Preliminary Water Quality Management Plan (WQMP)

Legacy at Coto

23333 and 23335 Avenida La Caza, Coto de Caza

Unincorporated Orange County

APN 804-231-02 and 804-231-04

Prepared for:

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HUITT-ZOLLARS

Prepared on: February 24, 2020

Project Owner's Certification

Permit/Application No.		Grading Permit No.	
Tract/Parcel Map No.	Parcel A1 and 2	Building Permit No.	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract)			APN 804-231-02 and 804-231-04

This Conceptual Water Quality Management Plan (WQMP) has been prepared for Legacy at Coto by Huitt-Zollars, Inc. The WQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the San Diego Region (South Orange County). Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner:			
Title	CGV Coto, LLC		
Company	CGV Coto, LLC		
Address	1209 Santiago Drive, Newport Beach, CA 92660		
Email			
Telephone #			
Signature		Date	
Preparer:			
Title	Jenny Mital		
Company	Huitt-Zollars International		
Signature	Jenny Mital	Date	2/24/20

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Section 1 Discretionary Permit(s) and Water Quality Conditions

Project Information			
Permit/Application No.	N/A	Site Address or Tract/Parcel Map No.	23333 and 23335 Avenida La Caza, Coto de Caza
Additional Information/ Comments:	This document is a Conceptual Water Quality Management Plan. This document is intended to get a review of the proposed development and water quality plan prior to proceeding to final design, in which the site plan may change.		
Water Quality Conditions			
Water Quality Conditions from prior approvals or applicable watershed-based plans	This WQMP has been prepared pursuant to the requirement of South OC MS4 Permit Order No. R9-2013-0001/NPDES No. CAS019266 of the San Diego Regional Water Quality Control Board. Order No. R9-2015-0001 was adopted on February 11, 2015, amending the Regional MS4 Permit to extend coverage to the Orange County Co-permittees.		

Section 2 Project Description

2.1 General Description

Description of Proposed Project		
Site Location	23333 and 23335 Avenida La Caza, Coto de Caza	
Project Area (ft²): 143,750 sf	Number of Dwelling Units: ____110___	SIC Code: n/a residential
Narrative Project Description:	The Legacy at Coto is a proposed three-story luxury senior residential village with about 100 to 110 units. The proposed village will include a driveway, above and below ground parking, a combined residential building with a restaurant, a pool, and landscaping. The site is located at 23333 and 23335 Avenida La Caza in the Coto de Caza Community, Orange County, California. It is bordered to the northwest by Via Alondra, to the southeast by Avenida La Caza, to the east by the existing Coto Valley Country Club, and to the west by existing residential homes and tennis courts. The existing site is developed and consists of tennis courts, a pool, parking, and offices. The site is located within the San Juan Creek Watershed. It drains in a general north to south direction with a mild slope into a natural earthen channel that forms the headwaters of Canada Gobernadora. Runoff flows south in Canada Gobernadora approximately 7.5 miles before entering San Juan Creek, where it flows an additional 7.5 miles southwest to outlet to the Pacific Ocean at Doheny State Beach. Although the segment of San Juan Creek that empties into the Pacific Ocean is listed on the Clean Water Act 2010 303(d) list, the segment of San Juan Creek in the vicinity of the Project is not listed. The one mile of San Juan Creek directly before the Pacific Ocean is listed on the 2010 303(d) list as impaired for bacteria, Dichlorodiphenyldichloroethylene (DDE) pesticide, nutrients, selenium, and toxicity. The stormwater regulatory requirements for the site include water quality requirements per the San Diego Regional Water Quality Board MS4 Permit, compliance with FEMA floodplain requirements, flood control requirements imposed by local jurisdictions, and jurisdictional water regulations from the California Department of Fish and Wildlife	

(CDFW), San Diego Regional Water Quality Control Board (RWQCB), and U.S. Army Corps of Engineers (USACE).

The San Diego Regional Water Quality Control Board South OC MS4 Permit Order No. R9-2013-0001/NPDES No. CAS019266 designates the site as a redevelopment project that requires both water quality treatment and hydromodification mitigation. The site is required to treat the 85% 24-hr storm, 0.95 inches, at the site either by retention or biofiltration. Based on the findings of the geotechnical due diligence report, infiltration into native soils underlying the fill currently appears infeasible due to existing fill, future fill requirements for building placement, and the high groundwater table. If infiltration is not feasible, the Permit states that the site can instead treat 150% of the 85% volume via biofiltration.

The site is not exempt from the San Diego Region hydromodification criteria because it outlets to the non-exempt, natural channel in Gobernadora Canada. The hydromodification control criteria state that the site must mitigate proposed development flows for 10% of the 2-year through the 10-year to existing condition flows using a continuous simulation model such as the South Orange County Hydrology Model (SOHM).

From Section 1.2.4 of the South Orange County TGD dated 9-28-2017, the project is a Priority Project that falls in the following categories:

"Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land."

And:

"New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and consist primarily of one or more of the following uses":

(i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). Information and an SIC search function are available at https://www.osha.gov/pls/imis/sicsearch.html.

(iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.

	(iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.			
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	1.28 ac	33%	2.58 ac	67%
Post-Project Conditions	0.77 ac	20%	3.09 ac	80%

Note: pre and post project imperviousness is 75% for the existing tennis facility, and 90% for the proposed residential site. There is almost 0.5 acres pervious natural area in both conditions, leading to the overall higher perviousness without the project boundary.

2.2 Post Development Drainage Characteristics

Drainage Patterns/Connections
The site is located within the San Juan Creek Watershed. The existing site drains in a general east to west direction with a mild slope into a natural earthen channel that forms the headwaters of Canada Gobernadora. Runoff flows south in Canada Gobernadora approximately 7.5 miles before entering San Juan Creek, where it flows an additional 7.5 miles southwest to outlet to the Pacific Ocean at Doheny State Beach.

The project is located in an existing canyon with approximately 77 acres of offsite drainage flowing under the site from east to west via two-30" storm drains. A Zone A FEMA Flood Plain is mapped on the west (downstream) side of the site in the canyon. The FEMA FIRM #06059C0452J is contained within Appendix G.2.

Post-development drainage patterns will be similar to existing condition, with flows from the developed area discharging to the west, downstream of the project. The offsite drainage will be diverted around the site will not run onto the site. Floodplain analysis may be required to ensure that the Zone A floodplain is at least 1 foot below the proposed building finished floor. A preliminary offsite hydrology study is contained in the offsite drainage report under a separate cover.

A more detailed drainage plan is discussed in Section 4.

2.3 Property Ownership/Management

The site is owned by CGV Coto, LLC, which will be responsible for storm drain and BMP funding and maintenance.

Section 3 Site & Watershed Characterization

3.1 Site Conditions

3.1.1 Existing Site Conditions

The existing site is developed and consists of tennis courts, a pool, parking, and offices. Based on aerial imagery, the existing site is approximately 75% impervious, with about 0.5 acres of undeveloped stream area. Elevations range from approximately 866 to 888 feet elevation. Onsite drainage patterns consist of sheet flow from east to west. Based on aerial imagery and topo of nearby undeveloped canyon regions, the pre-Columbian terrain prior to development was steep (slope >20%) natural canyon drainages with a land cover of scrub brush.

Existing Land Uses

Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Natural Scrub Cover	0.42 ac	0 ac	0.42 ac	0%
Tennis Facility	3.44 ac	2.58 ac	0.86 ac	75%
Total	3.86 ac	2.58 ac	1.28 ac	67%

3.1.2 Infiltration-Related Characteristics

3.1.2.1 Hydrogeologic Conditions

According to the California State Waterboard GeoTracker website, there are no contaminated sites near the project. There are no known groundwater plumes at the site. According to the Seismic Hazard Maps for this area, the historic depth to high groundwater at the site ranges from 5 to 10 feet below surface. The groundwater map is shown in Attachment C. The project is not in a Department of Water Resources Groundwater Basin. The GeoTracker Map of nearby contaminated sites is shown below in Figure 1.

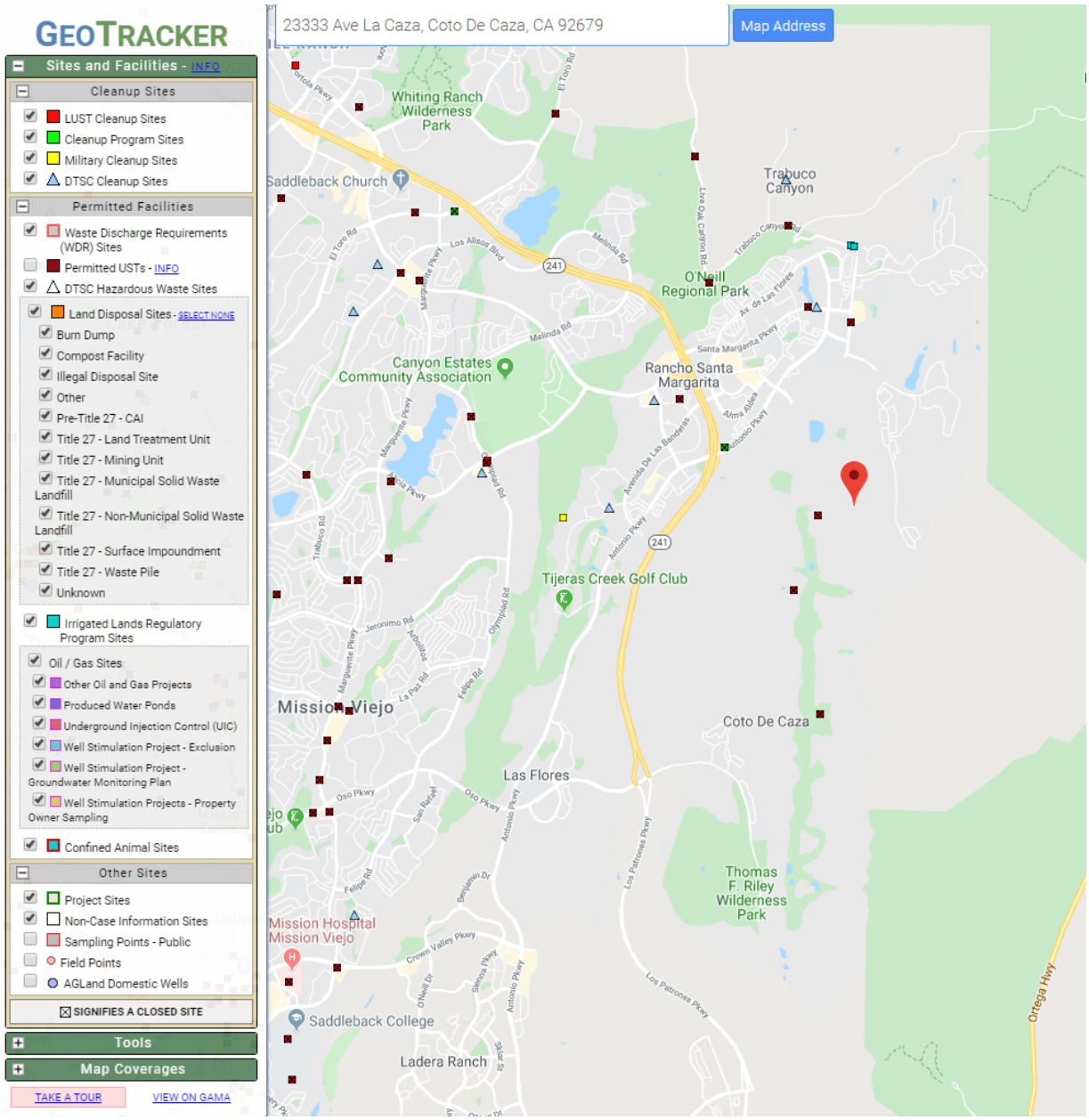


Figure 1. Geotracker Map of Groundwater Contamination

3.1.2.2 Soil and Geologic Infiltration Characteristics

A due-diligence geological assessment was conducted for the site in November 2018 by GMU Geotechnical and was updated in January 2020, titled "Due-Diligence Geotechnical Overview, Proposed Coto de Caza Luxury Senior Village, County of Orange, California." The study is attached in Appendix I. GMU reviewed available documentation and performed general geotechnical investigation to characterize the site and identify constraints and design considerations. GMU will conduct design-specific geotechnical testing prior to final design. GMU stated that the site soils likely consist of fill underlain by alluvial materials, which are expected to consist of silty sands and clayey sands with some sandy clay materials. According to the NRCS Web Soil Survey report, the site soil is composed of Capistrano sandy loam, 2 to 9 percent slopes, type "A." A type soils typically have high infiltration rates. The NRCS soil map is shown in Attachment G.1.

No official groundwater or infiltration testing has been performed at the site. A site specific geotechnical investigation will be performed prior to final design. GMU anticipates that infiltration of stormwater into the site soils may not be feasible due to the high groundwater table, planned corrective grading, and the presence shallow bedrock.

Groundwater was not encountered during the subsurface investigation for any bore holes (6-21ft deep), but perched water may be present at the slopewash/bedrock contact and may be encountered during grading. Based on the CGS Seismic Hazard Zone Report for the Canada Gobernadora 7.5-minute quadrangle, historic high groundwater levels are mapped as 5 to 10 feet below ground surface within the subject site as shown in Appendix C.

Artificial fill was encountered within five of the drill holes to a depth of four feet. It is expected that deeper fills are present within the site. Slopewash materials (i.e., alluvium/colluvium/slopewash) are present at the site to a depth of up to at least 15 feet. Bedrock of the Santiago Formation underlies the artificial fill and slopewash materials within the subject site and was encountered within three of the drill holes.

3.1.2.3 Geotechnical Conditions

According to the geotechnical report, the site is not expected to be affected by landsliding, lateral spreading, subsidence, or collapse. Liquefaction and lateral spreading potential at the site is anticipated to be very low.

3.1.2.4 Summary of Infiltration Opportunities and Constraints of Existing Site

GMU anticipates that infiltration of stormwater into the site soils may not be feasible due to the high groundwater table, planned corrective grading, and the presence shallow bedrock.

3.2 Proposed Site Development Activities

3.2.1 Overview of Site Development Activities

The Legacy Club will be a luxury senior living facility. Proposed land uses and activities will include above and below-ground parking, a driveway, a pool, landscaping, and the building, which will contain apartments, a theater, a store, and other amenities. The proposed water quality plan is shown in Exhibit 2, Preliminary Drainage Management Areas.

3.2.2 Project Attributes Influencing Stormwater Management

The proposed site design minimizes the risk of pollution. Most of the parking area will be below ground and will not receive any rain or stormwater runoff. All offsite runon will be conveyed around the site to avoid comingling. Expected pollutants of concern are Bacteria and Viruses, Nutrients, Pesticides, Sediments, Trash & Debris, Oil, and Grease.

The proposed grading at the site will protect the proposed building and follow the existing drainage patterns. Runoff will sheet flow or be conveyed by pipe into Modular Wetland System proprietary bioretention systems.

The site has been divided into 3 drainage management areas, one per each proposed bioretention BMP. Landuses and expected pollutants are the same for all drainage management areas.

Proposed Land Uses

Land Use Description	Total Area (acres)	Impervious Area (acres)	Pervious Area (acres)	Imperviousness (%)
Pavement and buildings	3.10	3.10	0	100%
Landscaping	0.34	0	0.34	0%
Total	3.44	3.10	0.34	90%

3.2.3 Effects on Infiltration and Harvest and Use Feasibility

The proposed site development activities do not affect the feasibility of infiltration BMPs at the site. However, the geotechnical analysis shows that infiltration is not feasible due to the high groundwater table.

Harvest and use is not feasible at the site because of insufficient irrigation demand. The site will be approximately 90% impervious, and the proposed landscape area will not have the required 80% demand to drawdown the DCV within 96 hours. Analysis is shown in Attachment D, BMP Calculations.

3.3 Receiving Waterbodies

The San Juan Creek watershed, located in the southern portion of Orange County, encompasses a drainage area of approximately 176 square miles and extends from the Cleveland National Forest in the Santa Ana Mountains to the Pacific Ocean at Doheny State Beach near Dana Point Harbor. The upstream tributaries of the watershed flow out of steep canyons and widen into alluvial floodplains. The major streams in the watershed include San Juan Creek, Bell Canyon Creek, Chiquita Creek, Gobernadora Creek, Verdugo Canyon Creek, Oso Creek, Trabuco Creek, and Lucas Canyon Creek. Elevations range from over 5,600 feet above sea level at Santiago Peak to sea level at the mouth of San Juan Creek (PCR et al. 2002).

Near the project, there are no ASBS or water bodies designated under the California Department of Fish and Wildlife's Natural Community Conservation Planning (NCCP) Program as preserves as the Southern Subregion NCCP. However, San Juan Creek is designated as a future Aquatic Resource Conservation Area under the SAMP and as a future habitat reserve lands under the SSHCP. According to the OC Local Implementation Plan, the Pacific Ocean Shoreline within the San Juan Watershed is designated as a CAR. However, this is several miles from the project so this designation is not a concern. Although the segment of San Juan Creek that empties into the Pacific Ocean is listed on the Clean Water Act 2010 303(d) list, the segment of San Juan Creek in the vicinity of the Project is not listed[1]. The Clean Water Act 303(d) listed pollutants in lower San Juan Creek are shown in Table 1. The OC Watersheds Website ESA map is shown in Figure 2.

Table 1. 2010 303(d) Listings for the San Juan Creek Watershed

Water Body	Pollutant	Extent	Expected TMDL Completion Date
Pacific Ocean Shoreline, Lower San Juan HSA, at San Juan Creek	Bacteria Indicators: Enterococcus, Fecal Coliform, and Total Coliform	0.03 miles	2021
San Juan Creek (mouth)	Bacteria Indicator	1.02 miles and at mouth (6.3 acres)	2008
San Juan Creek	Indicator Bacteria	1.02 miles	2019
San Juan Creek	Dichlorodiphenyldichloroethylene (DDE)	1.02 mile	2019
San Juan Creek	Phosphorus	1.02 miles	2021

[1] The 2010 303(d) list includes San Juan Creek for approximately 1 mile inland from its mouth at the Pacific Ocean Shoreline (slightly north of Stonehill Drive) as being impaired for indicator bacteria, Dichlorodiphenyldichloroethylene (DDE) pesticide, selenium, and toxicity. The segment on the 303(d) list is not located within the Ranch Plan Planned Community, which is located approximately 5.5 miles from the shoreline.

San Juan Creek	Selenium	1.02 miles	2021
San Juan Creek	Total Nitrogen as N	1.02 miles	2021
San Juan Creek	Toxicity	1.02 miles	2021

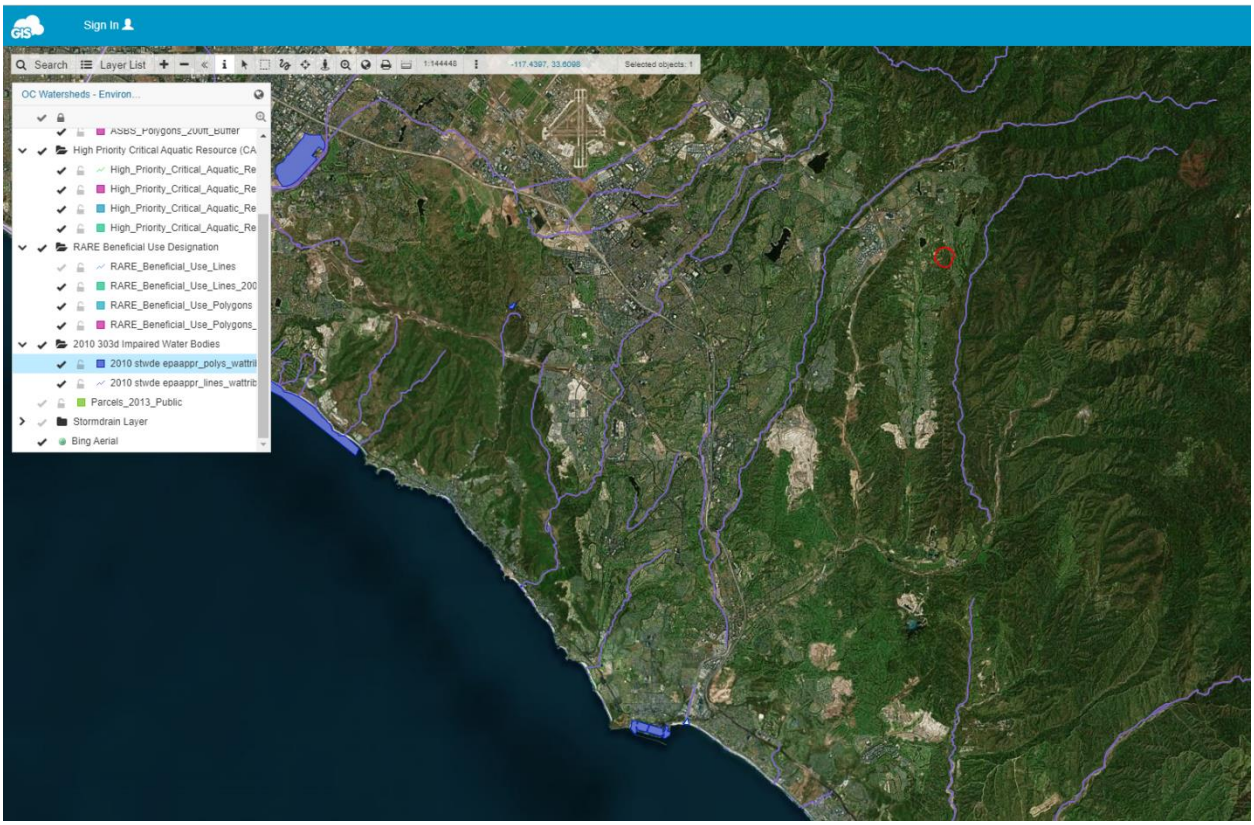


Figure 2. OC Watersheds ESA Map

Bacteria have been historically used as indicators of human pathogens because they are easier and less costly to measure than the pathogens themselves. TMDLs for indicator bacteria were developed to address 17 of the 38 bacteria-impaired water-bodies in the San Diego Region, as identified on the 303(d) List of Water Quality Limited Segments. This phase of the TMDL is referred to as Project I Beaches and Creeks in the San Diego Region. On February 10, 2010, the San Diego Water Board adopted Resolution No. R9-2010-0001, an Amendment to the Water Quality Control Plan for the San Diego Region to incorporate the revised TMDLs for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region. This TMDL Basin Plan amendment was subsequently approved by the State Board on December 14, 2010, the Office of Administrative Law (OAL) on April 4, 2011, and the United States Environmental Protection Agency (USEPA) on June 22, 2011. Under state law, this TMDL Basin Plan became fully effective on April 4, 2011, the date of OAL approval.

