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: Rancho Springs Medical Center

Development No:

Design Review/Case No: DP 2020-2199/RP 2020-2200

Prepared for: Universal Health Service, Inc.
Loren Williams/ 858-342-1049

Prepared by: Kimley-Horn and Associates, Inc.
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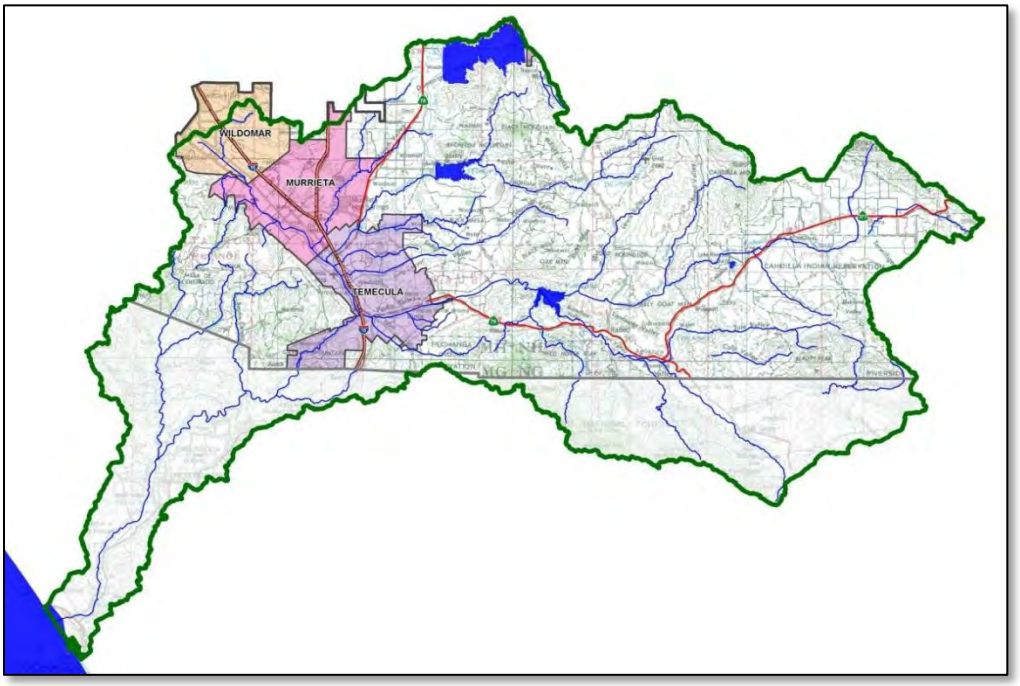


☐ **Preliminary**
☒ **Final**

Original Date Prepared: June 5, 2020

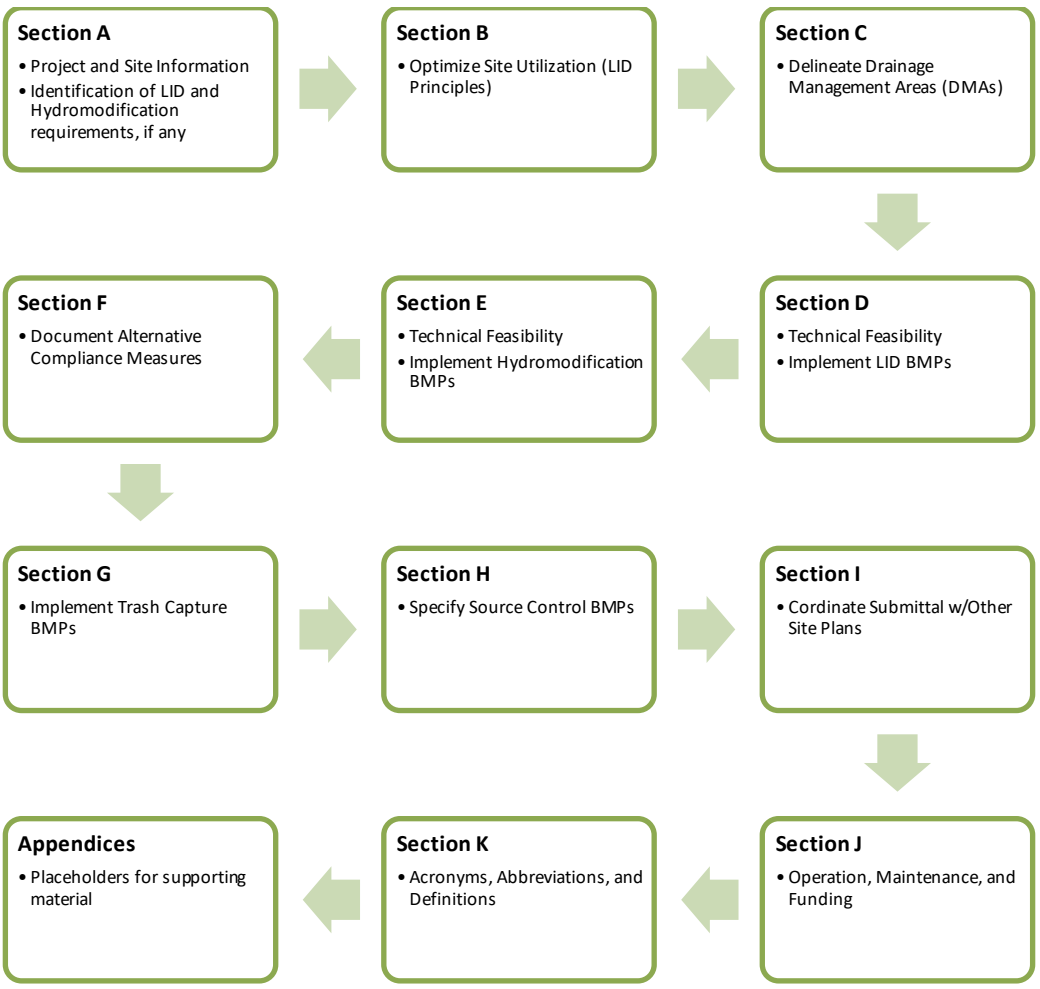
Revision Date(s): November 25, 2020

May 13, 2021

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 Universal Health Service, Inc. by Kimley-Horn and Associates, Inc. for the Rancho Springs Medical Center Expansion 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."

Loren Alex Williams — Owner's Signature

06/01/2021 — Date

Loren Alex Williams — Owner's Printed Name

Sr Regional Project Manager — 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**."

Nicole Kerry — Preparer's Signature

05/13/2021 — Date

Nikki Kerry, P.E. — Preparer's Printed Name

Project Engineer — Preparer's Title/Position

Preparer's Licensure: 58449

Table of Contents

List of Tables

List of Appendices

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:	Redevelopment	
Type of Project:	Commercial - Hospital	
Planning Area:	N/A	
Community Name:	N/A	
Development Name:	Rancho Springs Medical Center	
PROJECT LOCATION		
Latitude & Longitude (DMS):	33.558626, -117.183417	
Project Watershed and Sub-Watershed:	Santa Margarita River, Santa Margarita HU; Murrieta HA	
24-Hour 85th Percentile Storm Depth (inches):	0.8	
Is project subject to Hydromodification requirements?	☒ Y ☐ N (Select based on Section A.3)	
APN(s):	912-010-032	
Map Book and Page No.:		
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)		Medical Offices -Hospital
Proposed or Potential SIC Code(s)		8051, 8069
Existing Impervious Area of Project Footprint (SF)		174,008 sf
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement		182,239 sf
Total Project Area (ac)		5.30 acres
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 If "Y" insert Cell Number
Are there any natural hydrologic features on the project site?		☐ Y ☒ N
Is a Geotechnical Report attached?		☒ Y ☐ N
If no Geotech. Report, list the Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)		N/A

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
Murrietta Creek	Chlorpyrifos, Indicator Bacteria, Copper, Iron, Manganese, Nitrogen, Phosphorus, Toxicity	MUNI, AGR, IND, PROC, REC2, WARM, WILD	
Santa Margarita River (Upper)	Indicator bacteria, Iron, Manganese, Nitrogen, Phosphorus, Selenium, Toxicity	MUN, AGR, IND, REC1, REC2, WARN, COLD, WILD, **RARE**	The site is approximately 4 miles northwest from the confluence of Murrieta Creek and the Santa Margarita River.
Santa Margarita River (Lower)	Benthic Community Effect, Chlorpyrifos, Indicator Bacteria, Nitrogen, Phosphorus, Toxicity		

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
Murrietta Creek 4.6 miles	Native bottom	Exempt at the confluence and downstream of Warm Springs Creek	☐ Y ☒ N
Santa Margarita River 26 miles	Engineered bottom	Exempt.	☒ Y ☐ N
			☐ 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.

Yes, under existing conditions, stormwater runoff sheetflows towards multiple drain inlets centrally located around the Medical Building. Under proposed conditions, storm water will generally flow the same drainage patterns and be collected in a detention basin designed to release storm water at a calculated rate to mimic existing conditions.

☐ 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. *Existing vegetation will be redeveloped as part of the project. Additionally, vegetation strips and buffers similar to those of existing conditions have been proposed.*

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. *The Geotechnical Investigation prepared for this project identified low infiltration rates and therefore no infiltration BMPs have been identified.*	
☒ 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 areas have been minimized to the maximum extent practicable. Impervious areas are included for parking, sidewalks, and the medical building expansion. Parking lots, drive aisles, and sidewalks have all been designed to the minimum dimensions allowed.*	

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. *Based on the parking lot parking aisles, and proposed walkways, runoff dispersion will be limited near Medical Center Drive. Runoff from all areas will be diverted via a proposed storm drain system to a Bioclean Modular Wetland System.*	
☒ 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 or drought tolerant species to be provided in final design.*	

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. *Project does not provide enough demand to meet harvest and use drawdown requirements.*	
☐ 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. *Landscaped areas will be mostly in parking islands which will have a curb. However, during a large enough storm event, flow would enter the proposed BMPs. Sedimentation will be reduced through the implementation of vegetation and through inspection and maintenance of landscaped areas.*	

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	Asphalt, Concrete, and Landscape	210236	Type D
2	Asphalt, Concrete, and Landscape	18371	Deminimis (Cannot be routed to treatment system due to grading constraints)
3	Asphalt, Concrete, and Landscape	2115	Deminimis (Cannot be routed to treatment system due to grading constraints)

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)

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] = $[B] + \frac{[B]\cdot[C]}{[A]}$

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]

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

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

(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	Bioclean Modular Wetland System

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.

An updated Geotechnical Investigation Report, dated December 16, 2019 was prepared for the site by NOVA Services Inc. Five borings were advanced onsite. An upper fill layer in the upper 1 to 13 feet below ground surface (bgs) consists of silty sandy fill. Other sandstone/siltstone was encountered below the fill materials from about 3 feet to 13 feet bgs. The observed infiltration rates ranged from 0.33 to 2.64 in/hour at depths between 10-15 feet bgs. The highest infiltration rate was determined to be an outlier as this was found to be located near a utility trench. After applying a factor of safety of F-3, the lowest design infiltration rate is 0.11 in/hour.

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:		
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:		
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:		

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 (infiltration rate)		DMA 1-3

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)
1	Y	
2	Y	
3	Y	
4	Y	

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
Bioclean Modular Wetland System	☒ Proposed BMP has an active TAPE GULD Certification for the project pollutants of concern[4] or equivalent 3rd party demonstrated performance.	
	☒ The BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification.	
	☒ The BMP includes biological features including vegetation supported by engineered or other growing media.	
	☐ 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.	Bioclean Modular Wetland system is proprietary and is fully enclosed in concrete vault thus not allowing for partial infiltration. However, the proposed underground detention system will have open windows at its base to allow for minimal infiltration.

[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.	The Bioclean Modular Wetland System was sized for the water quality design flow rate of 0.61 cfs

Runoff entering the Bioclean Modular Wetland system will be controlled in a flow control structure immediately upstream of BMP #1. The treated runoff from the system will discharge to the proposed underground detention vault system.

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	
1	☐	☐	☒	☐
Insert text here	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐
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?	

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

b) When in the entitlement process were other investigations conducted (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?	
d) What public health and safety requirements affected infiltration locations?	
e) What were the conclusions and recommendations of the geotechnical engineer and/or other professional responsible for other investigations?	
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?	
g) What site design alternatives were considered to achieve infiltration or partial infiltration on site?	
h) What physical impairments (i.e., fire road egress, public safety considerations, utilities) and public safety concerns influenced site layout and infiltration feasibility?	

i) What LID Principles (site design BMPs) were included in the project site design?	

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]			
Total	*230,722*	*Mixed*	*0.82*	*0.62*	*143,048*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	263,089					0.8	95,48	***n/a***

[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 Flow (cfs)	Proposed Flow (cfs)
1	1,	Bioclean Modular Wetland System	0.61	0.61

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)
2	Total	Underground vault detention system	☒	0.882	0.15	73
			☐			
			☐			
			☐			

Runoff collected in DMA 1 will be routed into the Bioclean Modular Wetland System via the proposed underground storm drain system. After filtering through a pre-engineered soil mixture and collected in the perforated underdrain, the treated stormwater will discharge into the onsite underground vault detention system. Runoff exceeding the Bioclean Modular Wetland System capacity will bypass and discharge directly to the underground vault detention system. Minimal infiltration will be allowed in the system via windows at the base of the system. Outflow from the detention system will be controlled with a orifice and weir wall.

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.

Insert narrative description here

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]		
1	*210236*	*Mixed*	*0.82*	*0.63*	*132,448*	*Trash Capture Design Storm Intensity (in) [E]*	*Trash Capture Design Flow Rate (cubic feet or cfs) [D]*[E]/[G]*
	228607				132448[D]	0.47	***1.4***

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

Each Drainage Management Area has multiple sub-drainage areas which will have a grate or curb inlet. A FloGard Catch Basin Insert Filter has been proposed for each catch basin and will be sized per the manufacturer's sizing guide to meet design flow rates for each sub area.

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)
FloGard Catch Basin Insert Filter	1	FloGard Catch Basin Insert Filter	1.4	0.3-1.4

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
Storm Drain Inlets	Mark inlets with "Only Rain Down the Storm Drain"	Maintain and Periodically repaint of replace inlet markings. See CASQA Fact Sheet SC-44.
Trash Storage Areas	Refuse areas to be covered and marked with "Do Not Dump Hazardous Materials Here".	Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Pick liter up litter daily and clean up spills immediately. See CAQA Fact Sheet SC-34.

Fire Sprinkler Test/Maintenance Water	Provide means to drain fire sprinkler test water to the sanitary sewer.	Prevent and reduce the discharge of pollutants to stormwater from building. See CASQA Fact Sheet SC-22.
Plazas, Sidewalks, and Parking Lots		Sweep sidewalks and parking lots regularly to prevent accumulation of litter and debris.

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, City of Murrieta 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)
1	Storm drain keynote D9	Storm Drain Plans
2	Storm drain keynote D12	Storm Drain Plans
FloGard Inserts	Storm drain keynote D14	Storm Drain Plans
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: Maintenance agreement recorded against the property.

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): *Refer to Demolition Plan in Appendix 2.*
☒ 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

SANTA MARGARITA RIVER WATERSHED

Project Location

WILDOMAR

MURRIETA

TEMECULA

CAHUILLA INDIAN RESERVATION

PECHANGA INDIAN RESERVATION

RIVERSIDE

Warm Springs Creek

Murrieta Creek

Santa Gertrudis Creek

Long Canyon

Cole Creek

Adobe Creek

Tucalota Creek

Terrecula Creek

Pechawk

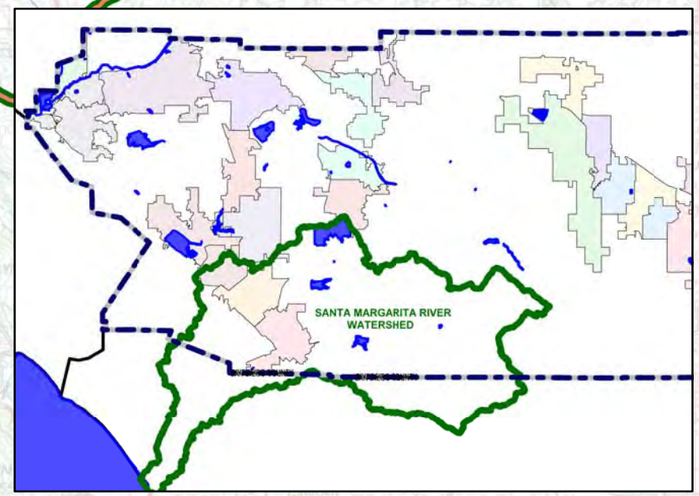
Santa Margarita

Temecula Creek

N

Legend

- RIVERSIDE COUNTY BOUNDARY
- SANTA MARGARITA RIVER MS4 PERMIT AREA BOUNDARY
- SANTA MARGARITA RIVER WATERSHED BOUNDARY



RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
GEOGRAPHIC INFORMATION SYSTEM
November 2013

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

0.85 MiraLoma
0.61 Riverside North
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.90 HurkeyCreek
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Santa Ana River Watershed
Santa Margarita Watershed

Project Location

JURUPA VALLEY | EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | HEMET | CANYON LAKE | LAKE ELSINORE | MENIFEE | WILDOMAR | MURRIETA | TEMECULA

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

DMA 1
4.83 AC
C = 0.63
Q_{BMP} = 0.61 CFS

DMA 2
0.42 AC
C = 0.29
Q_{BMP} = 0.02 CFS

DMA 3
0.05 AC
C = 0.63
Q_{BMP} = 0.01 CFS

EMERGENCY

LEGEND

- CENTER LINE
- PROPERTY LINE
- RIGHT-OF-WAY LINE / LEASE LINE
- EXISTING EASEMENT LINE
- PROPOSED EASEMENT LINE
- PROJECT LIMITS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- DENOTES DRAINAGE AREA BOUNDARY
- SURFACE FLOW DIRECTION
- PROPOSED LANDSCAPE

STRUCTURAL BMP NOTES

1. BMP #1: 8'X16' BIOCLEAN MODULAR WETLAND SYSTEM OR APPROVED EQUAL.
2. YARD DRAIN INLET WITH FLOGARD FILTER INSERT OR APPROVED EQUAL. SIZE PER PLAN.
3. STORM GATE MANHOLE FLOW CONTROL STRUCTURE.
4. BMP #2: UNDERGROUND VAULT DETENTION SYSTEM.
5. CURB INLET WITH FLOGARD FILTER INSERT OR APPROVED EQUAL. SIZE PER PLAN.
6. GRATE INLET WITH FLOGARD FILTER INSERT OR APPROVED EQUAL. SIZE PER PLAN.

SOURCE CONTROL BMP NOTES

- S1 STORM DRAIN INLET – MARK ALL INLETS WITH WORDS "ONLY RAIN DOWN THE STORM DRAIN" OR SIMILAR.
- S3 BUILDING DESIGN FEATURES TO DISCOURAGE ENTRY OF PESTS.
- S4 LANDSCAPE DESIGN TO MINIMIZE THE USE OF FERTILIZERS AND PESTICIDES: LANDSCAPE PALATE TO CONSIST OF PLANTS APPROPRIATE FOR SITE SOILS, SLOPES, CLIMATE, SUN, WING, RAIN, AND LAND USE.
- S5 TRASH ENCLOSURE DUMPSTER; KEEP LIDS CLOSED AND AREA CLEAN.
- S8 FIRE SPRINKLER TEST WATER TO DRAIN TO SANITARY SEWER.
- S10 PLAZAS SIDEWALKS AND PARKING LOTS TO BE SWEPT CLEAN REGULARLY TO PREVENT THE ACCUMULATION OF LITTER AND DEBRIS.

DRAINAGE AREAS SUMMARY

DRAINAGE MANAGEMENT AREA	ACREAGE	DESIGN CAPTURE VOLUME	WATER QUALITY FLOW RATE (CFS)	TREATMENT METHOD	HYDROMODIFICATION BMP	HYDROMODIFICATION VOLUME (AC-FT)
DMA 1	4.83	9548	0.61	BIOCLEAN MODULAR WETLAND SYSTEM	UNDERGROUND VAULT DETENTION SYSTEM	0.882
DMA 2	0.42		0.02	DE MINIMIS (LANDSCAPED AREAS SELF TREATING)		
DMA 3	0.05		0.01	DE MINIMIS (LANDSCAPED AREAS SELF TREATING)		

NORTH

GRAPHIC SCALE IN FEET
0 20 40 80

RANCHO SPRINGS MEDICAL CENTER
WQMP EXHIBIT
MAY 2021

Kimley»Horn

660 S. FIGUEROA ST, SUITE 2050, LOS ANGELES, CA 90017
PHONE: 213-261-4040

Appendix 2: Construction Plans

The latest set of Grading, Drainage and Street Improvement Plans **shall be included.**

For Bioretention and Biofiltration facilities, the following construction notes shall be shown on the Grading and/or Drainage plans.

1) BSM and Aggregates should not be delivered or placed in frozen, wet or muddy conditions. The Contractor should protect materials from absorbing excess water and from erosion at all times. The Contractor shall not store materials unprotected during large rainfall events (>.25 inches). If water is introduced into material while it is stockpiled, the Contractor shall allow the material to drain to an acceptable level before it is placed.
2) The Engineer shall furnish to the City a copy of the source testing and a signed certification that the fully blended Bioretention/Biofiltration Soil Media (BSM) material meets all of the WQMP requirements before the material is imported or if the material is mixed onsite prior to installation. Onsite mixing may only occur if sand or topsoil components are sourced from the Project site. Onsite mixing may be conducted by using loaders.
3) BSM shall be lightly compacted and placed in loose lifts of 12 inches thick. Compaction should not exceed 75% standard procter. Machinery should not be used in the BSM area to place BSM. As BSM material is being installed, Quality Assurance (QA) tests shall be conducted or for every 1,200 tons or 800 cubic yards mixed on-site from a completely mixed stockpile or windrow, with a minimum of three tests. For imported material from a supplier with a quality control program the QA tests shall be conducted 2,400 tons or 1,600 cubic yards from the supplier.
4) The Engineer conducting the Quality Control testing shall furnish to the City a copy of the QA testing and a certification that the BSM for the project meets all of the following requirements.
    a. BSM shall consist of 60-80% clean sand, up to 20% clean topsoil, and 20% of a nutrient-stabilized organic amendment. The initial infiltration rate shall be greater than 8 inches per hour per laboratory test.
    b. pH: 6.0 – 8.5; Salinity: 0.5 to 3.0 mmho/cm as electrical conductivity; sodium absorption ratio: < 6.0; Chloride: <800 ppm in saturated extract; Cation Exchange Capacity (CEC): > 10 meq/100 g; Organic Matter: 2 to 5 percent on a dry weight basis; Carbon: Nitrogen ratio: 12 to 40, preferably 15 to 40; Gravel larger than 2mm: 0 to 25-percent of the total sample; Clay smaller than 0.005 mm: 0 to 5 percent of the non-gravel fraction.
    c. BSM shall be tested to limit the leaching of potential inherent pollutants. BSM used in Biofiltration BMPs shall conform to the following limits for pollutant concentrations in saturated extract: Phosphorous: < 1 mg/L; Nitrate < 3 mg/L, Copper <0.025 mg/L. These pollutant limits are for the amount that is leached from the sample, not from the soil sample itself. Testing may be performed after laboratory rinsing of media with up to 15 pore volumes of water. Equivalent test results will be accepted if certified by a laboratory or appropriate testing facility.

d. Low nutrient compost used in BSM shall be sourced from a facility permitted through CalRecyle, preferably through USCC STA program. Compost shall conform to the following requirements: Physical contaminants <1% by dry weight; Carbon:Nitrogen ratio: 12:1 to 40:1, Maturity/Stability shall conform to either: Solvita Maturity Index: ≥ 5.5, CO_2 Evolution: < 2.5 mg CO_2-C per g compost organic matter per day, or < 5 mg CO_2 – shall be more than 6 months old and representative of current stockpiles.
e. Coconut coir pith used in BSM shall be thoroughly rinsed with freshwater and screened to remove coarse fibers as part of production and aged > 6 months. Peat used in BSM shall be sphagnum peat.

Potential BSM sources may include (not part of construction note): Gail Materials (Temescal Valley), Agriservice (Oceanside), Greatsoils (Escondido), and Earthworks (Riverside).

Potential Laboratories may include (not part of construction note): Fruit Growers Laboratory, Inc. (Santa Paula, http://www.fglinc.com/), Wallace Laboratories (El Segundo, http://us.wlabs.com/), Control Labs (Watsonville, http://controllabs.com) and A&L Western Laboratories (Modesto, http://www.al-labs-west.com/)

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.

UPDATE REPORT
GEOTECHNICAL INVESTIGATION

Proposed Two-Story Expansion and Renovation
Rancho Springs Medical Center Renovation
25500 Medical Center Drive, Murrieta, California

PREPARED FOR

RANCHO SPRINGS MEDICAL CENTER
A campus of Southwest Healthcare System

UHS of Delaware, Inc.
C/O The Barrie Company
9434 Chesapeake Drive, Suite 1208
San Diego, CA 92123

PREPARED BY

NOVA Services, Inc.
24632 San Juan Avenue, Suite 100
Dana Point, CA 92629

NOVA Project No. 3019061

December 16, 2019

NOVA

GEOTECHNICAL ■ MATERIALS ■ SPECIAL INSPECTIONS

SBE ■ DVBE

UHS of Delaware, Inc.
C/O Elizabeth Barrie
The Barrie Company
9434 Chesapeake Drive, Suite 1208
San Diego, CA 92123

December 16, 2019
NOVA Project No. 3019061

Attention: Mrs. Elizabeth Barrie

Subject: Update Report
Geotechnical Investigation
Proposed Rancho Springs Medical Center Two-Story Expansion and Renovation
25500 Medical Center Drive, Murrieta, California

Dear Mrs. Barrie:

NOVA Services, Inc. (NOVA) is pleased to present herewith its geotechnical investigation for the above-referenced project. The work reported therein was completed by NOVA for UHS of Delaware, Inc., in accordance with the scope of work identified in NOVA's proposal dated July 16, 2019, as authorized on July 26, 2019. This report has been updated and includes 2019 California Building Code (CBC) Seismic Design Parameters after ASCE 7-16. This report updates and replaces the previously submitted report dated 30 September 2019.

NOVA appreciates the opportunity to be of continued service to The Barrie Company and UHS of Delaware, Inc. Should you have any questions, please do not hesitate to contact the undersigned at (949) 388-7710.

Sincerely,

NOVA Services, Inc.

Jesse D. Bearfield, RCE
Senior Engineer

Tim Tavernetti, PG
Senior Geologist

John F. O'Brien, GE
Principal Geotechnical Engineer

Melissa Stayner PG, CEG
Senior Geologist

UPDATE REPORT
GEOTECHNICAL INVESTIGATION

Proposed Two-Story Expansion and Renovation
UHS Rancho Springs Medical Center
Murrieta, California

TABLE OF CONTENTS

List of Plates

List of Appendices

List of Tables

List of Figures

List of Figures (Continued)

1.0 INTRODUCTION

1.1 Terms of Reference

This report presents the findings of a geotechnical investigation of the site of a proposed two-story hospital building expansion and renovation to be constructed within the Rancho Springs Medical Center campus. This phase of development of the hospital will also include installation of a stormwater management facility.

The work reported herein was completed by NOVA Services, Inc. (NOVA) for UHS of Delaware, Inc. and The Barrie Company in accordance with the scope of work identified in NOVA's proposal dated July 16, 2019, as authorized on July 26, 2019.

Figure 1-1 depicts the vicinity of the Rancho Springs Medical Center campus.

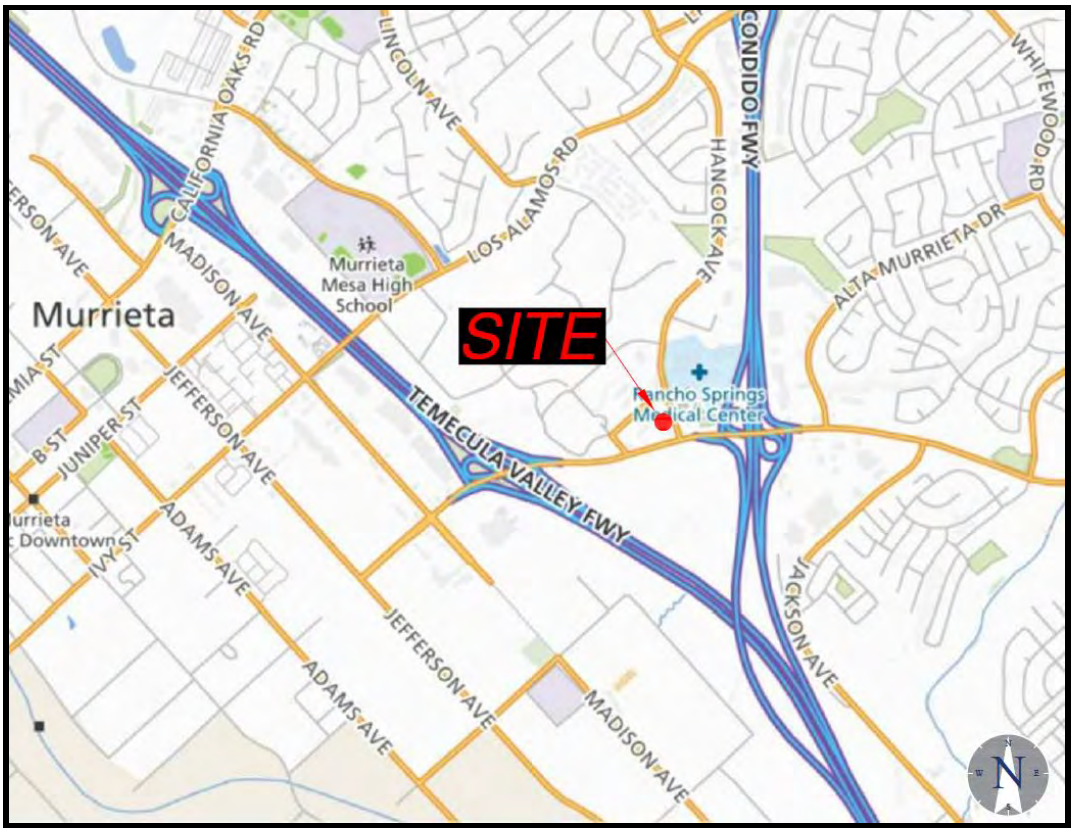


Figure 1-1. Vicinity Map

1.2 Objectives, Scope and Limitations of This Work

1.2.1 Objectives

The objectives of the work reported herein are twofold: (i) to characterize the subsurface conditions at the site in a manner sufficient to develop recommendations for geotechnical-related design and construction;

and, (ii) to conduct percolation testing to support development of recommendations for siting and design of permanent stormwater infiltration Best Management Practices ('BMPs').

1.2.2 Scope

In order to accomplish the above objective, NOVA undertook the task-based scope of services described below.

- Task 1, Review. Reviewed background data, including geotechnical reports, fault investigation reports and maps, topographic maps, geologic data, aerial photographs and preliminary development plans for the project. Coordinated with the Structural Engineer to obtain current structural information.

- Task 2, Field Exploration. Completed a subsurface exploration that included the subtasks listed below.

  - *Subtask 2-1, Reconnaissance.* Conducted a site reconnaissance, including layout of the engineering borings and soundings. Underground Service Alert was notified for utility mark-out services.

  - *Subtask 2-2, Engineering Borings.* Drilled, logged and sampled seven (7) engineering borings to depths of about 15 to 50 feet below existing ground surface (bgs). The borings were drilled and sampled using ASTM methodologies.

  - *Subtask 2-3, Percolation Testing.* Drilled five (5) percolation test borings, following which percolation testing was completed in each boring.

  - *Subtask 2-4, Closure*. The engineering borings and percolation test borings were each closed following completion. Closure consisted of backfilling the borings with cuttings from the drilling, as required by the City of Murrieta. Thereafter, the area around each boring was cleaned and restored to its approximate condition prior to drilling.

- Task 3, Laboratory Testing. Laboratory testing of both bulk and relatively undisturbed samples was completed using ASTM testing methods.

- Task 4, Engineering Evaluations. Utilizing the findings of the preceding tasks, conducted engineering evaluations that address the geotechnical-related aspects of the planned construction.

- Task 5, Reporting. Preparation of this report providing NOVA's findings and preliminary geotechnical recommendations completes the scope of work described in NOVA's proposal.

1.2.3 Limitations

The construction recommendations in this report are not final. These recommendations are developed by NOVA using judgment and opinion and based upon the limited information available from the borings and soundings. NOVA can finalize its recommendations only by observing actual subsurface conditions revealed during construction. At the time of preparation of this report, neither construction nor proposed

plans had been developed for the site. NOVA cannot assume responsibility or liability for the report's recommendations if NOVA does not perform construction observation.

This report does not provide any environmental assessment or investigation of the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site.

Appendix A to this report provides important additional guidance regarding the use and limitations of this report. This information should be reviewed by all users of the report.

1.3 Report Organization

The remainder of this report is organized as described below.

- Section 2 reviews the presently available project information.
- Section 3 describes the subsurface investigation and related laboratory testing.
- Section 4 describes the geologic setting and site-specific subsurface conditions.
- Section 5 reviews geologic, soil and siting-related hazards that commonly affect civil development in this region considering each for its potential to affect this site.
- Section 6 provides a description and an evaluation for developing seismic design parameters after ASCE 7-16 and 2019 California Building Code.
- Section 7 provides recommendations for earthwork and foundation-related design.
- Section 8 provides recommendations for development of stormwater infiltration BMPs.
- Section 9 provides recommendations for development of pavements.
- Section 10 lists the principal references utilized in preparation of this report.

Tables and figures that amplify discussion in the text of the report are embedded at the point at which they are referenced. Plates that provide larger scale views of certain figures are provided immediately following the text of the report.

The report is supported by four appendices. Appendix A provides guidance regarding the use and limitations of this report. Appendix B present logs of the borings. Appendix C provides records of the geotechnical laboratory testing.

The report is supported by four appendices.

- Appendix A presents guidance regarding use of this report.
- Appendix B provides logs of the engineering borings.
- Appendix C provides records of geotechnical laboratory testing.
- Appendix D provides documentation related to stormwater infiltration.

2.0 PROJECT INFORMATION

2.1 Location

The Rancho Springs Valley Medical Center is located at the address of 25500 Medical Center Drive, in the city of Murrieta, California. Plans for the proposed renovation are conceptual at this time, based upon referenced RFP documents (UHS RFP), NOVA understands that planned renovation will include the development of a new two-story expansion located in front of and immediately adjacent to an existing two-story emergency room building at the south side of the Rancho Springs Medical Center campus.

The medical campus and proposed project areas are bounded by vacant land to the north, Interstate 215 to the east, Murrieta Hot Springs Road to the south and Hancock Avenue to the west. Access to the medical campus is provided via the cul-de-sac of Medical Center Drive which terminates within the central portion of the campus.

Figure 2-1 provides a recent aerial view that depicts the location and approximate limits of the approximate project area at the site.

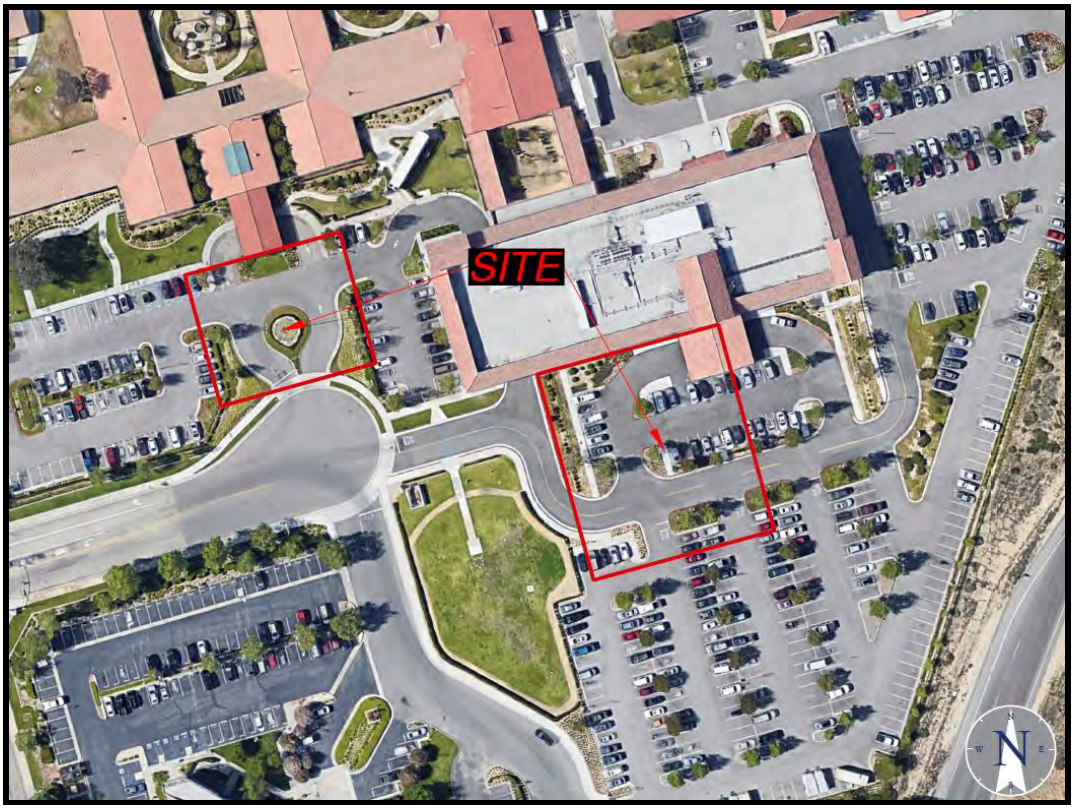


Figure 2-1. Location and Limits of the Site Improvements
(Source: adapted from Google Earth 2019)

2.2 Current and Historic Site Use

2.2.1 Current

As is evident by review of Figure 2-1, the proposed two-story expansion site location currently includes driveways and parking areas for the Rancho Springs emergency room. The parking areas include a few isolated landscaping islands supporting trees and arid environment ground cover. The average ground surface elevation in the vicinity of the planned two-story building expansion is about ±1,150 and the area of the proposed stormwater infiltration system to the west is ±1,147 feet mean sea level (msl), respectively.

