equipment modification;
  - ✓ Raw material substitution or elimination;
  - ✓ Loss prevention and housekeeping;
  - ✓ Waste segregation and separation; and
  - ✓ 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.

Objectives

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

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

Minimum BMPs Covered	
Good Housekeeping	✓
Preventative Maintenance	✓
Spill and Leak Prevention and Response	✓
Material Handling & Waste Management	✓
Erosion and Sediment Controls	
Employee Training Program	✓
Quality Assurance Record Keeping	✓

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- Use the entire product before disposing of the container.
- To the extent possible, store wastes under cover or indoors after ensuring all safety concerns such as fire hazard and ventilation are addressed.
- Provide containers for each waste stream at each work station. Allow time after shift to clean area.

Good Housekeeping

- 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 run-on 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.
- 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. Clean in a designated wash area that drains to a clarifier.
- 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.
- 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 or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.
- If possible, move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Preventative Maintenance

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.

- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or 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.
- Check waste 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 waste management area regularly. Use dry methods when possible (e.g., sweeping, vacuuming, 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.
- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Spill Response and Prevention Procedures

- Keep your spill prevention and plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills.
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - ✓ Vehicles equipped with baffles for liquid waste; and
  - ✓ Trucks with sealed gates and spill guards for solid waste.

Material Handling and Waste Management

Litter Control

- 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 regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- 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. Affix labels to all waste containers.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Employee Training Program

- Educate employees about pollution prevention measures and goals.
- Train employees how to properly handle and dispose of waste using the source control BMPs described above.
- Train employees and subcontractors in proper hazardous waste management.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

Quality Assurance and Record Keeping

- Keep accurate maintenance logs that document minimum BMP activities performed for waste handling and disposal, types and quantities of waste disposed of, and any improvement actions.
- Keep accurate logs of spill response actions that document what was spilled, how it was cleaned up, and how the waste was disposed.

- Establish procedures to complete logs and file them in the central office.

Potential Capital Facility Costs and Operation & Maintenance Requirements

Facilities

- Capital costs will vary substantially depending on the size of the facility and the types of waste handled. Significant capital costs may be associated with reducing wastes by modifying processes or implementing closed-loop recycling.
- Many facilities will already have indoor covered areas where waste materials will be stored and will require no additional capital expenditures for providing cover.
- If outdoor storage of wastes is required, construction of berms or other means to prevent stormwater run-on and runoff may require appropriate constructed systems for containment.
- Capital investments will likely be required at some sites if adequate cover and containment facilities do not exist and can vary significantly depending upon site conditions.

Maintenance

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

References and Resources

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Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities. Available online at: http://ocwatersheds.com/documents/bmp/industrialcommercialbusinessesactivities

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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

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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	J
Nutrients	
Trash	J
Metals	
Bacteria	J
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

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