The TMDL establishes numeric targets to meet numeric water quality objectives (WQOs) and subsequently ensure the protection of beneficial uses. TMDLs were established for each impaired water body, including San Juan Creek, for each indicator bacteria, for wet and dry

weather. Single sample maximum WQOs were used as wet weather numeric targets, while geometric mean WQOs were used as numeric targets for dry weather periods.

Impaired waters were given a priority number of 1, 2, or 3 with 1 being the highest priority. Priority 1 waters also included water bodies likely to be removed from the CWA Section 303(d) List of Water Quality Limited Segments. Priority schemes are designated within watersheds. The Pacific Ocean Shoreline at San Juan Creek and the San Juan Creek (mouth) are priority level 1 water bodies. San Juan Creek is a priority level 3 water body. The prioritized list recognizes the presence of segments or areas where bacterial water quality improvements are most likely to occur first (Priority 1), and segments or areas where bacterial water quality improvements are most likely to require more time to achieve (Priority 3).

Fecal coliform, total coliform, and enterococci loads and waste load reductions are required over a 10-year staged compliance schedule period. For San Juan Creek, a priority 3 water body, the first stage consists of an initial 6-year period during which no total coliform, fecal coliform, and enterococci load and waste load reductions are required. A 50 percent reduction to the allocations must be achieved by year 7 for priority 3 water bodies. A 100 percent reduction to the allocations is required for all water bodies by year 10.

Numeric wet weather targets allow a 22% exceedance frequency of the single sample WQOs for REC-1. The purpose of the exceedance frequency is to account for the natural, and largely uncontrollable, sources of bacteria (e.g., bird and wildlife feces) in the wet weather loads generated in the watersheds and at the beaches, which by themselves can cause exceedance of WQOs. The basis for the exceedance criteria is the frequency of exceedance of the single sample maximum WQOs measured in a reference stream system in Los Angeles County (Leo Carrillo Beach/Arroyo Sequit Watershed). A reference stream system is a beach and upstream watershed that are minimally impacted by anthropogenic activities. The reference stream system approach also incorporates antidegradation principles in that, if water quality is better than that of the reference system in a particular location, no degradation of existing bacteriological water quality is permitted.

The Final TMDLs for San Juan Creek for wet weather discharges and dry weather discharges are listed on page 29. Allocations for each TMDL are expressed as annual loads in terms of bacteria colonies per year (billion MPN/year), where MPN is the "most probable number." Responsible parties for point source discharges include the California Department of Transportation (Caltrans), and owners and operators of Phase I and Phase II MS4 systems within the San Juan Creek watershed. Persons responsible for controllable nonpoint discharges include owners and operators of agricultural and livestock operations in watersheds where bacteria loads from these land uses are more than 5 percent of the total load, including the San Juan Creek watershed. Non-controllable nonpoint source loads come from mostly natural sources (e.g. bird and wildlife feces).

The primary mechanism for TMDL attainment in urban areas will be increased regulation of the MS4 discharges through the MS4 NPDES Permits. As the WLA for MS4 discharges was not distributed among the various municipalities in the watershed, the MS4 dischargers are collectively responsible for meeting the TMDL requirements. The SDRWQCB will reissue the MS4 NPDES Permit to incorporate water quality-based effluent limitations (WQBELs) consistent with the assumptions and requirements of the bacteria WLAs, and requirements for

monitoring and reporting. At a minimum, WQBELs will include a BMP program of expanded or better-tailored BMPs to attain the WLAs in accordance with the TMDL compliance schedule.

Table 2. San Juan Creek Wet Weather TMDLs and Allocations (Resolution No. R9-2010-0001)

Lower San Juan HSA (901.27)	Indicator Bacteria[a]	Existing Load (MPN/year)	Simple Maximum Objective (MPN/100mL)	Allowable Numeric Objective Load (Billion MPN/Year)	Total Wet Days in Critical Year	Allowable Exceedance Frequency[b]	Allowable Wet Exceedance Days in Critical Year	Total Allowable Load [TMDL] (Billion MPN/year)
Pacific Ocean Shoreline San Juan Creek San Juan Creek mouth	Fecal Coliform	15,304,970	400	358,410	76	22%	17	14,714,833
	Total Coliform	130,258,863	10,000	8,947,114				122,879,189
	Enterococcus	12,980,098	104[c]	95,357				12,159,138
		12,980,098	61	56,119				12,152,446

Table 3. San Juan Creek Dry Weather TMDLs and Allocations

Lower San Juan HSA (901.27)	Indicator Bacteria	Existing Load (MPN/month)	30-Day Geometric Mean Objective (MPN/100mL)	Allowable Numeric Objective Load (Billion MPN/Month)	Total Wet Days in Critical Year	Allowable Exceedance Frequency	Allowable Wet Exceedance Days in Critical Year	Total Allowable Load [TMDL] (Billion MPN/Month)
Pacific Ocean Shoreline San Juan Creek San Juan Creek mouth	Fecal Coliform	6,455	200	1,665	289	0%	0	1,665
	Total Coliform	30,846	1,000	8,342				8,342
	Enterococcus	5,433	33	275				275

a. As San Juan Creek is not tributary directly to an impaired beach but instead to an impaired lagoon, numeric targets for total coliform were not needed to protect for shellfish beneficial uses. Thus, numeric WQOs were selected for fecal coliform and enterococci only.
b. Exceedance frequency based on reference condition observed in the Los Angeles Region.
c. TMDL calculated using a Enterococcus numeric target of 61 MPN/mL that is conservatively protective of the REC-1 "designated beach" usage frequency for freshwater creeks and downstream beaches. If the usage frequency of the freshwater creeks can be established as "moderately to lightly used" in the Basin Plan, alternative TMDLs calculated using an Enterococcus numeric target of 104 MPN/ml might be used.

3.4 Stormwater Pollutants or Conditions of Concern

The site is expected to generate pollutants associated with roads, restaurants, parking lots, and landscaping. This include leaks and spills of vehicle oil and fuel, dust, sediment, and nutrients.

The site is divided into four DMAs. DMA 1 (A) consists of the northern portion of the site, subareas A1 and A2. DMA 2 (B) consists of the southwestern portion of the site, subarea B1. DMA 3 (C) consists of the southeastern portion of the site, subareas C1 and C2. Subarea D consists of two natural, self-retaining areas in the creek (D1 and D2) that will not be developed and will not require treatment. All DMAs discharge to the existing earthen drainage channels west of the site. The same pollutants are expected for all developed DMAs (DMA 1-3), as shown in Table 4. DMA boundaries are shown in Exhibit 2.

Table 4. Pollutants of Concern

Pollutants or Conditions of Concern				
Pollutant	Expected from Proposed Land Uses/Activities (Yes or No)	Receiving Waterbody Impaired (Yes or No)	Priority Pollutant from WQIP or other Water Quality Condition? (Yes or No)	**Pollutant of Concern (Primary, Other, or No)**
Suspended-Solids	Y	N	N	N
Nutrients	Y	Y	N	N
Heavy Metals	Y	Y	N	N
Bacteria/Virus/ Pathogens	Y	Y	Y	Primary
Pesticides	Y	Y	N	N
Oil and Grease	Y	N	N	N
Toxic Organic Compounds	Y	Y	N	N
Trash and Debris	Y	N	N	N
Dry Weather Runoff	Y	N	N	N

According to Table 2-3 in the South Orange County Water Quality Improvement Plan (WQIP) dated June 2018, the Highest Priority Water Quality Conditions for South Orange County are pathogens (indicator bacteria), unnatural water balance, and channel erosion. Therefore, the primary pollutant of concern for the project site is bacteria.

Table 2-3: HPWQC for the South Orange County Watershed Management Area

Condition	Temporal Extent	Geographic Extent (or narrative criteria for future effort to define geographic extent)
Pathogen Health Risk	Dry and Wet	Beaches • Where recreational use/high value and persistent exceedances of FIB standards (limited extent in dry; most beaches during wet)
Unnatural Water Balance/Flow Regime	Dry	Stream Reaches and Coastal Estuaries • Reaches and outfalls demonstrated to be ponded or flowing in dry weather • Areas with other observed issues exacerbated by unnatural water balance (e.g., low IBI, high eutrophication, high invasive species) • Areas with highest intensity of recreational use/visibility • Areas that contribute unnatural dry weather flow to Aliso Creek Estuary
Channel Erosion/ Geomorphologic Impacts	Dry and Wet[1]	Stream Reaches • Where impacted • Where degraded channel form has become limiting factor in channel ecology • Areas with highest intensity of recreational use/visibility • Where sediment or particulate-bound pollutants are contributing to downstream water quality impairment or complicating restoration efforts

1 – While channel erosion is primarily a wet weather process, impairments of stream function associated with channel erosion are relevant in both wet and dry weather.

3.5 Hydrologic Conditions of Concern

Does a hydrologic condition of concern exist for this project?

☐ No – An HCOC does not exist for this receiving water because *(select one)*:

☐ Project discharges directly to a protected conveyance (bed and bank are concrete lined the entire way from the point(s) of discharge to a receiving lake, reservoir, embayment, or the Ocean

☐ Project discharges directly to storm drains which discharge directly to a reservoir, lake, embayment, ocean or protected conveyance (as described above)

☐ The project discharges to an area identified in the WMAA as exempt from hydromodification concerns

☒ Yes – An HCOC does exist for this receiving water because none of the above are applicable.

As shown in Attachment E, "San Clemente Exemption Map" from the South Orange County TGD (2017), runoff from the project drains to a hydromodification non-exempt natural

streambed in Canada Gobernadora immediately after it leaves the site. Downstream from the project, San Juan Creek has the large river exemption and is an engineered for the majority of the flowpath to the ocean. To protect this non-exempt streambed directly outside of the project site, hydromodification criteria apply.

3.6 Critical Coarse Sediment Yield Areas

Critical coarse sediment yield areas are important in supplying bed load material to streams. Potential critical coarse sediment areas have undeveloped land cover, coarse-grained topsoil, and the "high" and "highest" RUSLE erodibility categories. The project site is already developed and mostly impervious, so this development is unlikely to affect sediment availability in the watershed.

Section 4 Site Plan and Drainage Plan

4.1 Drainage Management Area Delineation

The site is divided into four DMAs. DMA 1 (A) consists of the northern portion of the site, subareas A1 and A2. DMA 2 (B) consists of the southwestern portion of the site, subarea B1. DMA 3 (C) consists of the southeastern portion of the site, subareas C1 and C2. Subarea D consists of two natural, self-retaining areas in the creek (D1 and D2) that will not be developed and will not require treatment. All DMAs discharge to the existing earthen drainage channels west of the site. DMA boundaries are shown in Exhibit 2.

Treatment in all DMAs is planned to be via proprietary modular wetland bioretention systems. BMPs for each DMA were selected based on the BMP hierarchy outlined in the TGD. Infiltration and harvest and use are not feasible at the site, so biotreatment BMPs were selected because they are the next most preferable. These systems are also utilized for hydromodification mitigation, as discussed in Section 6.

The creek on the upstream and downstream of the site has been delineated as State and Federal Jurisdictional Waters, as shown in the November 2018 Coto Village Jurisdictional Delineation Memo by VCS Environmental in Appendix H. Construction impacts within these areas will be avoided whenever possible.

4.2 Overall Site Design BMPs

Minimize Impervious Area – Approximately 0.5 acres of the 3.86 acre site will be left in a natural, pervious condition, and the development will also have landscaped areas.
Maximize Natural Infiltration Capacity – Infiltration is not feasible at the site due high groundwater, anticipated fill, and high bedrock.
Preserve Existing Drainage Patterns and Time of Concentration – Existing drainage patterns will be preserved by discharging water to the west, as in the existing condition.
Disconnect Impervious Areas – Landscaping will disconnect impervious area where feasible.
Protect Existing Vegetation and Sensitive Areas – The site is far from environmentally sensitive areas, and the existing condition is mostly developed.
Revegetate Disturbed Areas – Disturbed hillside will be replanted with the native, drought tolerant vegetation.
Soil Stockpiling and Site Generated Organics – If possible, native soil will be used at the site. The stockpile will be protected to prevent excessive compaction and covered to prevent erosion.
Firescaping – The site is not located in a high risk fire zone. Fire risk to the structures will be minimal because the site is in a developed area.
Water Efficient Landscaping – Any landscaping on the site will be native, drought tolerant plantings.
Slopes and Channel Buffers – The site will be mostly flat, impervious area. The hillsides that will be graded to accommodate the site will follow the TGD's guidelines to reduce erosion:

- Convey runoff safely from the tops of slopes by installing concrete channels at the top of the graded slope, at the bottom of the graded slope as needed to prevent runon to the development, and at intervals specified by any applicable grading regulations.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Install permanent stabilization BMPs on disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows with MWS units prior to reaching existing natural drainage systems
- Install energy dissipaters, such as riprap, at the outlets of new storm drains to the existing channels for both DMAs.
- Energy dissipaters should be installed in such a way as to minimize impacts to receiving waters.
- Instead of discharging to steep reaches, runoff will be conveyed to the bottom of the slope at the discharge point to the natural channels for each DMA.

4.3 DMA Characteristics and Site Design BMPs

Treatment in all DMAs is planned to be via proprietary modular wetland bioretention systems. BMPs for each DMA were selected based on the BMP hierarchy outlined in the TGD. Infiltration and harvest and use are not feasible at the site, so biotreatment BMPs were selected because they are the next most preferable. These systems are also utilized for hydromodification mitigation, as discussed in Section 6.

Harvest and use is not feasible for the site because there is insufficient demand to use the DCV within 48 hours. Harvest and use feasibility calculations are shown in Attachment D, BMP Calculations.

4.3.1 DMA 1 (A, North)

DMA 1 is the majority of the site and discharges to the natural watershed to the southwest of the site. General proposed drainage patterns are south to north and east to west, and runoff is conveyed by storm drains to the discharge location. The proposed grading is mostly flat, generally less than 5% with some 2:1 slopes. Water will be treated by a modular wetland system at the downstream end of the drainage area.

4.3.2 DMA 2 (B, Southwest)

DMA 2 consists of the south end of the building and western driveway and discharges to the natural watershed to the southwest of the site. General proposed drainage patterns are north to south, and runoff is conveyed by storm drains to the discharge location. The proposed grading is mostly flat, generally less than 5%. Water will be treated by a modular wetland system.

4.3.3 DMA 3 (C, Southeast)

DMA 3 consists of the southern portion of the site and discharges to the natural watershed to the southeast of the site. General proposed drainage patterns are north to south, and runoff is conveyed by storm drains to the discharge location. The proposed grading is mostly flat, generally less than 5% with some 2:1 slopes. Water will be treated by a modular wetland system at the downstream end of the drainage area.

4.3.4 DMA Summary

Drainage Management Areas				
DMA (Number/Description)	Total Area (acres)	Imperviousness (%)	Infiltration Feasibility Category (Full, Partial, or No Infiltration)	Hydrologic Source Controls Used
DMA 1 (A, North)	2.38	90%	No infiltration	None
DMA 2 (B, Southwest)	0.49	90%	No infiltration	None
DMA 3 (C, Southeast)	0.57	90%	No infiltration	None

4.4 Source Control BMPs

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**Reason Source Control is Not Applicable**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous waste will be present.
N6	Local Industrial Permit Compliance	☐	☐	This is not an industrial facility.
N7	Spill Contingency Plan	☐	☒	No hazardous waste will be present.

N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks will be at the site.
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous waste will be present.
N10	Uniform Fire Code Implementation	☒	☐	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☐	No loading docks.
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No gasoline will be sold.

A discussion of each selected Non-Structural Source Control BMP is provided in the following section.

N1 Education for Property Owners, Tenants and Occupants – Prior to opening of the station, Rancho MMC will provide educational materials to CR&R to inform them of their potential impacts to downstream water quality. Materials include those described in Section VI of this WQMP and provided in Attachment A of this WQMP.

N2 Activity Restrictions – Activity restrictions to minimize potential impacts to water quality and with the purpose of protecting water quality will be prescribed by the project's Covenant, Conditions and Restrictions (CC&Rs), or other equally effective measure.

N3 Common Area Landscape Management – Maintenance activities for landscape areas shall be consistent with County and manufacturer guidelines for fertilizer and pesticide use (OC DAMP Section 5.5). Maintenance includes trimming, weeding and debris removal and vegetation planting and replacement. Stockpiled materials during maintenance activities shall be placed away from drain inlets and runoff conveyance devices. Wastes shall be properly disposed of or recycled. Maintenance for common areas and landscape parking islands is scheduled by OC Operations and Maintenance.

N4 BMP Maintenance – Responsibility for implementation, inspection and maintenance of all BMPs (structural and non-structural) shall be consistent with the BMP Inspection and Maintenance Responsibilities Matrix provided in the Operations and Maintenance Manual (Attachment B of this WQMP), with documented records of inspections and maintenance activities completed.

N10 Uniform Fire Code Implementation - Compliance with Article 80 of the Uniform Fire Code is enforced by fire protection agency.

N11 Common Area Litter Control – Litter control onsite will include the use of litter patrols, violation reporting and clean up during landscaping maintenance activities and as needed to ensure good housekeeping of the project's common areas.

N12 Employee Training – All employees, contractors and subcontractors shall be trained on the proper use and staging of landscaping and other materials with the potential to impact runoff and proper clean up of spills and materials.

N14 Common Area Catch Basin – As required by the TGD, at least 80% of the project's private drainage facilities shall be inspected, cleaned/maintained annually, with 100% of facilities inspected and maintained within a two-year period.

N15 Street Sweeping Private Streets and Parking Lots – The project's road and parking areas shall be swept, at minimum, prior to the start of the traditional rainy season and as needed.

Structural Source Control BMPs

Identifier	Name	Check One		Reason Source Control is Not Applicable
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	N/A
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☐	☒	N/A
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☒	☐	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	N/A
S6	Dock areas	☐	☒	N/A
S7	Maintenance bays	☐	☒	N/A
S8	Vehicle wash areas	☐	☒	N/A
S9	Outdoor processing areas	☐	☒	N/A
S10	Equipment wash areas	☐	☒	N/A
S11	Fueling areas	☐	☒	N/A
S12	Hillside landscaping	☒	☐	

S13	Wash water control for food preparation areas	☒	☐	
S14	Community car wash racks	☐	☒	N/A

A discussion of each selected Structural Source Control BMP is provided in the following section.

S1 Storm Drain Stenciling – Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to Ocean") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and re-stenciled as needed to maintain legibility.

S4 Use Efficient Irrigation Systems and Landscape Design – Native or drought tolerant landscaping will be used to plant any slopes disturbed by grading, and irrigation will not be needed after plants have been established.

S5 Protect Slopes and Channels - Erosion will be minimized through slope protection and erosion protection at pipe outlets. Erosion protection on slopes will consist of native or drought tolerant vegetation, and concrete v-ditches if needed according to local grading codes. At each storm drain outlet to the natural channel, the design will includes a combination of an end wall and flow spreader or riprap outlet.

S12 Hillside Landscaping – Hillside areas that are disturbed by project development shall be landscaped with deep-rooted, drought tolerant plant species selected for erosion control, satisfactory to the local permitting authority.

S13 Wash Water Controls for Food Preparation Areas – Food establishments (per State Health & Safety Code 27520) shall have either contained areas or sinks, each with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes. If located outside, the contained areas or sinks shall also be structurally covered to prevent entry of stormwater. Adequate signs shall be provided and appropriately placed stating the prohibition of discharging washwater to the storm drain system.

Section 5 Low Impact Development BMPs

5.1 LID BMPs in DMA 1

As described in Section 3, infiltration is infeasible at the site due to high groundwater and fill/bedrock. Harvest and use is not feasible due to insufficient demand. Above-ground space for BMPs is limited. Therefore, Bioclean Modular Wetland System (MWS) bioretention units will be used.

5.1.1 Hydrologic Source Controls

Hydrologic Source Controls (HSCs) were not included in the site design. HSCs listed in the TGD include HSC-1: Localized On-Lot Infiltration, HSC-2: Impervious Area Dispersion, HSC-3: Street Trees, HSC-4: Residential Rain Barrels, HSC-5: Green Roof/Brown Roof, and HSC-6: Self-Retaining Areas. Infiltration is not feasible at the site. Some pervious landscaping will be included but will not be quantified as an HSC.

5.1.2 Structural LID BMPs for DMA 1 and 2

Proprietary biofiltration units (BIO-7) will be used in all DMAs. Bioclean Modular Wetland System (MWS) bioretention units were selected based on their small footprint and treatment of the pollutants of concern. The SOC TGD states that proprietary BMPs must achieve General Use Level Designation (GULD) from the Washington State Technology Acceptance Protocol-Ecology (WA TAPE), or equivalent to be accepted for use in south Orange County. The MWS has achieved GULD certification for basic treatment, phosphorus treatment, and enhanced treatment at a hydraulic loading rate of 1 gpm per square foot of wetland cell surface area. Multiple agencies have tested the MWS's performance, and findings are summarized below:

Table 5. MWS Removal Efficiencies

Agency	TSS	Dissolved copper	Phosphorus	Dissolved Zinc	Total Kjeldahl Nitrogen	Pathogens	Trash
WA TAPE	85-99%	79-93%	65%	78-80.5%	not tested	not tested	
University of Massachusetts Amherst	74-84%	32.5-35.9%	61.7-70.4%	60.5-63.3%	45%	not tested	
Rhode Island Department of Environmental Management (DEM)	85%	not tested	30%	not tested	30%	60%	
California Water Resources Control Board							Full capture certificati on

In addition, the MWS pretreatment filter removes trash, debris, sediment, TSS (80%), and hydrocarbons (90%), according to the MWS brochure included in Attachment F, Water Quality Product Information. The expected pollutants at the site are suspended solids, nutrients, bacteria/virus/pathogens, pesticides, oil and grease, and trash and debris. As shown in Table J-1 of the 2017 SOC TGD, all of the pollutants of concern are expected to be removed by the MWS pretreatment unit and media.