2.2.2 Historic

NOVA reviewed historic aerial photography and topographic mapping dating to 1938 as a basis for understanding historical uses of the site. This review indicates that prior to development of Rancho Springs Hospital, the site area had minimal development. It appears that a historic drainage channel transected the campus as indicated in Figure 2-2. This drainage channel has been since graded out during the development of the hospital.

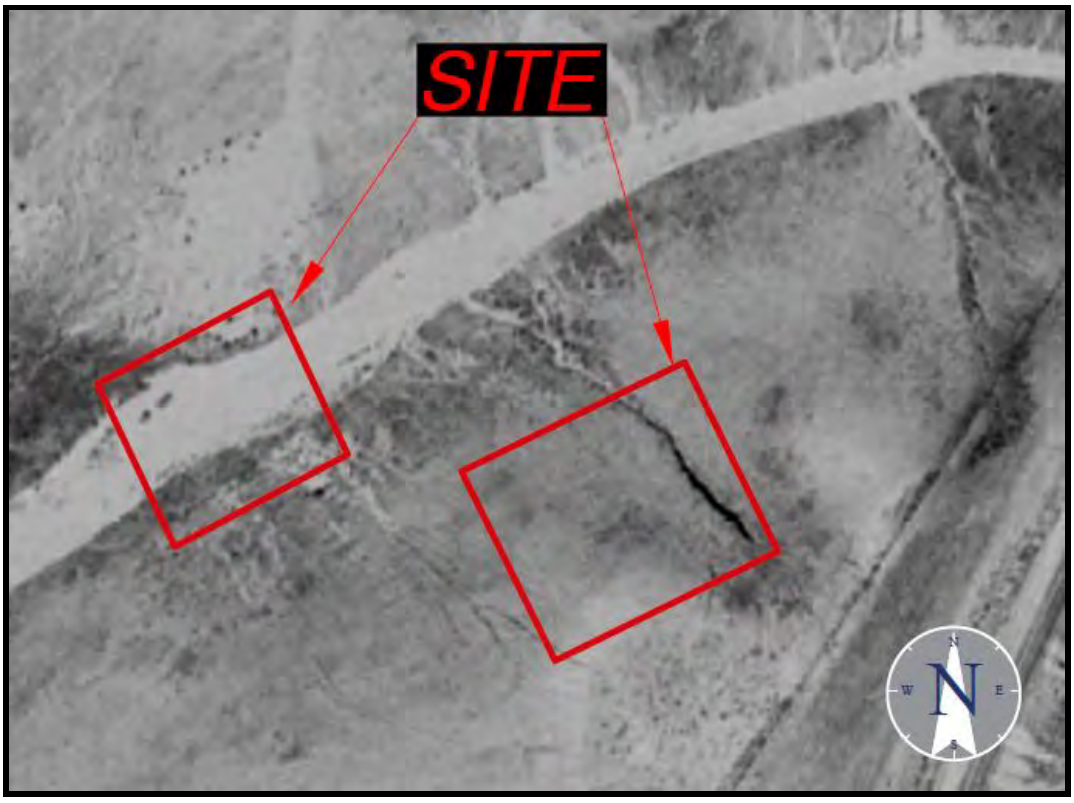


Figure 2-2. 1978 Historical Aerial Photograph of the Site Area

2.2.3 Previous Reporting

Previous geotechnical reporting for the development for some of the existing improvements and structures at Rancho Springs Valley Medical Center campus were reviewed. References to these reports are presented below.

- Leighton 2006. *Geotechnical Update Report, Rancho Springs Medical Office,* Leighton and Associates, Project No. 601207-001, January 3, 2006.

- Leighton 2007. *As Graded Report of Building Pad Remedial Grading and Post Grading, Rancho Springs Medical Office Building and Associated Improvements,* Leighton and Associates, Project No. 601207-003, November 20, 2007.

2.2.4 Schematic Planning

NOVA's understanding of current planning for the new two-story expansion and stormwater infiltration facility is based upon discussions with the design team, as well as review of the schematic design drawings that are listed below:

- KH 2019. *Rancho Springs Medical Center – Phase 2 Rough Grading,* Kimley Horn, 2019.

2.2.5 Architectural

Architect HOK describes the development of a two story, 18,095 square foot facility. NOVA anticipates the structure will be steel-framed centered near the southern midpoint of the existing hospital building, extending southward into the existing parking lot. The proposed expansion will be considered as an extension of the existing hospital emergency department at Rancho Springs Medical Center.

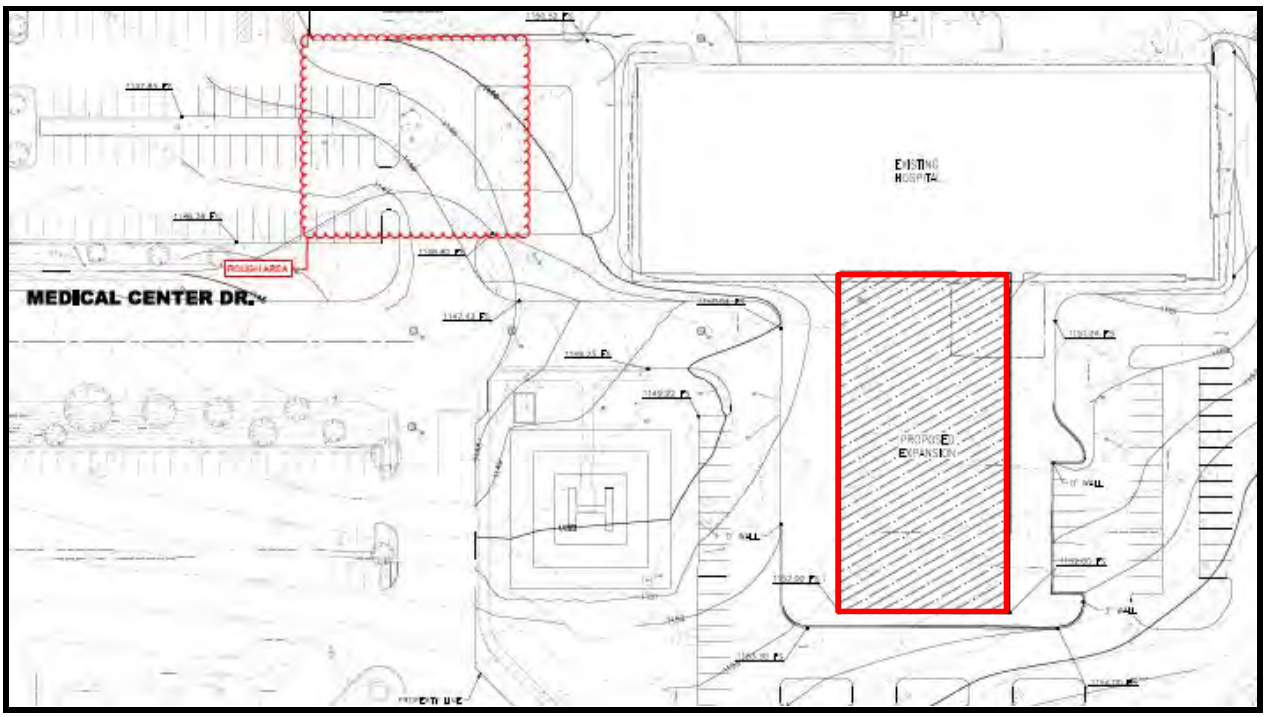


Figure 2-3. Proposed Two-Story Expansion and Infiltration Area
(Source: *Rancho Springs Medical Center, Phase 2 Rough Grading,* Kimley Horn 2019)

2.2.6 Structural

Limited information is available regarding structural concepts for the two-story expansion. Based upon experience with similar structures, NOVA expects that the new facility will be developed on shallow foundations, utilizing isolated and continuous foundations to support columns and walls. The interior floor slab will be a ground-supported mat. As noted above, it is anticipated that the structure will be steel framed.

Because design is still schematic, structural loads are unknown. However, Table 2-1 provides NOVA's estimate of the range of foundation reactions for this relatively light structure.

Table 2-1. Expected Column and Wall Loads (DL +LL)

Typical Exterior Col. Loads (kips)	Typical Interior Col. Loads (kips)	Typical Wall Loads (kips per lineal foot)
50 - 100	80 - 140	2- 4

2.2.7 Civil

The layout for the new facility is not yet finalized. Current planning considers options that generally center the planned expansion within the area of the existing asphalt-surfaced drive and parking area south of the existing emergency facility.

No below grade structures are depicted on the planning that has been reviewed by NOVA. Grading plans are not yet developed for the new facility. The current ground level is about one foot below the adjacent

street level, such that it is expected that development of the site will likely involve placing two to three feet of fill to adapt the new facility to the existing site and adjacent roadways.

Planning for stormwater management is not yet finalized and remains conceptual. The site development option in Figure 2-5 depicts the use of a storm water management area located west of the existing emergency structure and north of the Medical Center Drive cul-de-sac.

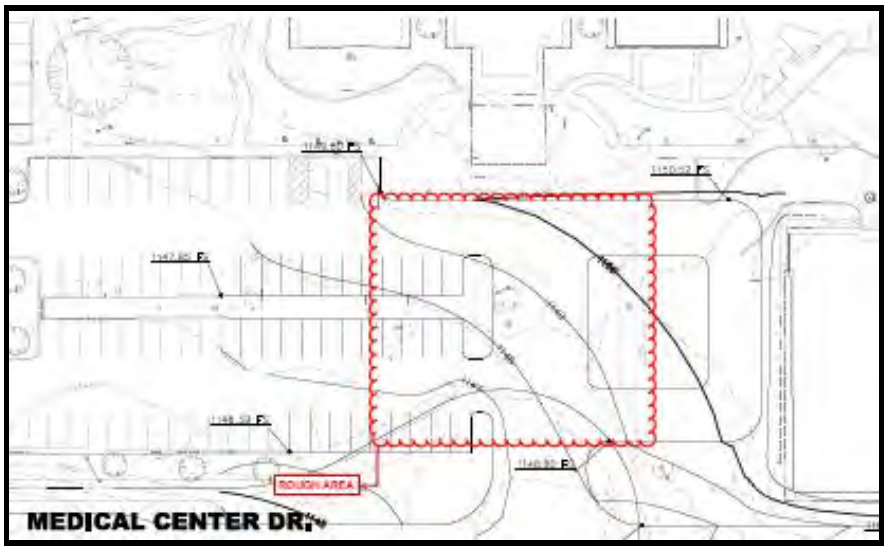


Figure 2-4. Proposed Stormwater Management Area
(Source: *Phase 2 Rough Grading* Kimley Horn 2019)

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Overview

The field exploration of the site was conducted on August 19, 2019. NOVA completed seven engineering borings ('B-1' through 'B-7') and five percolation tests ('P-1' through 'P-5'). The borings were drilled to a maximum depth of 50 feet below existing ground surface (bgs). Laboratory testing was completed on samples recovered from the borings. On November 2, 2019 a seismic traverse was performed to assess the one-dimensional average shear-wave velocity of the underlying site soils to a minimum depth of 100 feet bgs in order to classify the site in accordance with ASCE 7-16 Table 20.3-1.

Figure 3-1 provides a plan view of the site indicating the locations of the engineering and percolation test borings as well as the seismic traverse location (shown in blue). Plate 1, provided immediately following the text of this report, provides this graphic in larger detail.

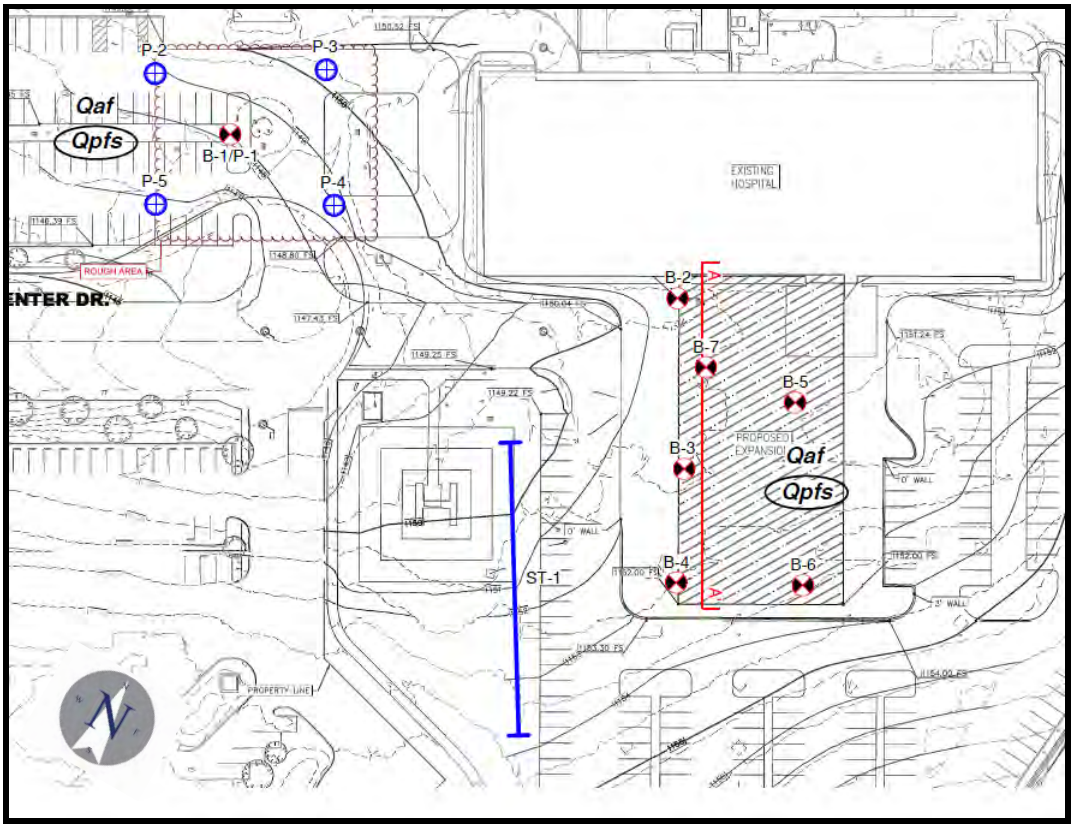


Figure 3-1. Engineering Borings, Percolation Test Borings, and Seismic Traverse Locations

3.2 Engineering Borings

3.2.1 Drilling

The geotechnical borings were advanced with a truck-mounted drill rig utilizing hollow stem drilling equipment. The borings were drilled at locations determined in the field by a NOVA geologist, then completed under the geologist's surveillance. Figure 3-2 below presents a photograph of the drilling operation.

Figure 3-2. Drilling Geotechnical Test Boring B-1

Table 3-1 provides an abstract of the engineering borings.

Table 3-1. Abstract of the Engineering Borings

Ref	Approx. Elev. (feet, msl)	Depth (feet)*	Approx. Ground Water Elevation (feet, msl)
B-1	+ 1,147	15.0	Not Encountered
B-2	± 1,149	26.5	Not Encountered
B-3	± 1,149	26.5	Not Encountered
B-4	± 1,151	21.5	Not Encountered
B-5	+1,151	21.5	Not Encountered
B-6	+ 1,151	21.5	Not Encountered
B-7	+ 1,150	50.0	Not Encountered

3.2.2 Sampling

Both disturbed and relatively undisturbed samples were recovered from the borings. Soil sampling was as described below.

1. The Modified California sampler ('ring sampler', after ASTM D3550) was driven using a 140-pound hammer falling for 30 inches with a total penetration of 18 inches, recording blow counts for each 6 inches of penetration.

2. The Standard Penetration Test sampler ('SPT', after ASTM D1586) was driven in the same manner as the ring sampler, recording blow counts in the same fashion. SPT blow counts for the final 12-inches of penetration comprise the SPT 'N' value, an index of soil consistency.

3. Bulk samples were recovered from the subsurface soils, providing composite samples for index testing.

Figure 3-3. Sample from B-7 at 30' bgs

3.2.3 Closure

Upon completion, each boring was backfilled with a mix of bentonite and soil cuttings and patched to match the existing surfacing.

Records of the engineering borings are presented in Appendix B.

3.3 Percolation Testing

3.3.1 General

NOVA directed the excavation and construction of five (5) percolation test borings, following the recommendations for percolation testing presented in the Riverside County Santa Margarita River

Watershed Region Design Handbook for Low Impact Development Best Management Practice (BMP) June 2018. The locations of these borings are shown in Figure 3-1.

3.3.2 Drilling

Borings were drilled with a truck mounted 8-inch hollow stem auger to the level of the base of expected stormwater infiltration BMPs. Field measurements were taken to confirm that the borings were excavated to approximately 8 inches in diameter.

The borings were logged by a NOVA geologist, who observed and recorded exposed soil cuttings and the boring conditions. Records of the feasibility documents for percolation testing are provided in Appendix D.

3.3.3 Conversion to Percolation Wells

Once the test borings were drilled to the design depth, the percolation test borings were converted to percolation wells by placing an approximately 2-inch layer of ¾-inch gravel on the bottom, then extending 3-inch diameter Schedule 40 perforated PVC pipe to the ground surface. The ¾-inch gravel was used to partially fill the annular space around the perforated pipe below existing grade to minimize the potential of soil caving.

3.3.4 Percolation Testing

The percolation test borings were pre-soaked by filling the holes with water to the ground surface elevation. Testing was conducted the following day, within a 24-hour window.

Water levels were recorded every 30 minutes for 6 hours (minimum of 12 readings), or until the water percolation stabilized after each reading. At the start of each half-hour test interval, the water level was raised to approximately the same height of previous tests, in order to maintain a near constant head during the 6-hour test. Water level (depth) measurements were obtained from the top of the pipe. Table 3-2 (following page) abstracts the indications of the percolation testing.

Table 3-2. Abstract of the Percolation Testing

Boring	Approx. Elevation (feet, msl) [2]	Total Depth (feet)	Approximate Percolation Test Elev. (feet, msl)	Percolation Rate (in/hour)	Subsurface Unit Tested[1]
P-1[3]	± 1,147	15.0	± 1,132	113.8[3]	Qpfs
P-2	± 1,148	10.0	± 1,138	12.0	Qpfs
P-3	± 1,148	10.0	± 1,138	15.6	Qpfs
P-4	± 1,147	11.0	± 1,136	28.8	Qpfs
P-5	± 1,147	10.0	± 1,137	18.6	Qpfs

Notes:
1. 'Qpfs' indicates 'Pauba Formation', occurring as a dense sandstone
2. Percolation test elevations are estimated.
3. P-1 appears to be within an existing utility trench. Test stopped after 2 hours for erroneous rates.

3.3.5 Closure

At the conclusion of the percolation testing, the upper sections of the PVC pipe were removed and the resulting holes backfilled with soil cuttings and patched to match the existing surfacing.

3.4 Shear Wave Velocity Analysis

3.4.1 General

A seismic shear wave survey was performed on November 2, 2019 by a Professional Geophysicist (PGP). The purpose of the survey was to assess the one-dimensional average shear-wave velocity of the underlying site soils to a minimum depth of 100 feet bgs in order to classify the site in accordance with ASCE 7-16 Table 20.3-1. Multi-channel analysis of surface waves (MASW) and microtremor array measurement (MAM) methods were used for the analysis. Combining results of both methods maximizes the depth and resolution of the data.

Figure 3-4. Seismic Survey Line, View towards the South.

The seismic survey of the subject site included one seismic shear wave survey traverse, approximately 180 feet in length. The approximate location is shown on Figure 3-5 and Plate 1. A 24-channel Geometrics StrataVisor NZXP model signal-enhancement refraction seismograph was used in conjunction with 24 4.5-Hz geophones spaced at regular intervals.

For the MASW survey, two seismic records were obtained by multiple hammer strikes of a 16-pound sledge hammer on steel plates positioned 25 feet from the end of each terminus of the seismic line. Vibrations were recorded using a one second record length at a sampling rate of 0.5 milliseconds.

The MAM survey records vibrations from background and ambient noise. The ground vibrations were recorded using a 32-second record length at 2-milisecond sampling rate with 30 separate records obtained for quality control purposes.

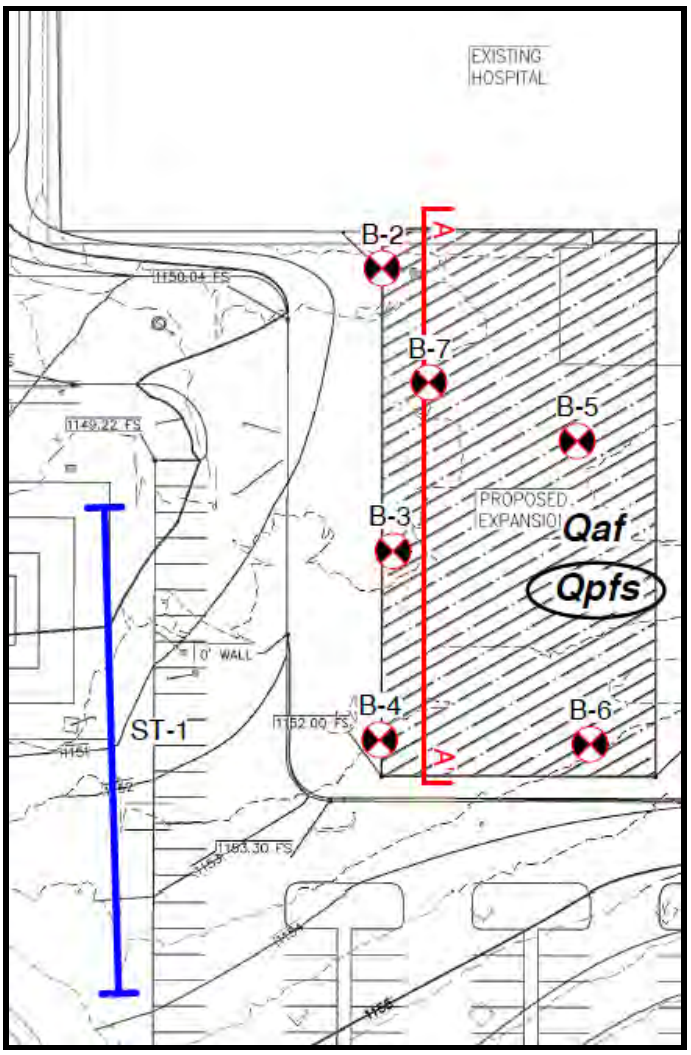


Figure 3-5. Approximate Seismic Traverse Location, ST-1

After the field data was collected, the geophysicist combined the MASW and MAM survey results using specialized software specific to this purpose. The weighted average for velocity in the upper 100 feet of the site (V_{100}) was computed from ASCE 7-16 Equation 20.4-1. The seismic model indicates that the average shear-wave velocity (weighted average) in the upper 100 feet is 1046.4 ft/sec. This average velocity classifies the underlying soils as Site Class D.

3.5 Laboratory Testing

3.5.1 General

Following completion of the fieldwork, representative samples of the subsurface soils recovered from the engineering borings were transferred to NOVA's geotechnical laboratory for testing.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS). The group symbols for each soil type are indicated on the boring logs. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs and profiles are approximate; *in-situ*, the transitions may be gradual.

Representative soil samples were selected and tested in NOVA's materials laboratory to check visual classifications and to determine pertinent engineering properties. The laboratory work included visual classifications of all soil samples as well as strength and index testing on selected soil samples. Testing was performed in general accordance with ASTM standards.

Records of the geotechnical laboratory testing are presented in Appendix C.

3.5.2 Gradation

The visual classifications were supplemented by soil gradation analyses after ASTM D 6913. The results of these analyses were used to support soil classification after ASTM D2488. Table 3-4 summarizes the results of this testing.

Table 3-3. Summary of the Soil Gradation Testing

Sample Reference		Percent Finer Than the U.S. No 200 Sieve	Classification after ASTM D2488
Boring	Depth (feet)		
2	10-16.5	58	ML
5	2.5-4	58	ML
7	20-21.5	36	SM

Note 1: The U.S. # 200 sieve is 0.074 mm,
Note 2. Gradation testing after ASTM D6913.

3.5.3 Moisture and Density

Laboratory compaction testing was completed after ASTM D1557 on a composite sample of soil from the upper five feet of B-7. This testing indicated an optimum dry unit weight ($\gamma_{dry\ opt}$) of 131.2 lb/ft^3 at a moisture content of 8.4%.

3.5.4 *In Situ* Moisture and Density

In-situ moisture content and dry unit weight testing were performed within NOVA's laboratory. The following Table 3-4 summarizes the results of this testing.

Table 3-4. In-Situ Moisture and Density

Sample Reference		Percent Moisture	Density (pcf)
Boring	Depth (feet)		
5	5	9.9	117.1
7	15	14.7	116.5
7	25	15.9	117.2

Note 1: The U.S. # 200 sieve is 0.074 mm,
Note 2. Gradation testing after ASTM D6913.

3.5.5 Corrosivity Testing

Resistivity, sulfate content and chloride contents were determined to estimate the potential corrosivity of on-site soils. These chemical tests were performed on a representative sample of the near-surface soils by Clarkson Laboratory and Supply, Inc. Table 3-5 summarizes the results of this testing.

Table 3-5. Summary of Corrosivity Testing of the Near Surface Soil

Parameter	Units	Boring B-7, 0-5 feet depth
pH	standard unit	8.3
Resistivity	Ohm-cm	1300
Water Soluble Chloride	ppm	75
Water Soluble Sulfate	ppm	220

4.0 SITE CONDITIONS

4.1 Geologic Setting

4.1.1 Regional

The site is located within the northern portion of the Peninsular Range Geomorphic Province. This province, which stretches from the Los Angeles basin to the tip of Baja California, is characterized by a series of northwest trending mountain ranges separated by subparallel fault zones, and a coastal plain of subdued landforms. The mountain ranges are underlain primarily by Mesozoic metamorphic rocks that were intruded by plutonic rocks of the southern California batholith. The active Elsinore fault zone, considered part of the greater San Andreas fault system, divides the Santa Ana Mountains block to the west from the Perris block to the east. In the center of this mapped area, the Murrieta Hot Springs Fault, a late Quaternary fault, not considered active, is a generally east striking major fault splay.

4.1.2 Site Specific

The property is underlain by the sandstone member of the Pauba Formation (Qpfs) of Pleistocene Age. This unit is generally composed of alluvial stream deposits with interbeds and mixtures of brownish siltstones, sandstones, and conglomerates that are moderately cemented. The Pauba Formation includes two informal members: an upper sandstone member (Qpfs) consisting of brown, moderately well-indurated, cross-bedded sandstone with sparse cobble to boulder conglomerate interbeds; and a lower fanglomerate member (Qpf) consisting of grayish brown, well-indurated, poorly sorted fanglomerate and mudstone. According to Kennedy and Morton, 2003, only the upper sandstone member is exposed near the site. Figure 4-1 reproduces mapping that depicts the area geology.

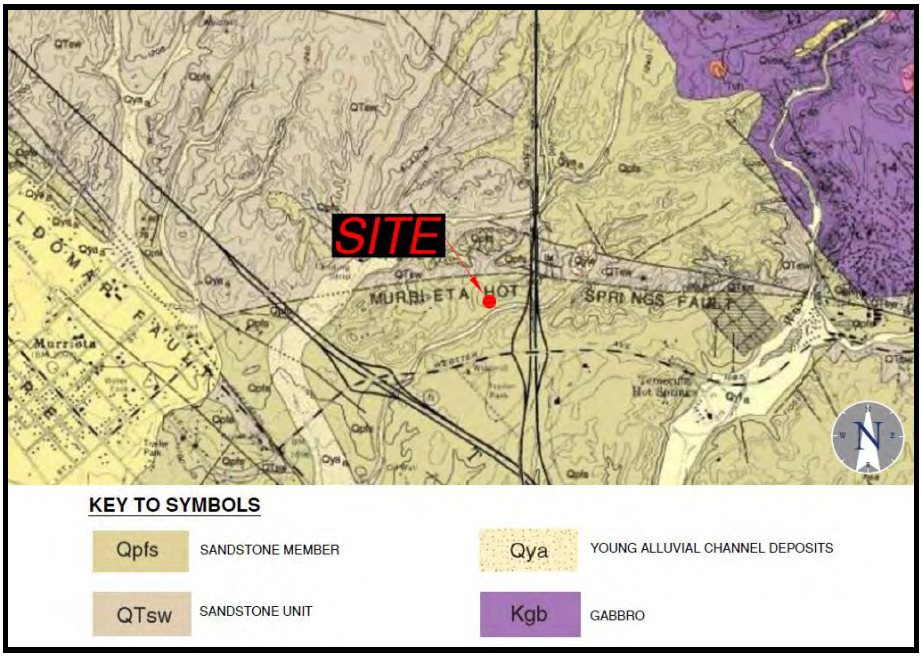


Figure 4-1. Geologic Map of the Site Area
(source: adapted from CGS 2007)

4.1.3 Faulting

There are no known active faults underlying the property. The nearest mapped active fault zone is the Elsinore-Temecula fault zone, which lies about 1.1 miles to the west of the project location. This vertical strike-slip fault has the potential to generate an earthquake with a maximum magnitude of 7.7 (USGS, Unified Hazard Tool) with peak ground accelerations (PGA) of 0.77g. Immediately north of the site lies the Murrieta Hot Springs fault. This well constrained late Quaternary fault is mapped as a discontinuous linear fault zone striking east-west between the Willard and Wildomar Faults along the southwestern side of the valley. This fault is considered to be potentially active and thus, not classified as an Alquist-Priolo (AP) Earthquake Fault Zone. An active fault is defined by the State of California as having surface displacement within the past 11,700 years or during the Holocene geologic time period. Figure 4-2 shows the AP fault zone hazard map of the site vicinity.

4.1.4 Seismic Hazard Mapping

Seismic hazard mapping developed by the California Geological Survey indicates the site is not located in an area at risk for liquefaction in the event of a severe seismic event. Liquefaction refers to the loss of soil strength and related subsidence that occurs when saturated (i.e., below the water table), predominately sandy soils are subject to earthquake shaking.

Figure 4-2 reproduces the AP Zone liquefaction hazard mapping of the site area. Section 5 of this report provides detailed evaluation of this risk. Figure 4-3 reproduces the faults mapped in the region of the site area. Active faults are indicated in orange and late Quaternary (potentially active) faults are in green.

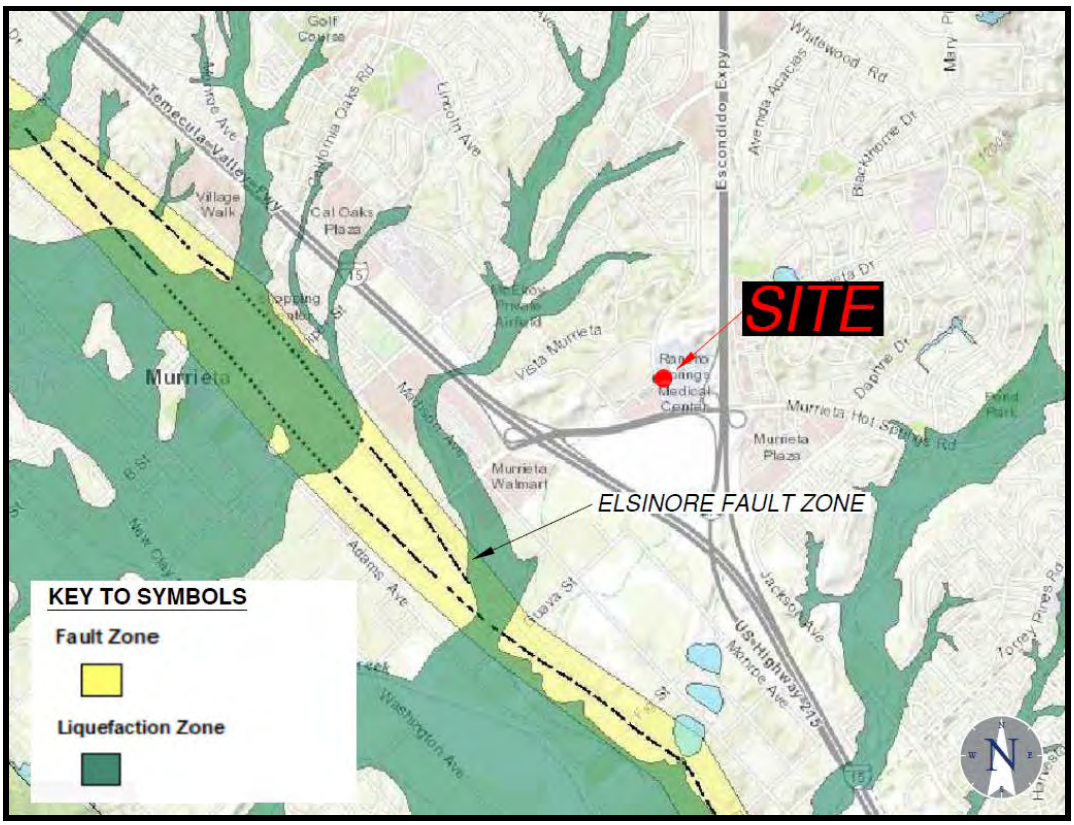


Figure 4-2. Geologic Hazard Mapping of the Site Area
(Source: *California Geological Survey AP Zone, Murrieta Quadrangle*, Jan. 11, 2018)

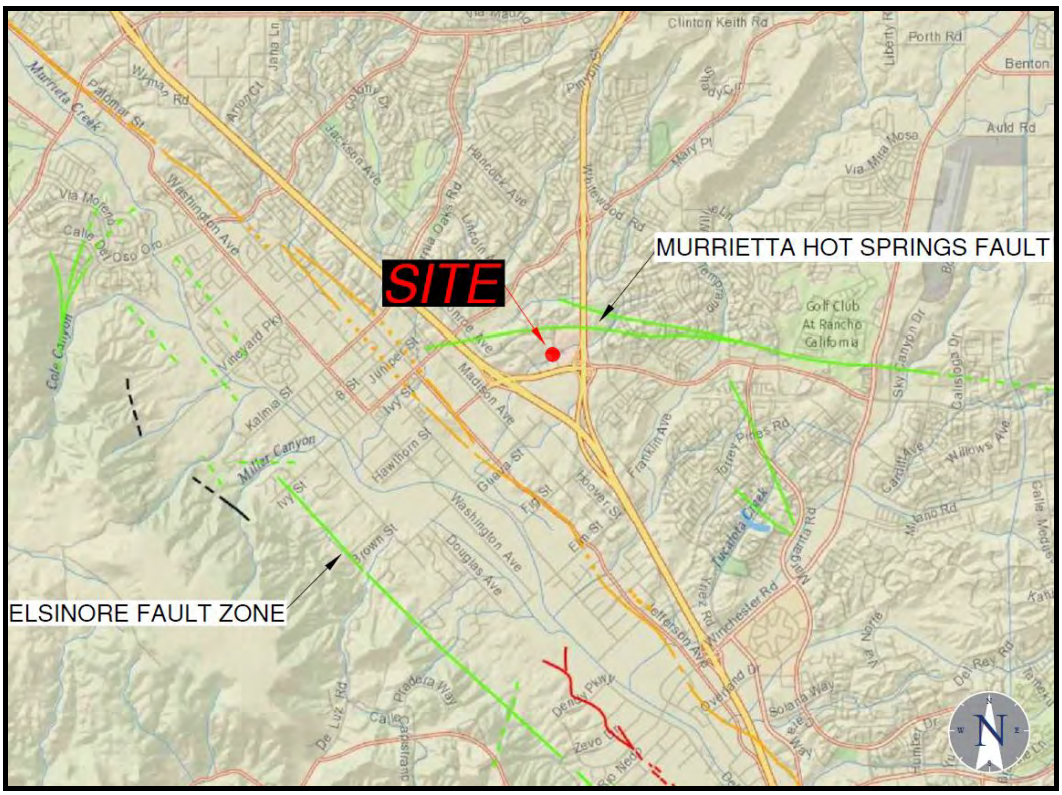


Figure 4-3. Regional Fault Map Site Area
(Source: U.S. Quaternary Faults, 2014, USGS Geologic Hazards Science Center, Elsinore [Temecula])

4.2 Site Conditions

4.2.1 Surface

As discussed in Section 2, the site is currently used for drive ways, parking areas, and landscaping improvements. The ground surface across the site is relatively level, with surface drainage flowing from the eastern edge of the campus at an elevation of approximately +1154 feet MSL westward toward Handcock Avenue with an elevation of approximately +1138 feet MSL.

4.2.2 Subsurface

For the purposes of this report, the sequence of soils that underlie the site may be described as follows.

- Unit 1, Fill (Qaf). The upper approximately 3 feet to 13 feet of the subsurface is fill comprised of silty and clayey sand and sandy silt. The fill was found to be in a damp to moist and in a loose to dense condition.
- Unit 2, Pauba Formation (Qpfs). Light to dark brown sandstone of the Pauba Formation was encountered below the overlying fill materials. The Pauba Formation was found to be medium dense to very dense.

4.2.3 Groundwater

Groundwater was not encountered during NOVA's subsurface investigation to a depth of 50 feet bgs. In reviewing historical groundwater levels in the site vicinity, it was found that within a well located about 0.25 miles from the site (State Well Number 335545N1171801W001), groundwater was at a depth of 124 feet bgs (elevation +1043 feet MSL) as measured in 1968 (California Department of Water Resources website). Monitoring wells for the Shell Service station #121641 (T0606553648), approximately 0.75 miles west of the site, show groundwater at an elevation of +1084 feet MSL (approximately 66 feet below finished grade of proposed building) as measured in 2009 (GeoTracker website).

4.2.4 Surface Water

No surface water was evident on the site at the time of NOVA's work. There was no evidence of springs, seeps, surface erosion, or staining that would indicate historic or current problems with surface water.

5.0 REVIEW OF GEOLOGIC, SOIL AND SITING HAZARDS

5.1 General

This section provides a review of soil, geologic and siting-related hazards common to this region of California, considering each for its potential to affect the planned facility. The primary hazards identified by this review are abstracted below.

1. Strong Ground Motion. The site is at risk for moderate-to-severe ground shaking in response to a large-magnitude earthquake during the lifetime of the planned development. The expectation of strong ground motion is common to all civil works in this area of California.

2. Liquefaction. Strong ground motion associated with a large magnitude earthquake will affect the site; however, the subsurface consists of a relatively thin layer of fill underlain by dense/stiff soil of the Pauba Formation (Qpfs). Liquefaction concerns are considered negligible.

The following subsections describe NOVA's review of soil and geologic hazards.

5.2 Geologic Hazards

5.2.1 Strong Ground Motion

The site is not located within a currently designated Alquist-Priolo Earthquake Zone (CGS, 2018). No known active faults are mapped on the site.

The nearest known active faults are two major strands of the Temecula segment of the Elsinore Fault Zone. These two strands are located approximately 1.1 and 1.2 miles to the west of the subject site at their closest points. The Elsinore Fault system has the potential to be a source of strong ground motion, generating an earthquake of Richter magnitude (M) of about M = 7.7, with a risk-based peak ground acceleration (PGA) of PGA_G = 0.77g.

5.2.2 Fault Rupture

As noted above there are no known active faults mapped at the subject property and the property is not located within an Alquist-Priolo earthquake fault zone. NOVA's site reconnaissance did not present any indications of active faulting. In consideration of these findings, NOVA does not consider the potential for onsite surface rupture from a seismic event a significant hazard.

5.2.3 Landslide

As used herein, 'landslide' describes downslope displacement of a mass of rock, soil, and/or debris by sliding, flowing, or falling. Such mass earth movements are generally greater than 10 feet thick and larger than 100 feet across. Landslides typically include cohesive block glides and disrupted slumps that are formed by translation or rotation of the slope materials along one or more slip surfaces.

The causes of classic landslides start with a preexisting condition- characteristically a plane of weak soil or rock inherent within the rock or soil mass. Thereafter, movement may be precipitated by earthquakes, wet weather, and changes to the structure or loading conditions on a slope (e.g., by erosion, cutting, filling, release of water from broken pipes, etc.). The site is set in nearly flat area such that NOVA considers the landslide hazard to be negligible for the site.

5.3 Soil Hazards

5.3.1 Liquefaction

General

"Liquefaction" refers to the loss of soil strength during a seismic event. The phenomenon is observed in geologically 'young' soils that include a shallow water table and coarse grained (i.e., 'sandy') soils of loose to medium dense consistency. Earthquake ground motions increase soil water pressures, decreasing grain-to-grain contact among the soil particles, causing the soil mass to lose strength. Liquefaction resistance increases with increasing soil density, plasticity (associated with clay-sized particles), geologic age, cementation, and stress history.

As is discussed in Section 4.1, the site is not mapped in an area that is at risk for liquefaction, and based on bedrock density and low groundwater levels, the potential for liquefaction-induced settlement is low.

5.3.2 Expansive Soils

Expansive soils are characteristically clayey, able to undergo significant volume changes (shrinking or swelling) due to variations in soil moisture content (drying or wetting). These volume changes can be damaging to structures. Nationally, the value of property damage caused by expansive soils is exceeded only by that caused by termites.

In consideration of the largely sandy soils that comprise the subsurface at this site, as supported by the index testing provided in Section 3, the potential for problems associated with soil expansivity is low. Surface reconnaissance and the subsurface investigation did not reveal the presence of potentially expansive soils that could affect development. Based on visual observation soils are not considered to be expansive.

5.3.3 Embankment Stability

As used herein, 'embankment stability' is intended to mean the safety of localized natural or man-made embankments against failure. Unlike landslides described above, embankment stability can include smaller scale slope failures such as erosion-related washouts and more subtle, less evident processes such as slope 'creep.'

No permanent slopes are planned as part of the proposed development. There is no risk of embankment instability for permanent construction. Section 7 provides guidance for management of the stability of temporary embankments and excavations during construction.

5.3.4 Collapsible Soils

Hydro-collapsible soils are common in the arid climates of the western United States in specific depositional environments (principally, in areas of young alluvial fans, debris flow sediments, and loess (wind-blown sediment)) deposits. These soils are characterized by low *in situ* density, low moisture contents and relatively high unwetted strength.

The soil grains of hydro-collapsible soils were initially deposited in a loose state (i.e., high initial 'void ratio') and thereafter lightly bonded by water sensitive binding agents (e.g., clay particles, low-grade cementation, etc.). While relatively strong in a dry state, the introduction of water into these soils causes the binding agents to fail. Destruction of the bonds/binding causes relatively rapid densification and volume loss (collapse) of the soil. This change is manifested at the ground surface as subsidence or

settlement. Ground settlements from the wetting can be damaging to structures and civil works. Human activities that can facilitate soil collapse include: irrigation, water impoundment, changes to the natural drainage, disposal of wastewater, etc.

Based upon the indications of the blow counts collected during our subsurface investigation, the site soils are not at risk for hydro-collapse.

5.3.5 Corrosive Soils

Chemical testing of the near surface soils indicates the soils contain low concentrations of soluble sulfates and chlorides. The tested soils will be corrosive to embedded metals, but not to embedded concrete. Section 7 addresses this consideration in more detail.

5.4 Siting Hazards

5.4.1 Effect on Adjacent Properties

The proposed project will not affect the structural integrity of adjacent properties or existing public improvements and public right-of-ways located adjacent to the site if the recommendations of this report are incorporated into project design.

5.4.2 Flood

The site is located within a flood zone designated as Flood "Zone X" (FEMA, Map 06065C2720G, effective 08/28/08). Zone X describes "*Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.*" This is an area of minimal flood hazard. Figure 5-1 reproduces flood mapping of the site area.

Figure 5-1. Flood Mapping of the Site Area
(Source: FEMA, Map 06065C2720G, effective 08/28/2008)

6.0 SEISMIC DESIGN PARAMETERS

6.1 Background

It has been known for some time[1] that seismic design parameters determined as described in ASCE 7-10 Chapter 11 have the potential to underestimate potential accelerations for structures founded on Site Classes D, E, and F. The recent code update of Sections 11 and 21 in ASCE 7-16 is intended to mitigate these shortcomings by requiring a Site-Specific Hazard Analysis (SSHA). The SSHA is used for quantitative estimations of ground motion characteristics at a specific site by incorporating several site-specific variables, principally distance from fault, site shear wave velocity, and fault geometry.

The SSHA includes the following principal elements of analyses and evaluation:

- field determination of the site class of the subject site,
- Probabilistic Seismic Hazard Analysis (PSHA);
- Deterministic Seismic Hazard Analysis (DSHA); and,
- determining design acceleration parameters using the resulting acceleration spectra.

The PSHA allows the uncertainties in size, location, and rate of recurrence of earthquakes and the variation of ground motion characteristics to be considered in the seismic evaluation. A DSHA involves development of an evaluation of ground motion hazard at a site based on a scenario in which an earthquake of a specified size occurring at a specified location occurs. This procedure provides a framework for evaluated worst-case ground motions (Kramer 1996).

NOVA has completed a SSHA for the subject site in accordance with CBC 2019 and ASCE 7-16. This report provides a summary of NOVA's procedure and results of the SSHA for the site

6.2 Procedure

6.2.1 Site Classification

A seismic shear wave survey of the subject site was completed on November 2, 2019. The objective of this survey was to determine the site class based on shear wave velocities of the upper 30 meters of subsurface, referred to as either V_{s30} or V_{100}.

The measured shear wave velocities were found to average 1,046.4 feet/second. Results of this analysis are shown in Figure 6-1. Using Table 20.3-1 from ASCE 7-16, the site is determined to be Site Class D.

[1] For example, see Kircher, C. A., *New Site-Specific Ground Motion Requirements of ASCE 7-16,* Proceedings, SEAOC Convention, 2017

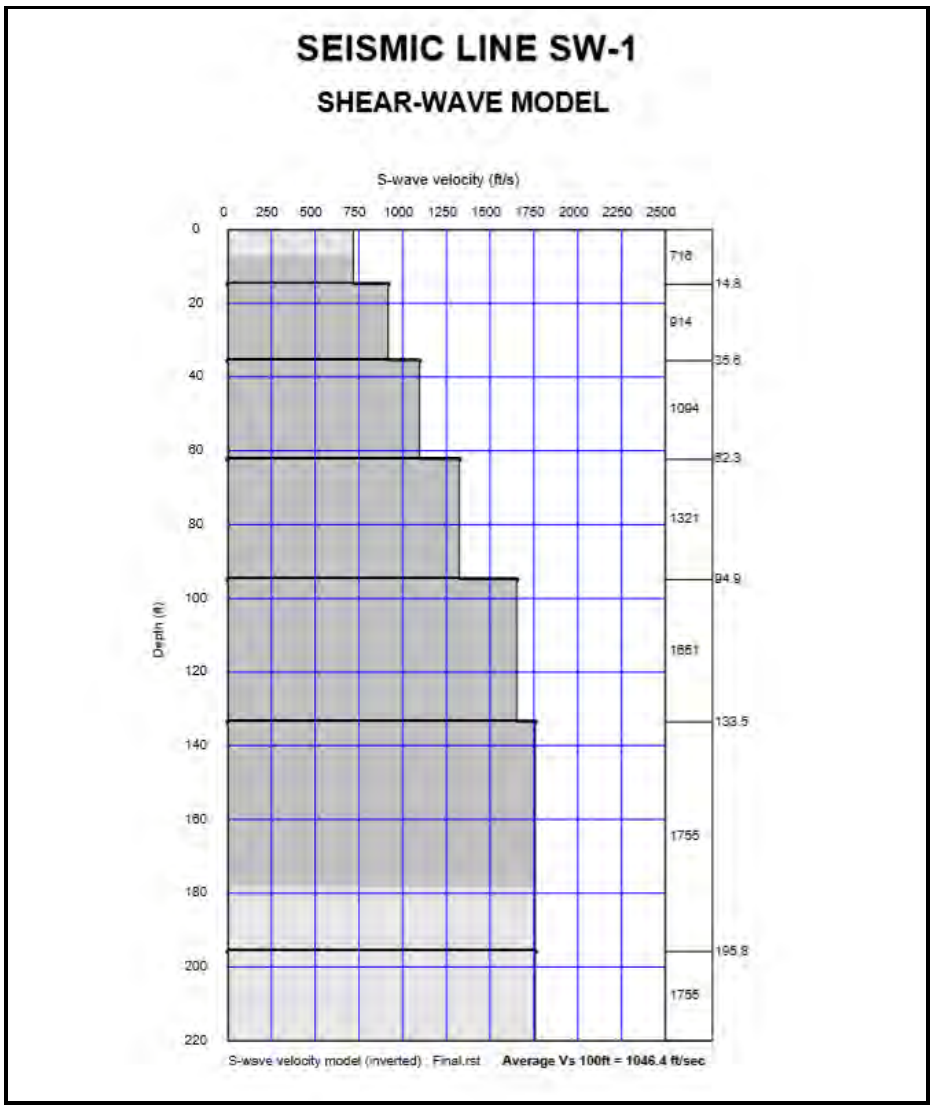


Figure 6-1. Shear Wave Velocities for the Subject Site

6.2.2 Probabilistic Hazard Analysis

The Probabilistic Seismic Hazard Analysis (PSHA) was completed using tools provided by USGS for this purpose. Site-specific parameters including site location by latitude and longitude, site class, and probability of an earthquake with 2% exceedance in 50 years were input into the Unified Hazard Tool. Peak Ground Acceleration was selected for Spectral Period and the default Time Horizon of 2,475 years was used. The earthquake fault dataset selected for the calculations performed by the tool was Dynamic: Conterminous U.S. 2014 (update) (v4.2.0) Edition. Calculations provided spectral acceleration values for periods between 0 and 5 seconds.

The computed values were then input into the USGS Risk-Targeted Ground Motion (RTGM) Calculator and recorded at periods shown in Table 1. Maximum Direction Scale Factors were then determined using

those specified in Section 21.2 for varying periods. Maximum Direction RTGM was then calculated as the product of RTGM and the Maximum Direction Scale Factor as shown in Table 6-1.

Table 6-1. Probabilistic Seismic Hazard Analysis Values

Period (s)	Risk Targeted GM (g)	Max Dir Scale Factor	Max Direction RTGM (g)
0	0.69	1.1	0.76
0.1	1.18	1.1	1.30
0.2	1.58	1.1	1.74
0.3	1.74	1.125	1.96
0.5	1.66	1.175	1.95
0.75	1.36	1.2375	1.68
1	1.13	1.3	1.47
2	0.62	1.35	0.84
3	0.41	1.4	0.57
4	0.29	1.45	0.42
5	0.22	1.5	0.33

Figure 6-2 provides the probabilistic site response based on the method described above.

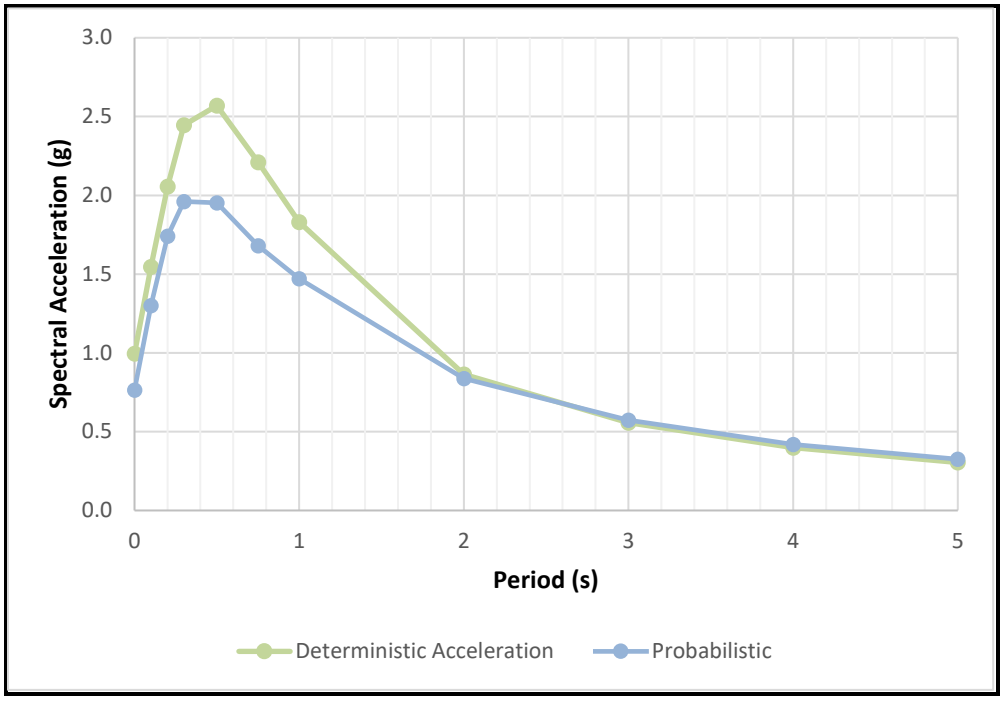


Figure 6-2. Probabilistic and Deterministic Seismic Accelerations

6.2.3 Deterministic Hazard Analysis

For the Deterministic Seismic Hazard Analysis (DSHA) the nearest active fault to the site was located using the USGS KML fault database overlain on Google Earth. Other active faults in the region were evaluated to ensure the correct controlling fault was used in the analysis. The nearest active fault is the Temecula section of the Elsinore Fault Zone at an approximate location of 1.69 km from the site.

The PEER NGA-West2 Excel file with 5 models calculating horizontal ground motion was used in the DSHA. The file provides the weighted average of peak values and the response spectra of the NGA-West2 horizontal ground motion prediction equations. NOVA used four of the five available models in the evaluation. The following four were weighted at 25% contribution: Abrahamson et al., Boor et al., Campbell and Bozorgnia, and Chiou and Youngs.

Site-specific parameters inputted into this spreadsheet were retrieved from the USGS Fault Section Data Database (USGS 2013) including Lower Seismic Depth and Dip Angle, and Earthquake Magnitude. Shear wave velocity at the upper 30 m (V_{S30}) determined from the site seismic shear-wave survey was also input into the model. The deterministic spectral response acceleration at each period was calculated as an 84th percentile 5% damped spectral response acceleration. These values were multiplied by the same Maximum Direction Scale Factors applied in the PSHA to produce the Maximum Direction Deterministic Spectral Accelerations. For simplicity of data presentation, the same periods were selected as those of the PSHA.

The values for the deterministic accelerations are shown in Table 6-2. Figure 6-2 depicts the Deterministic and Probabilistic curves graphically. Per Section 21.2.3, the MCE_R is taken as the lesser of the spectral response accelerations from the PSHA and the DSHA; and therefore, the PSHA accelerations control for this site specific analysis.

Table 6-2. Deterministic Seismic Hazard Analysis Values

Period (s)	84th Percentile 5% Dampening	Max Dir Scale Factor	Max Direction Deterministic Spectral Acceleration (g)
0	0.91	1.1	1.00
0.1	1.41	1.1	1.55
0.2	1.87	1.1	2.06
0.3	2.17	1.125	2.45
0.5	2.19	1.175	2.57
0.75	1.79	1.2375	2.21
1	1.41	1.3	1.83
2	0.64	1.35	0.86
3	0.40	1.4	0.56
4	0.27	1.45	0.40
5	0.20	1.5	0.30

6.2.4 Design Response Spectrum

Per ASCE 7-16 Section 21.3, the spectral response calculated above, shall not be less than 80% of those determined in accordance with Section 11.4.6. Figure 6-3 presents the 80% design response spectrum and the results of the controlling PSHA curves, which confirms site-specific accelerations exceed the 80% design response at all periods.

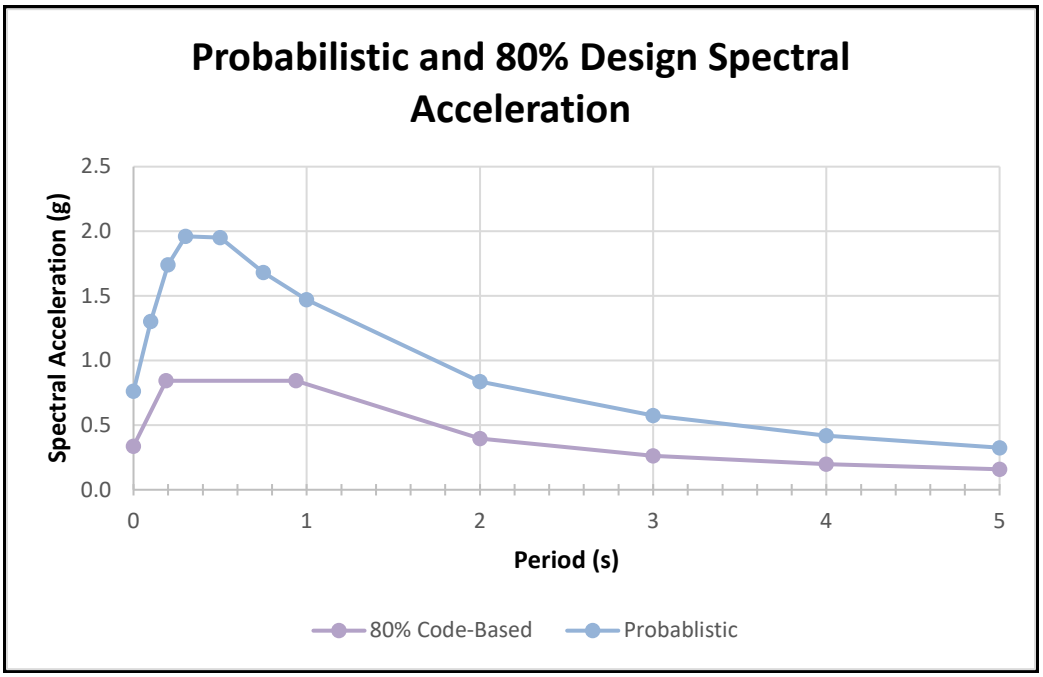


Figure 6-3. Probabilistic Spectral Accelerations and 80% Design Spectral Accelerations

6.2.5 Design Acceleration Parameters

Following Section 21.4 of ASCE 7-16, S_{DS} was taken as 90% of the maximum spectral acceleration (S_a) from the PSHA over the periods 0.2s to 5s. S_{D1} was taken as the maximum product value of period and spectral acceleration for the period, calculated over the periods 1s through 5s. The parameters S_{MS} and S_{M1} were calculated as 1.5 times S_{DS} and S_{D1}, respectively.

The values calculated were confirmed not to be less than 80% of the values determined in accordance with Section 11.4.3 of ASCE 7-16 for S_{MS} and S_{M1} and Section 11.4.5 for S_{DS} and S_{D1}. The calculated values of S_{DS}, S_{D1}, S_{MS}, and S_{M1} are shown in Table 6-3 (following page).

Table 6-3. Calculated and Code Based Design Acceleration Parameters

Parameter	Calculated	OSHPD F_a=1.0 F_v =1.7*
S_{MS}	2.65	1.58
S_{M1}	2.58	1.00
S_{DS}	1.76	1.05
S_{D1}	1.72	0.67
S_S	1.58	1.58
S_1	0.59	0.59

*F_a value taken from Table 11.4-1 (confirmed Site Class D)
F_v value taken from Table 11.4-2

6.2.6 Maximum Considered Earthquake Geometric Mean (MCE_G) Peak Ground Acceleration

The probabilistic peak ground acceleration was determined according to Section 21.5.1 using the Risk Targeting Ground Motion Tool for the Unified Hazard Ground Motion at a period of 0s. This calculator presents the geometric mean peak ground acceleration with a 2% probability of exceedance within a 50-year period. The resulting acceleration is 0.73g

The deterministic peak ground acceleration was determined according to Section 21.5.2 and calculated as the largest 84th percentile geometric mean peak ground acceleration for characteristic earthquakes on all known active faults within the site region. PGA was calculated as the point in the DSHA where the period is equal to 0s, resulting in spectral acceleration of 0.99 g.

The site-specific peak ground acceleration (PGA_M) was taken as the lesser of the probabilistic and deterministic peak ground accelerations. In accordance with code, it was confirmed that PGA_M was not taken as less than 80% of PGA_M determined from Eq. 11.8-1.

Table 6-4. Calculated and Code Based MCE_G Peak Ground Acceleration

Parameter	Calculated	OSHPD	80% OSHPD
MCE_G PGA	0.73	0.77	0.62

6.2.7 Exceptions to Site-Specific Hazard Analysis

Per Section 11.4.8 Exception 2, a SSHA is not required for structures in which the Structural Engineer will be using the Equivalent Lateral Force (ELF) procedure, which is common for buildings with short fundamental periods. If the ELF procedure is used, the seismic parameters may be calculated by using the F_a and F_v coefficients in Tables 11.4-1 and -2 (parameters shown under the OSHPD heading within Tables 6-3 and 6-4 of this report).

7.0 EARTHWORK AND FOUNDATIONS

7.1 Overview

7.1.1 Review of Site Hazards

Section 5 provides a review of soil and geologic hazards common to development of civil works in the project area. The primary hazards identified by that review are abstracted below.

1. Strong Ground Motion. The site is at risk for moderate-to-severe ground shaking in response to a large-magnitude earthquake during the lifetime of the planned development. The expectation of strong ground motion is common to all civil works in this area of California. Section 6 addresses seismic design parameters

2. Liquefaction. Strong ground motion associated with a large magnitude earthquake will effect some liquefaction and related ground settlement. However, ground movements will be small-about 1 inch or less- and will not threaten the integrity of the planned structure. With this consideration, the site is suitable for development of the facility on shallow foundations. Section 7.5 addresses design parameters for shallow foundations.

7.1.2 Site Suitability

Based upon the indications of the field and laboratory data developed for this investigation, as well as review of previously developed subsurface information, it is the opinion of NOVA that the site is suitable for development of the planned structure on shallow foundations, provided the geotechnical recommendations described herein are followed.

7.1.3 Review and Surveillance

The subsections following provide geotechnical recommendations for the planned development as it is now understood. It is intended that these recommendations provide sufficient geotechnical information to develop the project in general accordance with 2016 California Building Code (CBC) requirements.

NOVA should be given the opportunity to review the grading plan, foundation plan, and geotechnical-related specifications as they become available to confirm that the recommendations presented in this report have been incorporated into the plans prepared for the project.

All earthwork related to site and foundation preparation should be completed under the observation of NOVA.

7.2 Corrosivity and Sulfates

7.2.1 Corrosivity

Electrical resistivity, chloride content, sulfate contents and pH level are all indicators of a soil's tendency to corrode/attack metals and concrete. Chemical testing was performed on representative samples of soils from the site. The results of the testing are tabulated on the following Table 7-2.

Table 7-1. Summary of Corrosivity Testing of the Unit 1 Soil

Parameter	Units	Boring B-7, 0-5 feet
pH	standard unit	8.3
Resistivity	Ohm-cm	1300
Water Soluble Chloride	ppm	75
Water Soluble Sulfate	ppm	220

7.2.2 Metals

Caltrans considers a site to be corrosive if one or more of the following conditions exist for representative soil and/or water samples:

- chloride concentration is 500 parts per million (ppm) or greater;
- sulfate concentration is 2,000 ppm (0.2%) or greater; or,
- the pH is 5.5 or less.

Based on the Caltrans criteria, the on-site soils would not be considered corrosive to buried metals. Records of this testing are provided in Appendix C. These records include estimates of the life expectancy of buried metal culverts of varying gauge.

In addition to the above parameters, the risk of soil corrosivity buried metals is considered by determination of electrical resistivity (ρ). Soil resistivity may be used to express the corrosivity of soil only in unsaturated soils. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of DC electrical current from the metal into the soil. As the resistivity of the soil decreases, the corrosivity generally increases. A common qualitative correlation (cited in Romanoff 1989, NACE 2007) between soil resistivity and corrosivity to ferrous metals is tabulated below.

Table 7-2. Soil Resistivity and Corrosion Potential

Minimum Soil Resistivity (Ω-cm)	Qualitative Corrosion Potential
0 to 2,000	Severe
2,000 to 10,000	Moderate
10,000 to 30,000	Mild
Over 30,000	Not Likely

The resistivity testing summarized on Table 7-2 suggests that design should consider that the soils may be corrosive to embedded metals. Typical recommendations for mitigation of such corrosion potential in embedded ferrous metals include:

- a high quality protective coating such as an 18 mil plastic tape, extruded polyethylene, coal tar enamel, or Portland cement mortar;

- electrical isolation from above grade ferrous metals and other dissimilar metals by means of dielectric fittings in utilities and exposed metal structures breaking grade; and,

- steel and wire reinforcement within concrete having contact with the site soils should have at least 2 inches of concrete cover.

If extremely sensitive ferrous metals are expected be placed in contact with the site soils, it may be desirable to consult a corrosion specialist regarding choosing the construction materials and/or protection design for the objects of concern

7.2.3 Sulfate Attack

As shown on Table 7-2, the soil sample tested indicated water-soluble sulfate (SO_4) content of the soils are 0.02 percent by weight. With $SO_4 < 0.10$ percent by weight, the American Concrete Institute (ACI) publication ACI 318-08 considers a soil to have no potential (S0) for sulfate attack. Table 7-4 reproduces the sulfate Exposure Categories considered by ACI.

Table 7-3. Exposure Categories and Requirements for Water-Soluble Sulfates

Exposure Category	Class	Water-Soluble Sulfate (SO_4) In Soil (percent by weight)	Cement Type (ASTM C150)	Max Water-Cement Ratio	Min. f'_c (psi)
Not Applicable	S0	$SO_4 < 0.10$	-	-	-
Moderate	S1	$0.10 \leq SO_4 < 0.20$	II	0.50	4,000
Severe	S2	$0.20 \leq SO_4 \leq 2.00$	V	0.45	4,500
Very severe	S3	$SO_4 > 2.0$	V + pozzolan	0.45	4,500

Adapted from: ACI 318-08, Building Code Requirements for Structural Concrete

7.2.4 Limitations

Testing to determine several chemical parameters that indicate a potential for soils to be corrosive to construction materials are traditionally completed by the Geotechnical Engineer, comparing testing results with a variety of indices regarding corrosion potential.

Like most geotechnical consultants, NOVA does not practice in the field of corrosion protection, since this is not specifically a geotechnical issue. Should more information be required, a specialty corrosion consultant should be retained to address these issues.

7.3 Earthwork

7.3.1 General

Earthwork should be performed in accordance with Section 300 of the most recent approved edition of the "*Standard Specifications for Public Works Construction*" and "*Regional Supplement Amendments*."

7.3.2 Compaction

All fill and backfill should be compacted to a minimum of 90% relative compaction after ASTM D1557 (the 'modified Proctor') following moisture conditioning to 2% above the optimum moisture content. Fill placed in loose lifts no thicker than the ability of the compaction equipment to thoroughly densify the lift. For most construction equipment, this limit loose lifts to on the order of 10-inches or less.

7.3.3 Select Fill

Any engineered fill should be Select Fill; i.e., soil with at least 40 percent of the material less than ¼-inches in size, a maximum particle size of 1 inch, with an expansion index ('EI', after ASTM D 4829) of EI < 20. Select Fill should not include fibrous organic, perishable, spongy, deleterious, environmentally affected, or otherwise unsuitable material. The sandy Unit 1 soils will be suitable for use as Select Fill. If a detention pond is developed on site, this feature may be a good source of Select Fill.

7.3.4 Site Preparation and Remedial Grading

Any abandoned utilities should be removed and properly disposed off-site before the start of excavation operations. The area planned for structures and pavements should be cleared of vegetative material, including the root zone. Thereafter, remedial grading to improve and proof the quality of the Unit 1 fill should be undertaken in the step-wise manner described below.

1. Step 1, Excavation/Densification. Due to loose material encountered in the borings in the near-surface, remedial removals shall extend a minimum of 5 feet below existing ground surface within the limits of planned hospital expansion structure. This material should be excavated and staged for later replacement. Removals for areas receiving pavements should extend to at least 2 feet below existing or proposed grade, whichever is deeper. A NOVA representative should observe all excavation bottoms after removals. Deeper excavation may be necessary in localized areas. Laterally, removals should extend outward at least 5 feet and 2 feet for of the proposed structure and pavements, respectively.

   Removals directly adjacent to existing structures should be performed by slot cutting such that the existing improvements and existing foundations are not completely exposed. Existing foundations should in no case be undermined. A NOVA representative should observe the grading near existing improvements during the removal operation.

   The ground surface disturbed by this excavation should be densified to at 90% relative compaction after ASTM D1557 (the 'modified Proctor') following moisture conditioning to 2% above the optimum moisture content.

2. Step 2, Proof-Rolling. After the completion of compaction/densification of the excavated surface, the area should be proof-rolled. A loaded dump truck or similar should be used to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during this proof-rolling should be removed, replaced with an approved backfill, and compacted.

3. Step 3, Replacement. The soil excavated by Step 2 should be replaced in conformance with the criteria identified in Section 7.4.2 and Section 7.4.3.

7.3.5 New Fill

New fill to establish site grades should be placed in conformance with the criteria identified in Section 7.4.2 and Section 7.4.3.

Shallow foundations should be constructed as soon as possible following subgrade approval. The Contractor should be responsible for maintaining the subgrade in its approved condition (i.e., at the compacted moisture content, frees of disturbance, etc.) until foundations are constructed.

7.3.6 Trenching and Backfilling for Utilities

Excavation for utility trenches must be performed in conformance with OSHA regulations contained in 29 CFR Part 1926.

Utility trench excavations have the potential to degrade the properties of the adjacent soils. Utility trench walls that are allowed to move laterally will reduce the bearing capacity and increase settlement of adjacent footings and overlying slabs.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Backfill for utility trenches must be placed to meet the project specifications for the engineered fill of this project. Unless otherwise specified, the backfill for the utility trenches should be placed in 4 to 6-inch loose lifts and compacted to a minimum of 90 percent relative compaction after ASTM D1557 (the 'modified Proctor') at soil moisture +2 percent of the optimum moisture content. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to 90 percent relative compaction with respect to the Modified Proctor.

7.3.7 Flatwork

Prior to casting exterior flatwork, the upper one foot of subgrade soils- either Unit 1 sands or Select Fill- should be moisture conditioned densified as recommended in Section 7.4.2. Concrete slabs for pedestrian traffic or landscaping should be at least four (4) inches thick.

7.4 Shallow Foundations

7.4.1 Isolated and Continuous Foundations

Unit 1 fill improved as described in Section 7.4 and any new fill placed as described in Section 6.4 may be used to support isolated and continuous footings, as described below.

Isolated Foundations

Isolated foundations for interior columns may be designed for an allowable contact stress of 3,000 psf for dead and commonly applied live loads (DL+LL). These foundation units should have a minimum width of 30 inches, embedded a minimum of 24 inches below surrounding grade. This bearing value may be increased by one-third for transient loads such as wind and seismic.

Continuous Foundations

Continuous foundations may be designed for an allowable contact stress of 2,500 psf for dead and commonly applied live loads (DL+LL). These footings must be a minimum of 18 inches in width and embedded a minimum of 24 inches below surrounding grade. This bearing value may be increased by one-third for transient loads such as wind and seismic.

Resistance to Lateral Loads

Lateral loads to shallow foundations may be resisted by passive earth pressure against the face of the footing, calculated as a fluid density of 200 psf per foot of depth, neglecting the upper 1 foot of soil below surrounding grade in this calculation. Additionally, a coefficient of friction of 0.30 between soil and the concrete base of the footing may be used with dead loads.

Settlement
Supported as recommended above, the structure will settle on the order of 0.2 inch. This movement will occur elastically, as dead load (DL) and permanent live loads (LL) are applied. In usual circumstance, about 50% of this settlement will occur during the construction period. Angular distortion due to differential settlement of adjacent, unevenly loaded footings should be less than 1 inch in 40 feet (i.e., Δ/L less than 1:480).

7.4.2 Ground Supported Slabs

The ground level of the planned facility may employ a conventional on-grade (ground-supported) slab designed using a modulus of subgrade reaction (k) of 150 pounds per cubic inch (i.e., k = 150 pci).

The actual slab thickness and reinforcement should be designed by the Structural Engineer. NOVA recommends the slab be a minimum 5 inches thick, reinforced by at least #4 bars placed at 16 inches on center each way within the middle third of the slabs by supporting the steel on chairs or concrete blocks ("dobies").

Minor cracking of concrete after curing due to drying and shrinkage is normal. Cracking is aggravated by a variety of factors, including high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due during curing. The use of low-slump concrete or low water/cement ratios can reduce the potential for shrinkage cracking.

To reduce the potential for excessive cracking, concrete slabs-on-grade should be provided with construction or 'weakened plane' joints at frequent intervals. Joints should be laid out to form approximately square panels and never exceeding a length to width ratio of 1.5 to 1. Proper joint spacing and depth are essential to effective control of random cracking. Joints are commonly spaced at distances equal to 24 to 30 times the slab thickness. Joint spacing that is greater than 15 feet should include the use of load transfer devices (dowels or diamond plates). Contraction/ control joints must be established to a depth of ¼ the slab thickness as depicted in Figure 7-1.

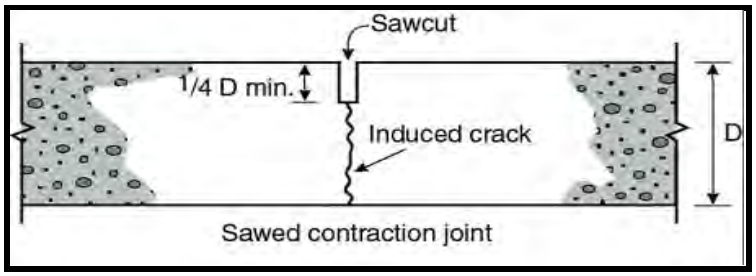


Figure 7-1. Sawed Contraction Joint

7.5 Capillary Break and Underslab Vapor Retarder

7.5.1 Capillary Break

The requirements for a capillary break ('sand layer') beneath the ground supported slab should be determined in accordance with ACI Publication 302 "*Guide for Concrete Floor and Slab Construction*."

A capillary break may consist of a 4-inch thick layer of compacted, well-graded sand should be placed below the floor slab. This porous fill should be clean coarse sand or sound, durable gravel with not more

than 5 percent coarser than the 1-inch sieve or more than 10 percent finer than the No. 4 sieve, such as AASHTO Coarse Aggregate No. 57.

7.5.2 Vapor Retarder

Responsibility

Soil moisture vapor that penetrates ground-supported concrete slabs can result in damage to moisture-sensitive floors, some floor sealers, or sensitive equipment in direct contact with the floor. It is not the responsibility of the geotechnical consultant to provide recommendations for vapor retarders to address this concern. This responsibility usually falls to the Architect. Decisions regarding the appropriate vapor retarder are principally driven by the nature of the building space above the slab, floor coverings, anticipated penetrations, concerns for mold or soil gas, and a variety of other environmental, aesthetic and materials factors known only to the Architect.

Products

A variety of specialty polyethylene (polyolefin)-based vapor retarding products are available to retard moisture transmission into and through concrete slabs. This remainder of this section provides an overview of design and installation guidance, and considers the use of vapor retarders in the building construction in the Murrieta area.

Detail to support selection of vapor retarders and to address the issue of moisture transmission into and through concrete slabs is provided in a variety of publications by the American Society for Testing and Materials (ASTM) and the American Concrete Institute (ACI). A partial listing of those publications is provided below.

- ASTM E1745-97 (2009). *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.*
- ASTM E154-88 (2005). *Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.*
- ASTM E96-95 (2005). *Standard Test Methods for Water Vapor Transmission of Materials.*
- ASTM E1643-98 (2009). *Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.*
- ACI 302.2R-06. *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.*

Vapor retarders employed for ground supported slabs are commonly specified as minimum 15 mil polyolefin plastic that conforms to the requirements of ASTM E1745 as a Class A vapor retarder (i.e., a maximum vapor permeance of 0.1 perms, minimum 45 lb/in tensile strength and 2,200 grams puncture resistance). Among the commercial products that meet this requirement are the series of Yellow Guard® vapor retarders vended by Poly-America, L.P.; the Perminator® products by W. R. Meadows; and, Stego®Wrap products by Stego Industries, LLC.