Table J-1. Acceptable WA TAPE Certifications, or Equivalent, for Polltuants of Concern

Project Pollutant of Concern	Acceptable Technology Acceptance Protocol-Ecology Certification, or Equivalent
Trash	Pretreatment, Basic Treatment, Phosphorus Treatment, or Enhanced Treatment
Sediments	Basic Treatment, Phosphorus Treatment, or Enhanced Treatment
Oil and Grease	Basic Treatment, Oil Treatment, Phosphorus Treatment, or Enhanced Treatment
Nutrients	Phosphorus Treatment[1]
Metals	Enhanced Treatment
Pesticides	Basic Treatment (including filtration)[2] Phosphorus Treatment, or Enhanced Treatment
Organics	Basic Treatment (including filtration)[2] Phosphorus Treatment, or Enhanced Treatment
Bacteria and Viruses	Basic Treatment (including bacteria removal processes)[3], Phosphorus Treatment, or Enhanced Treatment

1 – There is no Technology Acceptance Protocol-Ecology equivalent for nitrogen compounds; however, systems that are designed to retain phosphorus (as well as meet basic treatment designation), generally also provide treatment of nitrogen compounds. Where nitrogen is a pollutant of concern, relative performance of available certified systems for nitrogen removal should be considered in BMP selection.
2 – Pesticides, organics, and oxygen demanding substances are typically addressed by particle filtration; if a system with Basic treatment certification does not provide filtration, it is not acceptable for pesticides, organics or oxygen demanding substances.

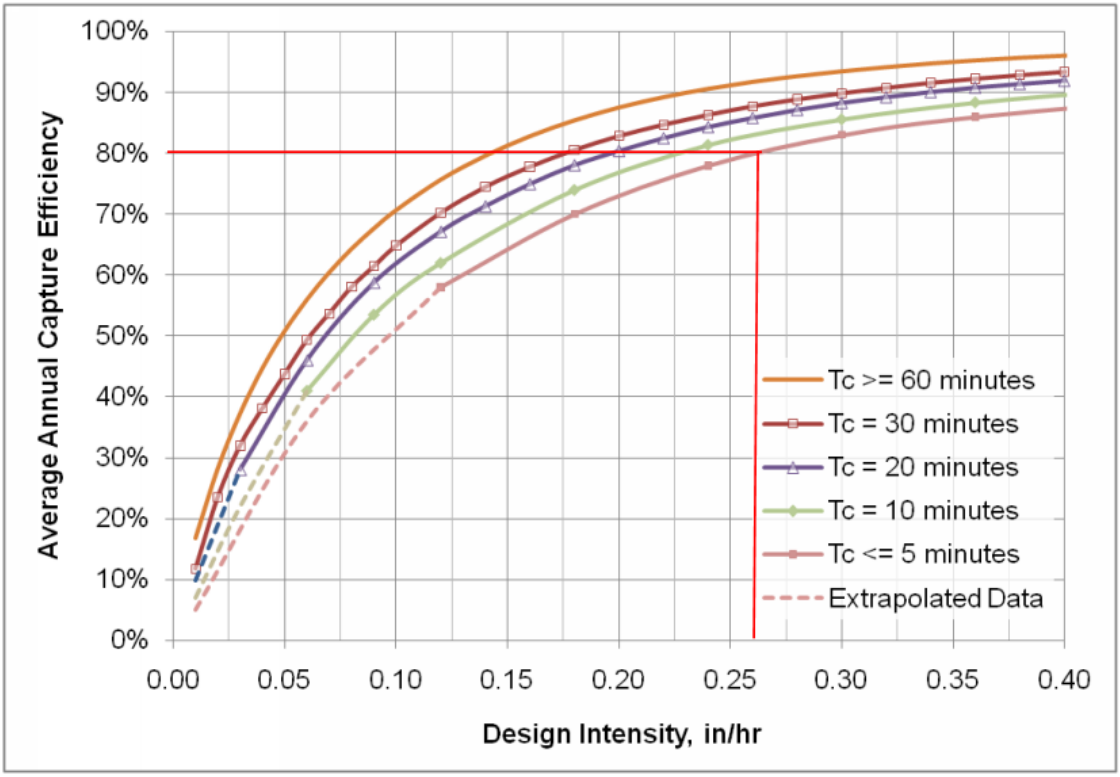
5.1.3 BMP Sizing

In south Orange County, proprietary bioretention BMPs with no infiltration can be sized using the Flow-Based Compact Biofiltration Sizing Method (E.3.5), which uses 150% of the water quality flow rate to size the BMP. The calculated flowrate is used to select the MWS from Bioclean's sizing chart. Calculations are included in Attachment D. The Bioclean MWS sizing chart and schematics of the selected units are shown in Attachment F, Water Quality Product Information. Table 6 summarizes the BMP sizing calculations and selected MWS models.

Table 6. MWS BMP Sizing

DMA	Subarea	Total area, ac	Impervious %	C	tc=5min Intensity, I, in/hr	WQF, cfs	1.5xWQF, cfs	MWS Treatment Flow, cfs	MWS unit
1	A1	1.24	90%	0.825	0.26	0.24	0.359		
1	A2	1.14	90%	0.825	0.26	0.22	0.329		
	Total DMA 1	2.38					0.688	0.693	MWS-L-8-24-V
2	B1 (DMA2)	0.49	90.00%	0.825	0.26	0.095	0.142	0.144	MWS-L-4-13-V
3	C1	0.53	90.00%	0.825	0.26	0.102317	0.153		
3	C2	0.04	90.00%	0.825	0.26	0.007722	0.012		
	Total DMA 3	0.57					0.165	0.175	MWS-L-4-15-C
5	D1	0.36	0	Self-retaining, drains offsite					
5	D2	0.06	0	Self-retaining, drains offsite					
	Total DMA4	0.42	0						

Figure E-7. Capture Efficiency Nomograph for Flow-based Biotreatment BMPs in Orange County



5.2 Summary of LID BMPs

The MWS units planned for each DMA area summarized below in Table 8.

Table 7. LID BMP Summary

DMA	Area, ac	1.5xWQF, cfs	MWS unit	MWS Design Treatment Flow, cfs
DMA 1 (North, A)	2.38	0.688	MWS-L-8-24	0.693
DMA 2 (Southwest, B)	0.49	0.142	MWS-L-4-13	0.144
DMA 3 (Southeast, C)	0.57	0.175	MWS-L-4-15	0.175

Section 6 Hydromodification BMPs

6.1 Points of Compliance

One point of compliance was designated at the outlet to the site.

6.2 Pre-Development (Natural) Conditions

The pre-development condition of the site is steep (greater than 15% slopes) scrub vegetation, based on surrounding natural areas. Drainage patterns are from East to West down the canyon.

6.3 Post-Development Conditions and Hydromodification BMPs

As discussed in Section 3.5, a Hydrologic Conditions of Concern is present in the natural channel downstream of the site. The project is required to comply with the South Orange County hydromodification requirements, which involve mitigating 10% of the 2-year event through 10-year event peak flows to within 10% of the existing conditions using a continuous simulation model. The South Orange County Hydrology Model (SOHM) was used to size the hydromodification BMPs and outlet structures.

The modular wetland treatment BMPs are also used for hydromodification mitigation for the site. Detailed drawings of the modular wetland units will be provided in the Final WQMP.

6.4 Measures for Avoidance of Critical Coarse Sediment Yield Areas

As described in Section 3.6, the site is not a Critical Coarse Sediment Yield Area because it is already developed. Energy dissipation such as a riprap and headwall will be provided at the storm drain outlets to the natural channels to prevent erosion.

6.5 Hydrologic Modeling and Hydromodification Compliance

SOHM hydromodification models were developed for the pre-development and post-development conditions. Landuse inputs are shown in Table 8 and 9 below. In the post-development condition model, runoff flows through MWS units before discharging. The SOHM hydromodification model results are located in Attachment E.

Table 8. SOHM Pre-development Landuse Inputs (Pre-Columbian)

POC	DMA	Pervious landuse type	Pervious landuse area (ac)	Impervious landuse type	Impervious landuse area (ac)
1	1	Soil A, Scrub, >15% slopes	3.44	N/A	0

Table 9. SOHM Proposed Landuse Inputs

Proposed condition, area of pervious urban slope

POC	DMA	Pervious percent	Pervious area, ac	0-5%	5-10%	10-15%	>15%	Sum of area
1	1 (A)	10%	0.24		0.04		0.20	0.24
1	2 (B)	10%	0.05	0.05				0.05
1	3 (C)	10%	0.06			0.02	0.04	0.06
							Total:	**0.35**

Proposed condition, area of impervious slope

POC	DMA	Impervious percent	Impervious area, ac	0-5%	5-10%	10-20%	>20%	Sum of area
1	1 (A)	90%	2.14	1.88	0.26	0.00	0.00	2.14
1	2 (B)	90%	0.44	0.39	0.05	0.00	0.00	0.44
1	3 (C)	90%	0.51	0.46	0.05	0.00	0.00	0.51
							Total:	**3.06**

Section 7 Educational Materials Index

Educational materials will be provided for the Final WQMP

Educational Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☐	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☐
Household Tips	☐	Compliance BMPs for Mobile Businesses	☐
Proper Disposal of Household Hazardous Waste	☐	**Other Material**	**Check If Attached**
Recycle at Your Local Used Oil Collection Center (North County)	☐		
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☐		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☐		☐
Tips for Pet Care	☐		☐
Tips for Projects Using Paint	☒		☐

Exhibits

HUITT-ZOLLARS

Coto de Caza Vicinity Map

EXHIBIT 1

PREPARED BY:
HUITT-ZOLLARS
Huitt-Zollars, Inc. Irvine
2603 Main Street, Suite 400
Irvine, California 92614
Phone (949) 988-5815 Fax (949) 988-5820

EXHIBIT 2
LEGACY AT COTO
PRELIMINARY DRAINAGE MANAGEMENT AREAS
COTO DE CAZA, CA

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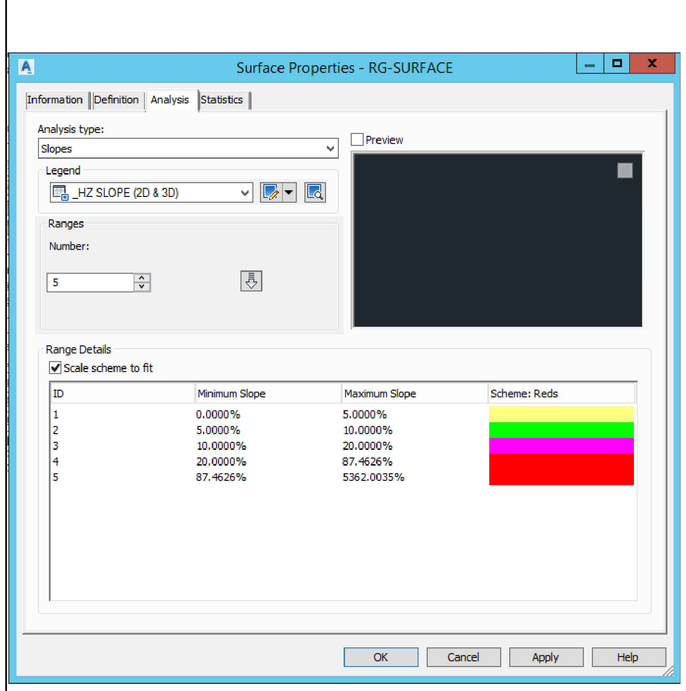

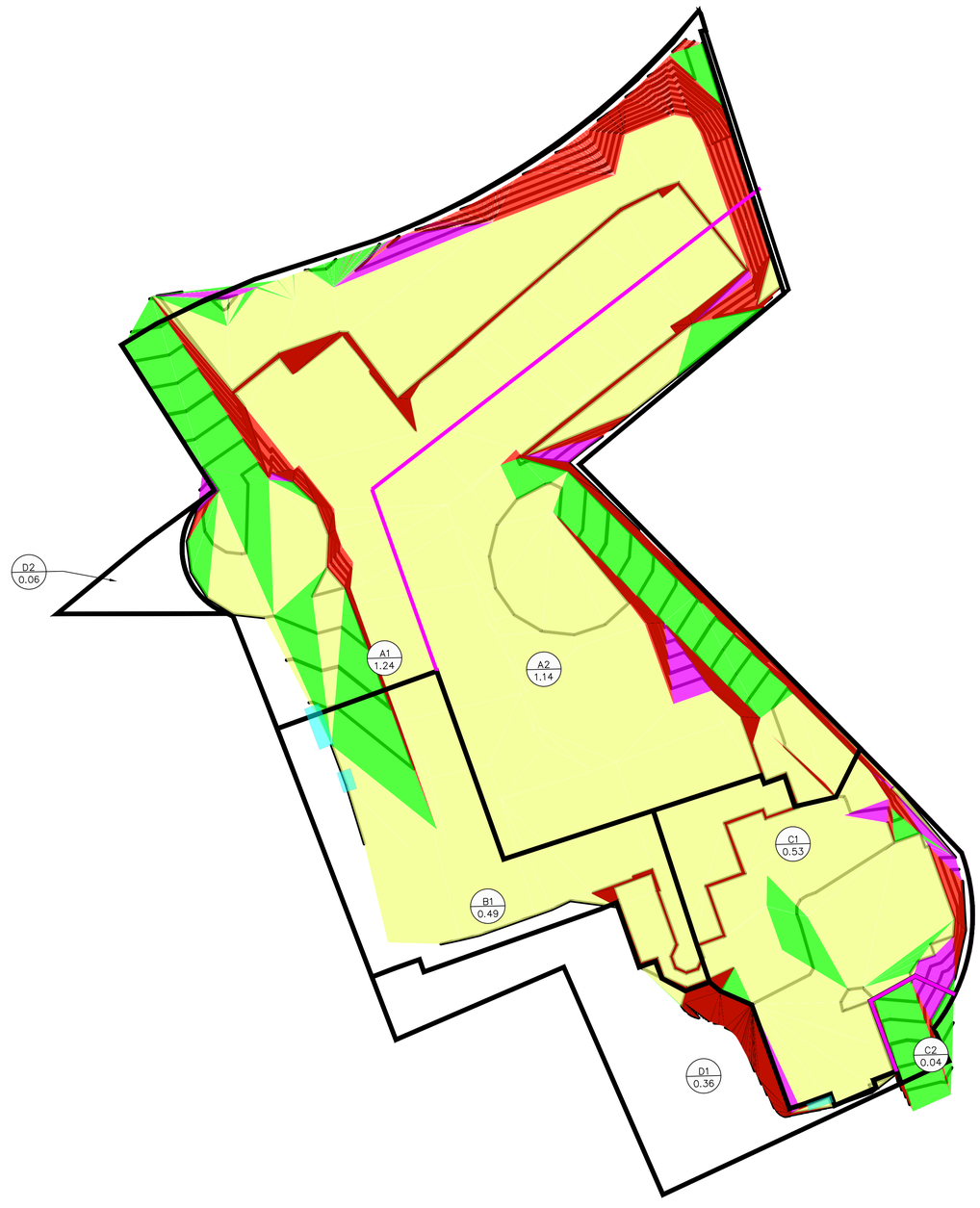

LEGEND

DRAINAGE MANAGEMENT AREA

DRAINAGE SUBAREA

N

40 0 20 40 80

SCALE 1"= 40'

EXHIBIT 3
LEGACY AT COTO
SOHM PROPOSED SLOPE EXHIBIT
COTO DE CAZA, CA

PREPARED BY:
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Huitt-Zollars, Inc. Irvine
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Irvine, California 92614
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Attachment A: Educational Materials

This is a placeholder sheet. In the Final WQMP, all relevant materials will be attached.

Attachment B: Operations and Maintenance Plan

This is a placeholder sheet. In the Final WQMP, all relevant materials will be attached.

Attachment C: Feasibility Screening

Worksheet 1: Infiltration Feasibility Categorization

Categorization of Infiltration Feasibility Condition			*Page 1 of 5*
Part 1: Physical Limitations of Infiltration Based on the criteria for physical limitations of infiltration described in Section 4.2.2.2, what level of physical feasibility of infiltration is the maximum that the BMP location will support?			
	Physical Infiltration Feasibility Category	**Mark applicable category**	**Next step**
1	Full Infiltration of the DCV		Continue to Part 2
	Biotreatment with Partial Infiltration		Continue to Part 3
	Biotreatment with No Infiltration	**X**	Select and Utilize Biotreatment without Infiltration
Provide summary of basis: High groundwater table (5-10ft below ground from USGS maps), high bedrock, and anticipated remedial grading Summarize findings of studies, provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Categorization of Infiltration Feasibility Condition		*Page 2 of 5*	
Part 2: Risks Limiting Full Infiltration of the DCV –*Would infiltration of the full DCV introduce risks of undesirable consequences that cannot reasonably be mitigated?*		***Yes***	***No***
2	**Would infiltration of the DCV pose significant risk for groundwater related concerns?** Use criteria described in Section 4.2.2.3 and results from **Worksheet 2** (Appendix C) to describe groundwater-related infiltration feasibility criteria.	X	
Provide basis: High groundwater table (5-10ft below ground from USGS maps), high bedrock, and anticipated remedial grading Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
3	**Would infiltration of the full DCV pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level**? Use criteria described in Section 4.2.2.4.		X
No. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	Would infiltration of the DCV cause an increase in groundwater flow or decrease in surface runoff over predevelopment conditions that would cause **impairment to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?** Use criteria in Section 4.2.2.5		X
Provide basis: Infiltration would not impair beneficial uses. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Categorization of Infiltration Feasibility Condition			***Page 3 of 5***
Part 2 (continued): Risks Limiting Full Infiltration of the DCV –*Would infiltration of the full DCV introduce risks of undesirable consequences that cannot reasonably be mitigated?*		***Yes***	***No***
5	Is there substantial evidence that infiltration of the DCV would **result in a significant increase in I&I to the sanitary sewer** that cannot be sufficiently mitigated?		X
Provide basis: Infiltration would not result in a significant increase in I&I to the sanitary sewer. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
6	Would infiltration of the DCV **violate downstream water rights**?		X
Provide basis: Infiltration would not violate downstream water rights. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 2 Result	If the answer to all questions 2-6 are “No”, then the DMA is categorized as “Full Infiltration” for the purposes of LID BMP type selection. Describe finding. At the Preliminary/Conceptual WQMP phase, describe the additional design-phase testing required to confirm this determination and identify contingencies for final design. At the Final Project WQMP phase, identify any required construction-phase testing and identify the design contingencies that should result based on construction-phase testing. If the answer to any of questions 2-6 is “Yes” then the site cannot be categorized as “Full Infiltration”. Continue to Part 3: Partial Infiltration Feasibility		
Categorization of Infiltration Feasibility Condition			***Page 4 of 5***
Part 3: Partial Infiltration Feasibility Criteria –*Would infiltration of any appreciable volume of stormwater result in risks of undesirable consequences that cannot reasonably be mitigated?*		***Yes***	***No***
8	**Would use of biotreatment BMPs with partial infiltration pose significant risk for groundwater related concerns?** Refer to criteria in Section 4.2.2.3 and Worksheet 1 (Appendix C) for guidance on groundwater-related infiltration feasibility criteria.	X	

Provide basis: High groundwater table (5-10ft below ground from USGS maps), high bedrock, and anticipated remedial grading Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
9	**Would the use of biotreatment BMPs with partial infiltration pose elevated risks of geotechnical hazards that cannot be mitigated to an acceptable level**? Refer to Section 4.2.2.4.		X
Provide basis: No Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
10	**Would the use of biotreatment BMPs with partial infiltration elevate risks or introduce conflicts related to groundwater balance, inflow and infiltration, or water rights?** Refer to Section 4.2.2.5. Note: this is uncommon and must be supported by site-specific analysis if it is used as a basis to reject biotreatment with partial infiltration.		X
Provide basis: Infiltration would not violate downstream water rights. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Categorization of Infiltration Feasibility Condition			***Page 5 of 5***
Part 3 Result	If the answer to all questions 8-10 are “No”, then the DMA is categorized as “Biotreatment with Partial Infiltration” for the purposes of LID BMP type selection. If the answer to any of questions 8-10 is “Yes” then the site is categorized as “Biotreatment with No Infiltration” for the purposes of LID BMP type selection.		Biotreatment with No Infiltration

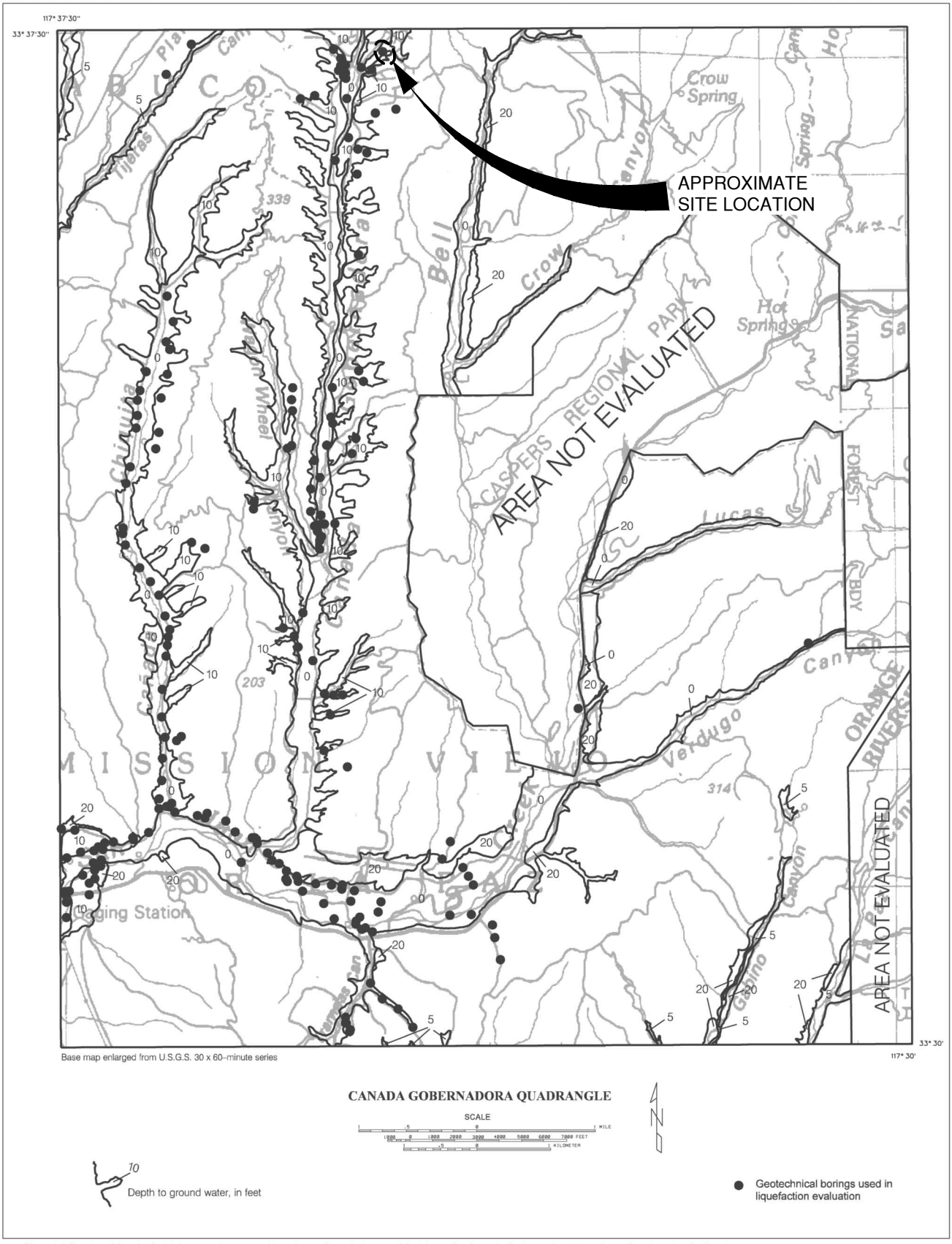


Plate 1.2 Depth to historically high ground water and locations of boreholes used in this study, Canada Gobernadora 7.5-minute Quadrangle, California

Historic High Groundwater

GMU	Date: January 7, 2020	Plate 5
	Project No.: 18-213-00	

Attachment D: BMP Calculations

LEGACY AT COTO
PRELIMINARY WQMP
2/24/2020

WATER QUALITY CALCULATIONS

Water Quality flow treatment calculations

DMA	Subarea	Total area, ac	Impervious Area, sf	Imp area, ac	Impervious %	C	tc=5min Intensity, I, in/hr	WQF, cfs	1.5xWQF, cfs	MWS Q, cfs	MWS unit
1	A1	1.24	48,613	1.12	90%	0.825	0.26	0.239	0.359		
1	A2	1.14	44,575	1.02	90%	0.825	0.26	0.219	0.329		
	Total DMA 1	2.38							0.688	0.693	MWS-L-8-24-V
2	B1 (DMA2)	0.49	19,210	0.44	90%	0.825	0.26	0.095	0.142	0.144	MWS-L-4-13-V
3	C1	0.53	20,778	0.48	90%	0.825	0.26	0.102	0.153		
3	C2	0.04	1,568	0.04	90%	0.825	0.26	0.008	0.012		
	Total DMA 3	0.57							0.165	0.175	MWS-L-4-15-C
5	D1	0.36	0	Self retaining pervious slopes, drain offsite							
5	D2	0.06	0	Self retaining pervious slopes, drain offsite							
	Sum self retaining	0.42									
	Sum treated	3.44	134,744	3.09	90%	0.825	0.26	0.664	0.995	N/A	N/A
	Sum project	3.86									

E.3.5 Flow-Based Compact Biofiltration Sizing Method

This sizing method is used to size compact, flow-based biofiltration BMPs. At this time, this method applies only to proprietary BMPs deemed acceptable per **Appendix J**.