The person responsible for design of the vapor barrier should consult with product vendors to ensure selection of the vapor retarder that best meets the project requirements. For example, concrete slabs with particularly sensitive floor coverings may require lower permeance or other performance-related factors are specified by the ASTM E1745 class rating.

Installation

The performance of vapor retarders is particularly sensitive to the quality of installation. Installation should be performed in accordance with the vendor's recommendations under full-time surveillance.

7.6 Control of Moisture Around Foundations

7.6.1 Erosion and Moisture Control During Construction

Surface water should be controlled during construction, via berms, gravel/sandbags, silt fences, straw wattles, siltation basins, positive surface grades, or other methods to avoid damage to the finish work or adjoining properties. The Contractor should take measures to prevent erosion of graded areas until such time as permanent drainage and erosion control measures have been installed. After grading, all excavated surfaces should exhibit positive drainage and eliminate areas where water might pond.

7.6.2 Design

Design for the structure should include care to control accumulations of moisture around and below the garage. Such design will require coordination from among the Design Team; at a minimum to include the Architect, the Civil Engineer, and the Landscape Architect.

Design for the areas around foundations should be undertaken with a view to the maintenance of an environment that encourages drainage away from below grade walls. Roof and surface drainage, landscaping, and utility connections should be designed to limit the potential for mounding of water near subterranean walls. In particular, rainfall to roofs should be collected in gutters and discharged away from foundations.

Proper surface drainage will be required to minimize the potential of water seeking the level of the garage walls and pavements. In areas where sidewalks or paving do not immediately adjoin the structure, protective slopes should be provided with a minimum grade (away from the structure) of approximately 3 percent for at least 5 feet. A minimum gradient of 1 percent is recommended in hardscape areas.

7.7 Retaining Walls

7.7.1 Lateral Pressures

Lateral earth pressures for retaining walls are related to the type of backfill, drainage conditions, slope of the backfill surface, and the allowable rotation of the wall. Table 7-5 provides recommendations for lateral soil for retaining walls with level backfill for varying conditions of wall yield.

Table 7-4. Lateral Earth Pressures to Retaining Walls

Condition	Equivalent Fluid Pressure (psf/foot) for Approved Backfill [Notes A, B]	
	Level Backfill	2:1 Backfill Sloping Upwards
Active	35	55
At Rest	55	80
Passive	250	300

Note A: site-sourced Unit 1 sands or similar imported soil.
Note B: assumes wall includes appropriate drainage and no hydrostatic pressure.

If footings or other surcharge loads are located a short distance outside the wall, these influences should be added to the lateral stress considered in the design of the wall. Surcharge loading should consider wall loads that may develop from adjacent streets and sidewalks. To account for such potential loads, a surcharge pressure of 75 psf can be applied uniformly over the wall to a depth of about 12 feet.

7.7.2 Seismic Increment

The seismic load increment should be calculated as a uniform 22H psf (with H the height of the wall in feet).

7.7.3 Drainage

Design for retaining walls should include drainage to limit accumulation of water behind the wall. Figure 7-2 provides guidance for such design. Note that the guidance provided on Figure 7-2 is conceptual. A variety of options are available to drain permanent below grade walls.

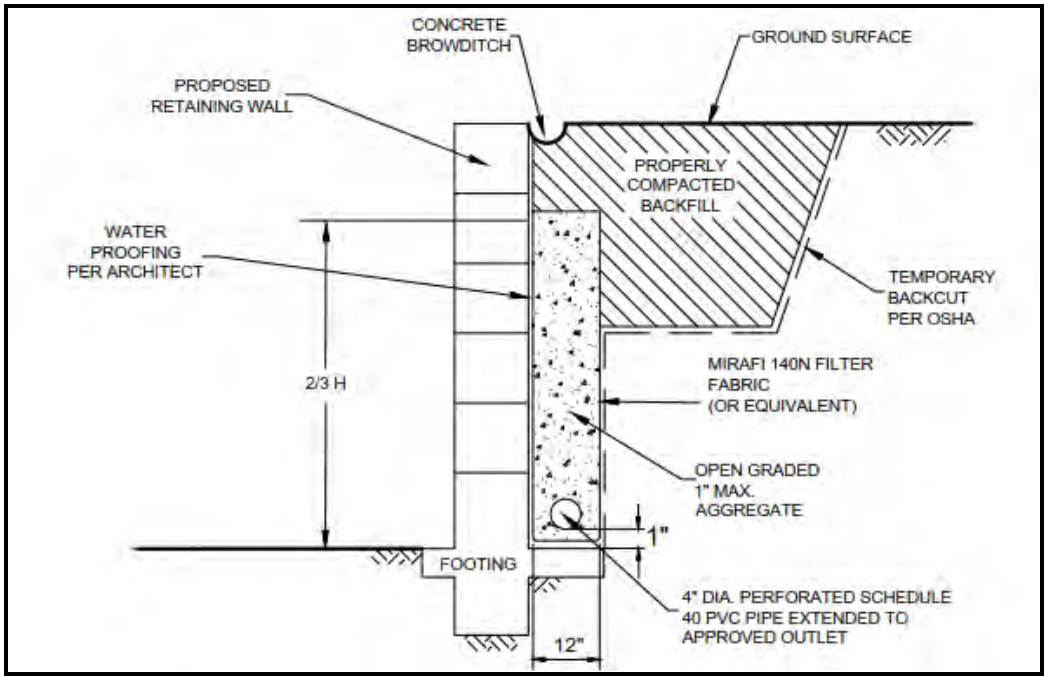


Figure 7-2. Conceptual Design for Retaining Wall Drainage

7.7.4 Elevator Pits

Elevators will likely be included within the projects final design. Elevators may require pits that extend below the lowest slab level. An elevator pit slab and related retaining wall footings will derive suitable support from the Unit 2 sandstones around it. Design for the elevator pit walls should consider the circumstances and conditions described below.

1. Wall Yield. NOVA expects that proper function of the elevator pit should not allow yielding of the elevator pit walls. As such, walls should be designed to resist 'at rest' lateral soil pressures and seismic pressures provided above, also allowing for any structural surcharge.

2. Construction. Design of the elevator pit walls should include consideration for surcharge conditions that will occur during and after construction.

7.8 Temporary Slopes

Any temporary slopes should be made in conformance with OSHA requirements. All temporary excavations should comply with local safety ordinances, as well all Occupational Safety and Health Administration (OSHA) requirements, as applied to California. These requirements may be found at http://www.dir.ca.gov/title8/sb4a6.html.

8.0 STORMWATER INFILTRATION

8.1 Overview

Based upon the indications of the field exploration and laboratory testing reported herein, NOVA has evaluated the site as abstracted below after guidance contained in *Riverside County, Santa Margarita River Watershed Region Design Handbook for Low Impact Development, Best Management Practices*, Riverside County Flood Control and Water Conservation District, Revised June 2018 (hereafter, 'the BMP Manual').

Section 3 provides a description of the fieldwork undertaken to complete the testing. Figure 3-1 depicts the location of the testing. This section provides the results of that testing and related recommendations for management of stormwater in conformance with the BMP Manual.

As is well-established in the BMP Manual, the feasibility of stormwater infiltration is principally dependent on geotechnical and hydrogeologic conditions at the project site. In consideration of the measured infiltration rates at this site, NOVA concludes that the site is feasible for development of "partial infiltration" permanent stormwater infiltration BMPs.

8.2 Infiltration Rates

8.2.1 General

The percolation rate of a soil profile is not the same as its infiltration rate ('I'). Therefore, the measured/calculated field percolation rate (see Table 3-3) was converted to an estimated infiltration rate utilizing the Porchet Method in accordance with guidance contained in the BMP Manual. Table 8-1 provides a summary of the infiltration rates determined by the percolation testing.

Table 8-1. Infiltration Rates Determined by Percolation Testing

Boring	Approximate Ground Elevation (feet, msl)	Depth of Test (feet)	Approximate Test Elevation (feet, msl)	Infiltration Rate (inches/hour)	Design Infiltration Rate (in/hour, F=3*)
P-1*	± 1,147	15.0	± 1,132	2.64*	0.88*
P-2	± 1,148	10.0	± 1,138	0.33	0.11
P-3	± 1,148	10.0	± 1,138	0.46	0.15
P-4	± 1,147	11.0	± 1,136	0.80	0.27
P-5	± 1,147	10.0	± 1,137	0.37	0.12

Notes: (1) 'F' indicates 'Factor of Safety' (2) elevations are approximate and should be reviewed.
* P-1 was inferred to be within an existing utility trench resulting in erroneous rates.

8.2.2 Design Infiltration Rate

As may be seen by review of Table 8-1, in consideration of the nature and variability of subsurface materials, as well as the natural tendency of infiltration structures to become less efficient with time, the infiltration rates measured in the testing should be modified to use at least a factor of safety (F) of F=3 for preliminary design purposes.

8.3 Review of Geotechnical Feasibility Criteria

8.3.1 Overview

It is common that seven factors be considered by the project geotechnical professional while assessing the feasibility of infiltration related to geotechnical conditions. These factors are:

1) Soil and Geologic Conditions
2) Settlement and Volume Change
3) Slope Stability
4) Utility Considerations
5) Groundwater Mounding
6) Retaining Walls and Foundations
7) Other Factors

The above geotechnical feasibility criteria are reviewed in the following subsections.

8.3.2 Soil and Conditions

The soil borings and percolation tests borings completed for this assessment disclose the sequence of soil units described below.

- Unit 1, Fill. The upper 1 to 13 feet of the subsurface is predominantly silty sandy fill characteristic of a relatively dense sand.
- Unit 2, Pauba Formation. Light to dark brown sandstone/siltstone of the Pauba Formation was encountered below the overlying fill materials occurs from about 3 feet depth to a 13 feet bgs.

8.3.3 Settlement and Volume Change

The sandy Unit 1 soils have very low expansion potential. These soils will not be prone to swelling upon wetting. These soils will not be prone to hydro-collapse on wetting.

8.3.4 Slope Stability

BMPs will not be located near slopes. There are no material slopes on site, nor are any planned.

8.3.5 Utilities

Infiltration can potentially damage subsurface and underground utilities. BMPs should be sited a minimum of 10 feet away from underground utilities. The locations at our percolation borings are located within 10 feet of an existing utility line. Infiltration testing from percolation boring P-1 results in erroneous results and it was determined that a nearby utility trench was located within the area. It is recommended to located drainage management areas (DMAs) at least 10 feet away from utilities. Where DMAs are located near utility lines, it is recommended to line the sidewalls of DMA systems with an impermeable liner.

8.3.6 Groundwater Mounding

Stormwater infiltration can result in groundwater mounding during wet periods, affecting utilities, pavements, flat work, and foundations.

8.3.7 Retaining Walls and Foundations

BMPs should not be located near foundations. BMPs should be sited a minimum of 25 feet away from any foundations or retaining walls.

8.3.8 Other Factors

The location at P-1 is near an existing private storm drain line. For this reason, the infiltration rate at this location should not be considered as representative of the site.

8.4 Suitability of the Site for Stormwater Infiltration

In consideration of the known geology of the site and the indications of the site-specific testing, the site allows for partial infiltration. Stormwater DMAs should be located away from existing utility lines.

9.0 PAVEMENTS

9.1 Overview

9.1.1 General

The structural design of pavement sections depends primarily on anticipated traffic conditions, subgrade soils, and construction materials. For the purposes of the preliminary evaluation provided in this section, NOVA has assumed a Traffic Index (TI) of 5.0 for passenger car parking, and 6.0 for the driveways. These traffic indices should be confirmed by the project civil engineer prior to final design.

9.1.2 Design to Limit Infiltration

The surface grades of pavements and related design features to limit infiltration should conform with the concepts discussed in Section 6.

An important consideration in the design and construction of pavements is surface and subsurface drainage. Where standing water develops, either on the pavement surface or within the base course, softening of the subgrade and other problems related to the deterioration of the pavement can be expected. Furthermore, good drainage should minimize the risk of the subgrade materials becoming saturated over a long period of time. The following recommendations should be considered to limit the amount of excess moisture, which can reach the subgrade soils:

- site grading at a minimum 2% grade away from the pavements;
- compaction of any utility trenches for landscaped areas to the same criteria as the pavement subgrade;
- sealing all landscaped areas in or adjacent to pavements to minimize or prevent moisture migration to subgrade soils near pavements; and,
- concrete curbs bordering landscaped areas should have a deepened edge to provide a cutoff for moisture flow beneath pavements (generally, the edge of the curb can be extended an additional twelve inches below the base of the curb).

9.1.3 Maintenance

Preventative maintenance should be planned and provided for. Preventative maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Preventative maintenance consists of both localized maintenance (e.g. crack sealing and patching) and global maintenance (e.g. surface sealing). Preventative maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements.

9.1.4 Review and Surveillance

The Geotechnical Engineer-of-Record should review the planning and design for pavement to confirm that the recommendations presented in this report have been incorporated into the plans prepared for the project. The preparation of subgrades for roadways should be observed on a full-time basis by a representative of the Geotechnical Engineer-of-Record.

9.2 Subgrade Preparation

Grading for paved areas should be as described in Section 6.4, densifying pavement subgrade to at least 95% relative compaction after ASTM D1557 (the 'modified Proctor').

After the completion of compaction/densification, areas to receive pavements should be proof-rolled. A loaded dump truck or similar should be used to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during this proof-rolling should be removed, replaced with an approved backfill, and compacted. The Geotechnical Engineer can provide alternative options such as using geogrid and/or geotextile to stabilize the subgrade at the time of construction, if necessary.

Construction should be managed such that preparation of the subgrade immediately precedes placement of the base course. Proper drainage of the paved areas should be provided to reduce moisture infiltration to the subgrade.

The preparation of roadway and parking area subgrades should be observed on a full-time basis by a representative of NOVA to confirm that any unsuitable materials have been removed and that the subgrade is suitable for support of the proposed driveways and parking areas.

9.3 Flexible Pavements

Provided the subgrade in paved areas is prepared per the recommendations in Section 9.2, an R-value of 30 can be assumed. Table 9-1 provides recommended sections for flexible pavements. The recommended pavement sections are for planning purposes only. Additional R-value testing should be performed on actual soils at the design subgrade levels to confirm the pavement design.

Table 9-1. Preliminary Recommendations for Flexible Pavements

Area	Assumed Subgrade R-Value	Traffic Index	Asphalt Thickness (in)	Base Course Thickness (in)
Auto Driveways/Parking	30	5.0	3.0	6.0
Roadways	30	6.0	4.0	7.0

The above sections assume properly prepared subgrade consisting of at least 12 inches of select soil compacted to a minimum of 95% relative compaction. The aggregate base materials should also be placed at a minimum relative compaction of 95%. Construction materials (asphalt and aggregate base) should conform to the current *Standard Specifications for Public Works Construction (Green Book)*.

9.4 Rigid Pavements

The flexible pavement specifications used in roadways and parking stalls may not be adequate for truck loading and turnaround areas, if such features are planned. In this event, NOVA recommends that a rigid concrete pavement section be provided. The pavement section should consist of 6 inches of concrete over a 6-inch base course. The aggregate base materials should also be placed at a minimum relative compaction of 95%. The concrete should be obtained from a mix design that conforms with the minimum properties shown in Table 9-2.

Longitudinal and transverse joints should be provided as needed in concrete pavements for expansion/ contraction and isolation. Sawed joints should be cut within 24-hours of concrete placement, and should be a minimum of 25% of slab thickness plus 1/4 inch. All joints should be sealed to prevent entry of

foreign material and doweled where necessary for load transfer. Where dowels cannot be used at joints accessible to wheel loads, pavement thickness should be increased by 25 percent at the joints and tapered to regular thickness in 5 feet.

Table 9-2. Recommendations for Concrete Pavements

Property	Recommended Requirement
Compressive Strength @ 28 days	3,250 psi minimum
Strength Requirements	ASTM C94
Minimum Cement Content	5.5 sacks/cu. yd.
Cement Type	Type V Portland
Concrete Aggregate	ASTM C33
Aggregate Size	1-inch maximum
Maximum Water Content	0.5 lb/lb of cement
Maximum Allowable Slump	4 inches

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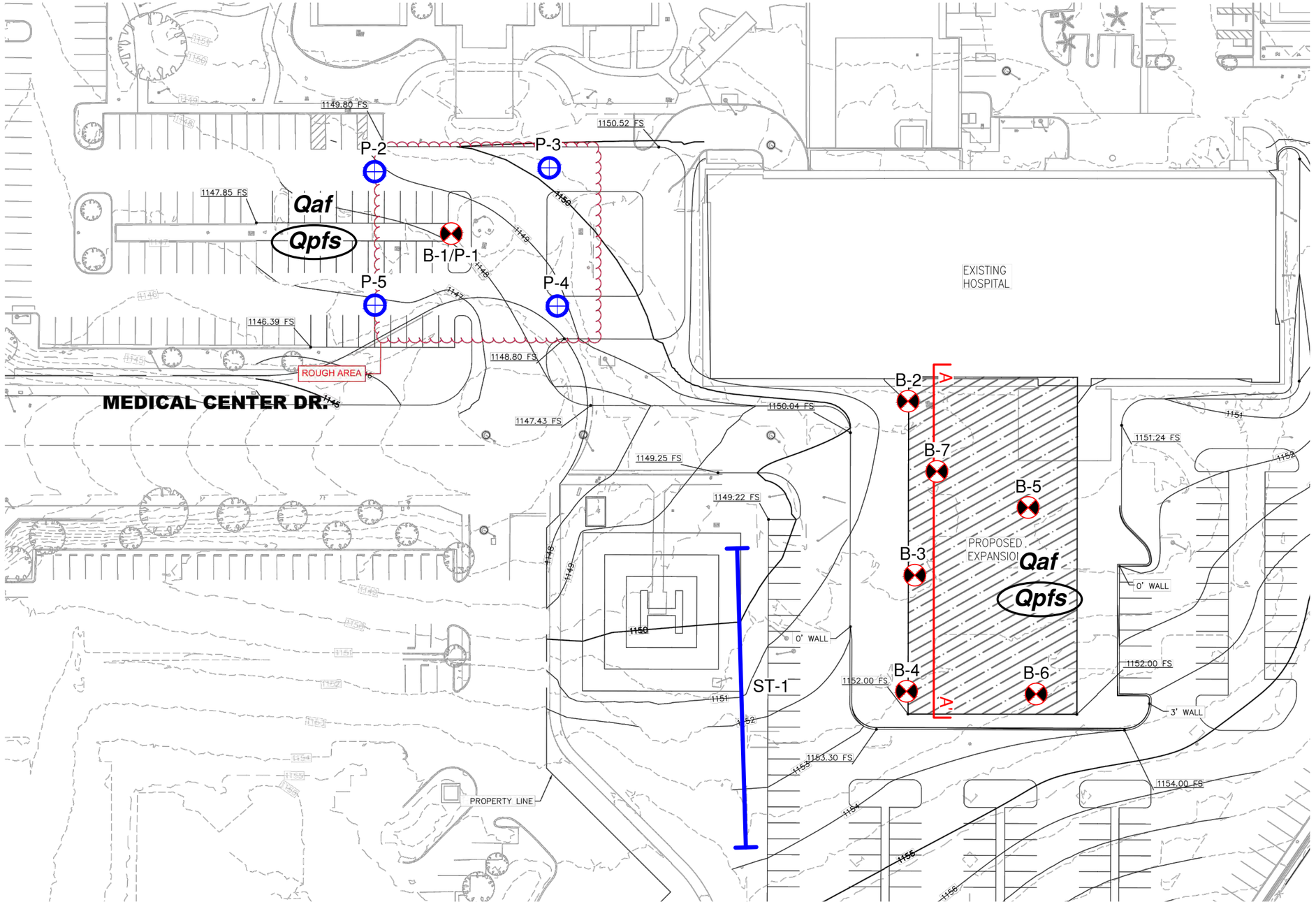
PLATES



KEY TO SYMBOLS

Qaf	FILL	B-7	LOCATION OF GEOTECHNICAL BORING
Qpfs	PAUBA FORMATION, CIRCLED WHERE BURIED	P-5	LOCATION OF PERCOLATION TEST BORING
A — A'	GEOLOGIC CROSS-SECTION	ST-1	SEISMIC TRAVERSE LINE LOCATION

PHASE 2 ROUGH GRADING

NOVA

24632 SAN JUAN AVE, SUITE 100
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UHS MEDICAL CENTER BUILDING

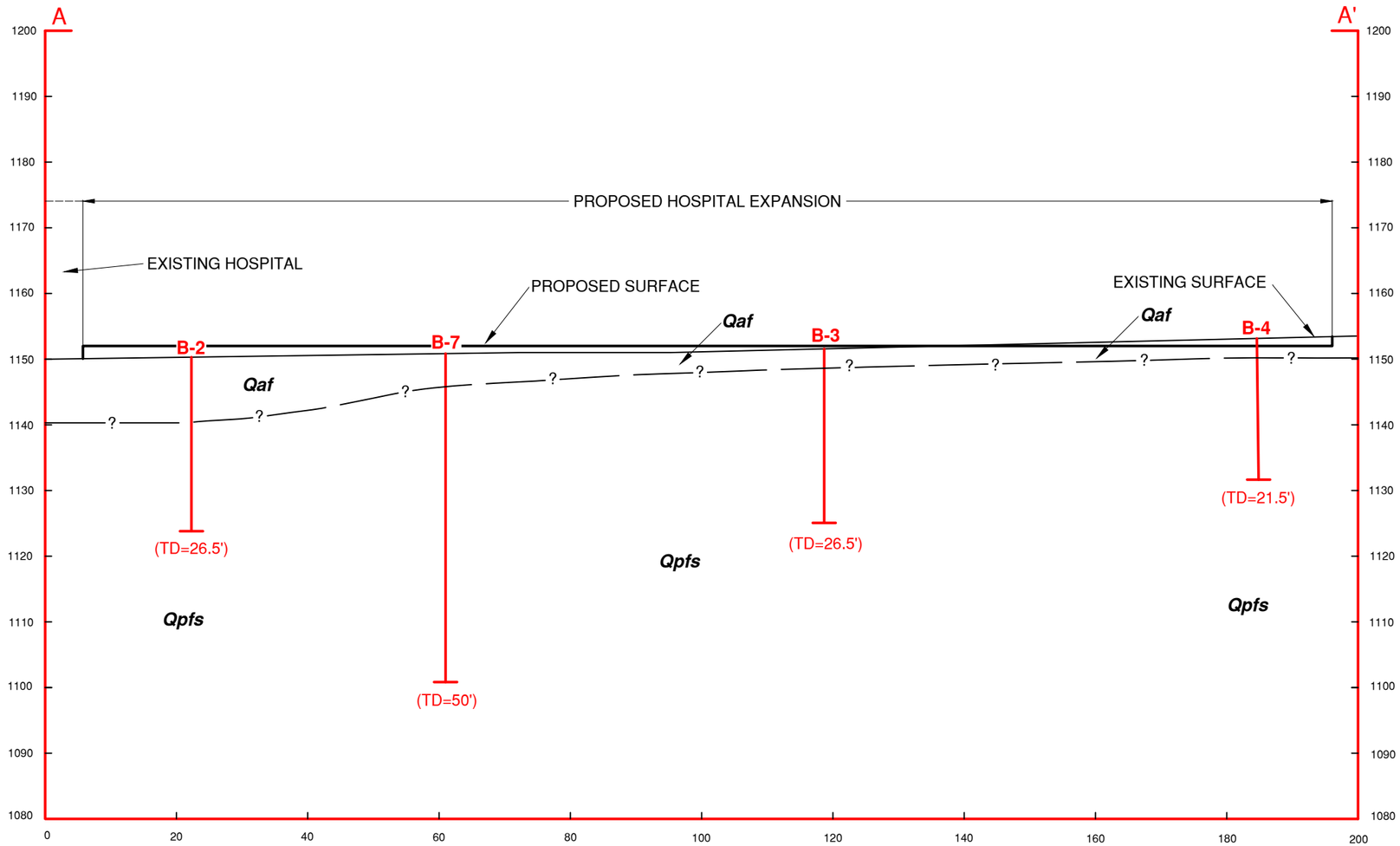
25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

PROJECT NO:	3019061
DATE:	DEC 2019
DRAWN BY:	DTW
REVIEWED BY:	JDB

SUBSURFACE EXPLORATION MAP

0 60' 120'

PLATE 1



KEY TO SYMBOLS

Qaf	FILL	B-7	LOCATION OF GEOTECHNICAL BORING
Qpfs	PAUBA FORMATION, CIRCLED WHERE BURIED	?~	GEOLOGIC CONTACT, QUERIED WHERE INFERRED

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25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

PROJECT NO:	3019061
DATE:	DEC 2019
DRAWN BY:	DTW
REVIEWED BY:	JDB

GEOLOGIC
CROSS-SECTION AA'

0 20' 40'

PLATE 2

APPENDIX A

USE OF THE GEOTECHNICAL REPORT

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

IIGER06045.0M

APPENDIX B

LOGS OF BORINGS

BORING LOG B-1/ P-1

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1147 FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						**ASPHALT: 3.5 INCHES, AGGREGATE BASE: 5.5 INCHES**		
				SM		**FILL (Qaf):** SILTY SAND; LIGHT TO DARK BROWN, DAMP TO MOIST, LOOSE TO MEDIUM DENSE, FINE TO MEDIUM GRAINED, TRACE GRAVEL.		
						DECREASING GRAVEL CONTENT.		
5				SC		CLAYEY SAND; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE, TRACE IRON STAINING, TRACE GRAVEL.		
10				SM		SILTY SAND WITH CLAY; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE, FINE TO COARSE GRAINED.		
				SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE TO DENSE, FINE TO COARSE GRAINED.		
15						BORING TERMINATED AT 15 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH CUTTINGS. CAPPED WITH AC COLD PATCH.		
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊠	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

NOVA

APPENDIX B.1

BORING LOG B-2

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1149FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION (SUMMARY OF SUBSURFACE CONDITIONS; USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)	LABORATORY	REMARKS
0			**ASPHALT: 4 INCHES, AGGREGATE BASE; 6 INCHES**		
	SM	11	**FILL (Qaf):** SILTY SAND; DARK BROWN, DAMP, LOOSE, MEDIUM TO COARSE GRAINED, TRACE IRON STAINING.		
5		2	VERY LOOSE.		
10	ML	26	**PAUBA FORMATION (Qpfs):** SANDY SILTSTONE; DARK BROWN, DAMP, VERY STIFF, FINE GRAINED, TRACE MICA, TRACE IRON STAINING.	SA	
15		26			
20	SM	32	SILTY SANDSTONE; LIGHT GRAY-BROWN, DAMP, VERY DENSE, MEDIUM TO COARSE GRAINED, ABUNDANT MICA, SOME IRON STAINING.		
25		57	SCATTERED MICA.		
			BORING TERMINATED AT 26.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH BORING CUTTINGS. CAPPED WITH AC COLD PATCH.		
30					

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊘	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.2

BORING LOG B-3

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1149FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION (SUMMARY OF SUBSURFACE CONDITIONS; USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)	LABORATORY	REMARKS
0						**ASPHALT: 4 INCHES, AGGREGATE BASE; 6 INCHES**		
				ML		**FILL (Qaf):** SANDY SILT; DARK BROWN, DRY TO DAMP, HARD, FINE TO MEDIUM GRAINED, SCATTERED MICA.		
					69			
				SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; DARK BROWN, DAMP, VERY DENSE, FINE GRAINED, TRACE MICA, TRACE IRON STAINING.		
5					>70#			
10					37	SANDY SILT INTERBED.		
15					50/ 4"	LIGHT BROWN, DRY TO DAMP, VERY DENSE, FINE TO MEDIUM GRAINED, TRACE MICA.		
20					40			
25					39	SILTY SANDSTONE; LIGHT GRAY-BROWN, DAMP, VERY DENSE, MEDIUM TO COARSE GRAINED, SCATTERED MICA, SOME IRON STAINING.		
30						BORING TERMINATED AT 26.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH BORING CUTTINGS. CAPPED WITH AC COLD PATCH.		

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊘	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.3

BORING LOG B-4

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1151FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION (SUMMARY OF SUBSURFACE CONDITIONS; USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)	LABORATORY	REMARKS
0						**ASPHALT: 4 INCHES, AGGREGATE BASE; 6 INCHES**		
				SM		**FILL (Qaf):** SILTY SAND; LIGHT TO DARK BROWN, DAMP, DENSE, FINE TO MEDIUM GRAINED, SCATTERED MICA, TRACE IRON STAINING.		
					48			
				SM		**PAUBA FORMATION (Qpfs):** SIL;TY SANDSTONE; BROWN, DAMP TO MOIST, VERY DENSE, FINE GRAINED, TRACE MICA, SCATTERED IRON STAINING, SILTSTONE INTERBEDS.		
5					20			
10					35	LIGHT BROWN TO LIGHT GRAY, FINE TO COARSE GRAINED, SOME IRON STAINING, SOME MICA.		
15					37	LIGHT BROWN, DRY TO DAMP, VERY DENSE, FINE TO MEDIUM GRAINED, TRACE MICA.		
20					42			
						BORING TERMINATED AT 21.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH BORING CUTTINGS. CAPPED WITH AC COLD PATCH.		
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊘	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.4

BORING LOG B-5

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1151FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION (SUMMARY OF SUBSURFACE CONDITIONS; USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)	LABORATORY	REMARKS
0			**ASPHALT: 4 INCHES, AGGREGATE BASE; 6 INCHES**		
	ML	57#	**FILL (Qaf):** SANDY SILT; RED BROWN, DAMP, HARD, FINE GRAINED, TRACE COARSE GRAINS, SCATTERED MICA, TRACE IRON STAINING.	SA	117.1 PCF, @ 9.9%
5		8	FINE GRAINED, ABUNDANT MICA.		
	SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; BROWN, DAMP TO MOIST, VERY DENSE, FINE GRAINED, TRACE MICA, SCATTERED IRON STAINING, SILTSTONE INTERBEDS.		
10		22	SANDY SILT INTERBEDS; RED BROWN, DAMP STIFF, FINE GRAINED, SCATTERED MICA, TRACE IRON STAINING.		
15		30			
20		44	LIGHT GRAY TO LIGHT BROWN, DAMP, MEDIUM DENSE, FINE TO MEDIUM GRAINED WITH VERY FINE SAND, ABUNDANT MICA, TRACE IRON STAINING.		
			BORING TERMINATED AT 21.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH BORING CUTTINGS. CAPPED WITH AC COLD PATCH.		
25					
30					

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊘	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.5

BORING LOG B-6

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1151FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION (SUMMARY OF SUBSURFACE CONDITIONS; USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)	LABORATORY	REMARKS
0			**ASPHALT: 4 INCHES, AGGREGATE BASE; 6 INCHES**		
	SM	36	**FILL (Qaf):** SANDY SILT; RED BROWN, DAMP, VERY STIFF, FINE TO MEDIUM GRAINED, TRACE MICA.		
5		16			
	SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT GRAY, DAMP, DENSE, FINE GRAINED, SOME MICA, SILTY INTERBEDS.		
10		41			
15		36	FINE TO MEDIUM GRAINED, SCATTERED MICA.		
20	SW	44	WELL GRADED SANDSTONE; LIGHT TO DARK GRAY, DAMP, VERY DENSE, FINE TO COARSE GRAINED, SCATTERED MICA, TRACE IRON STAINING, TRACE GRAVEL.		
			BORING TERMINATED AT 21.5 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH BORING CUTTINGS. CAPPED WITH AC COLD PATCH.		
25					
30					

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊘	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
▭	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.6

BORING LOG B-7

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1150FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION (SUMMARY OF SUBSURFACE CONDITIONS; USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)	LABORATORY	REMARKS
0			**ASPHALT: 4 INCHES, AGGREGATE BASE; 6 INCHES**		
	SC	8	**FILL (Qaf):** CLAYEY SAND; BROWN, DAMP, LOOSE, FINE TO COARSE GRAINED, SCATTERED MICA, TRACE GRAVEL.	MD CR RV	131.2 PCF, @ 8.4% SO_4 = 0.022% (220 PPM) R-VALUE = 25
5	SM	28	**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT GRAY, MOIST, MEDIUM DENSE, FINE GRAINED, SOME MICA, SILTSTONE INTERBEDS.		116.5 PCF, @ 14.7%
10		20	ABUNDANT MICA.		
15	ML	56	SANDY SILTSTONE; OLIVE BROWN, MOIST, VERY DENSE, SCATTERED TO SOME MICA, SCATTERED IRON STAINING.		117.2 PCF, @ 15.9%
20		30	DENSE, TRACE IRON STAINING.	SA	
25	SM	>70	LIGHT BROWN TO LIGHT GRAY, DAMP, VERY DENSE, FINE TO COARSE GRAINED, SCATTERED MICA.		
30					

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊘	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.7

CONTINUED BORING LOG B-7

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1150 FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS (USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
30			⧄	SW	47	WELL GRADED SANDSTONE; LIGHT TO DARK GRAY, DENSE, FINE TO COARSE GRAINED, TRACE FINE GRAVEL, TRACE IRON STAINING.		
35			■		>70	VERY DENSE, FINE TO MEDIUM GRAINED, SOME MICA.		
40			⧄		>50			
45			■		>70	FINE TO COARSE GRAINED,		
50			⧄		>70			
						BORING TERMINATED AT 50 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH BORING CUTTINGS.		
55								
60								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⧄	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.8

BORING LOG B-1/ P-1

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1147 FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						**ASPHALT: 3.5 INCHES, AGGREGATE BASE: 5.5 INCHES**		
				SM		**FILL (Qaf):** SILTY SAND; LIGHT TO DARK BROWN, DAMP TO MOIST, LOOSE TO MEDIUM DENSE, FINE TO MEDIUM GRAINED, TRACE GRAVEL.		
						DECREASING GRAVEL CONTENT.		
5				SC		CLAYEY SAND; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE, TRACE IRON STAINING, TRACE GRAVEL.		
10				SM		SILTY SAND WITH CLAY; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE, FINE TO COARSE GRAINED.		
				SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE TO DENSE, FINE TO COARSE GRAINED.		
15						BORING TERMINATED AT 15 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH CUTTINGS. CAPPED WITH AC COLD PATCH.		
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
☒	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.9

BORING LOG P-2

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1148 FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						**ASPHALT: 4 INCHES, AGGREGATE BASE: 6 INCHES**		
				SC		**FILL (Qaf):** CLAYEY SAND; RED BROWN, DAMP, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, TRACE MICA.		
5								
				SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE TO DENSE, FINE TO COARSE GRAINED.		
10						BORING TERMINATED AT 10 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH CUTTINGS. CAPPED WITH AC COLD PATCH.		
15								
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊠	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.10

BORING LOG P-3

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1148 FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0						**ASPHALT: 4 INCHES, AGGREGATE BASE: 10 INCHES**		
				SC		**FILL (Qaf):** CLAYEY SAND; RED BROWN, DAMP, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, TRACE MICA.		
5				SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE TO DENSE, FINE TO COARSE GRAINED.		
10						BORING TERMINATED AT 10 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH CUTTINGS. CAPPED WITH AC COLD PATCH.		
15								
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
☒	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.11

BORING LOG P-4

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1147 FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0				SC		**FILL (Qaf):** CLAYEY SAND; BROWN TO RED BROWN, MOIST, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, TRACE MICA, TRACE GRAVEL.		
5				SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT BROWN, MOIST, MEDIUM DENSE TO DENSE, FINE TO MEDIUM GRAINED, SCATTERED COARSE GRAINS.		
10						BORING TERMINATED AT 11 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH CUTTINGS.		
15								
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
☒	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.12

BORING LOG P-5

DATE EXCAVATED: AUGUST 19, 2019 **EQUIPMENT:** CME 75 DRILL RIG

EXCAVATION DESCRIPTION: 8 INCH DIAMETER AUGER BORING **GPS COORD.:**

GROUNDWATER DEPTH: NOT ENCOUNTERED **ELEVATION:** ± 1147 FT MSL (GOOGLE EARTH)

LAB TEST ABBREVIATIONS

CR	CORROSIVITY
MD	MAXIMUM DENSITY
DS	DIRECT SHEAR
EI	EXPANSION INDEX
AL	ATTERBERG LIMITS
SA	SIEVE ANALYSIS
RV	RESISTANCE VALUE
CN	CONSOLIDATION
SE	SAND EQUIVALENT

DEPTH (FT)	GRAPHIC LOG	BULK SAMPLE	CAL/SPT SAMPLE	SOIL CLASS. (USCS)	BLOWS PER 12-INCHES	SOIL DESCRIPTION *SUMMARY OF SUBSURFACE CONDITIONS* *(USCS; COLOR, MOISTURE, DENSITY, GRAIN SIZE, OTHER)*	LABORATORY	REMARKS
0				SC		**FILL (Qaf):** CLAYEY SAND; LIGHT TO DARK BROWN, MOIST, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, TRACE MICA.		
5				SM		**PAUBA FORMATION (Qpfs):** SILTY SANDSTONE; LIGHT TO DARK BROWN, MOIST, MEDIUM DENSE TO DENSE, FINE TO MEDIUM GRAINED.		
10						BORING TERMINATED AT 10 FT. NO GROUNDWATER ENCOUNTERED. NO CAVING. BACKFILLED WITH CUTTINGS.		
15								
20								
25								
30								

KEY TO SYMBOLS

▼/▽	GROUNDWATER / STABILIZED	#	ERRONEOUS BLOW COUNT
☒	BULK SAMPLE	*	NO SAMPLE RECOVERY
⊠	SPT SAMPLE (ASTM D1586)	———	GEOLOGIC CONTACT
■	CAL. MOD. SAMPLE (ASTM D3550)	— – —	SOIL TYPE CHANGE

25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

LOGGED BY:	TDT	DATE:	DEC 2019
REVIEWED BY:	JDB	PROJECT NO.:	3019061

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APPENDIX B.13

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

- **CLASSIFICATION:** *Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soils Classification System and are presented in the exploration logs.*
- **DENSITY OF SOIL IN PLACE (ASTM D2937):** *In-place moisture contents and dry densities were determined for representative soil samples. This information was an aid to classification and permitted recognition of variations in material consistency with depth. The dry unit weight is determined in pounds per cubic foot, and the in-place moisture content is determined as a percentage of the soil's dry weight. The results are summarized in the exploration logs.*
- **MAXIMUM DENSITY AND OPTIMUM MOISTURE CONTENT (ASTM D1557 METHOD A,B,C):** *The maximum dry density and optimum moisture content of typical soils were determined in the laboratory in accordance with ASTM Standard Test D1557, Method A, Method B, Method C.*
- **CORROSIVITY TEST (CAL. TEST METHOD 417, 422, 643):** *Soil PH, and minimum resistivity tests were performed on a representative soil sample in general accordance with test method CT 643. The sulfate and chloride content of the selected sample were evaluated in general accordance with CT 417 and CT 422, respectively.*
- **DIRECT SHEAR (ASTM D3080):** *Direct shear tests were performed on remolded and relatively undisturbed samples in general accordance with ASTM D3080 to evaluate the shear stregth characteristics of selected materials. The samples were inundated during shearing to represent adverse field conditions.*
- **R-VALUE (ASTM D2844):** *The resistance Value, or R-Value, for near-surface site soils were evaluated in general accordance with California Test (CT) 301 and ASTM D2844. Samples were prepared and evaluated for exudation pressure and expansion pressure. The equilibrium R-value is reported as the lesser or more conservative of the two calculated results.*
- **GRADATION ANALYSIS (ASTM C136 and/or ASTM D422):** *Tests were performed on selected representative soil samples in general accordance with ASTM D422. The grain size distributions of selected samples were determined in accordance with ASTM C136 and/or ASTM D422.*

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LAB TEST SUMMARY

UHS RANCHO SPRINGS MEDICAL CENTER RENOVATION
25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

BY: DTW	DATE: DECEMBER 2019	PROJECT: 3019061

APPENDIX C

LABORATORY ANALYTICAL RESULTS

Density of Soil in Place (ASTM D2937)

Sample Location	Sample Depth (ft)	Moisture (%)	Dry Density (pcf)
B-5	2.5'-4.0'	9.9	117.1
B-7	5.0'-6.5'	14.7	116.5
B-7	15.0'-16.5'	15.9	117.2

Resistance Value (Cal. Test Method 301 & ASTM D2844)

Sample Location	Sample Depth (ft.)	R-Value
B-7	0.0'-5.0'	25

Maximum Dry Density and Optimum Moisture Content (ASTM D1557)

Sample Location	Sample Depth (ft.)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
B-7	0.0'-5.0'	131.2	8.4

Direct Shear (ASTM D3080)

Sample Location	Depth (feet)	Soil Description	Peak Friction Angle (degrees)	Peak Apparent Cohesion (psf)
B-7	0.0'-5.0'	Brown Clayey Sand	34°	757

Corrosivity (Cal. Test Method 417,422,643)

Sample Location	Sample Depth (ft.)	pH	Resistivity (Ohm-cm)	Sulfate Content (ppm)	Sulfate Content (%)	Chloride Content (ppm)	Chloride Content (%)
B-7	0.0'-5.0'	8.3	1300	220	0.022	75	0.007

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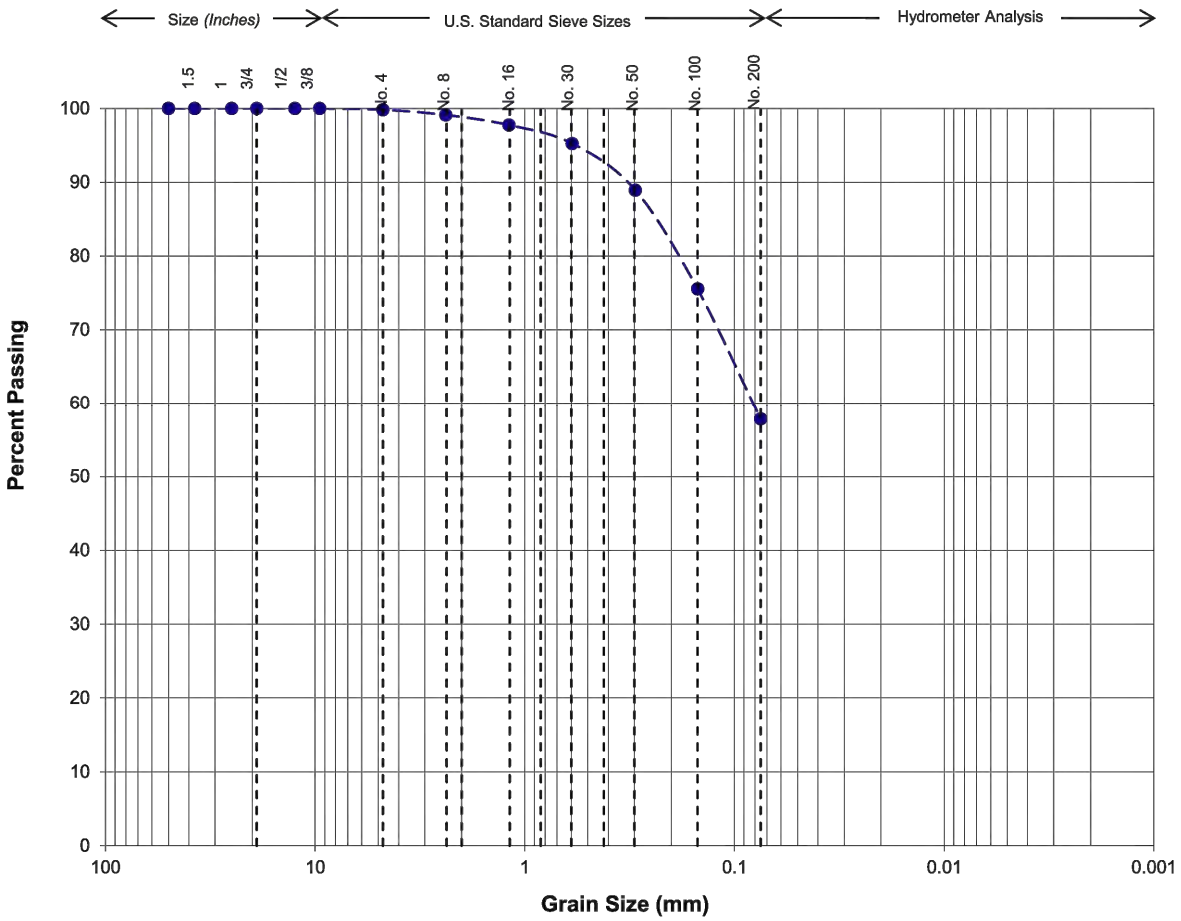
LAB TEST RESULTS

UHS RANCHO SPRINGS MEDICAL CENTER RENOVATION
25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

BY: DTW | DATE: DECEMBER 2019 | PROJECT: 3019061



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-2

Depth (ft): 10.0'-11.5' & 15.0'-16.5' (COMBINED)

USCS Soil Type: ML

Passing No. 200 (%): 58

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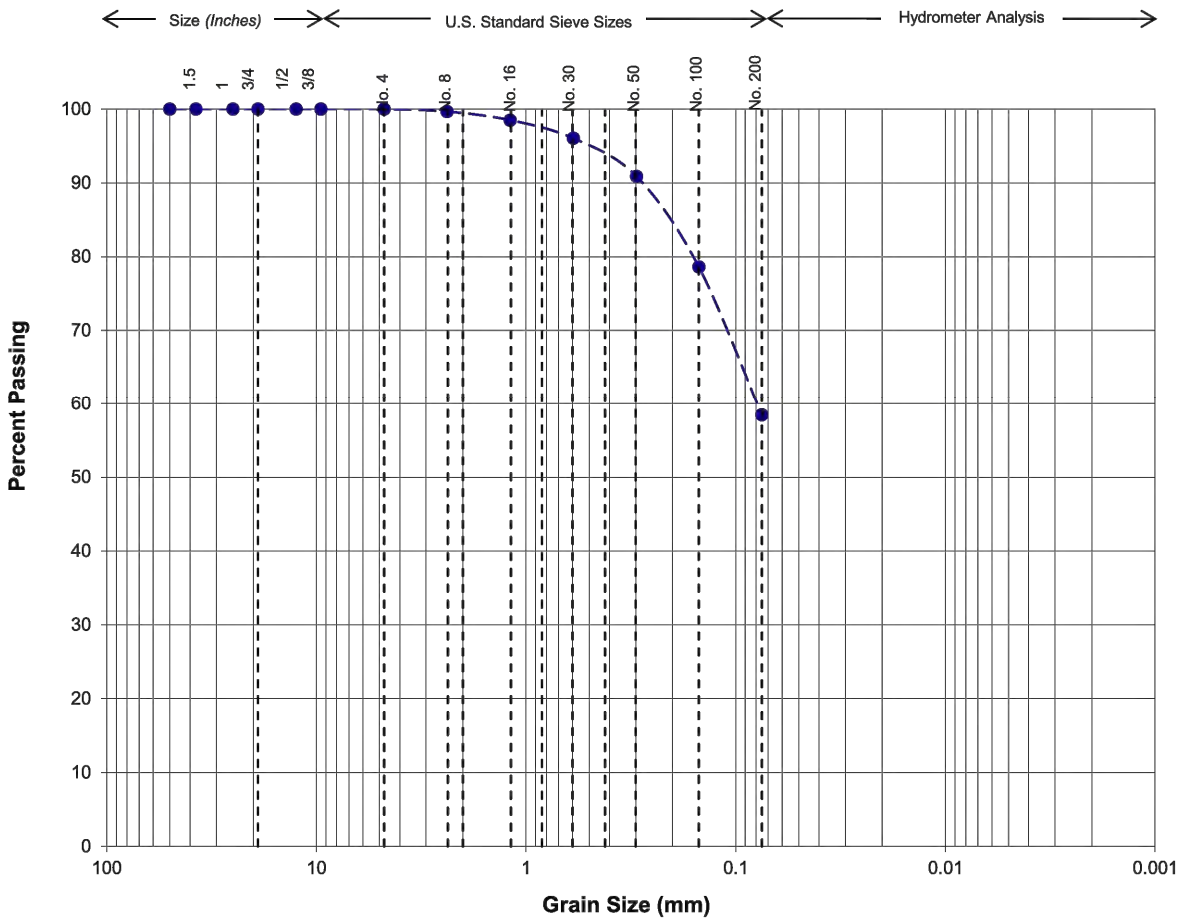
GRADATION ANALYSIS TEST RESULTS

UHS RANCHO SPRINGS MEDICAL CENTER RENOVATION
25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

BY: DTW	DATE: DECEMBER 2019	PROJECT: 3019061



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-5

Depth (ft): 2.5'-4.0'

USCS Soil Type: ML

Passing No. 200 (%): 58

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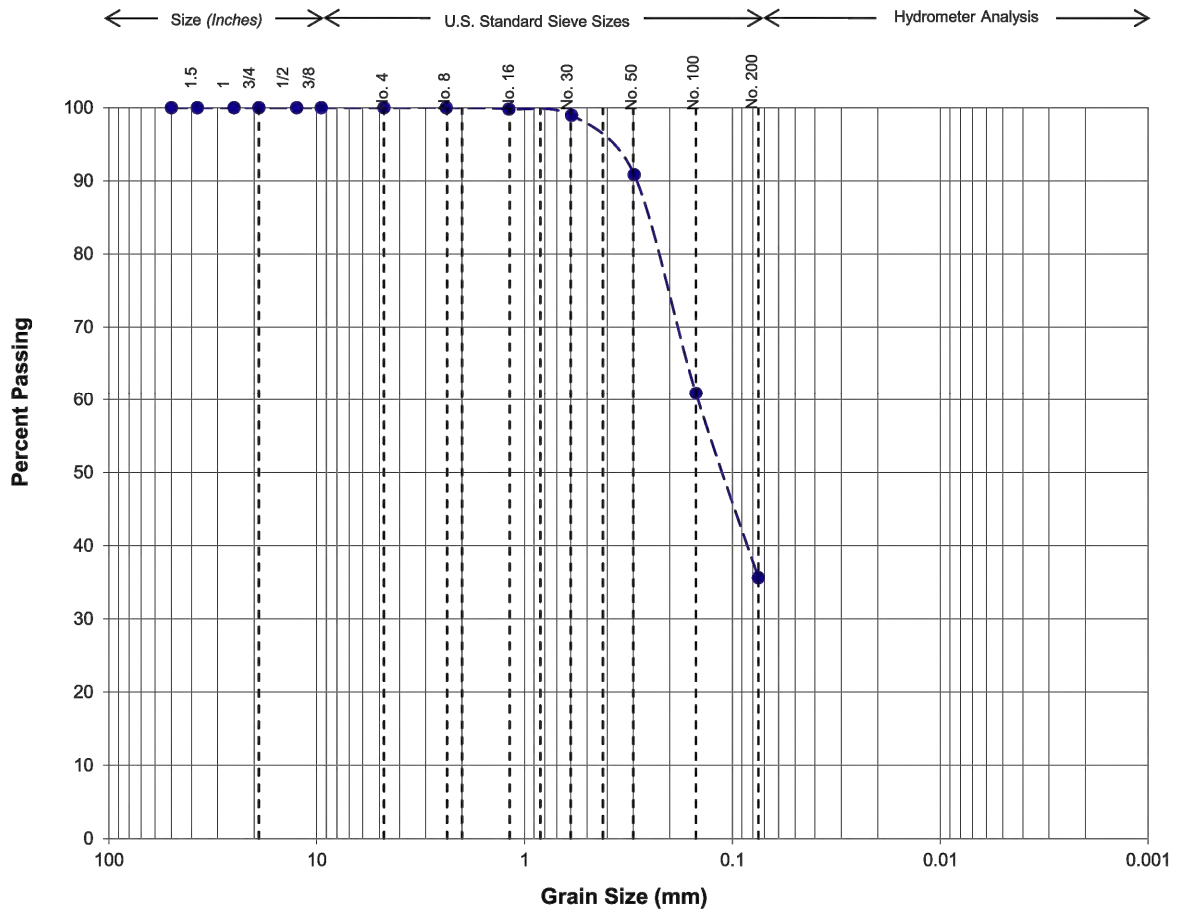
GRADATION ANALYSIS TEST RESULTS

UHS RANCHO SPRINGS MEDICAL CENTER RENOVATION
25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

BY: DTW	DATE: DECEMBER 2019	PROJECT: 3019061



Gravel		Sand			Silt or Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample Location: B-7

Depth (ft): 20.0'-21.5'

USCS Soil Type: SM

Passing No. 200 (%): 36

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GRADATION ANALYSIS TEST RESULTS

UHS RANCHO SPRINGS MEDICAL CENTER RENOVATION
25500 MEDICAL CENTER DRIVE
MURRIETA, CALIFORNIA

BY: DTW	DATE: DECEMBER 2019	PROJECT: 3019061

APPENDIX D

STORMWATER INFILTRATION

PERCOLATION TEST DATA SHEET P - __1___

Project:	25500 Med Ctr Road	Project No:	3019061	Date:	20-Aug-19
Test Hole No: P- **1**		Tested By:	Tim Taverentti		
Depth of test Hole:	15' (180")	USCS Soil Classification: Silty Sand with Clay (SM)			
Test Hole Dimensions (inches)				Length	Width
Diameter (if round) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trail No.	Start Time	Stop Time	Time Interval (min.)	Intital Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1							
2							

* If two consecutive measurements show that six inches of water seps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at lease 0.25".

Trail No.	Start Time	Stop Time	Time Interval (min)	Initial Depth to Water (ft)	Final Depth to Water (ft)	Change in Water Level (in)	Percolation Rate (min/ in)
1	8:30	9:00	30	6.35	7.15	9.60	3.13
2	9:15	9:46	31	7.35	11.25	46.80	0.66
3	9:54	10:29	35	6.00	10.26	51.12	0.68
4	10:30	10:55	25	6.00	9.95	47.40	0.53

NOTE: Location appears to be within an existing utility trench. Testing halted after 2.5 hours.

PERCOLATION TEST DATA SHEET P - __2___

Project:	25500 Med Ctr Road	Project No:	3019061	Date:	20-Aug-19
Test Hole No: P - 2		Tested By:	Tim Tavernetti		
Depth of test Hole:	10' (120")	USCS Soil Classification: Silty Sand (SM)			
Test Hole Dimensions (inches)				Length	Width
Diameter (if round) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trail No.	Start Time	Stop Time	Time Interval (min.)	Intital Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1							
2							

* If two consecutive measurements show that six inches of water seps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at lease 0.25".

Trail No.	Start Time	Stop Time	Time Interval (min)	Initial Depth to Water (ft)	Final Depth to Water (ft)	Change in Water Level (in)	Percolation Rate (min/ in)
1	8:43	9:00	17	4.05	4.71	7.92	2.15
2	9:20	9:46	35	3.85	4.55	8.40	4.17
3	9:58	10:29	34	3.75	4.46	8.52	3.99
4	10:34	10:55	23	3.70	4.24	6.48	3.55
5	10:59	11:23	24	3.60	4.15	6.60	3.64
6	11:25	11:57	32	3.72	4.32	7.20	4.44
7	11:59	12:28	29	3.90	4.40	6.00	4.83
8	12:30	13:01	31	4.00	4.52	6.24	4.97
9	13:04	13:31	27	3.94	4.41	5.64	4.79
10	13:32	14:07	35	3.89	4.70	9.72	3.60
11	14:09	14:39	30	3.90	4.40	6.00	5.00

PERCOLATION TEST DATA SHEET P - __3___

Project:	25500 Med Ctr Road	Project No:	3019061	Date:	20-Aug-19
Test Hole No: P - 3		Tested By:	Tim Tavernetti		
Depth of test Hole:	10' (120")	USCS Soil Classification: Silty Sand (SM)			
Test Hole Dimensions (inches)				Length	Width
Diameter (if round) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trail No.	Start Time	Stop Time	Time Interval (min.)	Intital Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1							
2							

* If two consecutive measurements show that six inches of water seps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at lease 0.25".

Trail No.	Start Time	Stop Time	Time Interval (min)	Initial Depth to Water (ft)	Final Depth to Water (ft)	Change in Water Level (in)	Percolation Rate (min/ in)
1	8:50	9:21	31	5.65	6.00	4.20	7.38
2	9:25	10:00	35	4.30	4.75	5.40	6.48
3	10:03	10:36	33	4.05	4.72	8.04	4.10
4	10:39	11:01	22	4.26	4.85	7.08	3.11
5	11:02	11:32	30	3.32	4.11	9.48	3.16
6	11:34	12:02	28	4.45	5.16	8.52	3.29
7	12:04	12:38	34	4.30	5.00	8.40	4.05
8	12:42	13:05	23	4.20	4.77	6.84	3.36
9	13:07	13:38	31	4.10	4.93	9.96	3.11
10	13:39	10:09	30	4.25	4.95	8.40	3.57
11	14:10	14:40	30	4.20	4.85	7.80	3.85

PERCOLATION TEST DATA SHEET P - __4___

Project:	25500 Med Ctr Road	Project No:	3019061	Date:	20-Aug-19
Test Hole No: P - 4		Tested By:	Tim Tavernetti		
Depth of test Hole:	11' (132")	USCS Soil Classification: Silty Sand (SM)			
Test Hole Dimensions (inches)				Length	Width
Diameter (if round) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trail No.	Start Time	Stop Time	Time Interval (min.)	Intital Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1							
2							

* If two consecutive measurements show that six inches of water seps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at lease 0.25".

Trail No.	Start Time	Stop Time	Time Interval (min)	Initial Depth to Water (ft)	Final Depth to Water (ft)	Change in Water Level (in)	Percolation Rate (min/ in)
1	8:50	9:27	32	2.95	5.40	29.40	1.09
2	9:32	10:03	31	2.11	5.20	37.08	0.84
3	10:05	10:41	36	4.25	5.85	19.20	1.88
4	10:44	11:14	30	4.40	5.77	16.44	1.82
5	11:17	11:48	31	4.40	5.80	16.80	1.85
6	11:50	12:20	30	4.40	5.71	15.72	1.91
7	12:23	12:53	30	5.22	6.12	10.80	2.78
8	12:54	13:18	24	5.15	6.20	12.60	1.90
9	13:23	13:51	28	4.50	5.57	12.84	2.18
10	13:52	14:20	28	4.80	5.90	13.20	2.12
11	14:22	14:52	30	4.60	5.80	14.40	2.08

PERCOLATION TEST DATA SHEET P - __5___

Project:	25500 Med Ctr Road	Project No:	3019061	Date:	20-Aug-19
Test Hole No: P - 5		Tested By:	Tim Tavernetti		
Depth of test Hole:	10' (120")	USCS Soil Classification: Silty Sand (SM)			
Test Hole Dimensions (inches)				Length	Width
Diameter (if round) =	8	Sides (if rectangular) =			

Sandy Soil Criteria Test*

Trail No.	Start Time	Stop Time	Time Interval (min.)	Intital Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1							
2							

* If two consecutive measurements show that six inches of water seps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at lease 0.25".

Trail No.	Start Time	Stop Time	Time Interval (min)	Initial Depth to Water (ft)	Final Depth to Water (ft)	Change in Water Level (in)	Percolation Rate (min/ in)
1	8:37	9:08	31	5.15	5.25	1.20	25.83
2	9:10	9:43	33	3.70	4.15	5.40	6.11
3	9:45	10:20	35	3.90	4.4	6.00	5.83
4	10:22	10:50	38	2.25	3.65	16.80	2.26
5	10:53	11:19	26	2.30	3.15	10.20	2.55
6	11:21	11:51	30	2.40	2.95	6.60	4.55
7	11:53	12:24	29	2.35	2.81	5.52	5.25
8	12:26	12:52	26	2.33	2.75	5.04	5.16
9	12:53	13:24	31	2.11	2.7	7.08	4.38
10	13:29	14:08	39	2.15	2.60	5.40	7.22
11	14:06	14:37	31	1.50	2.30	9.60	3.23

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.

N/A

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.

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?		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 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:		
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 Design Handbook).	X	
If Yes, list affected DMAs: DMA 1-4		
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:		
Other Site-Specific Factors (SMR WQMP Section 2.3.3.f)		
Does the project site…	**YES**	**NO**
…have DMAs where the geotechnical report discovered other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

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.

Refer to Appendix 3 for Soils Information.

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.

Santa Margarita Watershed

BMP Design Volume, V_{BMP}

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

Company Name	Kimley Horn and Associates, Inc.	Date	6/5/2020
Designed by	LAC	County/City Case No	
Company Project Number/Name	UHS Rancho Springs		
Drainage Area Number/Name	TOTAL SITE		

Enter the Area Tributary to this Feature A_T = 5.30 acres

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

Site Location: 15500 Medical Center Drive, Murrieta, CA 92562

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.80

Determine the Effective Impervious Fraction

Type of post-development surface cover: Mixed Surface Types

Effective Impervious Fraction I_f = 0.82

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.62

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.50 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 9,548 ft^3

Notes:

This spreadsheet was modified to account for a post-development surface cover of "Mixed Surface Types" since this drainage area contains both pervious and impervious elements

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP}

Company Name	Kimley Horn and Associates, Inc.	Date	5/12/2021
Designed by	LAC	County/City Case No	
Company Project Number/Name	UHS Rancho Springs		
Drainage Area Number/Name	DMA 1		

Enter the Area Tributary to this Feature A_T = 4.83 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover: Mixed Surface Types

Effective Impervious Fraction I_f = 0.82

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.63

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.61 ft^3/s

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP}

Company Name	Kimley Horn and Associates, Inc.	Date	5/12/2021
Designed by	LAC	County/City Case No	
Company Project Number/Name	UHS Rancho Springs		
Drainage Area Number/Name	DMA 2		

Enter the Area Tributary to this Feature A_T = 0.42 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover: Mixed Surface Types

Effective Impervious Fraction I_f = 0.42

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.29

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.02 ft^3/s

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP}

Company Name	Kimley Horn and Associates, Inc.	Date	5/12/2021
Designed by	LAC	County/City Case No	
Company Project Number/Name	UHS Rancho Springs		
Drainage Area Number/Name	DMA 2		

Enter the Area Tributary to this Feature A_T = 0.05 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover: Mixed Surface Types

Effective Impervious Fraction I_f = 0.82

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.63

BMP Design Flow Rate

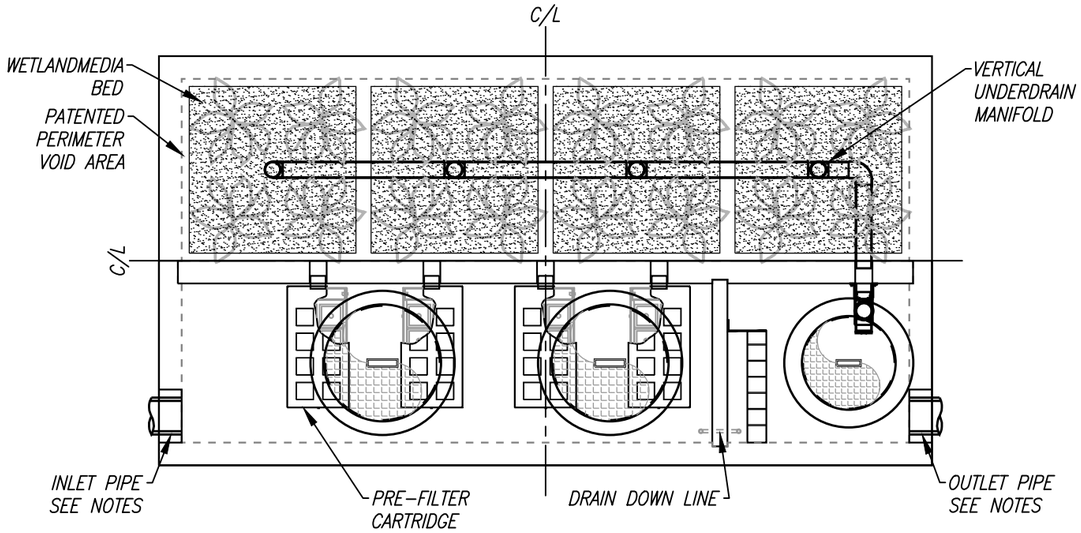
$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.01 ft^3/s

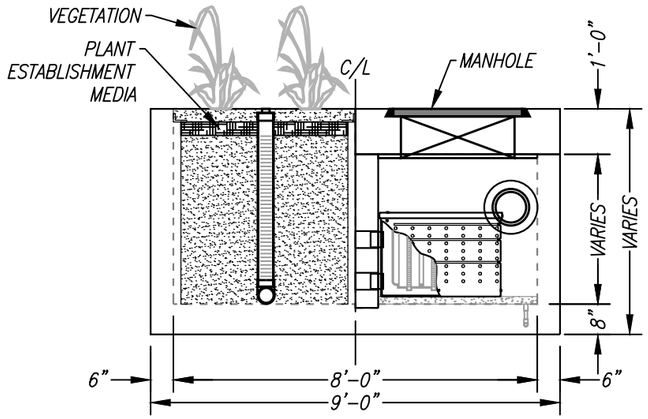
Notes:

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.462	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
FRAME & COVER	2EA ø30"	OPEN PLANTER	ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



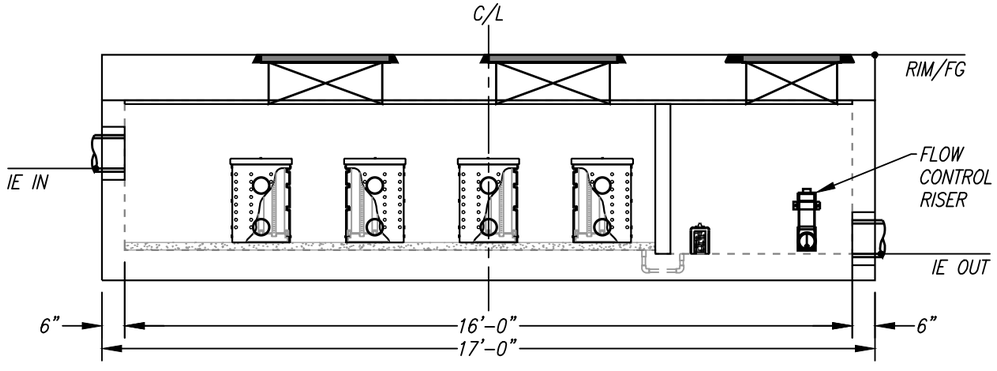
LEFT END VIEW

INSTALLATION NOTES

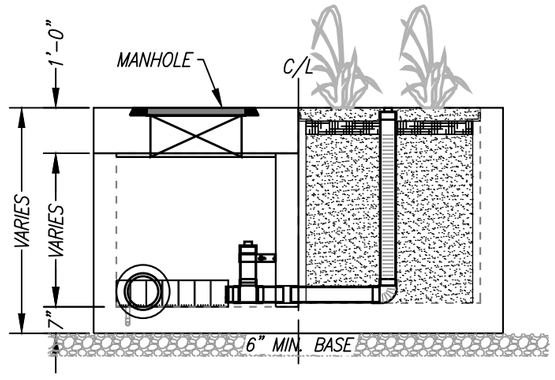
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATER TIGHT PER MANUFACTURERS STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.462
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-8-16-V
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

5/23/19 10:LEF

WASHINGTON STATE DEPARTMENT OF ECOLOGY

July 2017

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

    - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
    - Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
    - Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

    - Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
    - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
    - Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
    - Standing water remains in the vault between rain events, or
    - Bypass occurs during storms smaller than the design storm.
    - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
    - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Modular Wetland Systems, Inc.
Applicant's Address:	*PO. Box 869* *Oceanside, CA 92054*

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

Laboratory Testing

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:
Applicant: Zach Kent
BioClean A Forterra Company.
398 Vi9a El Centro
Oceanside, CA 92058
zach.kent@forterrabp.com

Applicant website: http://www.modularwetlands.com/

Ecology web link: http://www.ecy.wa.gov/programs/wg/stormwater/newtech/index.html

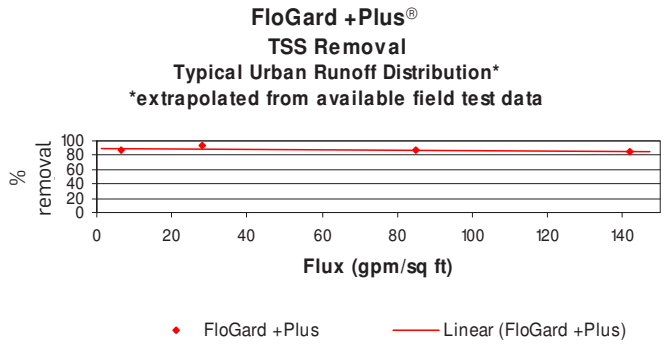
Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

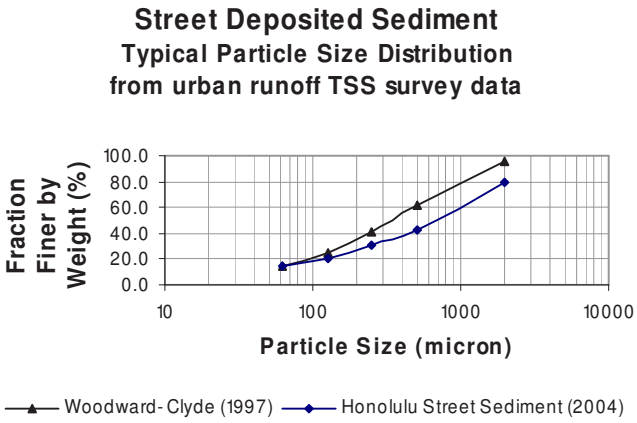
Revision History

Date	**Revision**
June 2011	Original use-level-designation document
September 2012	Revised dates for TER and expiration
January 2013	Modified Design Storm Description, added Revision Table, added maintenance discussion, modified format in accordance with Ecology standard
December 2013	Updated name of Applicant
April 2014	Approved GULD designation for Basic, Phosphorus, and Enhanced treatment
December 2015	Updated GULD to document the acceptance of MWS-Linear Modular Wetland installations with or without the inclusion of plants
July 2017	Revised Manufacturer Contact Information (name, address, and email)

FLOGARD +PLUS®

Independent field tests conducted in Hawaii and New Zealand on FloGard +PLUS® Catch Basin Insert Filters to determine removal efficiency of Total Suspended Solids (TSS). Results were extrapolated to a typical street deposited sediment particle size. Removal efficiencies were plotted and reflect effective TSS removal over a typical range of operating flow rates. Results are shown below as a function of unit internal surface area.





FloGard +PLUS® Catch Basin Insert Filter is an efficient inlet prefilter designed to remove suspended sediment and floatable trash and hydrocarbons from stormwater runoff in new or retrofit applications. It is ideally suited for removal of primary pollutants from paved surfaces in commercial and residential areas, or may form part of a treatment train. The device features a unique dual-bypass design, durable components, flexible installation options and easy maintenance access.

Units are sized to fit most common styles of drainage inlet grate frames or inlet widths. Rated filtered flow capacities for each model typically exceed the required "first flush" treatment flow rate, and account for reduction in capacity as the unit accumulates suspended pollutants. Rated bypass capacity for each model also typically exceeds the inlet capacity of the catch basin.

FloGard +PLUS® Test Results Summary

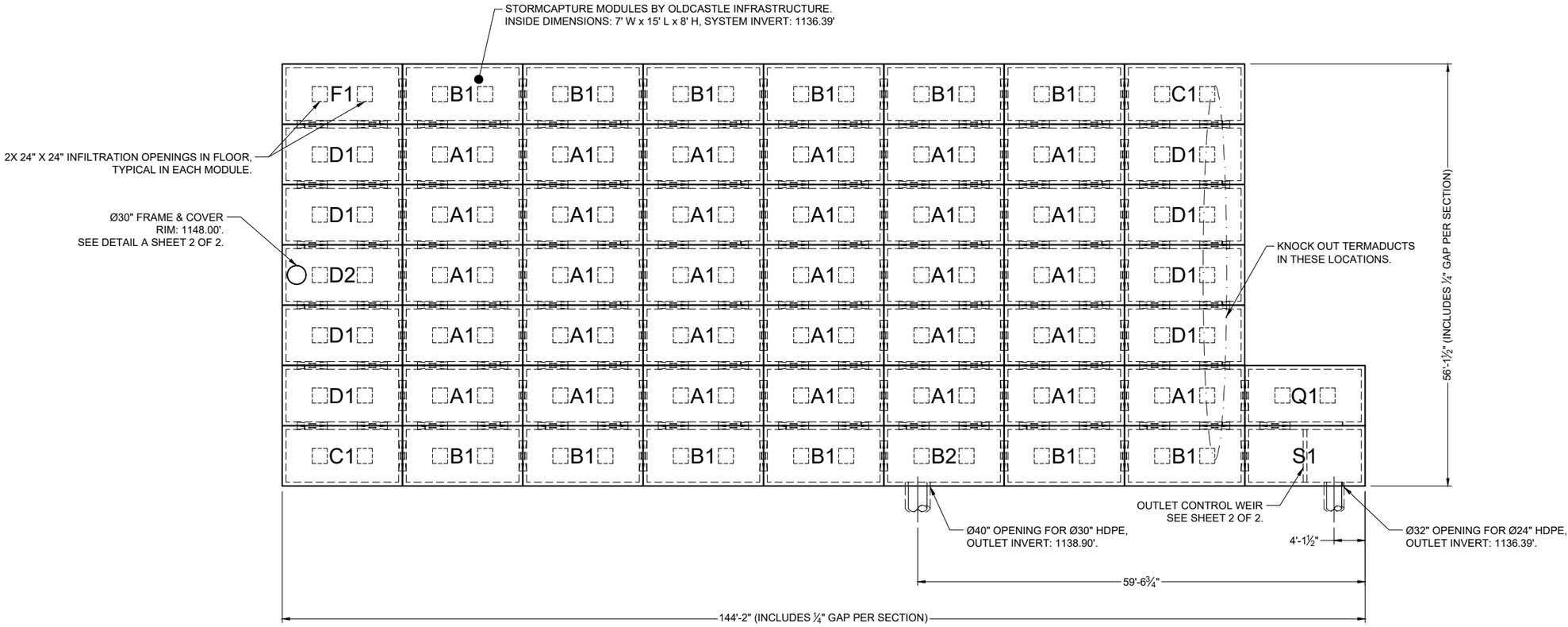
Testing Agency	%TSS Removal	% Oil & Grease Removal
UCLA	80*	70-80
U of Auckland Tonkin & Taylor LTD (City of Auckland)	95** 78-86***	
U of Hawaii (City of Honolulu)	80***	

*Sand larger than ~ 575 µm
**Sand distribution ~ 100-1000 µm
***Local street sweep material (distribution consistent with NURP)

See product specifications for standard model details.

REVISIONS			
REVISION	DATE	REV BY	DESCRIPTION
1	3/18/21	PPS	REVISED LAYOUT PLAN & EDITED PER RECEIVED REDLINES

BILL OF MATERIALS		
TYPE	QTY.	HEIGHT
A1	31	8'
B1	12	8'
B2	1	8'
C1	2	8'
D1	8	8'
D2	1	8'
F1	1	8'
Q1	1	8'
S1	1	8'
TOTALS		
4' TOP	58	
4' BASE	58	
Ø30" FRAME & COVER	1	
Ø30"X12" GRADE RING	2	
Ø30"X6" GRADE RING	1	
VOLUME	52,202	CUBIC FEET



PLAN VIEW
SCALE: 1/16" = 1'-0"

DESIGN NOTES:

1. DESIGN LOADINGS:
   - A. AASHTO HS-20-44 W/ IMPACT.
   - B. DEPTH OF COVER = 0.5' - 5.0' (120 PCF ASSUMED).
   - C. ASSUMED WATER TABLE = BELOW BOTTOM OF PRECAST.
   - D. DRY LATERAL EARTH PRESSURE (EFP) = 45 PCF.
   - E. LATERAL LIVE LOAD SURCHARGE = 80 PSF (APPLIED TO 8' BELOW GRADE).
   - F. NO LATERAL SURCHARGE FROM ADJACENT BUILDINGS, WALL PIERS, OR FOUNDATIONS.
2. CONCRETE 28 DAY COMPRESSIVE STRENGTH SHALL BE 6,000 PSI.
3. STEEL REINFORCEMENT: REBAR, ASTM A-615 OR A-706, GRADE 60.
4. MESH REINFORCEMENT: ASTM A-1064, S1.2, GRADE 80.
5. CEMENT: ASTM C-150 SPECIFICATION.
6. STORMCAPTURE MODULE TYPE = INFILTRATION.
7. REQUIRED BASE LAYER DEPTH = NOT APPLICABLE.
8. REQUIRED NATIVE ALLOWABLE SOIL BEARING PRESSURE = 2,500 PSF. NATIVE SOIL SHOULD BE LEVEL/SCREEDED AND COMPACTED ADEQUATELY TO ALLOW FOR REQUIRED BEARING CAPACITY.
9. REFERENCE STANDARDS:
   - A. ASTM C 890
   - B. ASTM C 891
   - C. ASTM C 913
10. CONSTRUCTION EQUIPMENT EXCEEDING DESIGN LOADING SHALL NOT BE ALLOWED ON STRUCTURE. ANY DESIGN CONSTRAINT DIFFERENT FROM ABOVE REQUIRES CUSTOM STRUCTURAL DESIGN AND MAY REQUIRE THICKER SUBGRADE AND REVISED PRICING.