In DMAs that are categorized as "Biotreatment with Partial Infiltration" the use of a compact BMP may need to be supplemented with volume reduction features. This method includes steps to account for supplemental volume reduction features. In DMAs that are categorized as "Biotreatment with No Infiltration" supplemental volume reduction features are not needed and those elements of the sizing method are not relevant.

E.3.5.1 Stepwise Instructions for Sizing Compact Biofiltration BMPs

The method includes the following calculations:

1. Calculate the time of concentration for the DMA (See **Section E.2.3**).
2. Locate the line corresponding to the time of concentration (T_c) in **Figure E-7**. Locate the point on the line that corresponds to 80% capture (y-axis) and record the corresponding value from the x-axis. This is the design intensity required in order to achieve 80% capture (I_1).
3. Determine the capture efficiency achieved by any upstream HSCs (**Section E.2.1**) or harvest and use BMPs (**Section E.3.6**). Trace a horizontal line **Figure E-7** corresponding to the capture efficiency achieved by the upstream HSC or harvest and use BMPs.
4. Find where the line traced in step (3) intersects the line corresponding to the time of concentration of the BMP selected in step (1) and read down to the x-axis. This is the equivalent flow rate captured by upstream HSCs or harvest and use BMPs. This is referred to as I_2. Note that if no upstream retention is provided in HSCs or harvest and use BMPs, I_2 will be 0.
5. Subtract I_2 from I_1 to determine the design intensity for flow-based BMPs that would achieve 80 percent long term capture.
6. Convert this intensity to a flow rate (See **Section E.2.4**).
7. Multiply the flow rate from Step (6) by 150% to obtain the required design flow rate of the compact flow-based biofiltration BMP.

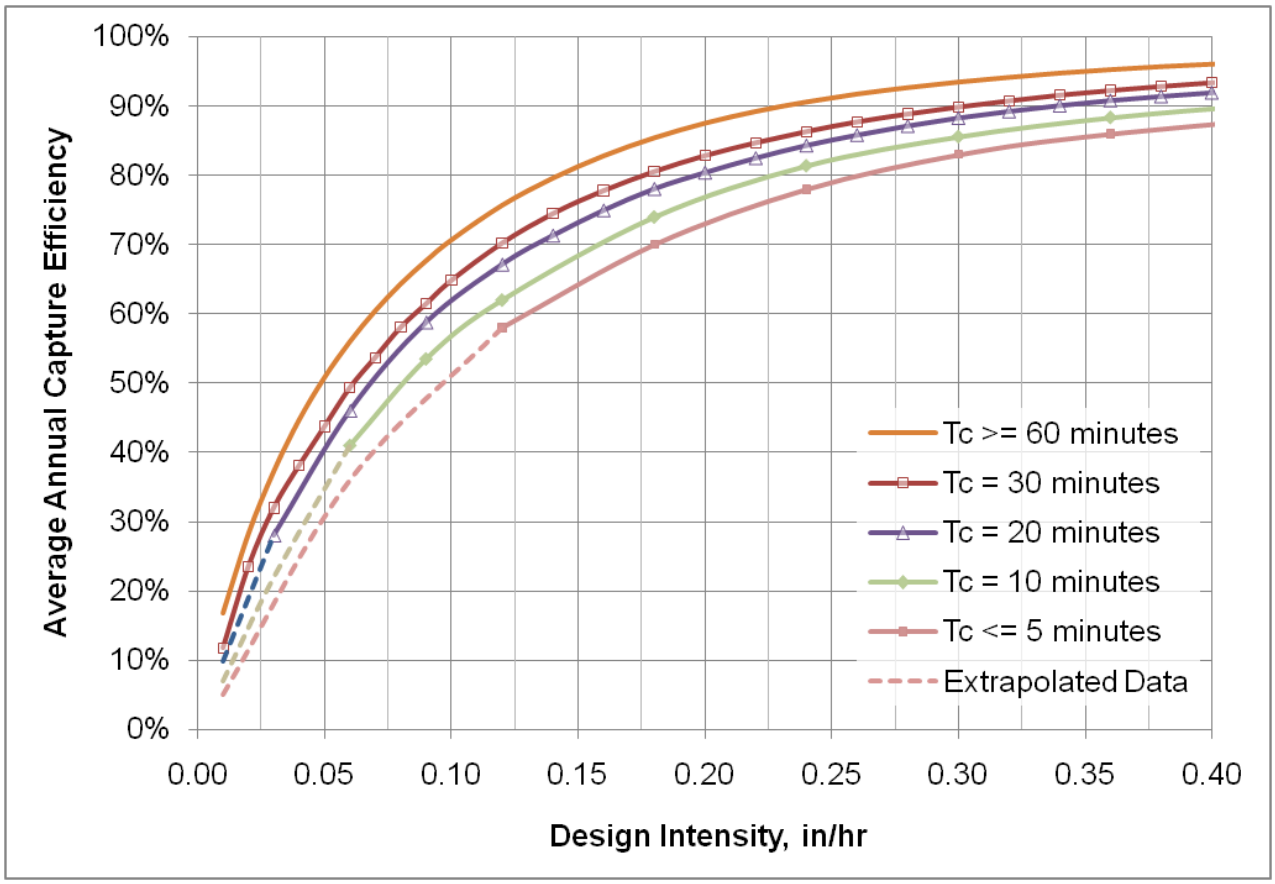
For BMPs in a DMA categorized a "biotreatment with no infiltration" stop here. For BMPs in a DMA categorized as "biotreatment with partial infiltration" proceed.

8. Select and describe HSCs, upstream BMPs, and/or downstream BMPs that are provided to result in volume reduction. This could include any HSC from **Appendix G**, cisterns or permeable pavement upstream of the BMP, or shallow infiltration galleries or trenches downstream of the BMP.
9. Demonstrate that one of the following options is met:

Option 1 for Supplemental Retention: Demonstrate that HSCs, upstream BMPs, and downstream BMPs collectively achieve at least 40 percent average annual runoff volume for the DMA. This can be demonstrated using the nomograph capture efficiency method in **Section E.3.2**, but setting the target for 40 percent rather than 80 percent.

Option 2 for Supplemental Retention: Demonstrate that the effective footprint for infiltration provided by HSCs, upstream BMPs, and downstream BMPs, as applicable, is equivalent to a conventional biofiltration BMP. The footprint to achieve partial volume reduction goals is determined via **Section E.4.2**.

Figure E-7. Capture Efficiency Nomograph for Flow-based Biotreatment BMPs in Orange County



E.3.5.2 Guidance on Sizing Compact Biofiltration with Upstream Detention

There are some design scenarios where an upstream cistern or tank could be used to detain and slow the flow entering a compact biofiltration BMP. This design approach can be used to extend the time of concentration of the catchment up to a maximum of 60 minutes. It cannot be used to

significantly extend the duration of flow through the compact biofilter. The following guidance applies to this configuration:

- Detention outlet should be sized such that the maximum discharge rate is equal to or less than the design capacity of the biofilter when the detention storage is full

- An adjustment to the time of concentration used in biofilter sizing can be calculated as:

  Tc increase = Volume of detention (cu-ft) / [Design flowrate of biofilter (cfs) * 3600 sec/hr]

  In no case can the total Tc used in sizing calculations exceed 60 minutes.

- The tank should be demonstrated to drain within 6 hours following the end of precipitation. It is unacceptable to use compact biofilters downstream of extended detention or flow duration control basins that drain over a longer time period due to potential issues with extended saturation and elevated loading per footprint area of the biofilter.

Proprietary compact biofiltration BMPs have not typically be tested for certification purposes under extended drawdown and heavier loading as would result from additional credits for detention. This adjustment to a maximum of a 60-minute time of concentration is the limit to which detention effects can be considered at this time.

E.3.5.3 Example Using the Method for Sizing Compact Biofiltration BMPs

Example E.9: Sizing to Achieve Target Average Annual Capture Efficiency, Flow-based Biotreatment BMPs

Given:

- Partial Infiltration condition
- Drainage Area = 1 acre
- Imperviousness = 90%
- The BMP is located in an area with an 85th percentile, 24-hour storm of 0.8 inches.
- HSCs upstream provide 15% volume reduction (See **Section E.2.1**)
- A compact biofiltration BMP is used that meets the acceptance criteria in **Appendix J**
- A shallow infiltration gallery will be provided downstream of the BMP to provide supplemental volume reduction
- The assumed infiltration rate is 0.15 inches per hour based on initial feasibility screening efforts; detailed design-level analyses are not required

Required:

- Determine compact biofiltration design flowrate and size supplemental infiltration gallery

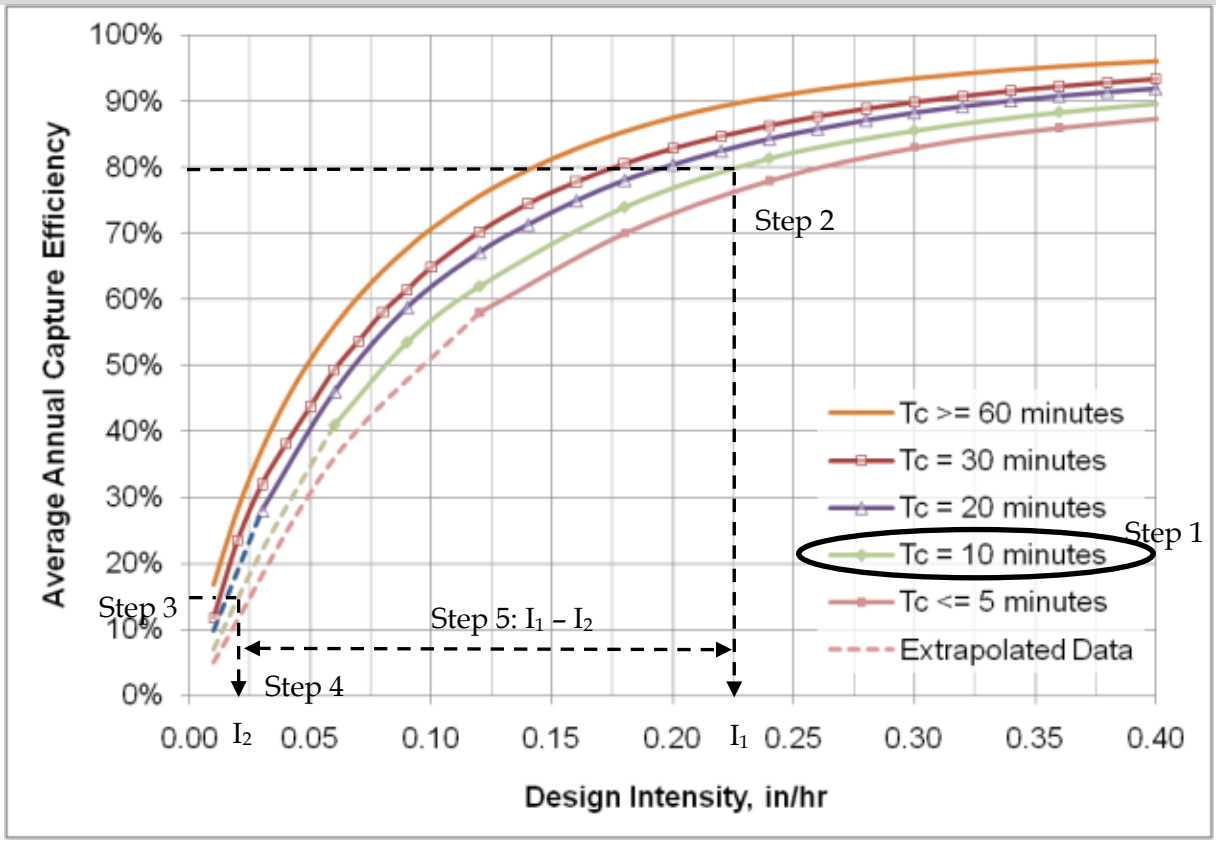
Solution:

1. Computed time of concentration, T_c = 10 minutes (This would be calculated per methods in **Section E.2.3**)
2. From **Figure E-7**: I_1 = 0.23 in/hr
3. Capture efficiency achieved in upstream HSCs is 15% (This would be calculated per methods in **Section E.2.1**)
4. From **Figure E-7**: I_2 = 0.02 in/hr
5. $I_1 – I_2$ = design intensity = 0.21 in/hr
6. Q = [(0.90 ×0.75+0.15) × 0.21 in/hr × 1 ac] = 0.17 cfs
7. Q_{design} = 0.17cfs x 150% = **0.26 cfs**
8. Upstream HSCs achieve 15% volume reduction (<40%), so additional supplemental infiltration is needed if determined to be feasible. A shallow infiltration gallery with a depth of 18 inches of stone will be used. Water from underdrains of the compact biofilter will be routed to this gallery to infiltrate. The degree of infiltration is comparable to a biofiltration BMP with elevated underdrains.
9. The demonstration of adequacy will be made based on providing an equivalent footprint for infiltration compared to a conventional biofiltration BMP. See The footprint to achieve partial volume reduction goals is determined via **E.4.2**. Per this section the combined footprint of upstream and downstream BMPs needs to be 1.7 percent of the tributary impervious area.

   90% * 1 ac * 1.7% * 43560 sq-ft/ac = 670 sq-ft infiltration area required.

   Provide a shallow infiltration gallery with a footprint of at least 670 sq-ft. Provide an overflow pipe at 18 inches above the bottom of the gallery. Alternatively, more aggressive use of upstream BMPs, such as permeable pavement, could provide the needed footprint for infiltration without a downstream infiltration gallery, and could also reduce the required size of the compact biofilter.

Graphical operations supporting solution:



BIO-5/BIO-7: PROPRIETARY BIOTREATMENT

Category: Biotreatment with Partial Infiltration (when accompanied by supplemental retention)

Biotreatment with No Infiltration (when used without supplemental retention)

Proprietary biotreatment BMPs are proprietary devices that are manufactured to treat stormwater. **Acceptance criteria for proprietary biotreatment BMPs are defined in Appendix J**. Proprietary BMPs that do not meet these acceptance criteria are not permitted. In addition, proprietary biotreatment BMPs must meet the definition of biofiltration in order to be used as LID biotreatment BMPs. There are two configurations of proprietary biotreatment, as explained in the following subsections.

BIO-5: Proprietary Biotreatment with Enhanced Retention Configuration

As standalone systems, proprietary biotreatment BMPs typically provide negligible volume reduction. To be used as a "biotreatment BMP with partial infiltration," these BMPs must be accompanied by a retention compartment. This could consist of several options:

- Permeable pavement upstream of the proprietary BMPl
- Shallow infiltration gallery or chambers downstream of the BMP, connected to underdrains.
- Proprietary biotreatment downstream of a cistern for harvest and use.
- Use of adequate hydrologic source controls in the watershed to meet volume reduction targets (see Sizing section of this Fact Sheet).
- Other configurations that are determined to be appropriate to maximize the feasible volume reduction for the DMA.

Guidance for retention compartments is provided in other fact sheets, such as INF-5 (Permeable Pavement) and INF-6 (Underground Infiltration).

BIO-7: Standard Configuration without Supplemental Retention

For conditions that do not require partial infiltration, volume retention is not a performance goal. Acceptable proprietary biotreatment BMPs may be used as standalone systems. Guidance related to complementary retention can be disregarded.

Pollutant Removal Considerations

BMPs that meet the acceptance criteria in **Appendix J** are considered to provide adequate treatment for pollutants of concern. According to these critera, there are different levels of treatment certification needed for different pollutants of concern.

Recommended Design Criteria and Considerations

	Design Criteria	Intent/Rationale
☐	Sediment sources should be controlled prior to operation of the system.	Proprietary systems are susceptible to clogging similar to other BMPs. Systems should not be used in areas that will continue to receive elevated sediment loading following construction, such as from open space area.
☐	When accompanied by infiltration compartments, the ponding should not be higher than the underdrain elevation of the proprietary BMP.	This is intended to ensure that the complementary retention compartment does not reduce the hydraulic capacity of the proprietary biotreatment BMP.
☐	When accompanied by infiltration compartments, these infiltration BMPs must adhere to siting guidance found in the respective fact sheet for the BMP	Specific siting considerations apply to infiltration BMPs.
☐	Proprietary biotreatment systems typically do not require separate pretreatment	These BMPs typically include integrated mechanisms for pretreatment.
☐	Proprietary BMPs must be designed in a manner consistent with manufacturer recommendations and consistent with the design configuration that was tested as part of the BMP certification	Proprietary devices have device-specific design, installation, and maintenance details which must be followed for proper treatment results.
☐	In right of way areas, plant selection should not impair traffic sightlines or vehicle access.	Vegetation must not be prohibitive for typical vehicular movement and parking access needs.
☐	Manufacturer guidance on vegetation selection and establishment should be followed	Manufacturers have experience with plant survival in specific climates for the BMP-specific conditions.

Calculations and Sizing Method

Proprietary Biotreatment BMPs are flow-based BMPs. See **Appendix E** for acceptable sizing methods.

Supplemental retention elements (for BIO-5 configuration) should be sized for one of the following targets, where possible:

- Approximately 40 percent long term volume reduction.
- Retention storage provided for approximately one-third of the DCV.
- Infiltration footprint (collective of all infiltrating elements of the project design) meeting target defined in **Section E.4.2**.

Construction Guidance

Construction Guidance	Intent/Rationale
☐ Plans should include a construction sequence for the BMP. Revisions proposed by the contractor should be reviewed by the engineer. The construction sequence should address erosion control, utilities, BMP installation, inspections, testing and certifications, vegetation, stabilization, and post-construction monitoring.	Construction sequencing is critical to avoid issues/damage and allow appropriate inspections, testing, and certifications to be performed.
☐ Provide for inspection of buried infrastructure (e.g., underdrain, filter course) before it is buried.	It is impractical to inspect buried elements once they are covered.
☐ Fully stabilize sources of sediment within the tributary area (i.e., no exposed soil) prior to placing the finished BMP into service.	Sediment loading can seriously impair the capacity of the BMP.
☐ Allow plants and mulch to stabilize for as long as practicable (preferably several months) prior to placing the finished BMP into service.	Stabilization of the system allows plants to mature before stressing the system with stormwater loading.

O&M Activities and Frequencies

Activity	Frequency
GENERAL INSPECTIONS	
Remove trash and debris	Four times per year during wet season, including inspection just before the wet season and within 24 hours after at least two storm events ≥ 0.5 inches.
Identify excess erosion or scour	
Identify sediment accumulation that requires maintenance	
Inspect during storm event, when possible, to estimate treatment capacity and determine if premature bypass is occurring	
Evaluate plant health and need for corrective action	
Identify any needed corrective maintenance that will require site-specific planning or design	
OPERATION AND MAINTENANCE	
• O&M of proprietary BMPs must follow established manufacturer guidelines • O&M of accompanying retention BMPs should follow the guidelines established in the associated fact sheet for that BMP.	

LEGACY AT COTO
PRELIMINARY WQMP
2/24/2020

HARVEST AND USE FEASIBILITY CALCULATIONS

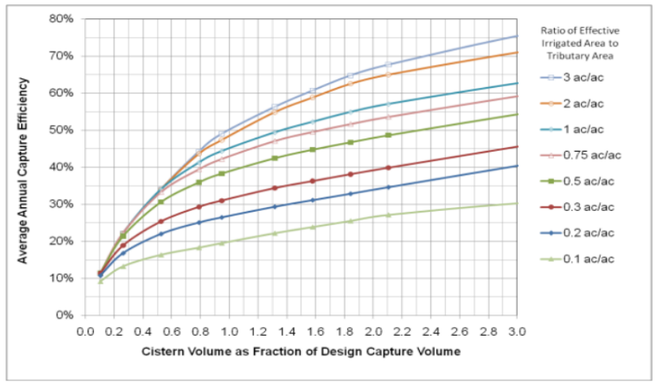
Development area, ac	Imp area, ac	Impervious %	C	LID: 24-hr, 85% depth, in	LID DCV, ac-ft	LID DCV, cf
3.44	3.10	90%	0.825	0.80	0.17	7,417

*If retain 100-yr volume onsite to satisfy the Industrial Permit, no hydromod calcs for impervious area.
Would still have hydromod calcs for other graded area on site though, but if that much area is being retained, it is unlikely to be an issue.

Summary

Total site area, ac	Imp area, ac	Pervious area, ac	Impervious area DCV, ac-ft	Maximum Irrigation demand, cf/day	Water Volume, ac-ft	Preliminary Inner Dimensions - no wall thickness
3.86	3.1	0.76	0.17	3144		

Figure X.1: Harvest and Use Sizing Nomograph



Harvest and Use

LID DCV, cf	Required Demand for 48-hr drawdown, gpd	Total site area, ac	Pervious area, ac	Pervious area, sf
7,417	27,741	3.86	0.76	33,280

Harvest and use is not feasible for 80% capture.

Estimated daily average water usage during wet season (EAWU)

The following equation is used to calculate the Modified EAWU:

$$\text{Modified EAWU} = (ETo_{Wet} \times K_L \times LA \times 0.015) / IE$$

	ETo WET, in/month	KL, landscape coeff	LA, Landscape Area, sf	IE, Irrigation Efficiency	Modified EAWU, gal/day	gpd/ac	cf/day	Demand cfs	Days to use DCV	Hours to use DCV	**check ratio and Fig. X.1:** EIATA, ac pervious: ac impervious	Min irrigated area: tributary imp area for partial capture, ac/ac	Required min irrigated area, ac	Actual Pervious area, ac
Low use	2.75	0.35	33,280	0.9	534	699	71	0.0008	103.9	2494	3762	0.88	2.72	0.76
Max use	3	0.7	33,280	0.9	1,165	1525	156	0.0018	47.6	1143	7525			
	Range 2.75-3, Laguna, Irvine, Santa Ana; used Irvine	Table X.4: Planning level Kl for non-active turf	Assumed entire pervious area within project boundary	Assume 90% per TGD								Table X.8	Partial capture feasible	
	Table X.2	0.35 non-active, 0.7 active												

For tank at 1x DCV

Vol for 48-hr drawdown, cf	% of DCV
143	1.92%
311	4.20%

Attachment E: Hydromodification Modeling

SOHM slope and impervious areas

Proposed condition, approx. area of slope

DMA	MWS ID	0-5%	5-10%	10-20%	>20%	Sum of area
1 (A)	MWS-L-8-24-V	1.9	0.30	0.00	0.20	2.38
2 (B)	MWS-L-4-13-V	0.44	0.05	0.00	0.00	0.49
3 (C)	MWS-L-4-15-C	0.46	0.05	0.02	0.04	0.57
	Totals	2.78	0.40	0.02	0.24	

Proposed condition, area of pervious slope

DMA	MWS ID	Pervious percent	Pervious area, ac	0-5%	5-10%	10-15%	>15%	Sum of area
1 (A)	MWS-L-8-24-V	10%	0.24		0.04		0.20	0.24
2 (B)	MWS-L-4-13-V	10%	0.05	0.05				0.05
3 (C)	MWS-L-4-15-C	10%	0.06			0.02	0.04	0.06

Proposed condition, area of impervious slope

DMA	MWS ID	Imperviou s percent	Imperviou s area, ac	0-5%	5-10%	10-20%	>20%	Sum of area
1 (A)	MWS-L-8-24-V	90%	2.14	1.88	0.26	0.00	0.00	2.14
2 (B)	MWS-L-4-13-V	90%	0.44	0.39	0.05	0.00	0.00	0.44
3 (C)	MWS-L-4-15-C	90%	0.51	0.46	0.05	0.00	0.00	0.51

SOHM

PROJECT REPORT

General Model Information

Project Name:	LegacyClub_CotodeCaza
Site Name:	Coto de Caza
Site Address:	23335 Ave La Caza
City:	Coto de Caza
Report Date:	2/13/2020
Gage:	Trabuco Canyon
Data Start:	10/01/1958
Data End:	09/30/2005
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/01/22

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

Existing Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A,Scrub,VSteep(>15%)	3.44
Pervious Total	3.44

Impervious Land Use	acre
Impervious Total	0
Basin Total	3.44

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

DMA 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A,Urban,Mod(5-10%)	0.04
A,Urban,VSteep(>15%)	0.2
Pervious Total	0.24

Impervious Land Use	acre
Impervious,Flat(0-5)	1.88
Impervious,Mod(5-10)	0.26
Impervious Total	2.14
Basin Total	2.38

Element Flows To:

Surface	Interflow	Groundwater
Flow Splitter 1	Flow Splitter 1	

DMA3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A,Urban,VSteep(>15%)	0.04
A,Urban,Steep(10-15)	0.02
Pervious Total	0.06

Impervious Land Use	acre
Impervious,Flat(0-5)	0.46
Impervious,Mod(5-10)	0.05
Impervious Total	0.51
Basin Total	0.57

Element Flows To:

Surface	Interflow	Groundwater
Flow Splitter 3	Flow Splitter 3	

DMA2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A,Urban,Flat(0-5%)	0.05
Pervious Total	0.05

Impervious Land Use	acre
Impervious,Flat(0-5)	0.39
Impervious,Mod(5-10)	0.05
Impervious Total	0.44
Basin Total	0.49

Element Flows To:

Surface	Interflow	Groundwater
Flow Splitter 2	Flow Splitter 2	

Mitigated Routing

MWS 1

MWS Model Number: MWS-L-8-24
Media Filter Rate (in/hr): 25

Element Flows To:
Outlet 1 Outlet 2

MWS Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
14.000	0.002	0.000	0.000	0.000
14.000	0.002	0.000	0.000	0.019
14.000	0.002	0.000	0.000	0.039
14.000	0.002	0.001	0.000	0.058
14.000	0.002	0.002	0.000	0.078
14.000	0.002	0.003	0.000	0.098
14.000	0.002	0.005	0.000	0.117
14.000	0.002	0.006	0.000	0.137
14.000	0.002	0.008	0.000	0.157
14.000	0.002	0.010	0.000	0.176
14.000	0.002	0.013	0.000	0.196
14.000	0.002	0.015	0.000	0.215
14.000	0.002	0.018	0.000	0.235
14.000	0.002	0.021	0.000	0.255
14.000	0.002	0.025	0.000	0.274
14.000	0.002	0.028	0.000	0.294
14.000	0.002	0.032	0.000	0.314
14.000	0.002	0.036	0.000	0.333
14.000	0.002	0.040	0.000	0.353
14.000	0.002	0.045	0.000	0.372
14.000	0.002	0.050	0.000	0.392
14.000	0.002	0.055	0.000	0.412
14.000	0.002	0.060	0.000	0.431
14.000	0.002	0.065	0.000	0.451
14.000	0.002	0.071	0.000	0.471
14.000	0.002	0.077	0.000	0.490
14.000	0.002	0.083	0.000	0.510
14.000	0.002	0.090	0.000	0.529
14.000	0.002	0.096	0.000	0.549
14.000	0.002	0.103	0.000	0.569
14.000	0.002	0.110	0.000	0.588
14.000	0.002	0.118	0.000	0.608
14.000	0.002	0.125	0.000	0.628
14.000	0.002	0.133	0.000	0.647
14.000	0.002	0.141	0.000	0.667
14.000	0.002	0.150	6.000	0.667

Flow Splitter 1

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	0.693	0.000
0.111	0.002	0.000	0.693	0.000
0.222	0.002	0.000	0.693	0.000
0.333	0.002	0.000	0.693	0.000
0.444	0.002	0.001	0.693	0.000
0.555	0.002	0.001	0.693	0.000
0.666	0.002	0.001	0.693	0.000
0.777	0.002	0.001	0.693	0.000
0.888	0.002	0.002	0.693	0.000
1.000	0.002	0.002	0.693	0.000
1.111	0.002	0.002	0.693	0.000
1.222	0.002	0.002	0.693	0.000
1.333	0.002	0.003	0.693	0.000
1.444	0.002	0.003	0.693	0.000
1.555	0.002	0.003	0.693	0.000
1.666	0.002	0.003	0.693	0.000
1.777	0.002	0.004	0.693	0.000
1.888	0.002	0.004	0.693	0.000
2.000	0.002	0.004	0.693	0.000
2.111	0.002	0.004	0.693	0.000
2.222	0.002	0.005	0.693	0.000
2.333	0.002	0.005	0.693	0.000
2.444	0.002	0.005	0.693	0.000
2.555	0.002	0.005	0.693	0.000
2.666	0.002	0.006	0.693	0.000
2.777	0.002	0.006	0.693	0.000
2.888	0.002	0.006	0.693	1000
3.000	0.002	0.006	0.693	1000
3.111	0.002	0.007	0.693	1000
3.222	0.002	0.007	0.693	1000
3.333	0.002	0.007	0.693	1000
3.444	0.002	0.007	0.693	1000
3.555	0.002	0.008	0.693	1000
3.666	0.002	0.008	0.693	1000
3.777	0.002	0.008	0.693	1000
3.888	0.002	0.008	0.693	1000
4.000	0.002	0.009	0.693	1000
4.111	0.002	0.009	0.693	1000
4.222	0.002	0.009	0.693	1000
4.333	0.002	0.009	0.693	1000
4.444	0.002	0.010	0.693	1000
4.555	0.002	0.010	0.693	1000
4.666	0.002	0.010	0.693	1000
4.777	0.002	0.011	0.693	1000
4.888	0.002	0.011	0.693	1000
5.000	0.002	0.011	0.693	1000
5.111	0.002	0.011	0.693	1000

5.222	0.002	0.012	0.693	1000
5.333	0.002	0.012	0.693	1000
5.444	0.002	0.012	0.693	1000
5.555	0.002	0.012	0.693	1000
5.666	0.002	0.013	0.693	1000
5.777	0.002	0.013	0.693	1000
5.888	0.002	0.013	0.693	1000
6.000	0.002	0.013	0.693	1000
6.111	0.002	0.014	0.693	1000
6.222	0.002	0.014	0.693	1000
6.333	0.002	0.014	0.693	1000
6.444	0.002	0.014	0.693	1000
6.555	0.002	0.015	0.693	1000
6.666	0.002	0.015	0.693	1000
6.777	0.002	0.015	0.693	1000
6.888	0.002	0.015	0.693	1000
7.000	0.002	0.016	0.693	1000
7.111	0.002	0.016	0.693	1000
7.222	0.002	0.016	0.693	1000
7.333	0.002	0.016	0.693	1000
7.444	0.002	0.017	0.693	1000
7.555	0.002	0.017	0.693	1000
7.666	0.002	0.017	0.693	1000
7.777	0.002	0.017	0.693	1000
7.888	0.002	0.018	0.693	1000
8.000	0.002	0.018	0.693	1000
8.111	0.002	0.018	0.693	1000
8.222	0.002	0.018	0.693	1000
8.333	0.002	0.019	0.693	1000
8.444	0.002	0.019	0.693	1000
8.555	0.002	0.019	0.693	1000
8.666	0.002	0.019	0.693	1000
8.777	0.002	0.020	0.693	1000
8.888	0.002	0.020	0.693	1000
9.000	0.002	0.020	0.693	1000
9.111	0.002	0.020	0.693	1000
9.222	0.002	0.021	0.693	1000
9.333	0.002	0.021	0.693	1000
9.444	0.002	0.021	0.693	1000
9.555	0.002	0.021	0.693	1000
9.666	0.002	0.022	0.693	1000
9.777	0.002	0.022	0.693	1000
9.888	0.002	0.022	0.693	1000
10.00	0.002	0.023	0.693	1000
10.11	0.002	0.023	0.693	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Flows To:
Outlet 1 Outlet 2
MWS 1

Flow Splitter 3

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	0.175	0.000
0.111	0.002	0.000	0.175	0.000
0.222	0.002	0.000	0.175	0.000
0.333	0.002	0.000	0.175	0.000
0.444	0.002	0.001	0.175	0.000
0.555	0.002	0.001	0.175	0.000
0.666	0.002	0.001	0.175	0.000
0.777	0.002	0.001	0.175	0.000
0.888	0.002	0.002	0.175	0.000
1.000	0.002	0.002	0.175	0.000
1.111	0.002	0.002	0.175	0.000
1.222	0.002	0.002	0.175	0.000
1.333	0.002	0.003	0.175	0.000
1.444	0.002	0.003	0.175	0.000
1.555	0.002	0.003	0.175	0.000
1.666	0.002	0.003	0.175	0.000
1.777	0.002	0.004	0.175	0.000
1.888	0.002	0.004	0.175	0.000
2.000	0.002	0.004	0.175	0.000
2.111	0.002	0.004	0.175	0.000
2.222	0.002	0.005	0.175	0.000
2.333	0.002	0.005	0.175	0.000
2.444	0.002	0.005	0.175	0.000
2.555	0.002	0.005	0.175	0.000
2.666	0.002	0.006	0.175	0.000
2.777	0.002	0.006	0.175	0.000
2.888	0.002	0.006	0.175	1000
3.000	0.002	0.006	0.175	1000
3.111	0.002	0.007	0.175	1000
3.222	0.002	0.007	0.175	1000
3.333	0.002	0.007	0.175	1000
3.444	0.002	0.007	0.175	1000
3.555	0.002	0.008	0.175	1000
3.666	0.002	0.008	0.175	1000
3.777	0.002	0.008	0.175	1000
3.888	0.002	0.008	0.175	1000
4.000	0.002	0.009	0.175	1000
4.111	0.002	0.009	0.175	1000
4.222	0.002	0.009	0.175	1000
4.333	0.002	0.009	0.175	1000
4.444	0.002	0.010	0.175	1000
4.555	0.002	0.010	0.175	1000
4.666	0.002	0.010	0.175	1000
4.777	0.002	0.011	0.175	1000
4.888	0.002	0.011	0.175	1000
5.000	0.002	0.011	0.175	1000
5.111	0.002	0.011	0.175	1000

5.222	0.002	0.012	0.175	1000
5.333	0.002	0.012	0.175	1000
5.444	0.002	0.012	0.175	1000
5.555	0.002	0.012	0.175	1000
5.666	0.002	0.013	0.175	1000
5.777	0.002	0.013	0.175	1000
5.888	0.002	0.013	0.175	1000
6.000	0.002	0.013	0.175	1000
6.111	0.002	0.014	0.175	1000
6.222	0.002	0.014	0.175	1000
6.333	0.002	0.014	0.175	1000
6.444	0.002	0.014	0.175	1000
6.555	0.002	0.015	0.175	1000
6.666	0.002	0.015	0.175	1000
6.777	0.002	0.015	0.175	1000
6.888	0.002	0.015	0.175	1000
7.000	0.002	0.016	0.175	1000
7.111	0.002	0.016	0.175	1000
7.222	0.002	0.016	0.175	1000
7.333	0.002	0.016	0.175	1000
7.444	0.002	0.017	0.175	1000
7.555	0.002	0.017	0.175	1000
7.666	0.002	0.017	0.175	1000
7.777	0.002	0.017	0.175	1000
7.888	0.002	0.018	0.175	1000
8.000	0.002	0.018	0.175	1000
8.111	0.002	0.018	0.175	1000
8.222	0.002	0.018	0.175	1000
8.333	0.002	0.019	0.175	1000
8.444	0.002	0.019	0.175	1000
8.555	0.002	0.019	0.175	1000
8.666	0.002	0.019	0.175	1000
8.777	0.002	0.020	0.175	1000
8.888	0.002	0.020	0.175	1000
9.000	0.002	0.020	0.175	1000
9.111	0.002	0.020	0.175	1000
9.222	0.002	0.021	0.175	1000
9.333	0.002	0.021	0.175	1000
9.444	0.002	0.021	0.175	1000
9.555	0.002	0.021	0.175	1000
9.666	0.002	0.022	0.175	1000
9.777	0.002	0.022	0.175	1000
9.888	0.002	0.022	0.175	1000
10.00	0.002	0.023	0.175	1000
10.11	0.002	0.023	0.175	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Flows To:
Outlet 1 Outlet 2
MWS 3

Flow Splitter 2

Bottom Length: 10.00 ft.
Bottom Length: 10.00 ft.
Depth: 10 ft.
Side slope 1: 0 To 1
Side slope 2: 0 To 1
Side slope 3: 0 To 1
Side slope 4: 0 To 1

Threshold Splitter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Primary(cfs)	Secondary(cfs)
0.000	0.002	0.000	0.144	0.000
0.111	0.002	0.000	0.144	0.000
0.222	0.002	0.000	0.144	0.000
0.333	0.002	0.000	0.144	0.000
0.444	0.002	0.001	0.144	0.000
0.555	0.002	0.001	0.144	0.000
0.666	0.002	0.001	0.144	0.000
0.777	0.002	0.001	0.144	0.000
0.888	0.002	0.002	0.144	0.000
1.000	0.002	0.002	0.144	0.000
1.111	0.002	0.002	0.144	0.000
1.222	0.002	0.002	0.144	0.000
1.333	0.002	0.003	0.144	0.000
1.444	0.002	0.003	0.144	0.000
1.555	0.002	0.003	0.144	0.000
1.666	0.002	0.003	0.144	0.000
1.777	0.002	0.004	0.144	0.000
1.888	0.002	0.004	0.144	0.000
2.000	0.002	0.004	0.144	0.000
2.111	0.002	0.004	0.144	0.000
2.222	0.002	0.005	0.144	0.000
2.333	0.002	0.005	0.144	0.000
2.444	0.002	0.005	0.144	0.000
2.555	0.002	0.005	0.144	0.000
2.666	0.002	0.006	0.144	0.000
2.777	0.002	0.006	0.144	0.000
2.888	0.002	0.006	0.144	1000
3.000	0.002	0.006	0.144	1000
3.111	0.002	0.007	0.144	1000
3.222	0.002	0.007	0.144	1000
3.333	0.002	0.007	0.144	1000
3.444	0.002	0.007	0.144	1000
3.555	0.002	0.008	0.144	1000
3.666	0.002	0.008	0.144	1000
3.777	0.002	0.008	0.144	1000
3.888	0.002	0.008	0.144	1000
4.000	0.002	0.009	0.144	1000
4.111	0.002	0.009	0.144	1000
4.222	0.002	0.009	0.144	1000
4.333	0.002	0.009	0.144	1000
4.444	0.002	0.010	0.144	1000
4.555	0.002	0.010	0.144	1000
4.666	0.002	0.010	0.144	1000
4.777	0.002	0.011	0.144	1000
4.888	0.002	0.011	0.144	1000
5.000	0.002	0.011	0.144	1000
5.111	0.002	0.011	0.144	1000

5.222	0.002	0.012	0.144	1000
5.333	0.002	0.012	0.144	1000
5.444	0.002	0.012	0.144	1000
5.555	0.002	0.012	0.144	1000
5.666	0.002	0.013	0.144	1000
5.777	0.002	0.013	0.144	1000
5.888	0.002	0.013	0.144	1000
6.000	0.002	0.013	0.144	1000
6.111	0.002	0.014	0.144	1000
6.222	0.002	0.014	0.144	1000
6.333	0.002	0.014	0.144	1000
6.444	0.002	0.014	0.144	1000
6.555	0.002	0.015	0.144	1000
6.666	0.002	0.015	0.144	1000
6.777	0.002	0.015	0.144	1000
6.888	0.002	0.015	0.144	1000
7.000	0.002	0.016	0.144	1000
7.111	0.002	0.016	0.144	1000
7.222	0.002	0.016	0.144	1000
7.333	0.002	0.016	0.144	1000
7.444	0.002	0.017	0.144	1000
7.555	0.002	0.017	0.144	1000
7.666	0.002	0.017	0.144	1000
7.777	0.002	0.017	0.144	1000
7.888	0.002	0.018	0.144	1000
8.000	0.002	0.018	0.144	1000
8.111	0.002	0.018	0.144	1000
8.222	0.002	0.018	0.144	1000
8.333	0.002	0.019	0.144	1000
8.444	0.002	0.019	0.144	1000
8.555	0.002	0.019	0.144	1000
8.666	0.002	0.019	0.144	1000
8.777	0.002	0.020	0.144	1000
8.888	0.002	0.020	0.144	1000
9.000	0.002	0.020	0.144	1000
9.111	0.002	0.020	0.144	1000
9.222	0.002	0.021	0.144	1000
9.333	0.002	0.021	0.144	1000
9.444	0.002	0.021	0.144	1000
9.555	0.002	0.021	0.144	1000
9.666	0.002	0.022	0.144	1000
9.777	0.002	0.022	0.144	1000
9.888	0.002	0.022	0.144	1000
10.00	0.002	0.023	0.144	1000
10.11	0.002	0.023	0.144	1000

Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Flows To:
Outlet 1 Outlet 2
MWS 2

MWS 3

MWS Model Number: MWS-L-4-15
Media Filter Rate (in/hr): 25

Element Flows To:
Outlet 1 Outlet 2

MWS Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
5.0000	0.000	0.000	0.000	0.000
5.0000	0.000	0.000	0.000	0.005
5.0000	0.000	0.000	0.000	0.010
5.0000	0.000	0.000	0.000	0.015
5.0000	0.000	0.000	0.000	0.020
5.0000	0.000	0.001	0.000	0.025
5.0000	0.000	0.001	0.000	0.030
5.0000	0.000	0.002	0.000	0.035
5.0000	0.000	0.002	0.000	0.040
5.0000	0.000	0.003	0.000	0.045
5.0000	0.000	0.004	0.000	0.050
5.0000	0.000	0.005	0.000	0.055
5.0000	0.000	0.006	0.000	0.060
5.0000	0.000	0.007	0.000	0.065
5.0000	0.000	0.008	0.000	0.070
5.0000	0.000	0.009	0.000	0.075
5.0000	0.000	0.010	0.000	0.080
5.0000	0.000	0.011	0.000	0.085
5.0000	0.000	0.013	0.000	0.091
5.0000	0.000	0.014	0.000	0.096
5.0000	0.000	0.016	0.000	0.101
5.0000	0.000	0.017	0.000	0.106
5.0000	0.000	0.019	0.000	0.111
5.0000	0.000	0.021	0.000	0.116
5.0000	0.000	0.023	0.000	0.121
5.0000	0.000	0.025	0.000	0.126
5.0000	0.000	0.027	0.000	0.131
5.0000	0.000	0.029	0.000	0.136
5.0000	0.000	0.031	0.000	0.141
5.0000	0.000	0.033	0.000	0.146
5.0000	0.000	0.036	0.000	0.151
5.0000	0.000	0.038	0.000	0.156
5.0000	0.000	0.041	0.000	0.161
5.0000	0.000	0.043	0.000	0.166
5.0000	0.000	0.046	0.000	0.171
5.0000	0.000	0.048	6.000	0.171