NOTES TO REVIEWING ENGINEER:

1. THIS SYSTEM IS DESIGNED TO THE PARAMETERS NOTED. PLEASE VERIFY THAT THESE PARAMETERS MEET PROJECT REQUIREMENTS (I.E. LIVE LOAD AND FILL RANGE). IF DESIGN PARAMETERS ARE INCORRECT NOTIFY OLDCASTLE IMMEDIATELY FOR REDESIGN AND RE-PRICING.
2. REVIEWING ENGINEER TO CONFIRM ALL PIPE PENETRATION LOCATIONS, SIZES, AND INVERTS.
3. REVIEWING ENGINEER TO CONFIRM ALL FRAME & COVER LOCATIONS AND RIM ELEVATIONS.
4. UNLESS OTHERWISE NOTED, ALL PIPE SUPPLIED AND INSTALLED BY OTHERS.
5. THIS SYSTEM IS DESIGNED FOR A GROUNDWATER TABLE BELOW SYSTEM INVERT. REVIEWING ENGINEER TO VERIFY THAT THE DESIGN GROUNDWATER TABLE IS BELOW INVERT OF PRECAST. IF DESIGN PARAMETERS ARE INCORRECT NOTIFY OLDCASTLE IMMEDIATELY FOR REDESIGN AND REVISED PRICING.
6. THIS SYSTEM IS DESIGNED WITHOUT A CONTAINMENT MEMBRANE LINER. IF A LINER IS NEEDED PLEASE CONTACT OLDCASTLE TO PROVIDE THIS OPTION IN THE FINAL DESIGN.

Detention/
Infiltration

- PRELIMINARY -
NOT FOR CONSTRUCTION

Oldcastle Infrastructure™
A CRH COMPANY

Ph: 800.579.8819 | www.oldcastleinfrastructure.com/stormwater

STORMCAPTURE®
SC2 Infiltration System

CUSTOMER
Kimley-Horn

JOB NAME
Rancho Springs Medical Center - UHS - Murrietta, CA

DATE	MFG	DRAWN	ENGINEER	CHECKED	SALES ORDER
7/9/20	070-FO	PPS	TJR	TJR	---

INTERNAL DRAWING ID	REVISION	SHEET
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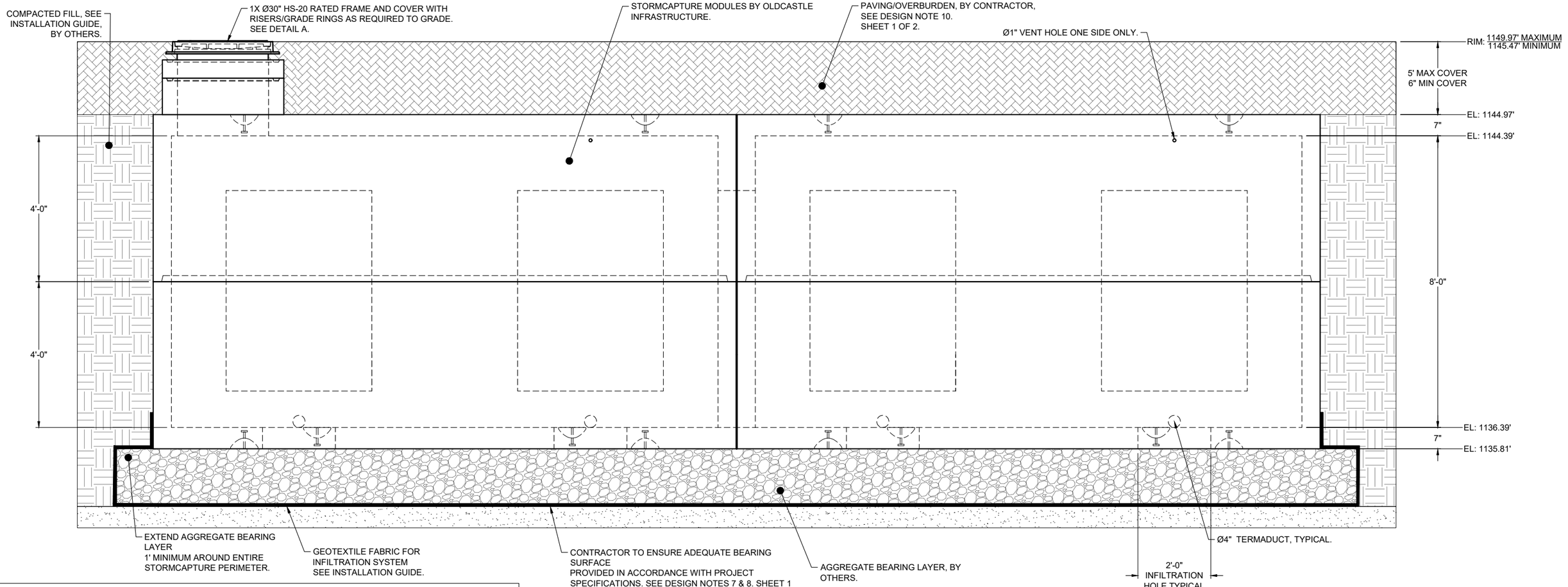
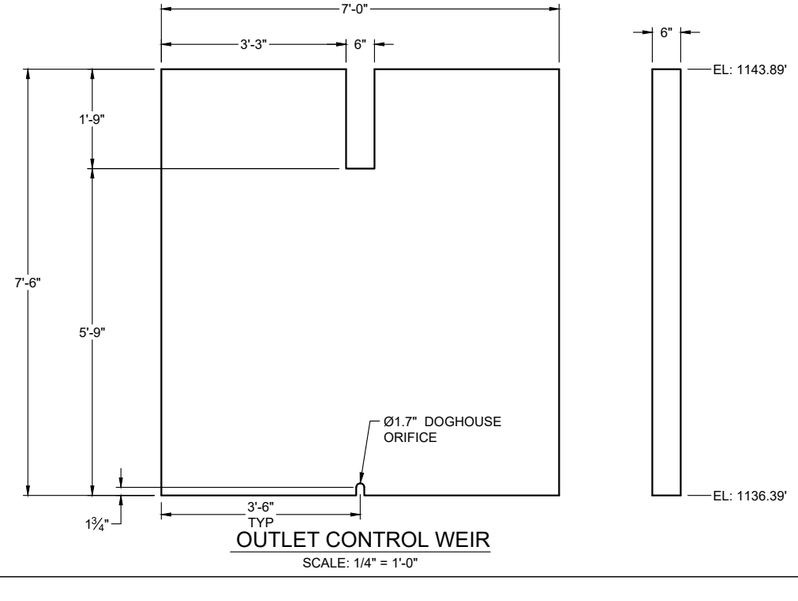


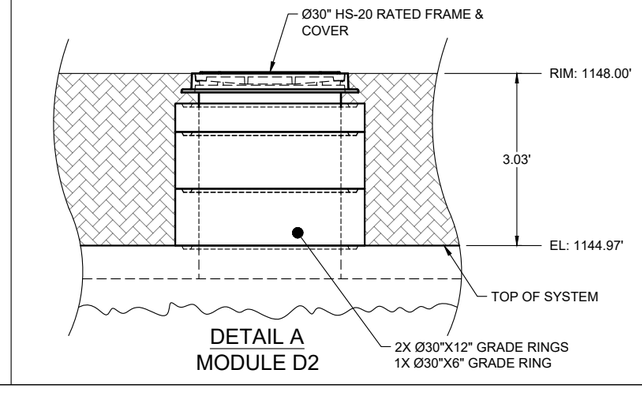
TYPICAL ELEVATION

SCALE: 3/8" = 1'-0"



OUTLET CONTROL WEIR

SCALE: 1/4" = 1'-0"



DETAIL A
MODULE D2

NOTE:

1. TERMADUCT INSERTS TO BE KNOCKED OUT AT SPECIFIED LOCATIONS ONLY (BY OTHERS).
2. FOR INFILTRATION - EXFILTRATION SYSTEMS, THE AGGREGATE SUBGRADE MUST BE WASHED AND CLEAN.

Detention/ Infiltration

Oldcastle Infrastructure™
A CRH COMPANY

Ph: 800.579.8819 | www.oldcastleinfrastructure.com/stormwater

STORMCAPTURE®
SC2 Infiltration System

CUSTOMER: Kimley-Horn

JOB NAME: Rancho Springs Medical Center - UHS - Murrietta, CA

DATE	MFG	DRAWN	ENGINEER	CHECKED	SALES ORDER
7/9/20	070-FO	PPS	TJR	TJR	---

INTERNAL DRAWING ID	REVISION	SHEET
SCDD-1887	1 REV DATE 3/18/21	2 OF 2

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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.

SMRHM

PROJECT REPORT

General Model Information

Project Name: 2021.03.17_Temecula
Site Name:
Site Address:
City:
Report Date: 3/17/2021
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,Shrub,Mod(5-10%)	5.25
Pervious Total	5.25

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.25

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Shrub,Flat(0-5%)	1.21
Pervious Total	1.21

Impervious Land Use	acre
Roof Area	0.41
Parking,Flat(0-5%)	3.24
Parking,Mod(5-10%)	0.39
Impervious Total	4.04
Basin Total	5.25

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 74.4572454824625 ft.
Length: 74.4572454824625 ft.
Depth: 8 ft.
Discharge Structure
Riser Height: 7 ft.
Riser Diameter: 54 in.
Notch Type: Rectangular
Notch Width: 0.629 ft.
Notch Height: 1.470 ft.
Orifice 1 Diameter: 1.757 in. Elevation:0 ft.
Element Flows To:
Outlet 1 Outlet 2

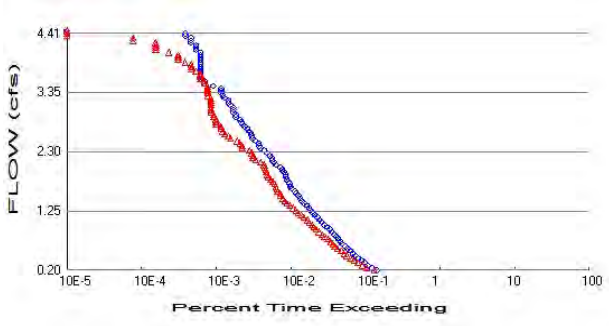
Vault Hydraulic Table

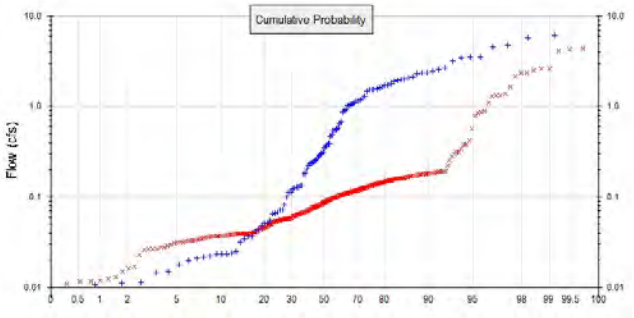
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.127	0.000	0.000	0.000
0.0889	0.127	0.011	0.025	0.000
0.1778	0.127	0.022	0.035	0.000
0.2667	0.127	0.033	0.043	0.000
0.3556	0.127	0.045	0.050	0.000
0.4444	0.127	0.056	0.055	0.000
0.5333	0.127	0.067	0.061	0.000
0.6222	0.127	0.079	0.066	0.000
0.7111	0.127	0.090	0.070	0.000
0.8000	0.127	0.101	0.074	0.000
0.8889	0.127	0.113	0.079	0.000
0.9778	0.127	0.124	0.082	0.000
1.0667	0.127	0.135	0.086	0.000
1.1556	0.127	0.147	0.090	0.000
1.2444	0.127	0.158	0.093	0.000
1.3333	0.127	0.169	0.096	0.000
1.4222	0.127	0.181	0.099	0.000
1.5111	0.127	0.192	0.103	0.000
1.6000	0.127	0.203	0.106	0.000
1.6889	0.127	0.214	0.108	0.000
1.7778	0.127	0.226	0.111	0.000
1.8667	0.127	0.237	0.114	0.000
1.9556	0.127	0.248	0.117	0.000
2.0444	0.127	0.260	0.119	0.000
2.1333	0.127	0.271	0.122	0.000
2.2222	0.127	0.282	0.124	0.000
2.3111	0.127	0.294	0.127	0.000
2.4000	0.127	0.305	0.129	0.000
2.4889	0.127	0.316	0.132	0.000
2.5778	0.127	0.328	0.134	0.000
2.6667	0.127	0.339	0.136	0.000
2.7556	0.127	0.350	0.139	0.000
2.8444	0.127	0.362	0.141	0.000
2.9333	0.127	0.373	0.143	0.000
3.0222	0.127	0.384	0.145	0.000
3.1111	0.127	0.396	0.147	0.000
3.2000	0.127	0.407	0.149	0.000

3.2889	0.127	0.418	0.151	0.000
3.3778	0.127	0.429	0.154	0.000
3.4667	0.127	0.441	0.156	0.000
3.5556	0.127	0.452	0.158	0.000
3.6444	0.127	0.463	0.159	0.000
3.7333	0.127	0.475	0.161	0.000
3.8222	0.127	0.486	0.163	0.000
3.9111	0.127	0.497	0.165	0.000
4.0000	0.127	0.509	0.167	0.000
4.0889	0.127	0.520	0.169	0.000
4.1778	0.127	0.531	0.171	0.000
4.2667	0.127	0.543	0.173	0.000
4.3556	0.127	0.554	0.174	0.000
4.4444	0.127	0.565	0.176	0.000
4.5333	0.127	0.577	0.178	0.000
4.6222	0.127	0.588	0.180	0.000
4.7111	0.127	0.599	0.181	0.000
4.8000	0.127	0.610	0.183	0.000
4.8889	0.127	0.622	0.185	0.000
4.9778	0.127	0.633	0.186	0.000
5.0667	0.127	0.644	0.188	0.000
5.1556	0.127	0.656	0.190	0.000
5.2444	0.127	0.667	0.191	0.000
5.3333	0.127	0.678	0.193	0.000
5.4222	0.127	0.690	0.195	0.000
5.5111	0.127	0.701	0.196	0.000
5.6000	0.127	0.712	0.236	0.000
5.6889	0.127	0.724	0.328	0.000
5.7778	0.127	0.735	0.447	0.000
5.8667	0.127	0.746	0.585	0.000
5.9556	0.127	0.758	0.737	0.000
6.0444	0.127	0.769	0.900	0.000
6.1333	0.127	0.780	1.072	0.000
6.2222	0.127	0.791	1.249	0.000
6.3111	0.127	0.803	1.432	0.000
6.4000	0.127	0.814	1.617	0.000
6.4889	0.127	0.825	1.804	0.000
6.5778	0.127	0.837	2.014	0.000
6.6667	0.127	0.848	2.249	0.000
6.7556	0.127	0.859	2.493	0.000
6.8444	0.127	0.871	2.747	0.000
6.9333	0.127	0.882	3.902	0.000
7.0222	0.127	0.893	4.327	0.000
7.1111	0.127	0.905	5.938	0.000
7.2000	0.127	0.916	8.438	0.000
7.2889	0.127	0.927	11.57	0.000
7.3778	0.127	0.939	15.21	0.000
7.4667	0.127	0.950	19.29	0.000
7.5556	0.127	0.961	23.73	0.000
7.6444	0.127	0.972	28.47	0.000
7.7333	0.127	0.984	33.44	0.000
7.8222	0.127	0.995	38.58	0.000
7.9111	0.127	1.006	43.83	0.000
8.0000	0.127	1.018	49.11	0.000
8.0889	0.127	1.029	54.37	0.000
8.1778	0.000	0.000	59.53	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 5.25
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.21
Total Impervious Area: 4.04

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.971843
5 year	3.201039
10 year	4.406989
25 year	5.793304

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.786981
5 year	2.348555
10 year	2.645383
25 year	4.279507

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1972	1849	1715	92	Pass
0.2397	1587	1351	85	Pass
0.2822	1399	1185	84	Pass
0.3248	1258	1036	82	Pass
0.3673	1154	917	79	Pass
0.4098	1040	814	78	Pass
0.4523	955	741	77	Pass
0.4948	876	676	77	Pass
0.5374	820	620	75	Pass
0.5799	748	547	73	Pass
0.6224	696	506	72	Pass
0.6649	637	474	74	Pass
0.7075	600	444	74	Pass
0.7500	560	404	72	Pass
0.7925	531	370	69	Pass
0.8350	498	343	68	Pass
0.8776	462	312	67	Pass
0.9201	431	284	65	Pass
0.9626	397	266	67	Pass
1.0051	367	249	67	Pass
1.0476	342	231	67	Pass
1.0902	318	217	68	Pass
1.1327	293	194	66	Pass
1.1752	272	180	66	Pass
1.2177	255	163	63	Pass
1.2603	237	153	64	Pass
1.3028	227	139	61	Pass
1.3453	214	126	58	Pass
1.3878	195	116	59	Pass
1.4304	182	108	59	Pass
1.4729	174	101	58	Pass
1.5154	163	94	57	Pass
1.5579	153	94	61	Pass
1.6005	148	87	58	Pass
1.6430	135	85	62	Pass
1.6855	129	82	63	Pass
1.7280	126	79	62	Pass
1.7705	121	75	61	Pass
1.8131	114	70	61	Pass
1.8556	111	66	59	Pass
1.8981	110	62	56	Pass
1.9406	105	61	58	Pass
1.9832	100	60	60	Pass
2.0257	94	58	61	Pass
2.0682	83	57	68	Pass
2.1107	76	51	67	Pass
2.1533	73	44	60	Pass
2.1958	71	40	56	Pass
2.2383	68	40	58	Pass
2.2808	63	39	61	Pass
2.3233	57	36	63	Pass
2.3659	51	29	56	Pass
2.4084	49	29	59	Pass

2.4509	48	27	56	Pass
2.4934	44	25	56	Pass
2.5360	40	20	50	Pass
2.5785	39	19	48	Pass
2.6210	38	17	44	Pass
2.6635	36	16	44	Pass
2.7061	34	15	44	Pass
2.7486	31	15	48	Pass
2.7911	29	13	44	Pass
2.8336	28	13	46	Pass
2.8762	27	13	48	Pass
2.9187	24	12	50	Pass
2.9612	24	12	50	Pass
3.0037	22	11	50	Pass
3.0462	22	11	50	Pass
3.0888	22	11	50	Pass
3.1313	20	11	55	Pass
3.1738	19	11	57	Pass
3.2163	19	11	57	Pass
3.2589	17	11	64	Pass
3.3014	16	10	62	Pass
3.3439	15	10	66	Pass
3.3864	15	10	66	Pass
3.4290	15	10	66	Pass
3.4715	12	10	83	Pass
3.5140	9	9	100	Pass
3.5565	9	9	100	Pass
3.5990	8	8	100	Pass
3.6416	8	8	100	Pass
3.6841	8	8	100	Pass
3.7266	8	7	87	Pass
3.7691	8	6	75	Pass
3.8117	8	6	75	Pass
3.8542	8	6	75	Pass
3.8967	8	5	62	Pass
3.9392	8	4	50	Pass
3.9818	8	4	50	Pass
4.0243	8	4	50	Pass
4.0668	8	3	37	Pass
4.1093	7	2	28	Pass
4.1518	7	2	28	Pass
4.1944	7	2	28	Pass
4.2369	6	2	33	Pass
4.2794	6	1	16	Pass
4.3219	6	1	16	Pass
4.3645	5	0	0	Pass
4.4070	5	0	0	Pass

Water Quality

Drawdown Time Results

Pond: Vault 1

Days	Stage(feet)	Percent of Total Run Time
1	1.110	2.9275
2	2.966	0.9727
3	5.864	0.0514
4	0.000	N/A
5	0.000	N/A

Maximum Stage: 7.000 Drawdown Time: 03 01:02:50

Rational Method

Data for Rational Method is not available.

Model Default Modifications

Total of 0 changes have been made.

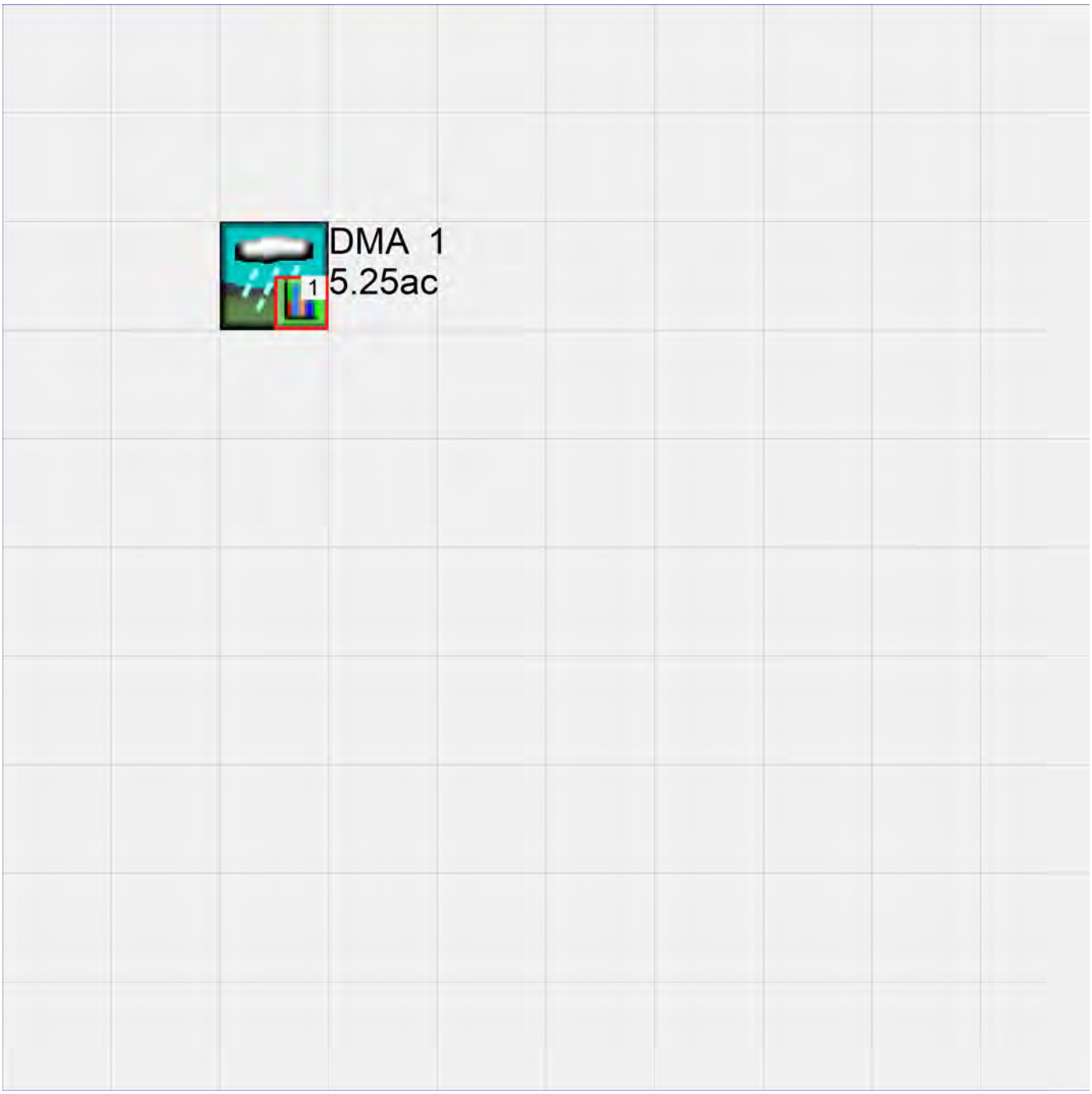
PERLND Changes

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
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   2021.03.17_Temecula.wdm
MESSU       25   Pre2021.03.17_Temecula.MES
            27   Pre2021.03.17_Temecula.L61
            28   Pre2021.03.17_Temecula.L62
            30   POC2021.03.17_Temecula1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      38
      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 ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # 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           ***
   38     C/D,Shrub,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 ***
   38         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  *********
   38         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 ***
   38         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
   38             0       4.5      0.04       350       0.1         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   38            40        35         3         2      0.15      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   38             0       0.7       0.3       1.2      0.45         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   38       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  ***
   38      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
  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
   38             0         0      0.01         0       0.5       0.3      0.01
  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  38                        5.25     COPY   501     12
PERLND  38                        5.25     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

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   2021.03.17_Temecula.wdm
MESSU       25   Mit2021.03.17_Temecula.MES
            27   Mit2021.03.17_Temecula.L61
            28   Mit2021.03.17_Temecula.L62
            30   POC2021.03.17_Temecula1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      37
      IMPLND       5
      IMPLND      14
      IMPLND      15
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  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 ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   37     C/D,Shrub,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 ***
   37         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  *********
   37         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 ***
   37         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
   37              0       4.8     0.045       400      0.05         2      0.95
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   37             40        35         3         2      0.15      0.15         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                 ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   37              0       0.9       0.3         2       0.7         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   37       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  ***
   37      0.13 0.13 0.13 0.14 0.15 0.15 0.15 0.15 0.15 0.15 0.14 0.13
  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
   37              0         0      0.01         0       0.5       0.3      0.01
  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
   15     Parking,Mod(5-10%)       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
   15         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
   15         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
   15         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
   15            100       0.1       0.1      0.09
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -   # ***PETMAX    PETMIN
    5              0         0
   14              0         0
   15              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -   # ***  RETS      SURS
    5              0         0
   14              0         0
   15              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK    ***
<Name>   #                 <-factor->     <Name>   #   Tbl#    ***
DMA  1***
PERLND  37                      1.21     RCHRES   1      2
PERLND  37                      1.21     RCHRES   1      3
IMPLND   5                      0.41     RCHRES   1      5
IMPLND  14                      3.24     RCHRES   1      5
IMPLND  15                      0.39     RCHRES   1      5

******Routing******
PERLND  37                      1.21     COPY     1     12
IMPLND   5                      0.41     COPY     1     15
IMPLND  14                      3.24     COPY     1     15
IMPLND  15                      0.39     COPY     1     15
PERLND  37                      1.21     COPY     1     13
RCHRES   1                         1     COPY   501     16
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                              ***
    1     Vault  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
  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
  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  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       0.5       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  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
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.127270  0.000000  0.000000
  0.088889  0.127270  0.011313  0.024976
  0.177778  0.127270  0.022626  0.035322
  0.266667  0.127270  0.033939  0.043260
  0.355556  0.127270  0.045252  0.049952
  0.444444  0.127270  0.056564  0.055848
  0.533333  0.127270  0.067877  0.061179
  0.622222  0.127270  0.079190  0.066081
  0.711111  0.127270  0.090503  0.070643
  0.800000  0.127270  0.101816  0.074929
  0.888889  0.127270  0.113129  0.078982
  0.977778  0.127270  0.124442  0.082837
  1.066667  0.127270  0.135755  0.086520
  1.155556  0.127270  0.147068  0.090053
  1.244444  0.127270  0.158380  0.093452
  1.333333  0.127270  0.169693  0.096732
  1.422222  0.127270  0.181006  0.099905
  1.511111  0.127270  0.192319  0.102979
  1.600000  0.127270  0.203632  0.105965
  1.688889  0.127270  0.214945  0.108869
  1.777778  0.127270  0.226258  0.111697
  1.866667  0.127270  0.237571  0.114455
```

1.955556	0.127270	0.248884	0.117149
2.044444	0.127270	0.260196	0.119782
2.133333	0.127270	0.271509	0.122358
2.222222	0.127270	0.282822	0.124881
2.311111	0.127270	0.294135	0.127354
2.400000	0.127270	0.305448	0.129780
2.488889	0.127270	0.316761	0.132162
2.577778	0.127270	0.328074	0.134501
2.666667	0.127270	0.339387	0.136800
2.755556	0.127270	0.350700	0.139061
2.844444	0.127270	0.362012	0.141287
2.933333	0.127270	0.373325	0.143477
3.022222	0.127270	0.384638	0.145635
3.111111	0.127270	0.395951	0.147761
3.200000	0.127270	0.407264	0.149857
3.288889	0.127270	0.418577	0.151924
3.377778	0.127270	0.429890	0.153964
3.466667	0.127270	0.441203	0.155976
3.555556	0.127270	0.452516	0.157963
3.644444	0.127270	0.463828	0.159926
3.733333	0.127270	0.475141	0.161864
3.822222	0.127270	0.486454	0.163780
3.911111	0.127270	0.497767	0.165673
4.000000	0.127270	0.509080	0.167545
4.088889	0.127270	0.520393	0.169397
4.177778	0.127270	0.531706	0.171228
4.266667	0.127270	0.543019	0.173040
4.355556	0.127270	0.554332	0.174833
4.444444	0.127270	0.565644	0.176608
4.533333	0.127270	0.576957	0.178366
4.622222	0.127270	0.588270	0.180106
4.711111	0.127270	0.599583	0.181829
4.800000	0.127270	0.610896	0.183537
4.888889	0.127270	0.622209	0.185228
4.977778	0.127270	0.633522	0.186905
5.066667	0.127270	0.644835	0.188566
5.155556	0.127270	0.656148	0.190213
5.244444	0.127270	0.667460	0.191846
5.333333	0.127270	0.678773	0.193465
5.422222	0.127270	0.690086	0.195070
5.511111	0.127270	0.701399	0.196663
5.600000	0.127270	0.712712	0.236830
5.688889	0.127270	0.724025	0.328798
5.777778	0.127270	0.735338	0.447623
5.866667	0.127270	0.746651	0.585408
5.955556	0.127270	0.757964	0.737470
6.044444	0.127270	0.769276	0.900506
6.133333	0.127270	0.780589	1.071968
6.222222	0.127270	0.791902	1.249781
6.311111	0.127270	0.803215	1.432189
6.400000	0.127270	0.814528	1.617672
6.488889	0.127270	0.825841	1.804881
6.577778	0.127270	0.837154	2.014271
6.666667	0.127270	0.848467	2.249403
6.755556	0.127270	0.859780	2.493847
6.844444	0.127270	0.871092	2.747259
6.933333	0.127270	0.882405	3.902379
7.022222	0.127270	0.893718	4.327461
7.111111	0.127270	0.905031	5.938668
7.200000	0.127270	0.916344	8.438449
7.288889	0.127270	0.927657	11.57198
7.377778	0.127270	0.938970	15.21910
7.466667	0.127270	0.950283	19.29690
7.555556	0.127270	0.961596	23.73633
7.644444	0.127270	0.972908	28.47326
7.733333	0.127270	0.984221	33.44450
7.822222	0.127270	0.995534	38.58609
7.911111	0.127270	1.006847	43.83276
8.000000	0.127270	1.018160	49.11815
8.088889	0.127270	1.029473	54.37553

```
  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

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   1 HYDR   RO     1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     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       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