MWS 2

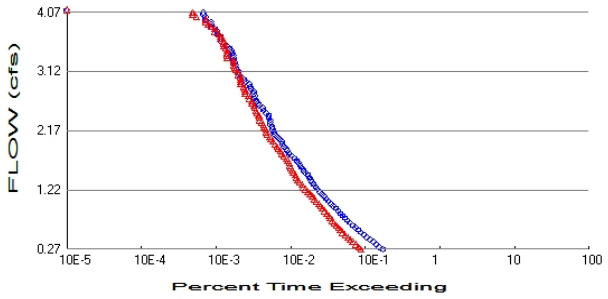
MWS Model Number: MWS-L-4-13
Media Filter Rate (in/hr): 25

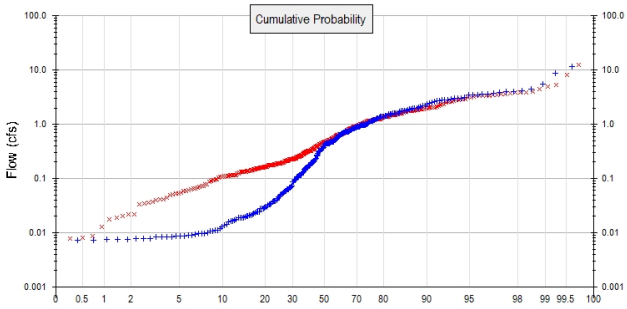
Element Flows To:
Outlet 1 Outlet 2

MWS Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
4.0000	0.000	0.000	0.000	0.000
4.0000	0.000	0.000	0.000	0.004
4.0000	0.000	0.000	0.000	0.008
4.0000	0.000	0.000	0.000	0.012
4.0000	0.000	0.000	0.000	0.016
4.0000	0.000	0.001	0.000	0.020
4.0000	0.000	0.001	0.000	0.025
4.0000	0.000	0.001	0.000	0.029
4.0000	0.000	0.002	0.000	0.033
4.0000	0.000	0.003	0.000	0.037
4.0000	0.000	0.003	0.000	0.041
4.0000	0.000	0.004	0.000	0.045
4.0000	0.000	0.005	0.000	0.049
4.0000	0.000	0.006	0.000	0.054
4.0000	0.000	0.007	0.000	0.058
4.0000	0.000	0.008	0.000	0.062
4.0000	0.000	0.009	0.000	0.066
4.0000	0.000	0.010	0.000	0.070
4.0000	0.000	0.011	0.000	0.074
4.0000	0.000	0.012	0.000	0.079
4.0000	0.000	0.014	0.000	0.083
4.0000	0.000	0.015	0.000	0.087
4.0000	0.000	0.017	0.000	0.091
4.0000	0.000	0.018	0.000	0.095
4.0000	0.000	0.020	0.000	0.099
4.0000	0.000	0.021	0.000	0.104
4.0000	0.000	0.023	0.000	0.108
4.0000	0.000	0.025	0.000	0.112
4.0000	0.000	0.027	0.000	0.116
4.0000	0.000	0.029	0.000	0.120
4.0000	0.000	0.031	0.000	0.124
4.0000	0.000	0.033	0.000	0.129
4.0000	0.000	0.035	0.000	0.133
4.0000	0.000	0.037	0.000	0.137
4.0000	0.000	0.040	0.000	0.141
4.0000	0.000	0.042	6.000	0.141

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.44
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.35
Total Impervious Area: 3.09

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	2.678777
5 year	3.620446
10 year	4.065784
25 year	7.499052

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	2.88848
5 year	3.73997
10 year	4.408272
25 year	6.969447

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.2679	2825	1439	50	Pass
0.3062	2536	1341	52	Pass
0.3446	2307	1217	52	Pass
0.3830	2101	1117	53	Pass
0.4213	1907	1029	53	Pass
0.4597	1730	960	55	Pass
0.4981	1570	884	56	Pass
0.5364	1442	818	56	Pass
0.5748	1331	763	57	Pass
0.6131	1224	717	58	Pass
0.6515	1110	671	60	Pass
0.6899	1032	628	60	Pass
0.7282	950	598	62	Pass
0.7666	879	561	63	Pass
0.8050	818	532	65	Pass
0.8433	764	499	65	Pass
0.8817	710	468	65	Pass
0.9200	665	433	65	Pass
0.9584	615	412	66	Pass
0.9968	572	392	68	Pass
1.0351	525	360	68	Pass
1.0735	496	342	68	Pass
1.1119	459	321	69	Pass
1.1502	427	299	70	Pass
1.1886	406	280	68	Pass
1.2269	379	259	68	Pass
1.2653	356	242	67	Pass
1.3037	332	234	70	Pass
1.3420	316	215	68	Pass
1.3804	308	204	66	Pass
1.4188	298	194	65	Pass
1.4571	280	190	67	Pass
1.4955	259	178	68	Pass
1.5338	245	172	70	Pass
1.5722	231	166	71	Pass
1.6106	220	159	72	Pass
1.6489	207	157	75	Pass
1.6873	197	150	76	Pass
1.7257	185	145	78	Pass
1.7640	169	132	78	Pass
1.8024	159	124	77	Pass
1.8407	149	119	79	Pass
1.8791	142	112	78	Pass
1.9175	134	108	80	Pass
1.9558	127	100	78	Pass
1.9942	123	95	77	Pass
2.0326	115	90	78	Pass
2.0709	108	86	79	Pass
2.1093	102	79	77	Pass
2.1476	98	77	78	Pass
2.1860	95	76	80	Pass
2.2244	93	73	78	Pass
2.2627	89	71	79	Pass

2.3011	88	67	76	Pass
2.3395	88	63	71	Pass
2.3778	84	62	73	Pass
2.4162	84	61	72	Pass
2.4546	76	58	76	Pass
2.4929	71	56	78	Pass
2.5313	69	54	78	Pass
2.5696	63	53	84	Pass
2.6080	60	50	83	Pass
2.6464	57	50	87	Pass
2.6847	54	46	85	Pass
2.7231	54	45	83	Pass
2.7615	53	40	75	Pass
2.7998	52	40	76	Pass
2.8382	48	40	83	Pass
2.8765	47	38	80	Pass
2.9149	46	35	76	Pass
2.9533	41	35	85	Pass
2.9916	39	35	89	Pass
3.0300	36	35	97	Pass
3.0684	33	33	100	Pass
3.1067	33	32	96	Pass
3.1451	31	30	96	Pass
3.1834	30	29	96	Pass
3.2218	30	28	93	Pass
3.2602	29	28	96	Pass
3.2985	28	28	100	Pass
3.3369	28	23	82	Pass
3.3753	28	23	82	Pass
3.4136	27	23	85	Pass
3.4520	26	23	88	Pass
3.4903	25	22	88	Pass
3.5287	23	21	91	Pass
3.5671	21	21	100	Pass
3.6054	19	21	110	Pass
3.6438	19	19	100	Pass
3.6822	19	19	100	Pass
3.7205	17	18	105	Pass
3.7589	17	16	94	Pass
3.7972	16	16	100	Pass
3.8356	14	14	100	Pass
3.8740	14	13	92	Pass
3.9123	14	12	85	Pass
3.9507	12	12	100	Pass
3.9891	12	9	75	Pass
4.0274	11	8	72	Pass
4.0658	11	8	72	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

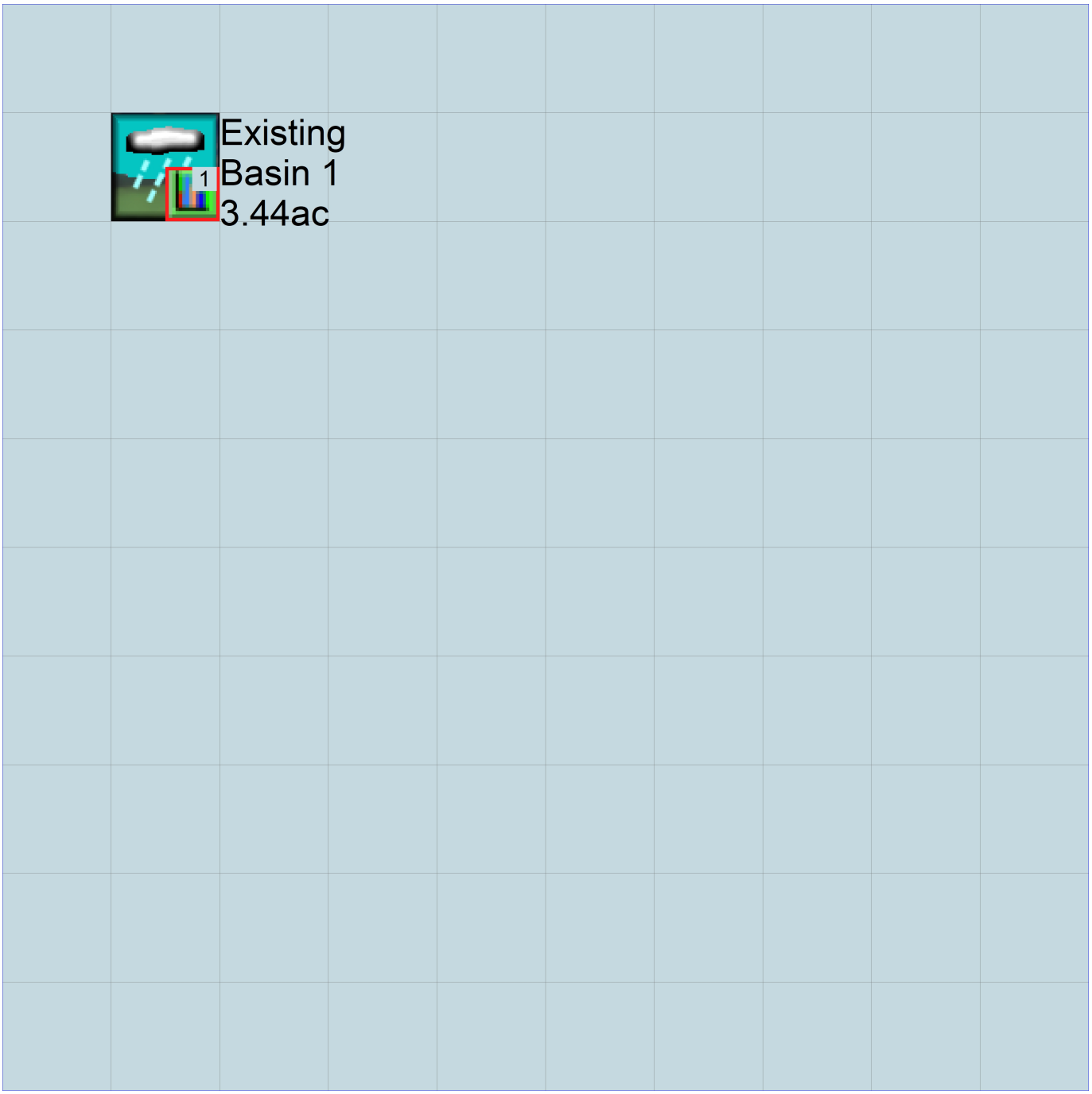
PERLND Changes

No PERLND changes have been made.

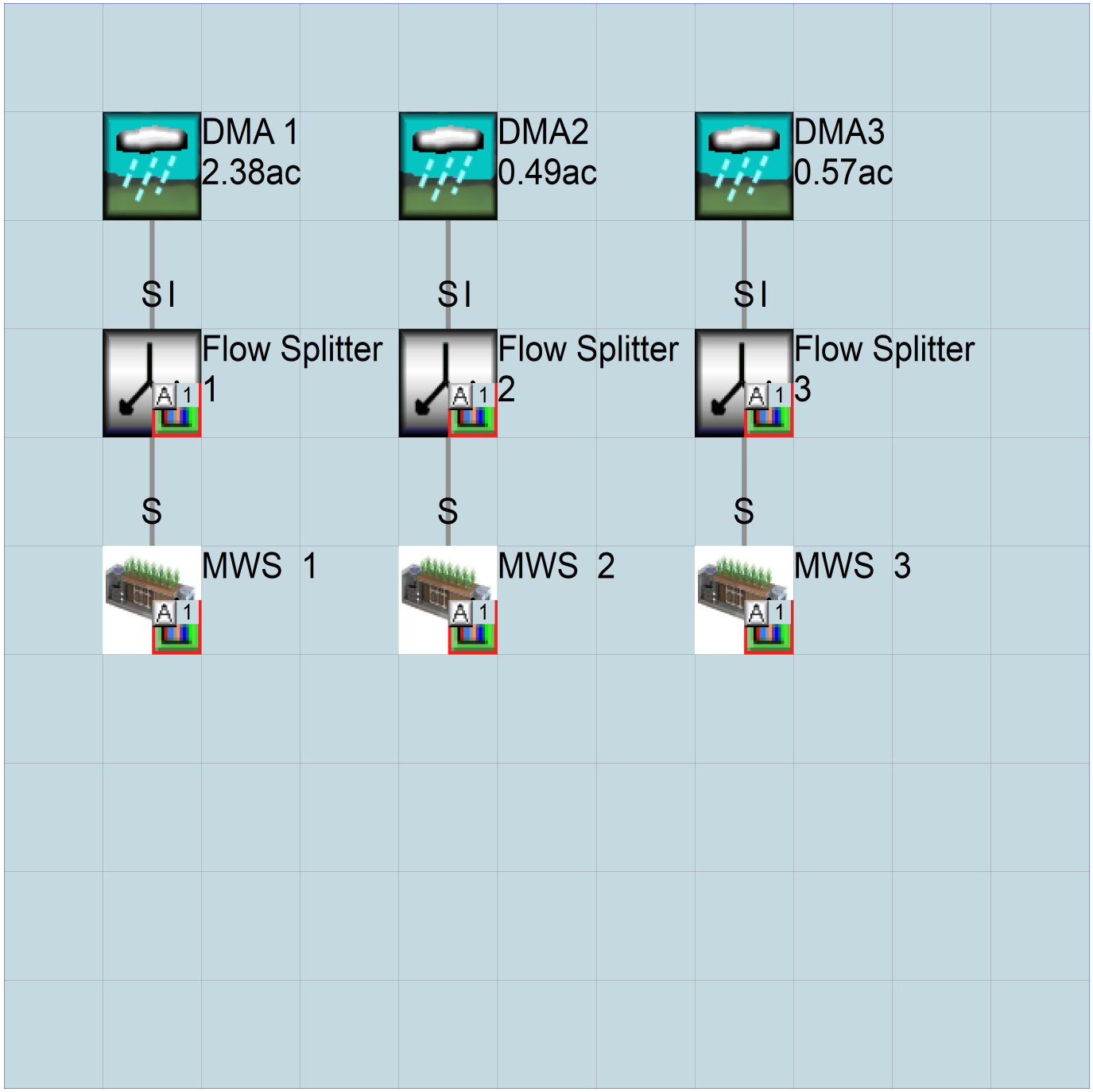
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Disclaimer

Legal Notice

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Local (360)943-0304

www.clearcreeksolutions.com

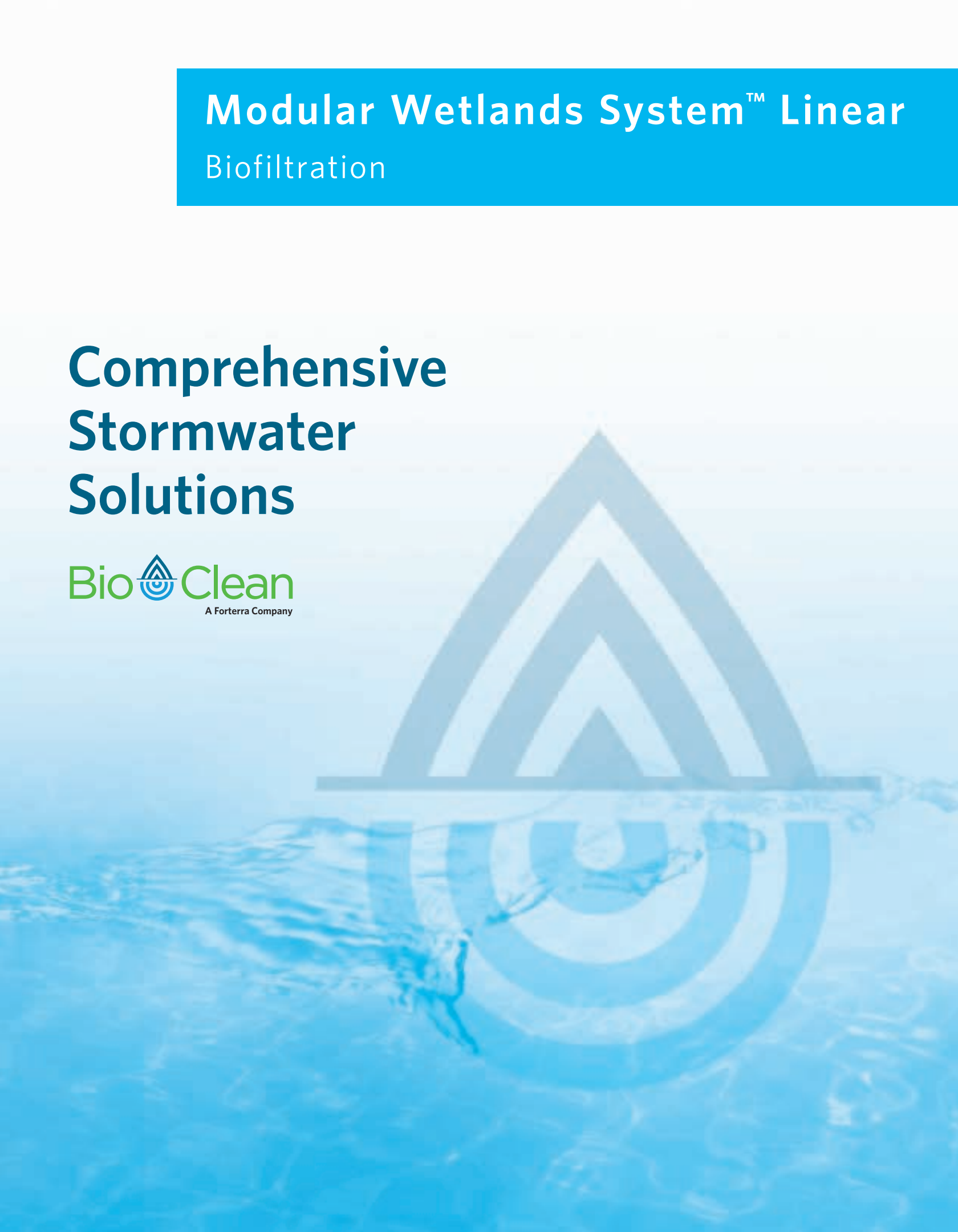
Attachment F: Water Quality Product Information

Modular Wetlands System™ Linear

Biofiltration

Comprehensive Stormwater Solutions

Bio Clean
A Forterra Company



OVERVIEW

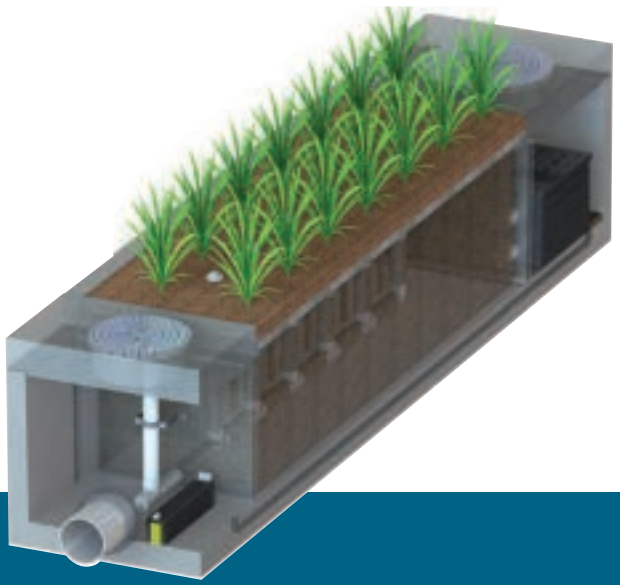
The Bio Clean Modular Wetlands System™ Linear (MWS Linear) represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pretreatment,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

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 our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands, our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate waterways in urban areas.



PERFORMANCE

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With its advanced pretreatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses nature's ability to process, transform, and remove even the most harmful pollutants.

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

APPROVALS

The 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.

WASHINGTON STATE 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.

DEQ 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

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 DEM APPROVED

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 MWS 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, and minimizes maintenance. Figure 1 and Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

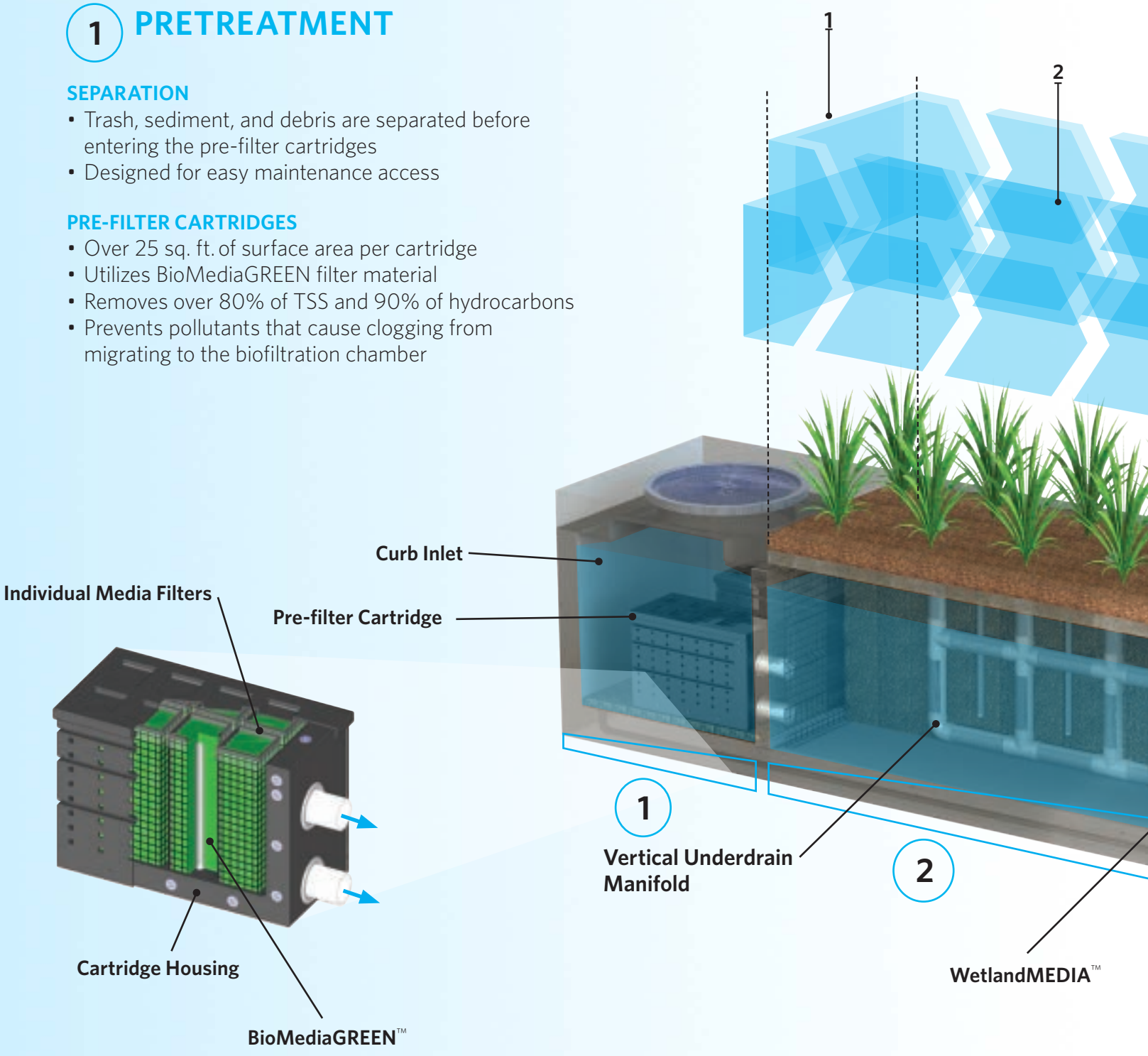
1 PRETREATMENT

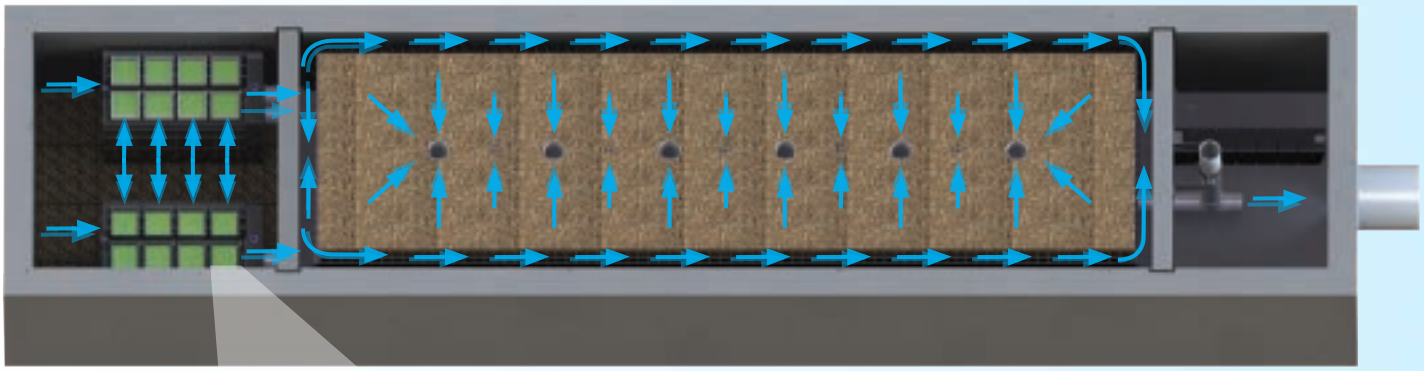
SEPARATION

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

PRE-FILTER CARTRIDGES

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





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

Figure 2, Top View

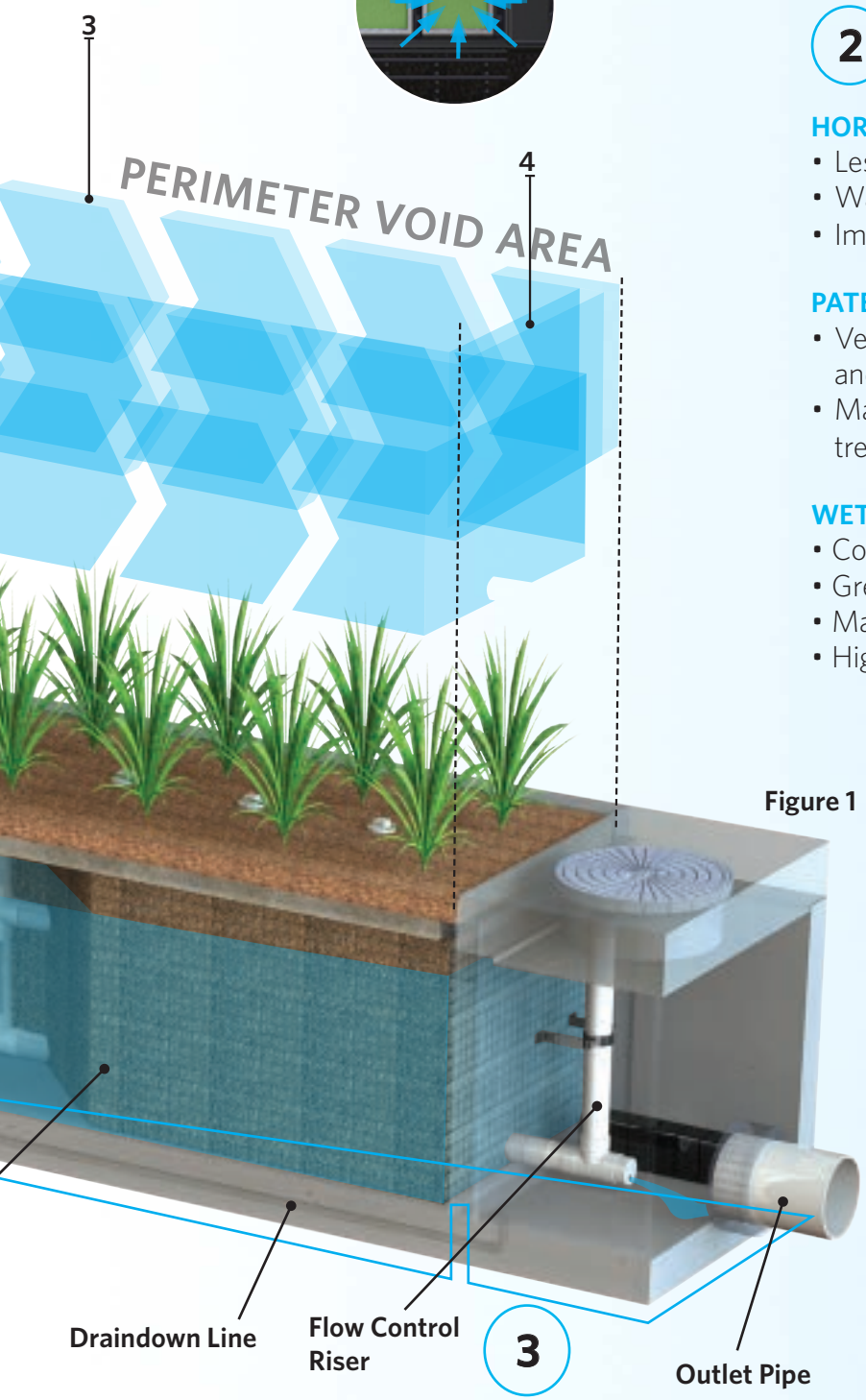


Figure 1

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

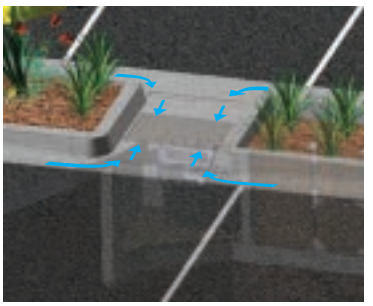
- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated

CONFIGURATIONS

The MWS 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.

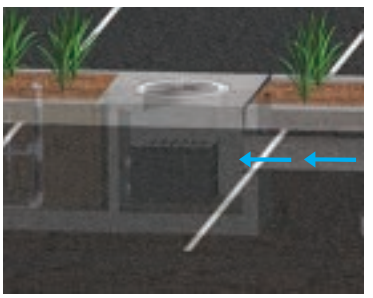
CURB TYPE

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 MWS Linear 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

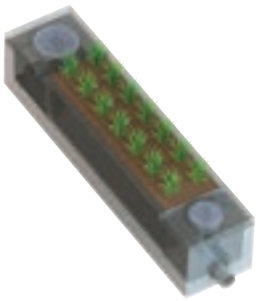
The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be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

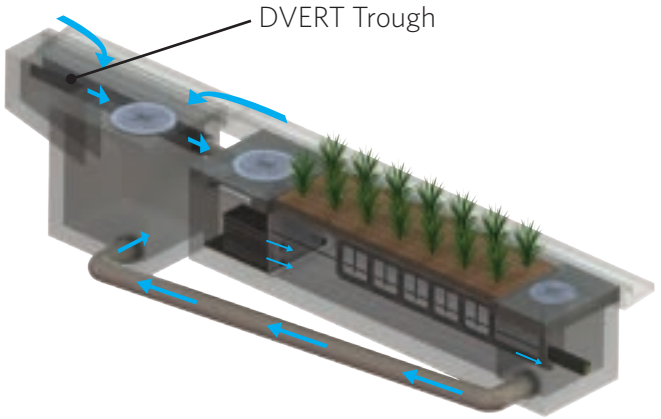
EXTERNAL DIVERSION WEIR STRUCTURE

This traditional offline diversion method can be used with the MWS 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 MWS 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 MWS Linear to be installed anywhere space is available.

SPECIFICATIONS

FLOW-BASED

The MWS Linear can be used in stand-alone applications to meet treatment flow requirements. Since the MWS Linear 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

SPECIFICATIONS

VOLUME-BASED

Many states require treatment of a water quality volume and do not offer the option of flow-based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume-based design installed downstream of ponds, detention basins, and underground storage systems.

MODEL #	TREATMENT CAPACITY (cu. ft.) @ 24-HOUR DRAINDOWN	TREATMENT CAPACITY (cu. ft.) @ 48-HOUR DRAINDOWN
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-6-8	3191	6382
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145
MWS-L-8-20	12560	25120
MWS-L-8-24	15108	30216

APPLICATIONS

The MWS 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 MWS Linear 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 MWS Linear. 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 MWS Linear 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 MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

COMMERCIAL

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

MIXED USE

The MWS Linear 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 MWS 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 MWS Linear, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the MWS Linear's micro/macro flora and fauna.

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

INSTALLATION

The MWS Linear 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 are available to supervise installations and provide technical support.

MAINTENANCE

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

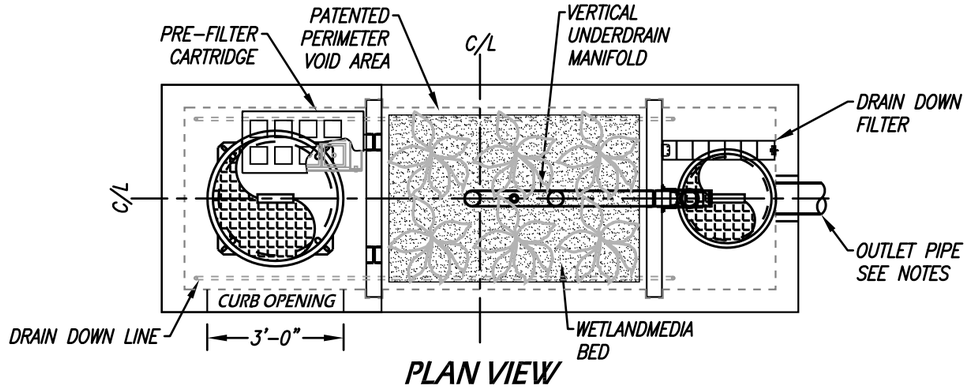
Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac 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

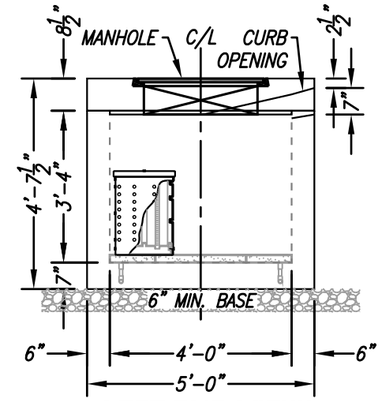
398 Via El Centro
Oceanside, CA 92058
855.566.3938
stormwater@forterrabp.com
biocleanenvironmental.com

072318R1

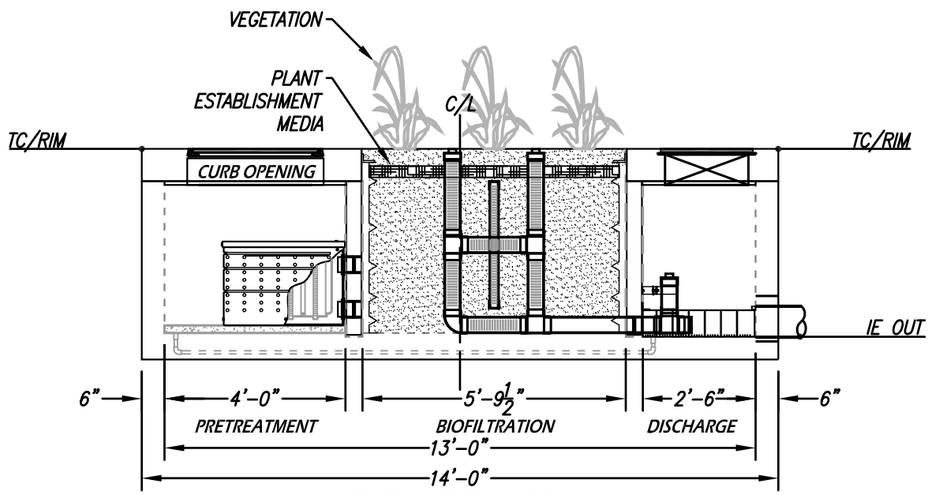
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			3.05
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø1.71"
MAXIMUM PICK WEIGHT (LBS)			27000
NOTES:			



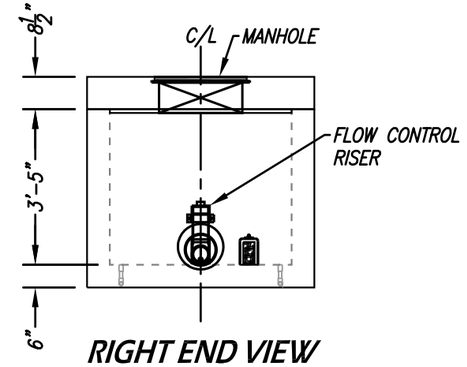
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT 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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON–SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

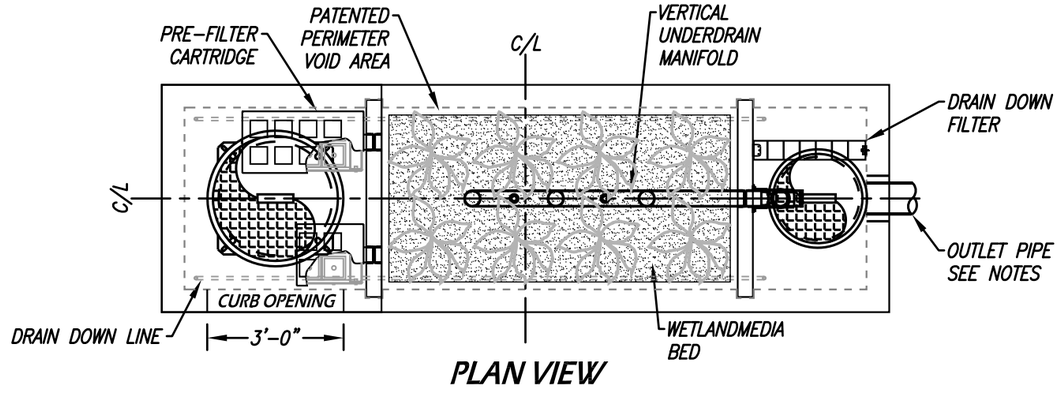
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.

TREATMENT FLOW (CFS)	0.144
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

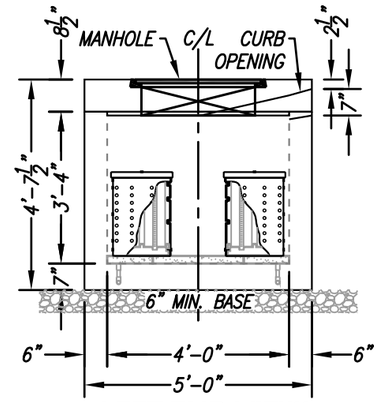
MODULAR WETLANDS
www.ModularWetlands.com | (855) 5MOD-WET

MWS-L-4-13-C
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

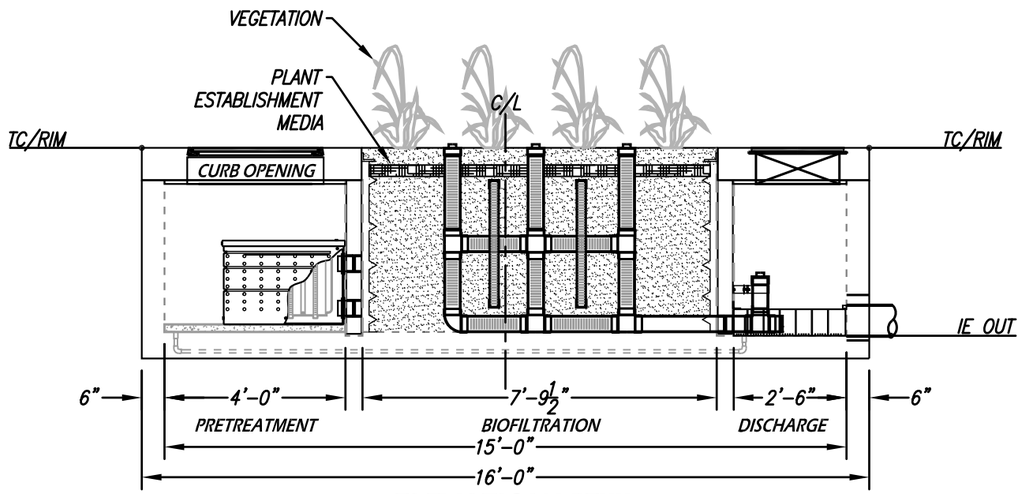
SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
WETLANDMEDIA VOLUME (CY)			4.30
WETLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			ø1.89"
MAXIMUM PICK WEIGHT (LBS)			31000
NOTES:			



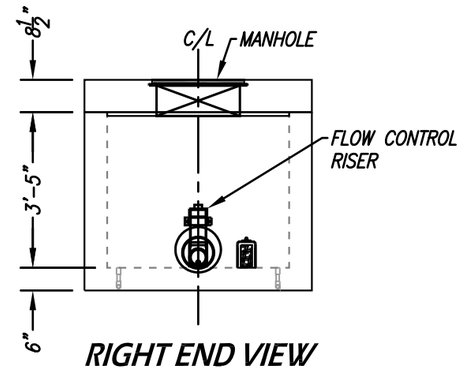
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT 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.
3. 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 GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
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. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

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 MANUFACTURER.