END MASS-LINK

END RUN
```

Disclaimer

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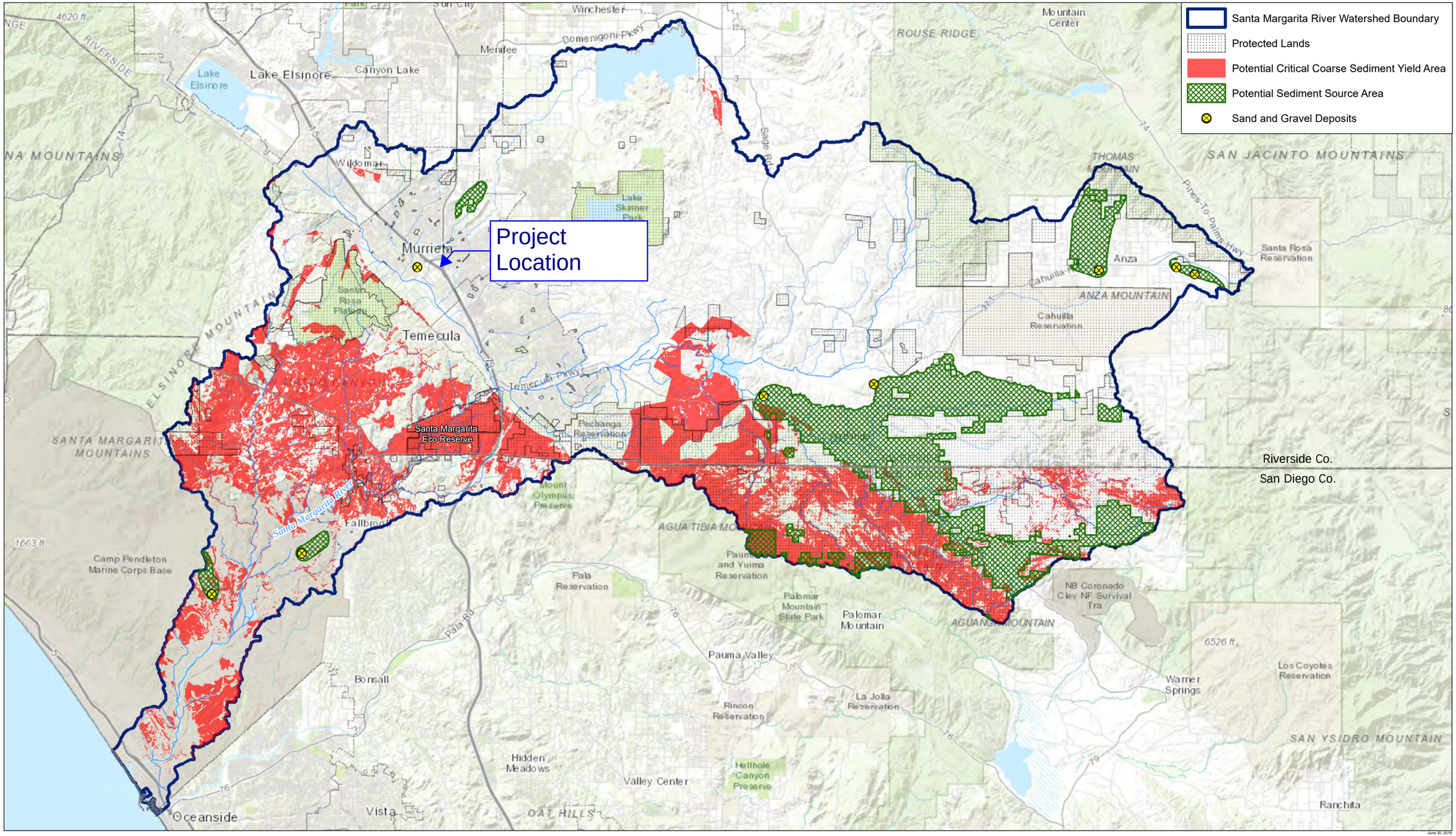

June 20, 2018

Exhibit G-1

SANTA MARGARITA RIVER WATERSHED

POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS AND POTENTIAL SEDIMENT SOURCE AREAS

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.**

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.

Operations, Maintenance, Inspection and Funding Plan

I. Introduction

The Rancho Springs Medical Center site is located at 25500 Medical Center Drive in the City of Murrieta, CA. The proposed improvements included as part of this includes approximately 5.25 acres located centrally in the Medical Center and includes the parking areas north and southeast of Medical Center Drive, new medical office building, eastern helipad and parking lot immediately south of the helipad. The City identification APN for the project is 912-010-032-6 and 912-010-030-4. The site drains to multiple catch basins lpocated at low points within the property which then drain to a proposed Bioclean Modular Wetland System before discharging to an underground vault detention system.

The LID principles incorporated in the site design are Flogard+Plus Catch Basin Insert Filters, one (1) Bioclean Modular Wetland System, and one (1) underground vault detention system. Pollutants of concern are suspended solids, nutrients (phosphorus and nitrogen), pathogens, and metals (copper, lead, zinc).

II. Responsibility for Maintenance

A. General

The site is owned by Universal Health Service, Inc. The owner is responsible for the operation, maintenance, inspection and funding of the source control BMPs, LID BMPs and drainage structures designed for the purposes of the Final Water Quality Management Plan and development of the project. The Rancho Springs Medical Center will be responsible for implementing general housekeeping BMPs.

Responsible Parties
Universal Health Service, Inc
(858) 342-1049

24-Hour Contact Information
[TBD]

B. Funding

Universal Health Service, Inc. is responsible for funding source control, LID, and hydromodification BMP operations and maintenance, including storm drain catch basins, Flogard+Plus Catch Basin Insert Filters, Bioclean Modular Wetland System, underground vault detention system, and storm drainpipe appurtenances and conveyances within the project's limits.

C. Training

Proper training for the inspection and maintenance of installed BMPs will be provided to employees by the owner at the time of hiring and reviewed on an annual basis. Proper training for the inspection and maintenance of General Housekeeping BMPs, and any other applicable responsibilities needed will be provided to the appropriate Medical Center staff by the owner at the time of hiring and reviewed on an annual basis. The Medical Center will be responsible for providing this information to their respective employees. A training log will be developed and retained for records.

D. Bioclean Modular Wetland System

The Bioclean Modular Wetland System will be inspected and maintained by the project site owner following the manufacturer standards and recommendations. Maintenance and regular inspections are important for proper function of the system. Plants, soil, and pretreatment filter shall be maintained yearly. Maintenance should be completed when an inspection reveals the system has overgrown vegetation, has invasive vegetation/weeds, trash and debris, pre-treatment filter are clogged, presence of erosion/sediment accumulation, any evidence of pollutants/contaminants, and standing water. Annual maintenance should take place in the summer/early fall seasons prior to the start of a rainy season. Maintenance cost will be dependent on maintenance frequency, requirement, and provider and shall be determined by owner at time of maintenance. Refer to manufacturer guidelines for inspection and maintenance in Attachment 2.

E. Underground vault detention system

The underground vault detention system will be inspected and maintained by the project site owner following the manufacturer's standards and specifications. Maintenance and regular inspections are important for proper function of the system. Inspection must be inspected at a minimum of two times per year. Annual maintenance should take place in the summer/early fall seasons prior to the start of a rainy season. Maintenance cost will be dependent on maintenance frequency, requirement, and provider and shall be determined by owner at time of maintenance. The manufacturer's manual can be found in Attachment 3.

F. Flogard+Plus Catch Basin Insert Filters

Flogard+Plus Catch Basin Insert Filters shall be inspected and maintained per the manufacturer's standards and specifications. Catch Basin insert filters must be maintained and inspected a minimum of three times per year with a change of filter medium once per year. Prior to, during, and following the rainy season all catch basins shall be inspected for exposed filter medium and collected debris. Maintenance cost will be dependent on maintenance frequency, requirement, and provider and shall be determined by owner at time of maintenance. The manufacturer's maintenance manual can be found in Attachment 4.

III. Inspection Forms

Inspection forms for the Project are included in Attachment 1. Inspection forms are to be filled out during the annual maintenance and inspection. All inspection forms are to be retained for records for a minimum of 5 years for the bioretention basin.

Attachment 1: Inspection Sheets

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Inspection & Maintenance Log

BMP#			Location: Rancho Springs Medical Center		
Date	**Depth of Sediment**	**Accumulated Trash**	**Maintenance Performed**	**Maintenance Personnel**	**Comments**

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Attachment 2: Bioclean Modular Wetland System Manufacturer Instructions

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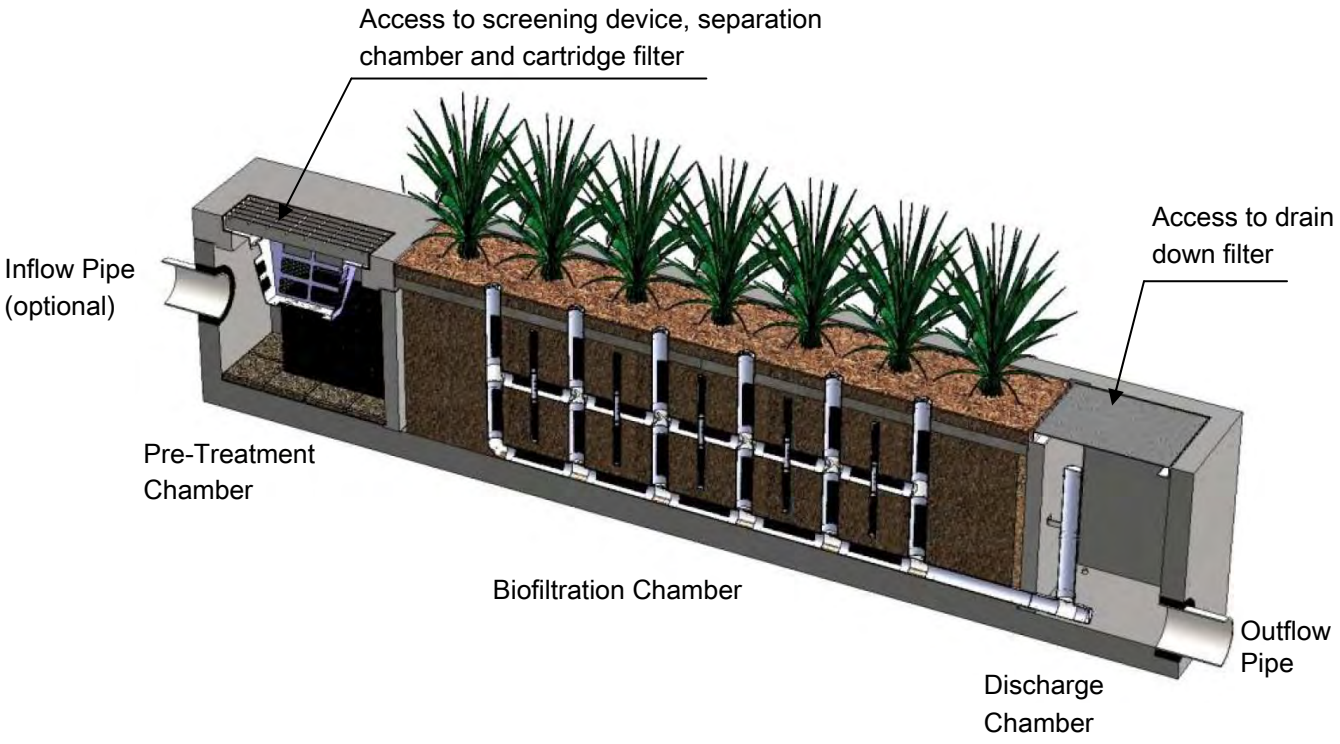
Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

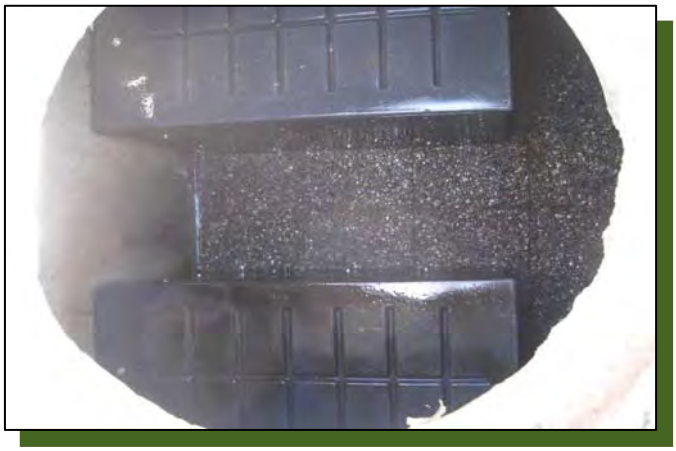
The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.

Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.



Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ___/___/___ Time _____ AM / PM

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____

2972 San Luis Rey Road, Oceanside, CA 92058 P (760) 433-7640 F (760) 433-3176

Maintenance Report

Modular Wetland System, Inc.
P. 760.433-7640
F. 760-433-3176
E. Info@modularwetlands.com

www.modularwetlands.com

Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

2972 San Luis Rey Road, Oceanside, CA 92058 P. 760.433.7640 F. 760.433.3176

Attachment 3: Underground Vault Detention System Manufacturer Instructions

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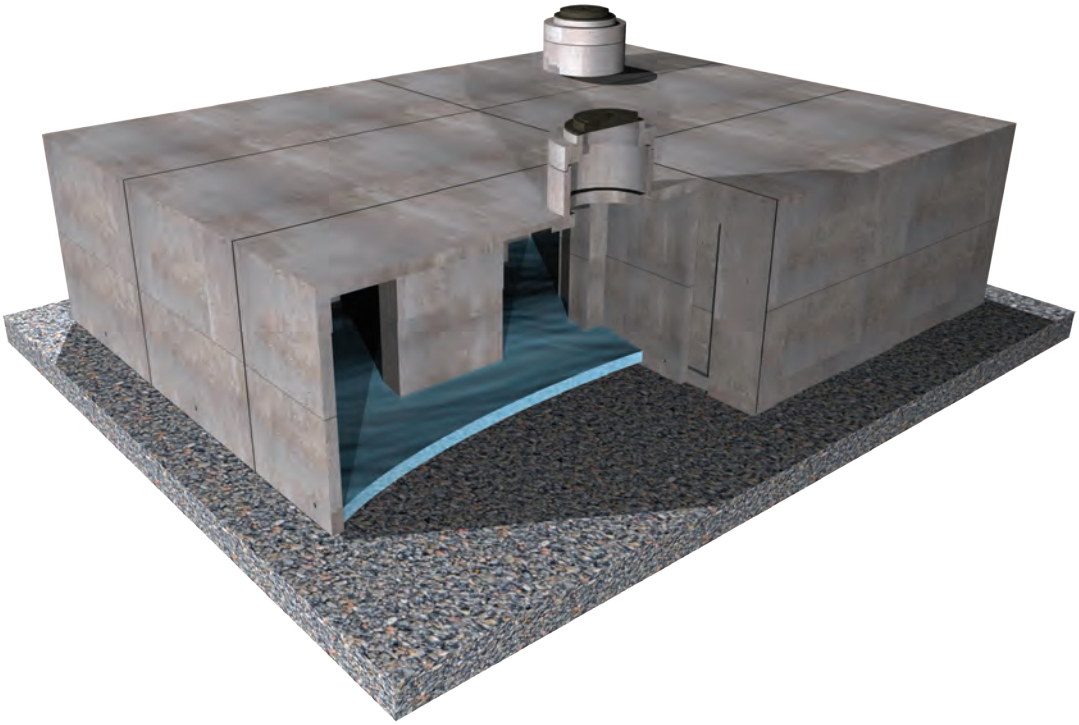
Oldcastle Infrastructure™
A CRH COMPANY

STORMCAPTURE®

Inspection and Maintenance Guide



Water

Description

The StormCapture® system is an underground, modular, structural precast concrete storage system for stormwater detention, retention, infiltration, harvesting and reuse, and water quality volume storage. The system's modular design utilizes multiple standard precast concrete units with inside dimensions of 7 feet by 15 feet (outside dimensions of 8 feet by 16 feet) to form an underground storage system. The inside height of the StormCapture system can range from 2 feet to 14 feet. This modular design provides limitless configuration options for site-specific layouts.

StormCapture components can be provided as either open-bottom modules to promote infiltration or closed-bottom modules for detention. In some cases, StormCapture modules can be placed in a checkerboard configuration for an even more efficient design. A Link Slab, with a footprint of 9 feet by 17 feet, is then used to bridge each space without a module.

The standard StormCapture design incorporates lateral and longitudinal passageways between modules to accommodate internal stormwater conveyance throughout the system. These passageways may be classified as either a "window configuration" with standard 12-inch tall sediment baffles extending up from the floor of the module to the bottom of the window, or a "doorway configuration" without the sediment baffles. The function and drainage rate of a StormCapture system depends on site-specific conditions and requirements.

Stormwater typically enters the StormCapture system through an inlet pipe. Grated inlets can also be used for direct discharge into the system. The StormCapture system is rated for H-20 traffic loading with limited cover. Higher load requirements can also be accommodated. In addition, StormCapture systems are typically equipped with a limited number of maintenance modules that provide access to the system for ongoing inspection and maintenance.

Function

The StormCapture system is primarily used to manage water quantity by temporarily storing stormwater runoff from impervious surfaces to prevent flooding, slow down the rate at which stormwater leaves the site, and reduce receiving stream erosion. In addition, the StormCapture system can be used to capture stormwater runoff for water quality treatment. Regardless of how the StormCapture system is used, some sedimentation may occur in the modules during the time water is stored.

Configurations

The configuration of the StormCapture systems may vary, depending on the water quality and/or quantity requirements of the site. StormCapture configurations for detention, retention/infiltration, and retention/harvesting are described below.

Detention

StormCapture Detention systems are designed with a closed bottom to detain stormwater runoff for controlled discharge from the site. This design may incorporate a dead storage sump and a permanent pool of water if the outlet pipe is higher than the floor elevation. Discharge from the system is typically controlled by an outlet orifice and/or outlet weir to regulate the rate of stormwater leaving the system. StormCapture Detention systems are typically designed with silt-tight joints, however when conditions exist that require a StormCapture system to be watertight, the system may be wrapped in a continuous, impermeable geomembrane liner. If the StormCapture Detention system includes Link Slabs, a liner must be used to detain water since the chambers under each Link Slab have no floor slab. In this case, care must be taken by maintenance personnel not to damage the exposed liner beneath each Link Slab.

Retention/Infiltration

StormCapture Retention/Infiltration systems are designed with an open bottom to allow for the retention of stormwater onsite through infiltration into the base rock and surrounding soils. For infiltration systems, the configuration of the base of the StormCapture system may vary, depending on the needs of the site and the height of the system. Some systems may use modules that have fully open bottoms with no concrete floor, while other systems may use modules that incorporate floor openings in the base of each module. These are typically 24-inch by 24-inch openings. For open-bottom systems, concrete splash pads may be installed below inlet grate openings and pipe inlets to prevent erosion of base rock. A StormCapture Infiltration system may have an elevated discharge pipe for peak overflow.

Retention/Harvesting

StormCapture Retention/Harvesting systems are similar to detention systems using closed-bottom modules, but stormwater is typically retained onsite for an extended period of time and later reused for non-potable applications or irrigation. For rainwater harvesting systems, an impermeable geomembrane liner is typically installed around the modules to provide a water-tight system.

Inspection and Maintenance Overview

State and local regulations typically require all stormwater management systems to be inspected on a regular basis and maintained as necessary to ensure performance and protect downstream receiving waters. Inspections should be used to evaluate the conditions of the system. Based on these inspections, maintenance needs can be determined. Maintenance needs vary by site and system. Using this Inspection & Maintenance Guide, qualified maintenance personnel should be able to provide a recommendation for maintenance needs. Requirements may range from minor activities such as removing trash, debris or pipe blockages to more substantial activities such as vacuuming and removal of sediment and/or non-draining water. Long-term maintenance is important to the operation of the system since it prevents excessive pollutant buildup that may limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Only authorized personnel shall inspect and/or enter a StormCapture system. Personnel must be properly trained and equipped before entering any underground or confined space structure. Training includes familiarity with and adherence to any and all local, state and federal regulations governing confined space access and the operation, inspection, and maintenance of underground structures.

Inspection and Maintenance Frequency

The StormCapture system should be inspected on a regular basis, typically twice per year, and maintained as required. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. Local jurisdictions may also dictate inspection and maintenance frequencies.

Inspection Equipment

The following equipment is helpful when conducting StormCapture inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

A typical StormCapture system provides strategically placed access points that may be used for inspection. StormCapture inspections are usually conducted visually from the ground surface, without entering the unit. This typically limits inspection to the assessment of sediment depth, water drain down, and general condition of the modules and components, but a more detailed assessment of structural condition may be conducted during a maintenance event.

To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be inspected and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Observe inlet and outlet pipe penetrations for blockage or obstruction.
- If possible, observe internal components like baffles, flow control weirs or orifices, and steps or ladders to determine whether they are broken, missing, or possibly obstructed.
- Observe, quantify, and record the sediment depths within the modules.
- Retrieve as much floating trash as possible with a long-handled net. If a significant amount of trash remains, make a note in the Inspection & Maintenance Log.
- For infiltration systems, local regulations may require monitoring of the system to ensure drain down is occurring within the required permit time period (typically 24 to 72 hours). If this is the case, refer to local regulations for proper inspection procedure.

Maintenance Indicators

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Inlet or outlet piping is blocked or obstructed.
- Internal components are broken, missing, or obstructed.
- Accumulation of more than six inches of sediment on the system floor or in the sump, if applicable.
- Significant accumulation of floating trash and debris that cannot be retrieved with a net.
- The system has not drained completely after it hasn't rained for one to three days, or the drain down does not meet permit requirements.
- Any hazardous material is observed or reported.

Maintenance Equipment

The following equipment is helpful when conducting StormCapture maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- Vacuum truck

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is usually required to maintain the StormCapture. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Once safety measures such as traffic control have been deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove trash and debris using an extension on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely remove accumulated sediment. Some jetting may be necessary to fully evacuate sediment from the system floor or sump. Jetting is acceptable in systems with solid concrete floors or base slabs (referred to as closed-bottom systems). However, jetting is not recommended for open-bottom systems with a gravel foundation since it may cause bedding displacement, undermining of the foundation, or internal disturbance.
- All material removed from the system during maintenance must be disposed of in accordance with local regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Inspect inlet and outlet pipe penetrations for cracking and other signs of movement that may cause leakage.
- Inspect the concrete splash pads (applicable for open-bottom systems only) for proper function and placement.
- Inspect the system for movement of modules. There should be less than 3/4-inch spacing between modules.
- Inspect the general interior condition of modules for concrete cracking or deterioration. If the system consists of horizontal joints as part of the modules, inspect those joints for leakage, displacement or deterioration.

Be sure to securely replace all access covers, as appropriate, following inspection and/or maintenance. If the StormCapture modules or any of the system components show significant signs of cracking, spalling, or deterioration or if there is evidence of excessive differential settlement between modules, contact Oldcastle Infrastructure at **800-579-8819.**

StormCapture
Inspection & Maintenance Log

Refer to as-built records for details about system size and location onsite

Location _____

System Configuration:

Inspection Date _____

☐ Detention ☐ Infiltration ☐ Retention/Harvesting

Inlet or Outlet Blockage or Obstruction

Notes:

☐ Yes ☐ No

Condition of Internal Components

Notes:

☐ Good ☐ Damaged ☐ Missing

Sediment Depth Observed

Notes:

☐ Inches of Sediment: _____

Trash and Debris Accumulation

Notes:

☐ Significant ☐ Not Significant

Drain Down Observations

Notes:

☐ Appropriate Time Frame ☐ Inappropriate Time Frame

Maintenance Requirements

☐ **Yes - Schedule Maintenance** ☐ **No - Inspect Again in _____ Months**

STORMCAPTURE®

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Attachment 4: Flogard+Plus Catch Basin Insert Filters

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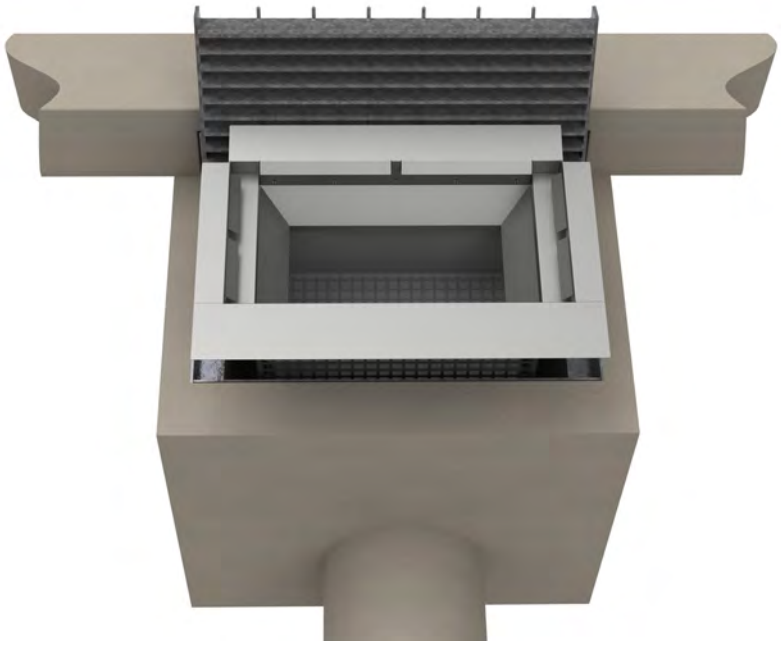
Oldcastle Precast®

FLOGARD +PLUS®

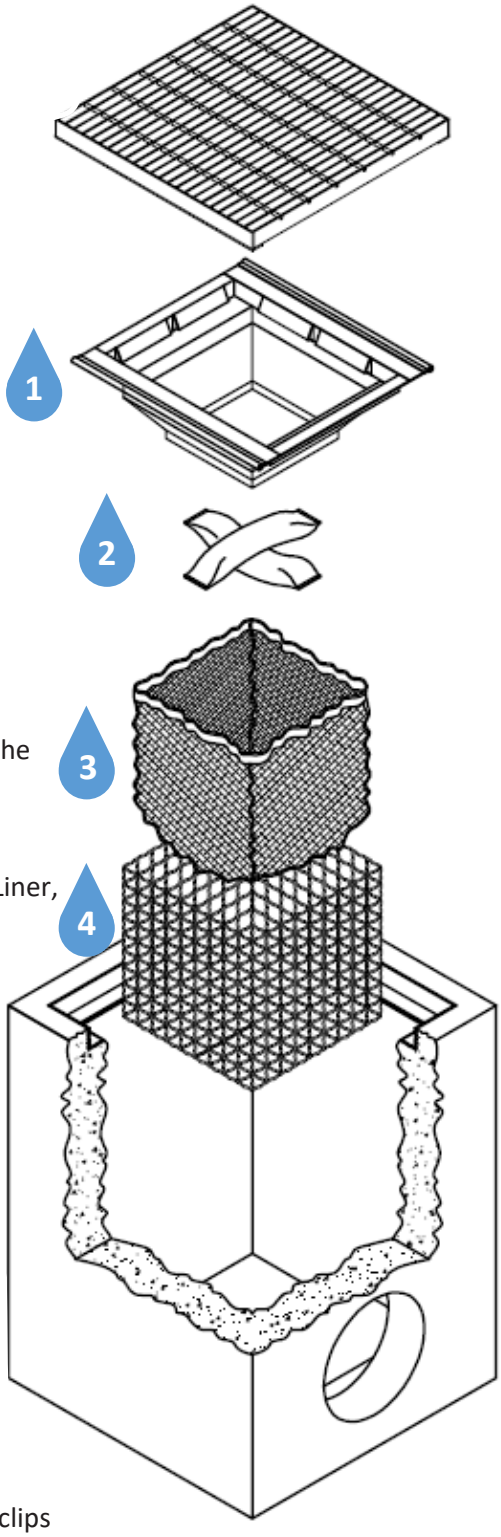
Replacement & Repair

Instruction Manual



Stormwater

FloGard Plus Replacement and Repair



Parts of the FloGard Plus Inlet Filter-

1. FloGard Stainless Steel Support Frame
2. Fossil Rock Absorbent Pouches
3. Liner
4. GeoGrid Support Basket & Cable

* Grate and Basin NOT INCLUDED

Disassembly:

1. Clear FloGard of any existing debris by hand or vacuum.
2. Unclip and remove the Fossil Rock pouches from the inside Liner.
3. Lift the FloGard from the catch basin.
4. Using a slotted screw driver, carefully pry open the metal tabs holding the GeoGrid and Cable in place. Separate the GeoGrid and Liner from the FloGard frame.
5. Unclip the Liner from the inside of the GeoGrid. If you are reusing the Liner, rinse thoroughly with water and inspect for tears. (If torn, mend with stainless steel wire or replace the Liner).
6. Rinse and inspect the GeoGrid Basket and the reinforcing cable. (If torn, mend with stainless steel wire or replace the GeoGrid).
7. Rinse and inspect the Stainless Steel FloGard frame.

Reassembly:

1. Fully expand the GeoGrid Basket and orient to the FloGard frame. Hook cable and GeoGrid to the FloGard frame metal tabs and close the tabs using slotted screwdriver. Move around the FloGard until all tabs are closed and GeoGrid is secured to the Frame.
2. Expand and orient the Liner, locating the clips at each corner and side. Push the Liner through the center of the FloGard frame and secure the clips to the GeoGrid Basket close to the top support cable. Push the Liner to expand inside of the basket.
3. Clip new Fossil Rock Rubberizer pouches to the inside of the Liner.
4. Lower FloGard back into the basin, replace grate.

FLOGARD +PLUS®

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Oldcastle Infrastructure™
A CRH COMPANY

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

DRAINAGE PROTECTION SYSTEMS
DPS
A division of
Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner's D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Attachment 5: Operations & Maintenance Agreement

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Example Covenant and Agreement

Water Quality Management Plan and Urban Runoff BMP Transfer, Access and Maintenance Agreement (adapted from documents from the Ventura County Stormwater Management Program)

Recorded at the request of:

City of _____

After recording, return to:

City of _____

City Clerk _____

Water Quality Management Plan and Urban Runoff BMP Transfer, Access and Maintenance Agreement

OWNER: _____

PROPERTY ADDRESS: _____

_____

APN: _____

THIS AGREEMENT is made and entered into in

_____, California, this _____ day of

_____ , by and between

_____, herein after

referred to as “Owner” and the CITY OF _____, a municipal corporation, located in the County of Riverside, State of California hereinafter referred to as “CITY”;

WHEREAS, the Owner owns real property (“Property”) in the City of

_____, County of Riverside, State of California, more specifically described in Exhibit “A” and depicted in Exhibit “B”, each of which exhibits is attached hereto and incorporated herein by this reference;

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

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

WHEREAS, the Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, on file with the City, hereinafter referred to as “WQMP”, to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff;

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

WHEREAS, said BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all maintenance or replacement, therefore, the sole responsibility of the Owner in accordance with the terms of this Agreement;

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

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

1. Owner hereby provides the City of City’s designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by City’s Director of Public Works no advance notice, for the purpose of inspection, sampling, testing of the Device, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner’s expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner’s use of the Property.

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

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

4. The City may require the owner to post security in form and for a time period satisfactory to the city to guarantee the performance of the obligations state herein. Should the Owner fail to perform the obligations under the Agreement, the City may, in the case of a cash bond, act for the Owner using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement. As an additional remedy, the Director may withdraw any previous Urban Runoff-related approval with respect to the property on which BMPs have been installed and/or implemented until such time as Owner repays to City its reasonable costs incurred in accordance with paragraph 3 above.

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

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

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

8. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

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

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

IF TO CITY:

IF TO OWNER:

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

APPROVED AS TO FORM:

City Attorney

CITY OF

Name

Title

ATTEST:

City Clerk Date

OWNER:

Name

Title

OWNER:

Name

Title

NOTARIES ON FOLLOWING PAGE

Attachment 6: WQMP Exhibit

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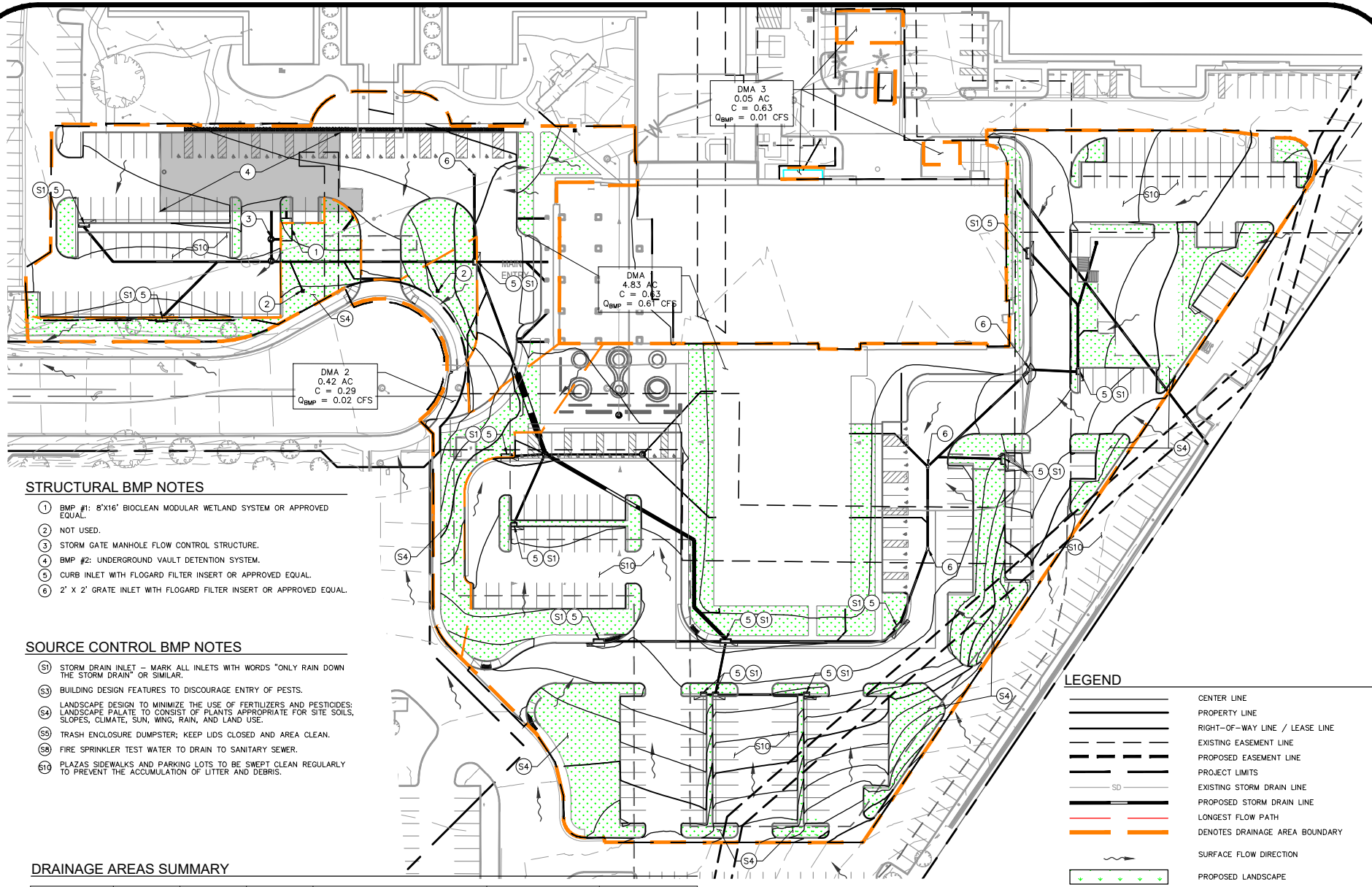

STRUCTURAL BMP NOTES

1. BMP #1: 8'X16' BIOCLEAN MODULAR WETLAND SYSTEM OR APPROVED EQUAL.
2. NOT USED.
3. STORM GATE MANHOLE FLOW CONTROL STRUCTURE.
4. BMP #2: UNDERGROUND VAULT DETENTION SYSTEM.
5. CURB INLET WITH FLOGARD FILTER INSERT OR APPROVED EQUAL.
6. 2' X 2' GRATE INLET WITH FLOGARD FILTER INSERT OR APPROVED EQUAL.

SOURCE CONTROL BMP NOTES

- S1 STORM DRAIN INLET – MARK ALL INLETS WITH WORDS "ONLY RAIN DOWN THE STORM DRAIN" OR SIMILAR.
- S3 BUILDING DESIGN FEATURES TO DISCOURAGE ENTRY OF PESTS.
- S4 LANDSCAPE DESIGN TO MINIMIZE THE USE OF FERTILIZERS AND PESTICIDES; LANDSCAPE PALATE TO CONSIST OF PLANTS APPROPRIATE FOR SITE SOILS, SLOPES, CLIMATE, SUN, WING, RAIN, AND LAND USE.
- S5 TRASH ENCLOSURE DUMPSTER; KEEP LIDS CLOSED AND AREA CLEAN.
- S8 FIRE SPRINKLER TEST WATER TO DRAIN TO SANITARY SEWER.
- S10 PLAZAS SIDEWALKS AND PARKING LOTS TO BE SWEPT CLEAN REGULARLY TO PREVENT THE ACCUMULATION OF LITTER AND DEBRIS.

LEGEND

- CENTER LINE
- PROPERTY LINE
- RIGHT-OF-WAY LINE / LEASE LINE
- EXISTING EASEMENT LINE
- PROPOSED EASEMENT LINE
- PROJECT LIMITS
- EXISTING STORM DRAIN LINE
- PROPOSED STORM DRAIN LINE
- LONGEST FLOW PATH
- DENOTES DRAINAGE AREA BOUNDARY
- SURFACE FLOW DIRECTION
- PROPOSED LANDSCAPE

DRAINAGE AREAS SUMMARY

DRAINAGE MANAGEMENT AREA	ACREAGE	DESIGN CAPTURE VOLUME	WATER QUALITY FLOW RATE (CFS)	TREATMENT METHOD	HYDROMODIFICATION BMP	HYDROMODIFICATION VOLUME (AC-FT)
DMA 1	4.83	9548	0.61	BIOCLEAN MODULAR WETLAND SYSTEM	UNDERGROUND VAULT DETENTION SYSTEM	0.882
DMA 2	0.42		0.02	DE MINIMIS (LANDSCAPED AREAS SELF TREATING)		
DMA 3	0.05		0.01	DE MINIMIS (LANDSCAPED AREAS SELF TREATING)		

NORTH

GRAPHIC SCALE IN FEET
0 18 35 71

RANCHO SPRINGS MEDICAL CENTER
WQMP O&M EXHIBIT
MAY 2021

Kimley»Horn

660 S. FIGUEROA ST, SUITE 2050, LOS ANGELES, CA 90017
PHONE: 213-261-4040

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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.

Bio Clean

A Forterra Company

Modular Wetlands® Linear

A Stormwater Biofiltration Solution

OVERVIEW

The Modular Wetlands® Linear (MWS Linear*) represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint, higher treatment capacity, and a wide range of versatility. While most biofilters use little or no pretreatment, the Modular Wetlands Linear incorporates an advanced pretreatment chamber that includes separation and pre-filter boxes. In this chamber, sediment and hydrocarbons are removed from runoff before entering the biofiltration chamber, reducing maintenance costs and improving performance.

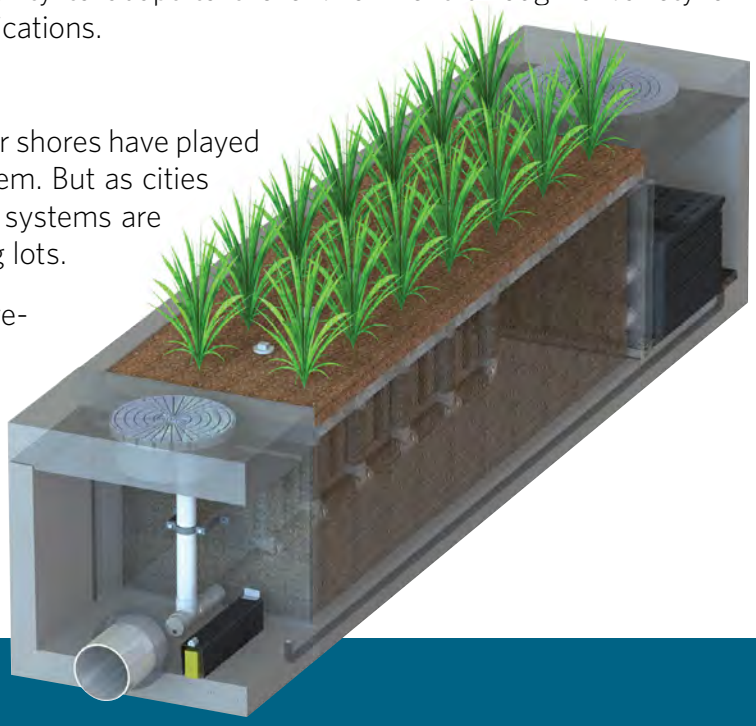
Horizontal flow also gives the system the unique ability to adapt to the environment through a variety of configurations, bypass orientations, and diversion applications.

The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as cities grow and develop, our environment's natural filtration systems are blanketed with impervious roads, rooftops, and parking lots.

Bio Clean understands this loss and has spent years re-establishing nature's presence in urban areas, and rejuvenating waterways with the Modular Wetlands Linear.

*Also known as: Modular Wetlands®, Modular Wetlands® System Linear, Modwet™, or MWS Linear™.



PERFORMANCE

The Modular Wetlands® Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the Modular Wetlands Linear has been field tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. In fact, the Modular Wetlands Linear harnesses some of the same biological processes found in natural wetlands in order to collect, transform, and remove even the most harmful pollutants.

66% REMOVAL OF DISSOLVED ZINC	**69%** REMOVAL OF TOTAL ZINC	**38%** REMOVAL OF DISSOLVED COPPER	**85%** REMOVAL OF TSS	**100%** REMOVAL OF TRASH
45% REMOVAL OF NITROGEN	**50%** REMOVAL OF TOTAL COPPER	**95%** REMOVAL OF MOTOR OIL	**67%** REMOVAL OF ORTHO PHOSPHORUS	**64%** REMOVAL OF TOTAL PHOSPHORUS

APPROVALS

The Modular Wetlands® Linear (MWS Linear) has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world. Here is a list of some of the most high-profile approvals, certifications, and verifications from around the country.

Washington State Department of Ecology TAPE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

California Water Resources Control Board, Full Capture Certification

The Modular Wetlands® Linear is the first biofiltration system to receive certification as a full capture trash treatment control device.

Virginia Department of Environmental Quality, Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) regulation technical criteria.

Maryland Department of the Environment, Approved ESD

Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.

MASTEP Evaluation

The University of Massachusetts at Amherst – Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.

Rhode Island Department of Environmental Management, Approved BMP

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.

ADVANTAGES

- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

OPERATION

The Modular Wetlands® Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which:

- Improves performance
- Reduces footprint
- Minimizes maintenance

Figure 1 & Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

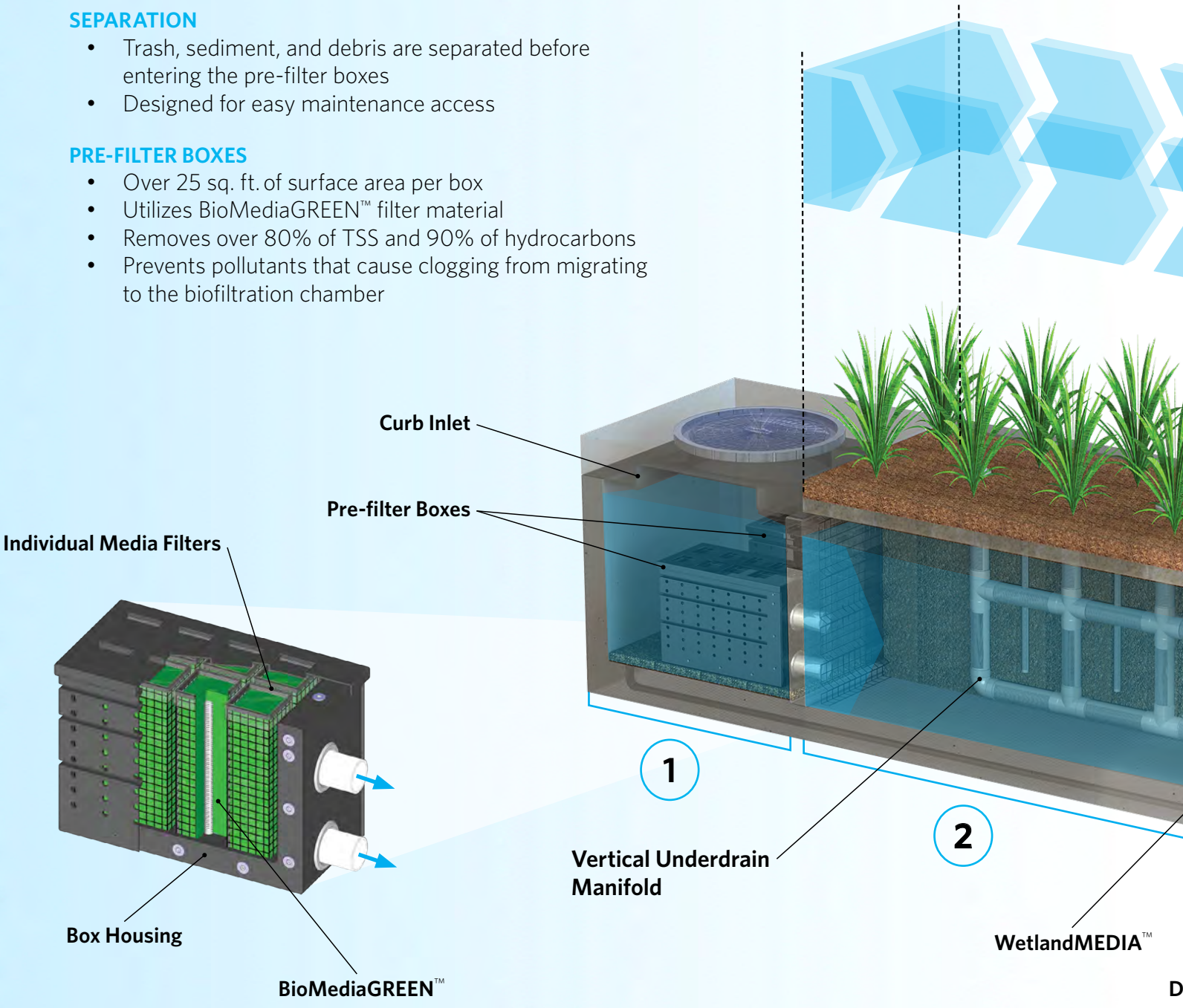
1 PRETREATMENT

SEPARATION

- Trash, sediment, and debris are separated before entering the pre-filter boxes
- Designed for easy maintenance access

PRE-FILTER BOXES

- Over 25 sq. ft. of surface area per box
- Utilizes BioMediaGREEN™ filter material
- Removes over 80% of TSS and 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



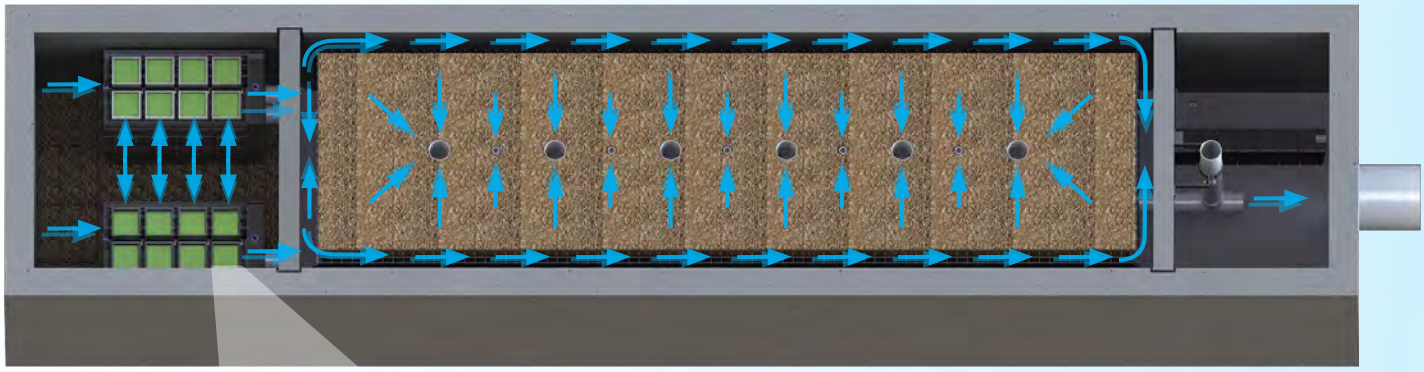


Figure 2,
Top View

2x to 3x more surface area than traditional downward flow bioretention systems.

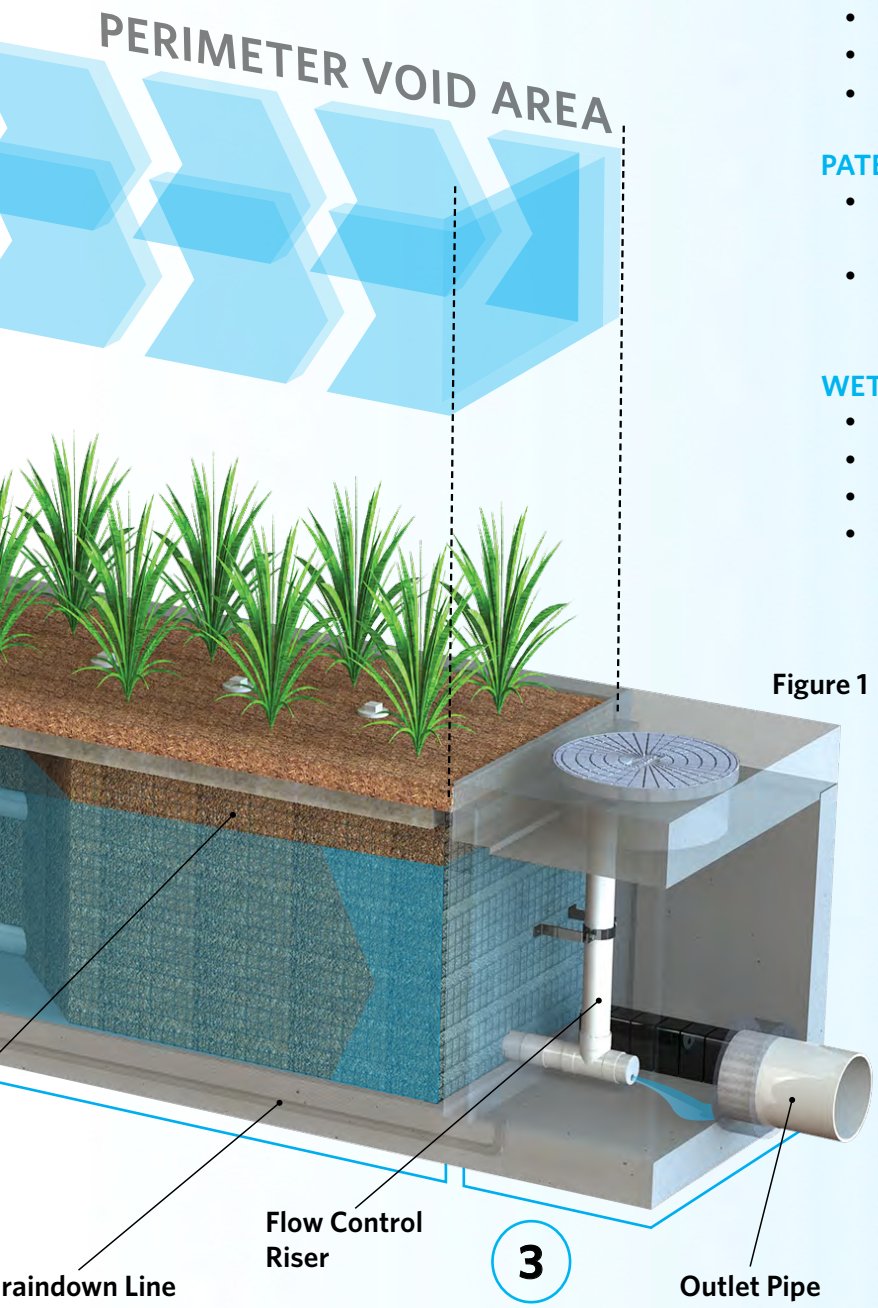


Figure 1

2 BIOFILTRATION

HORIZONTAL FLOW

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

PATENTED PERIMETER VOID AREA

- Vertically extends void area between the walls and the WetlandMEDIA™ on all four sides
- Maximizes surface area of the media for higher treatment capacity

WETLANDMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and lightweight

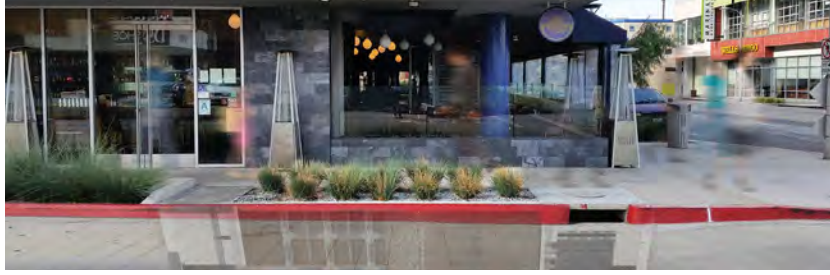
3 DISCHARGE

FLOW CONTROL

- Orifice plate controls flow of water through WetlandMEDIA™ to a level lower than the media's capacity
- Extends the life of the media and improves performance

DRAINDOWN FILTER

- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

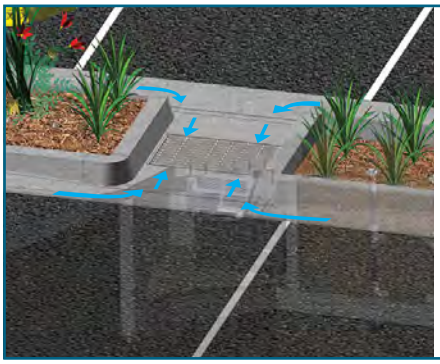


CONFIGURATIONS

The Modular Wetlands® Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

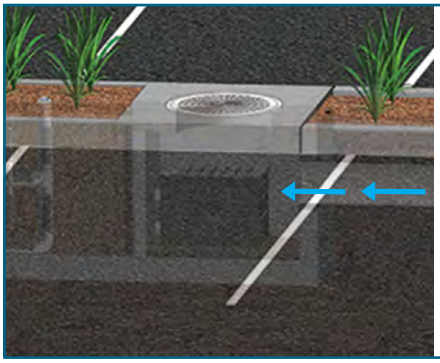
CURB TYPE

The Curb Type configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions. Length of curb opening varies based on model and size.



GRATE TYPE

The Grate Type configuration offers the same features and benefits as the Curb Type but with a grated/drop inlet above the systems pretreatment chamber. It has the added benefit of allowing pedestrian access over the inlet. ADA-compliant grates are available to assure easy and safe access. The Grate Type can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



VAULT TYPE

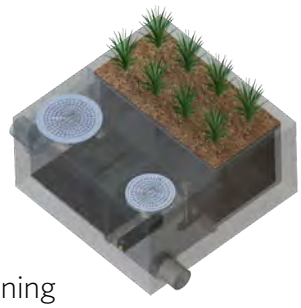
The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pretreatment chamber, meaning the Modular Wetlands® can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/ bioretention systems. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

DOWNSPOUT TYPE

The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

ORIENTATIONS

SIDE-BY-SIDE



The Side-By-Side orientation places the pretreatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.

END-TO-END

The End-To-End orientation places the pretreatment and discharge chambers on opposite ends of the biofiltration chamber, therefore minimizing the width of the system to 5 ft. (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is that bypass must be external.

BYPASS

INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

The Side-By-Side orientation places the pretreatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pretreatment chamber directly to the discharge chamber.

EXTERNAL DIVERSION WEIR STRUCTURE

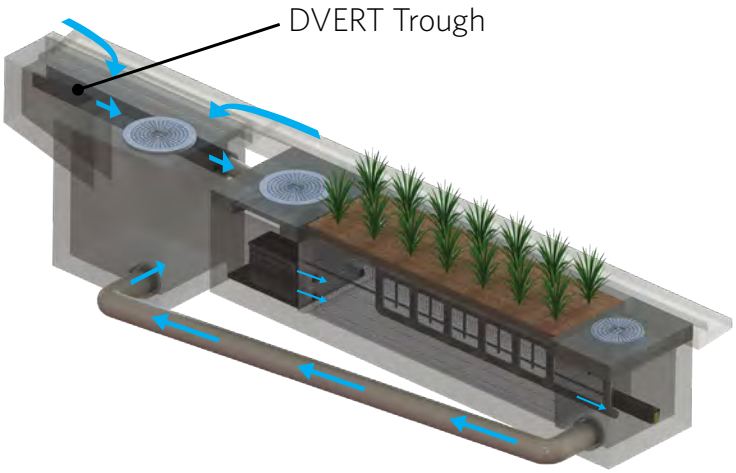
This traditional offline diversion method can be used with the Modular Wetlands® Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

FLOW-BY-DESIGN

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT LOW FLOW DIVERSION

This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the Modular Wetlands® Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over



to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the system to be installed anywhere space is available.

SPECIFICATIONS

FLOW-BASED DESIGNS

The Modular Wetlands® System Linear can be used in stand-alone applications to meet treatment flow requirements, and since it is the only biofiltration system that can accept inflow pipes several feet below the surface, it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

MODEL #	DIMENSIONS	WETLANDMEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4′ x 4′	23	0.052
MWS-L-4-6	4′ x 6′	32	0.073
MWS-L-4-8	4′ x 8′	50	0.115
MWS-L-4-13	4′ x 13′	63	0.144
MWS-L-4-15	4′ x 15′	76	0.175
MWS-L-4-17	4′ x 17′	90	0.206
MWS-L-4-19	4′ x 19′	103	0.237
MWS-L-4-21	4′ x 21′	117	0.268
MWS-L-6-8	7′ x 9′	64	0.147
MWS-L-8-8	8′ x 8′	100	0.230
MWS-L-8-12	8′ x 12′	151	0.346
MWS-L-8-16	8′ x 16′	201	0.462
MWS-L-8-20	9′ x 21′	252	0.577
MWS-L-8-24	9′ x 25′	302	0.693
MWS-L-10-20	10' x 20'	302	0.693

VOLUME-BASED DESIGNS

HORIZONTAL FLOW BIOFILTRATION ADVANTAGE

MODULAR WETLANDS® SYSTEM LINEAR WITH URBANPOND™ PRESTORAGE

In the example above, the Modular Wetlands® System Linear is installed downstream of the UrbanPond storage system. The MWS Linear is designed for the water quality volume and will treat and discharge the required volume within local draindown time requirements. The MWS Linear's unique horizontal flow design, gives it benefits no other biofilter has - the ability to be placed downstream of detention ponds, extended dry detention basins, underground storage systems and permeable paver reservoirs. The system's horizontal flow configuration and built-in orifice control allows it to be installed with just 6" of fall between inlet and outlet pipe for a simple connection to projects with shallow downstream tie-in points.

UrbanPond
Single and Double Modules

DESIGN SUPPORT

Bio Clean engineers are trained to provide you with superior support for all volume sizing configurations throughout the country. Our vast knowledge of state and local regulations allow us to quickly and efficiently size a system to maximize feasibility. Volume control and hydromodification regulations are expanding the need to decrease the cost and size of your biofiltration system. Bio Clean will help you realize these cost savings with the MWS Linear, the only biofilter than can be used downstream of storage BMPs.

ADVANTAGES

- LOWER COST THAN FLOW-BASED DESIGN
- MEETS LID REQUIREMENTS
- BUILT-IN ORIFICE CONTROL STRUCTURE
- WORKS WITH DEEP INSTALLATIONS

APPLICATIONS

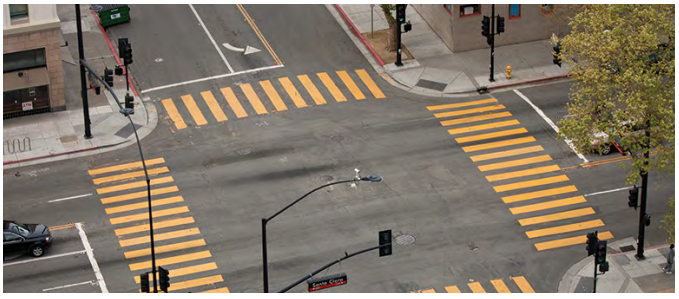
The Modular Wetlands® System Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

INDUSTRIAL

Many states enforce strict regulations for discharges from industrial sites. The Modular Wetlands® has helped various sites meet difficult EPA-mandated effluent limits for dissolved metals and other pollutants.

RESIDENTIAL

Low to high density developments can benefit from the versatile design of the Modular Wetlands®. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.



STREETS

Street applications can be challenging due to limited space. The Modular Wetlands® is very adaptable, and it offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

PARKING LOTS

Parking lots are designed to maximize space and the Modular Wetlands'® 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

COMMERCIAL

Compared to bioretention systems, the Modular Wetlands® can treat far more area in less space, meeting treatment and volume control requirements.

MIXED USE

The Modular Wetlands® can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications include:

• Agriculture • Reuse • Low Impact Development • Waste Water

PLANT SELECTION

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the Modular Wetlands® System Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade, the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the Modular Wetlands®, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the Modular Wetlands'® micro/macro flora and fauna.

A wide range of plants are suitable for use in the Modular Wetlands®, but selections vary by location and climate. View suitable plants by visiting biocleanenvironmental.com/plants.

INSTALLATION

The Modular Wetlands® is simple, easy to install, and has a space-efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles precast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians is available to supervise installations and provide technical support.

MAINTENANCE

Reduce your maintenance costs, man hours, and materials with the Modular Wetlands®. Unlike other biofiltration systems that provide no pretreatment, the Modular Wetlands® is a self-contained treatment train which incorporates simple and effective pretreatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long-term operation, and there is absolutely no need to replace expensive biofiltration media.

Bio Clean
A Forterra Company

5796 Armada Drive Suite 250
Carlsbad, CA 92008
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

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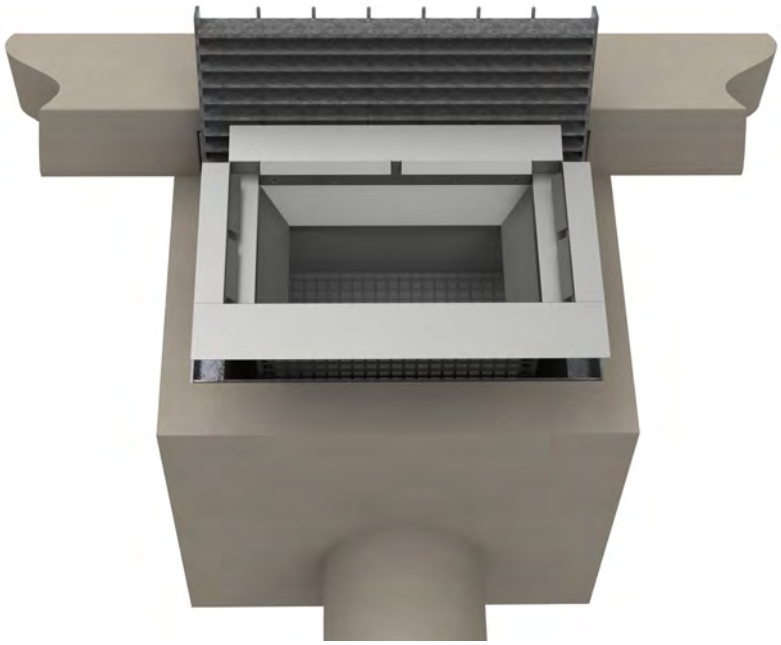
Oldcastle Precast®

FLOGARD +PLUS®

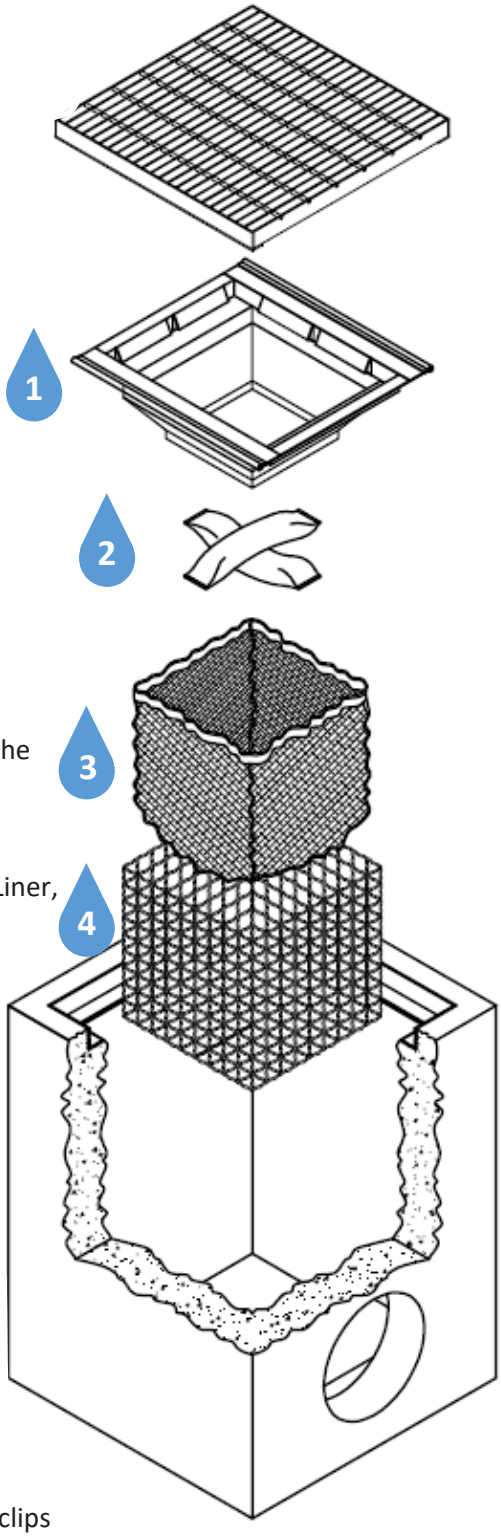
Replacement & Repair

Instruction Manual



Stormwater

FloGard Plus Replacement and Repair



Parts of the FloGard Plus Inlet Filter-

1. FloGard Stainless Steel Support Frame
2. Fossil Rock Absorbent Pouches
3. Liner
4. GeoGrid Support Basket & Cable

* Grate and Basin NOT INCLUDED

Disassembly:

1. Clear FloGard of any existing debris by hand or vacuum.
2. Unclip and remove the Fossil Rock pouches from the inside Liner.
3. Lift the FloGard from the catch basin.
4. Using a slotted screw driver, carefully pry open the metal tabs holding the GeoGrid and Cable in place. Separate the GeoGrid and Liner from the FloGard frame.
5. Unclip the Liner from the inside of the GeoGrid. If you are reusing the Liner, rinse thoroughly with water and inspect for tears. (If torn, mend with stainless steel wire or replace the Liner).
6. Rinse and inspect the GeoGrid Basket and the reinforcing cable. (If torn, mend with stainless steel wire or replace the GeoGrid).
7. Rinse and inspect the Stainless Steel FloGard frame.

Reassembly:

1. Fully expand the GeoGrid Basket and orient to the FloGard frame. Hook cable and GeoGrid to the FloGard frame metal tabs and close the tabs using slotted screwdriver. Move around the FloGard until all tabs are closed and GeoGrid is secured to the Frame.
2. Expand and orient the Liner, locating the clips at each corner and side. Push the Liner through the center of the FloGard frame and secure the clips to the GeoGrid Basket close to the top support cable. Push the Liner to expand inside of the basket.
3. Clip new Fossil Rock Rubberizer pouches to the inside of the Liner.
4. Lower FloGard back into the basin, replace grate.

FLOGARD +PLUS®

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

Oldcastle Infrastructure™
A CRH COMPANY

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

Inspection and Maintenance Guide

DRAINAGE PROTECTION SYSTEMS
DPS
A division of
Oldcastle Infrastructure

Water

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed FloGard+Plus Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (wash racks, parking garages, etc.): On a recurring basis (no less than three times per year).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing FloGard+Plus catch basin inserts).
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc., shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, and the pouch tethers re-attached to the liner's D-ring.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium will be replaced with new material. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of storm drain filters, catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined-space trained and certified. Call us at (888) 950-8826 for further information and assistance.

FLOGARD+PLUS®
CATCH BASIN INSERT FILTER

OUR MARKETS

BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION

WEATHER the Storm

StormCapture® System

Oldcastle Infrastructure™
A CRH COMPANY

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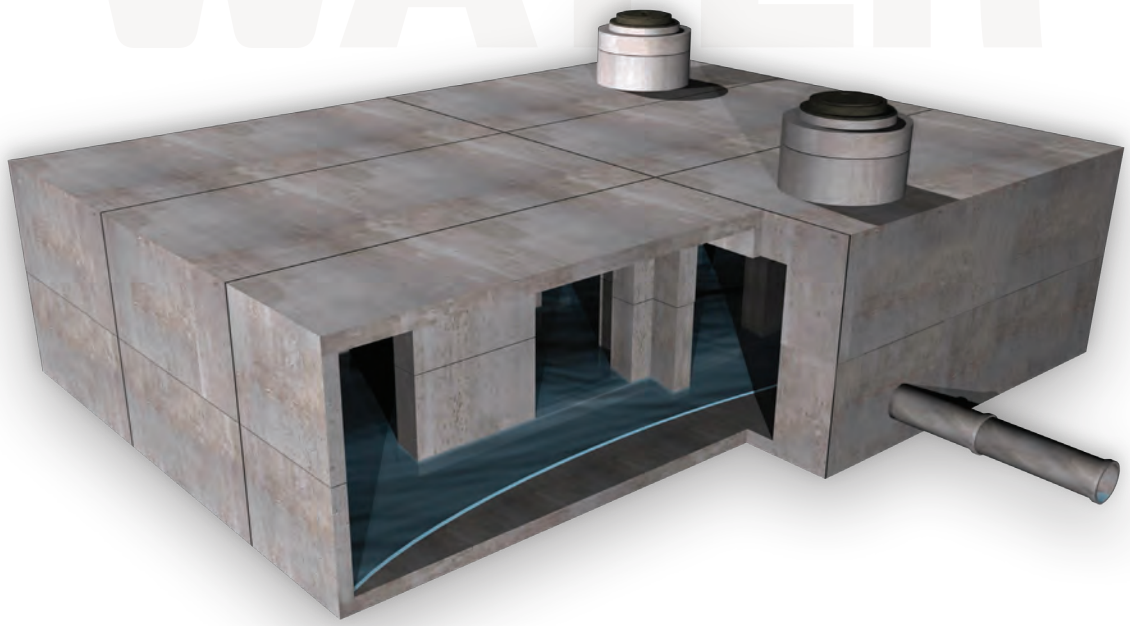
STORMCAPTURE®

Modular Stormwater Management System for Infiltration, Detention, Retention, Treatment and Harvesting



StormCapture® System

Backfill Requirements–Modules are typically backfilled with existing site materials.

Custom Sizes–Available in internal heights from 2’ to 14’ to best-fit site needs.

Design Assistance–Let our professionals customize for your specific needs.

Easy to Install–Fast installation with minimal handling.

Large Storage Capacity–Smaller system footprint for greater design flexibility.

Modular Design–Precast concrete modules measure 8’ wide by 16’ long OD, (7’ x 15’ ID), with customizable heights.

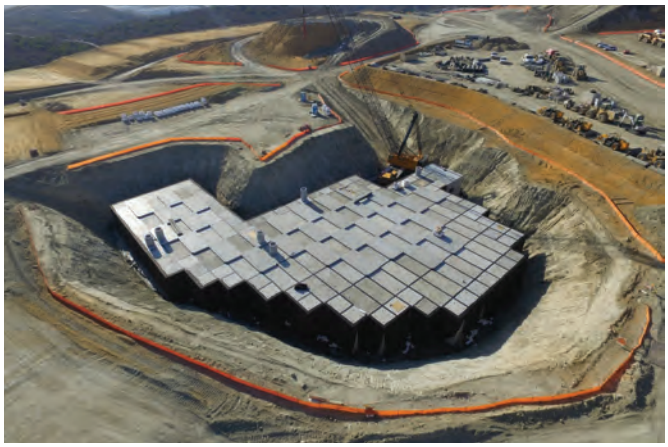
Traffic Loading–Only requires 6” of cover.

Treatment Train–Available with pre-treatment, post-treatment, or both.

StormCapture Advantages

Same-day staging and installation of StormCapture project.

StormCapture offers fast installation with minimal handling.



StormCapture modules are designed for HS20 traffic loading.

StormCapture detention system installed beneath office parking lot.

Fast Service – Get help from our national engineering team with layouts and specifications to meet your project's requirements.

Cost Savings – Highly competitive installation and maintenance costs.

Codes – Designed to the latest codes for HS-20-44 (full truckload plus impact).

Sustainability – The system is maintainable for long-term sustainability.

LID – Ideal for Low-Impact Development (LID).

LEED – Manufactured locally with recycled material for potential LEED credits. LEED 2009 for New Construction & Major Renovation, U.S. Green Building Council: Sustainable Sites (5.1, 5.2, 6.1, 6.2), Materials & Resources (4.1, 4.2, 5.1, 5.2), Water Efficiency (1.1, 1.2, 3.1, 3.2).

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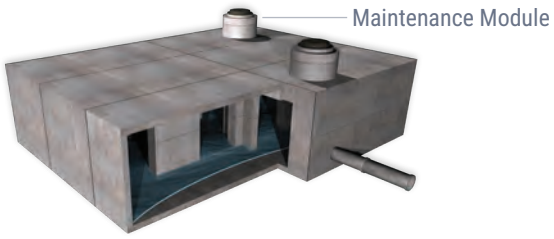
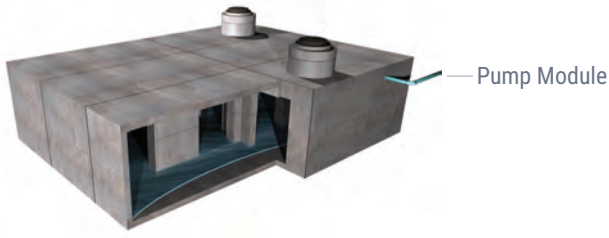
Applications

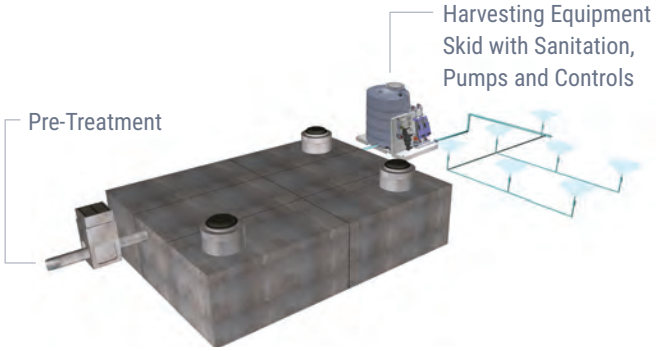
StormCapture offers numerous options for infiltration, detention, retention, treatment and harvesting to solve your stormwater management needs. Let us show you how we can design and customize a solution for you.



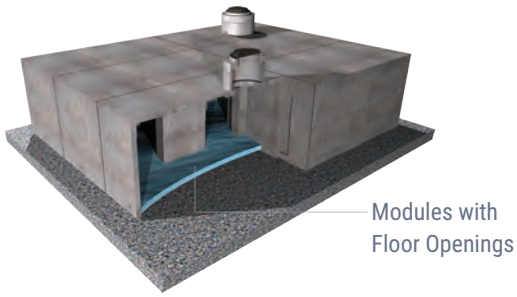
DETENTION



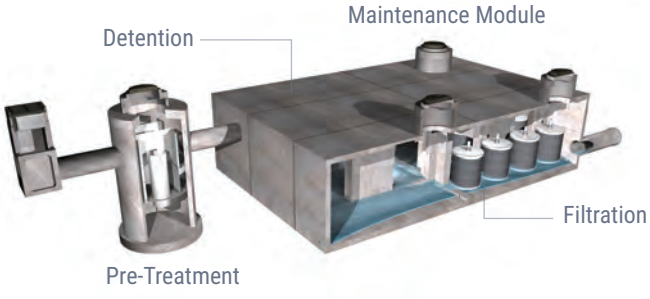
RETENTION



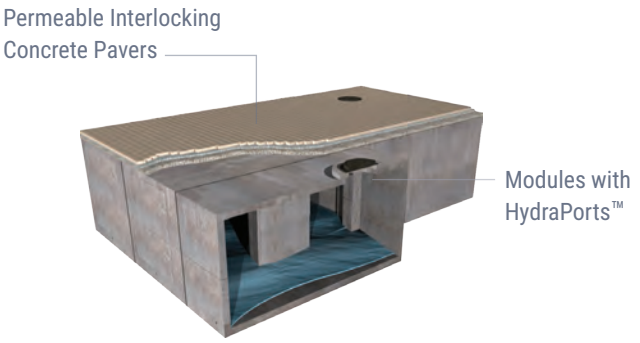
HARVESTING



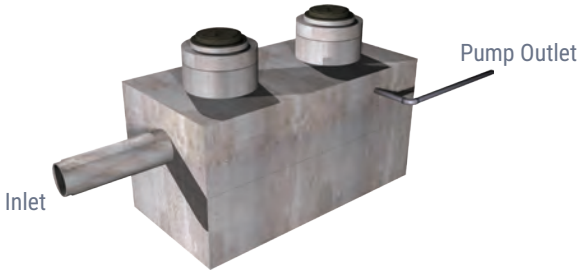
INFILTRATION



TREATMENT



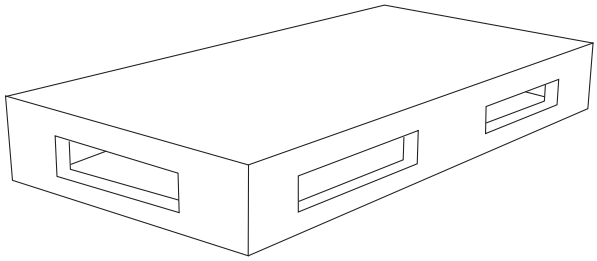
PERMECAPTURE



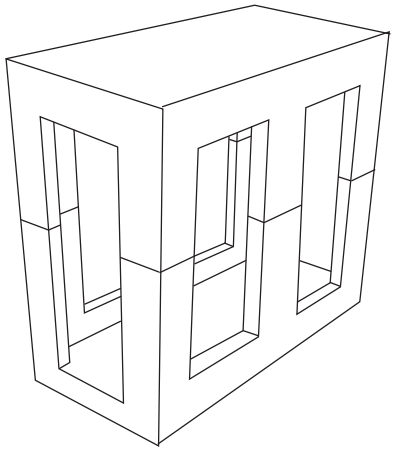
CISTERNS

INSTALLED IN JUST ONE DAY

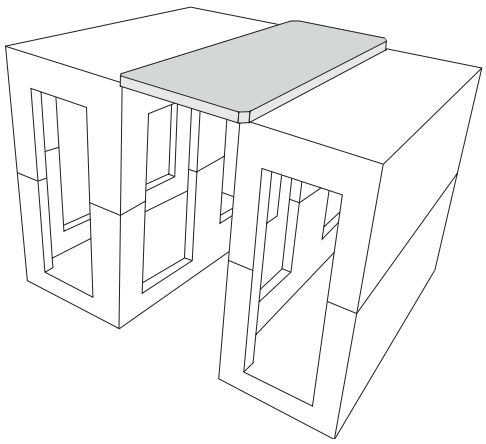
StormCapture Modules



SC1 - Single piece modules can be used for applications from 2' to 7' tall. Appropriate for cisterns, infiltration, detention and retention systems. SC1 modules are typically installed on minimally compacted gravel base, depending on specific project requirements.



SC2 - Two piece modules can be used for applications from 7' to 14' tall for maximum storage capacity in a condensed footprint. Appropriate for cisterns, infiltration, detention and retention systems. SC2 modules are typically installed on compacted native subgrade.



Link Slab - Unique design allows for significant reduction in the quantity of modules and associated costs, while providing maximum storage capacity.

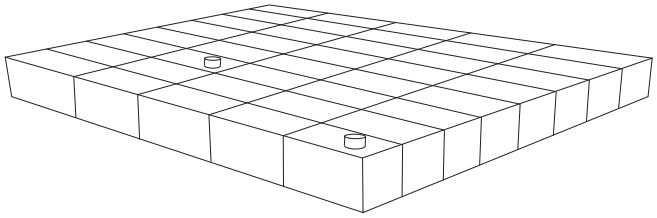
Module Sizes & Capacities

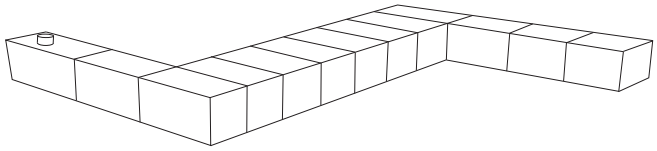
Modules are 8'x16' outside dimensions.
Capacity varies by configuration of openings.

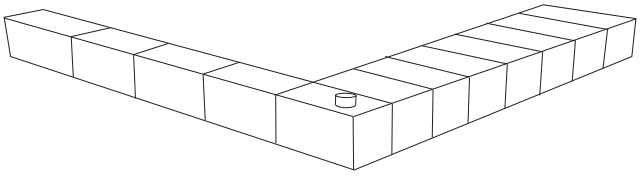
INSIDE DIMENSIONS (FT)	CAPACITY RANGE (FT^3)
7x15x2	210-212
7x15x3	315-325
7x15x4	420-442
7x15x5	525-559
7x15x6	630-678
7x15x7	735-793
7x15x8	840-910

INSIDE DIMENSIONS (FT)	CAPACITY RANGE (FT^3)
7x15x9	945-1,027
7x15x10	1,050-1,140
7x15x11	1,155 - 1,257
7x15x12	1,260 - 1,374
7x15x13	1,365 -1,491
7x15x14	1,470 - 1,608

Endless Configurations







Contact us today to start designing your system!

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Water