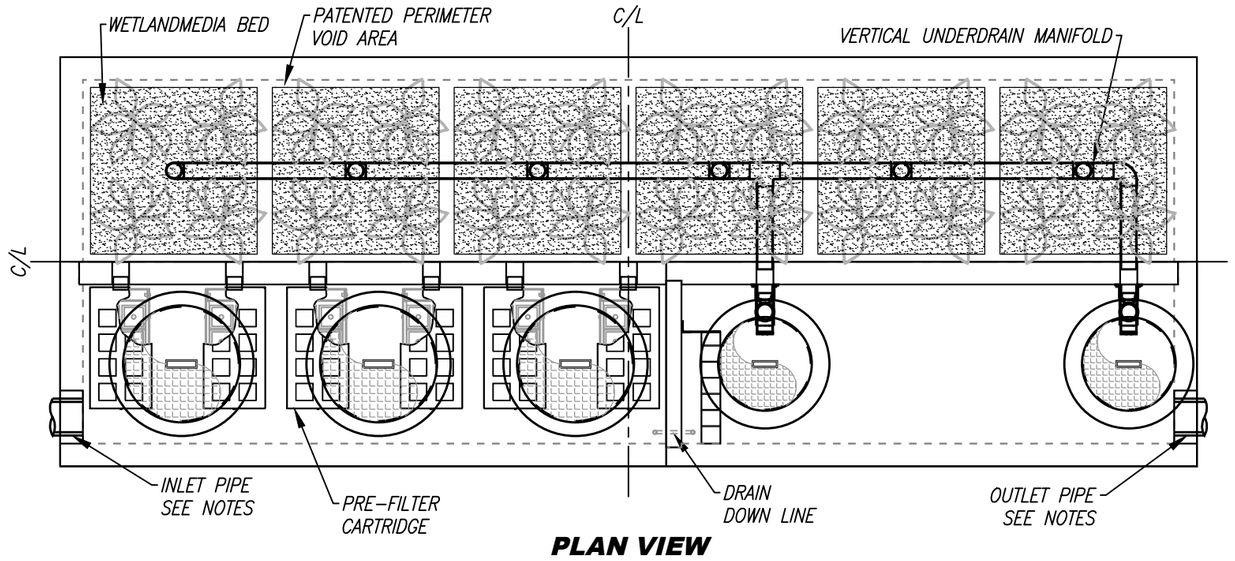
TREATMENT FLOW (CFS)	0.175
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS
www.ModularWetlands.com | (855) 5MOD-WET

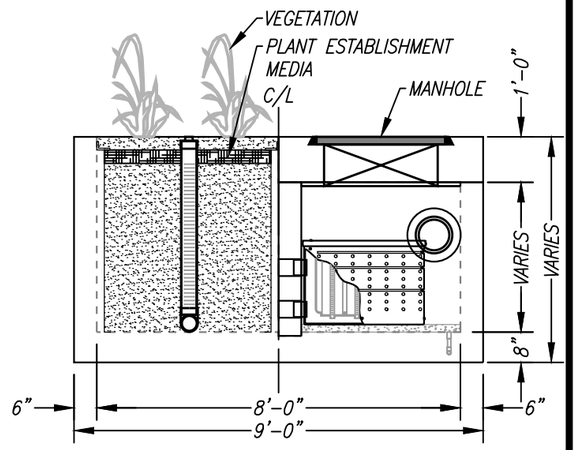
MWS-L-4-15-C
STORMWATER BIOFILTRATION SYSTEM STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.693	
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	3EA ø30"	OPEN PLANTER	2EA ø24"
NOTES:			

* PRELIMINARY NOT FOR CONSTRUCTION



PLAN VIEW



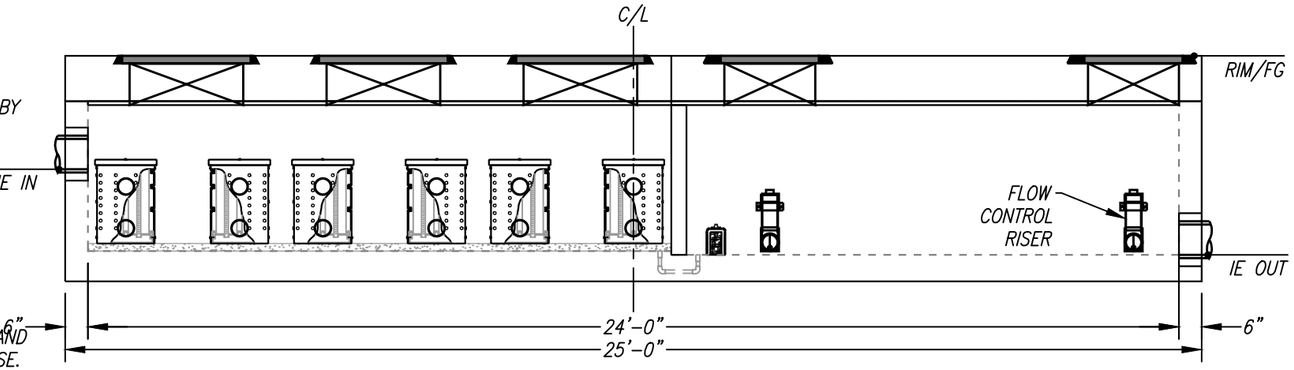
LEFT END VIEW

INSTALLATION NOTES

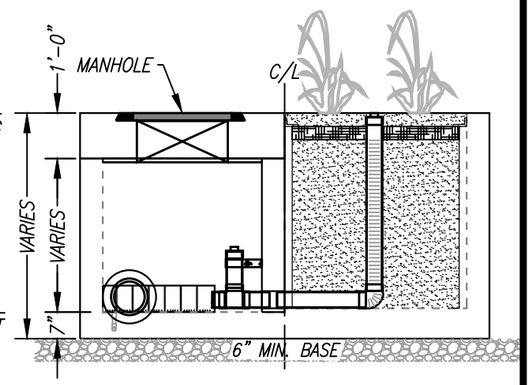
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER 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)	0.693
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

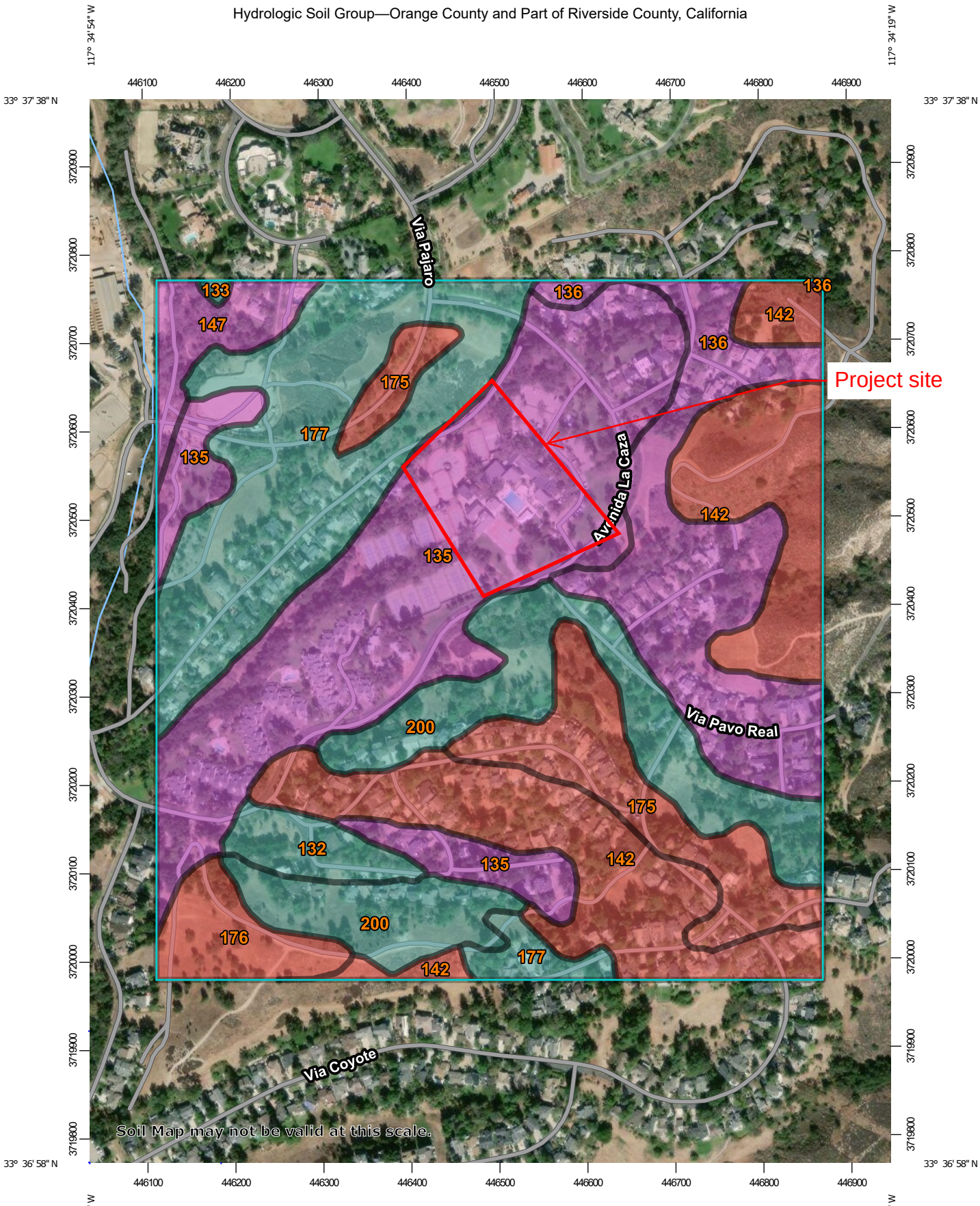
Bio Clean
A Forterra Company

MWS-L-8-24-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

5/23/19 10:LEF

Attachment G: Reference

Attachment G.1: NRCS Soil Maps



Map Scale: 1:5,870 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 13, Sep 16, 2019

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

Date(s) aerial images were photographed: Dec 31, 2009—Oct 25, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
132	Botella clay loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	3.1	2.1%
133	Botella clay loam, 9 to 15 percent slopes	C	0.2	0.1%
135	Capistrano sandy loam, 2 to 9 percent slopes	A	40.3	27.1%
136	Capistrano sandy loam, 9 to 15 percent slopes	A	17.5	11.8%
142	Cieneba sandy loam, 30 to 75 percent slopes, eroded	D	26.5	17.8%
147	Corralitos loamy sand, moderately fine substratum	A	3.9	2.6%
175	Myford sandy loam, 9 to 15 percent slopes	D	11.1	7.5%
176	Myford sandy loam, 15 to 30 percent slopes	D	4.3	2.9%
177	Myford sandy loam, 9 to 30 percent slopes, eroded	C	24.0	16.2%
200	Soper loam, 30 to 50 percent slopes	C	17.8	11.9%
Totals for Area of Interest			**148.7**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Attachment G.2: FEMA FIRM

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from the National Agriculture Imagery Program, dated 2005.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

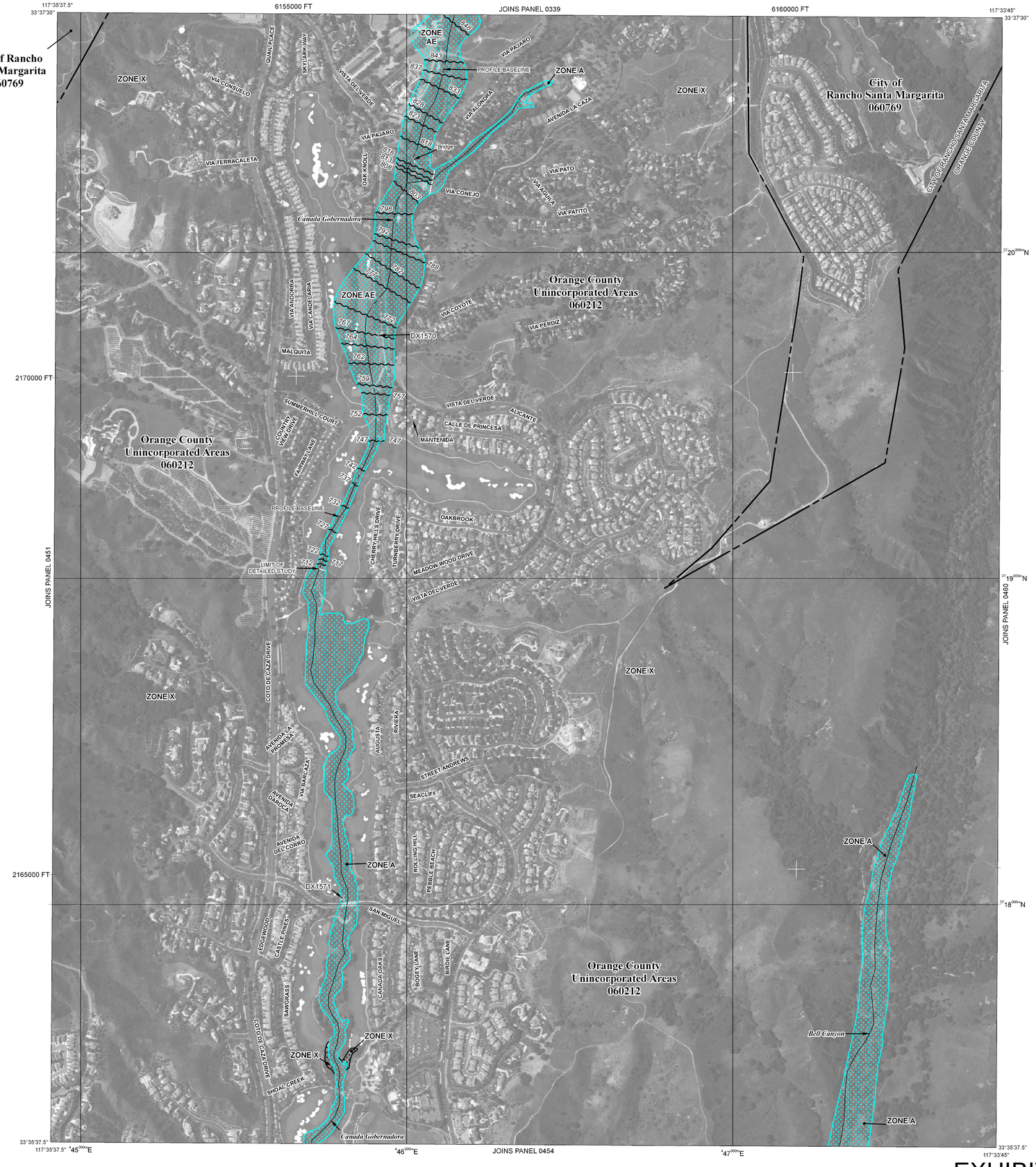


EXHIBIT 7

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	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.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A A	Cross section line
23 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
3776000mN	1000-meter Universal Transverse Mercator grid values, zone NAD 1983 UTM Zone 11N
600000 FT	5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
●M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 15, 1989

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
February 5, 1992 - November 3, 1993 - January 3, 1997 - February 18, 2004 - December 3, 2009 : for description of revisions, see Notice to Users page in the Flood Insurance Study report.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0452J

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 452 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ORANGE COUNTY	060212	0452	J
RANCHO SANTA MARGARITA, CITY OF	060769	0452	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06059C0452J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

Attachment H: Environmental Jurisdictional Memo

VCS Environmental
EXPERTS IN STRATEGIC SOLUTIONS

Memorandum

Date: November 7, 2018

To: Drew Purvis and Denny Fitzpatrick, CGV Coto, LLC

From: Wade Caffrey, VCS Environmental

Subject: Coto Village Jurisdictional Delineation

The purpose of this memorandum is to identify the jurisdictional waters within the Coto Village property and the regulatory permits that would be required for impacts to those jurisdictional waters. VCS assessed the property on August 20, 2018 and subsequently conducted an aerial review of the property to determine the limits of jurisdictional waters, as depicted in the attached Figure 1.

Based on the site assessment and aerial review, the property supports jurisdictional waters of the State of California and the United States, which, if impacted, would be subject to the California Department of Fish and Wildlife (CDFW), San Diego Regional Water Quality Control Board (RWQCB), and U.S. Army Corps of Engineers (USACE). Impacts to the waters subject to the jurisdiction of these agencies, depending on the acreage of impacts, would be expected to require the following permits:

- CDFW Section 1600 Streambed Alteration Agreement
- USACE Section 404 Letter of Permission through the Special Aquatic Management Plan
- RWQCB Section 401 Water Quality Certification

The permit processing time varies for each agency and is subject to change based on agency staffing/workload and project complexity. A project like this is anticipated to take approximately 6-9 months to obtain the 1600 Agreement following the submittal of the application, the 404 Permit is estimated to take 12-16 months, and the 401 Permit is estimated to take 12-16 months.

Furthermore, based on the habitat present and a review of the United States Fish and Wildlife Critical Habitat and California Natural Diversity Database (CNDDB) as shown in Figures 2 and 3, we do not anticipate the need for threatened or endangered species permits.

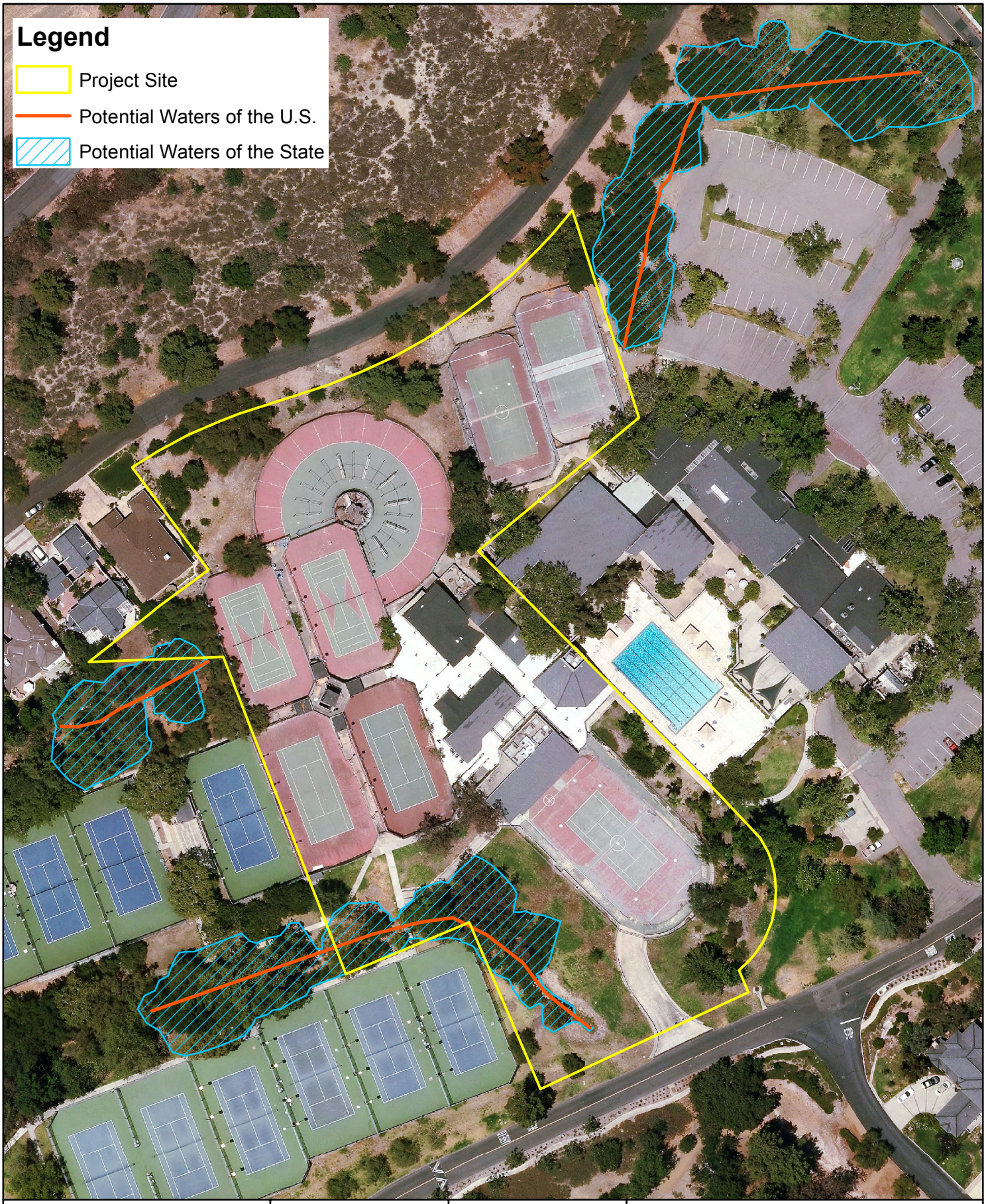
Based on the current drainage plan, a 404 Permit and Section 401 Certification is not expected to be required. A Section 1600 may be advantageous to the project and is a 120-day process to prepare and process an Agreement, but the project is not necessarily dependent on this.

Should you have any questions or comments, please contact me at 949.234.6076 or wcaffrey@vcsenvironmental.com.

Attachments:

1. Figure 1 – Delineation
2. Figure 2 – CNDDB
3. Figure 3 – Critical Habitat

\\vcssvrsbs1\company\documents\coto de caza\delineation\coto de caza delineation memo.docx



Prepared By:

VCS Environmental

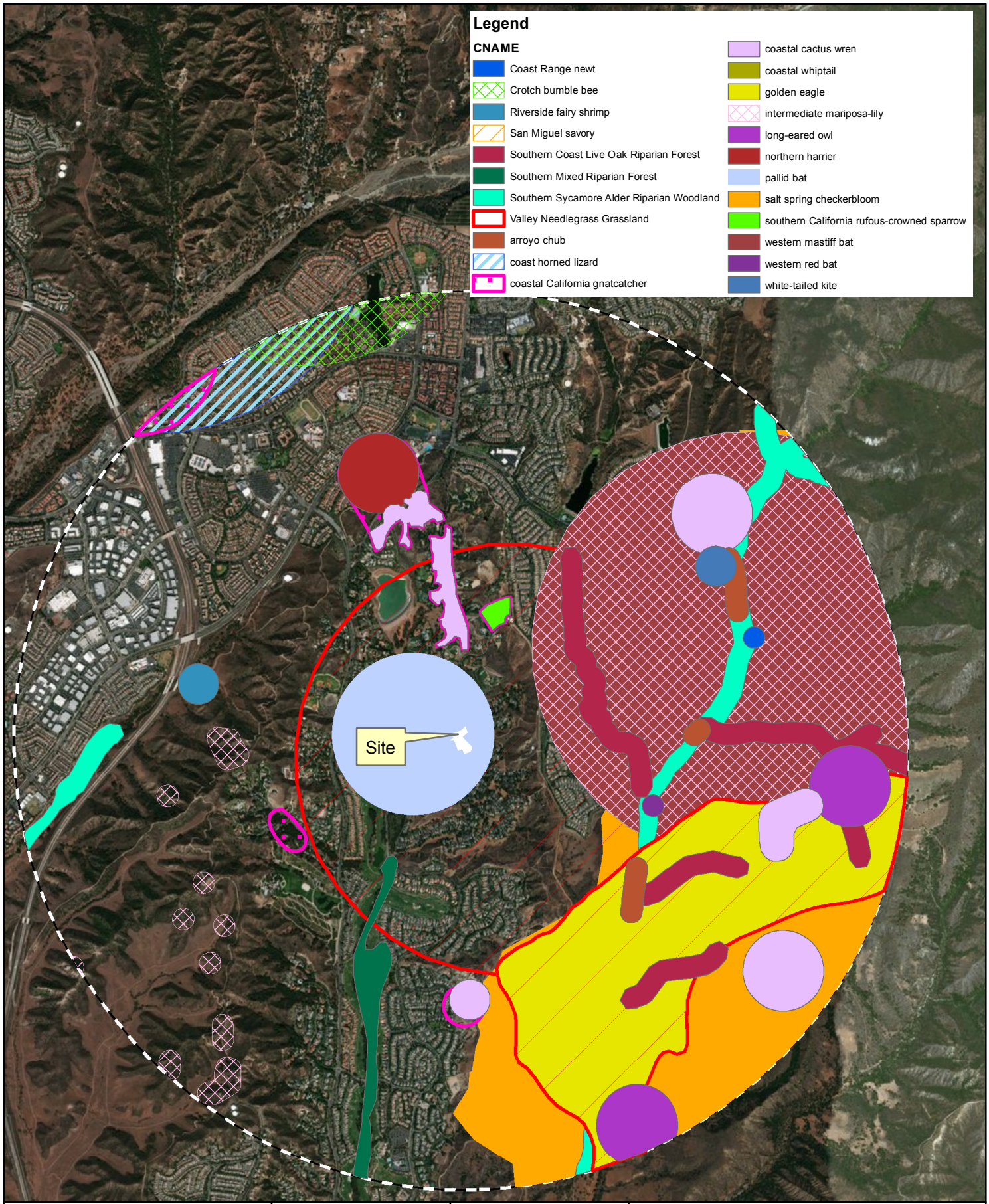
Map Created: Oct 2018

0 25 50 75 100 Feet

Data Source: HUITT-ZOLLARS

Coto Village Property

Figure 1. Potential Drainages



Prepared By:

VCS Environmental

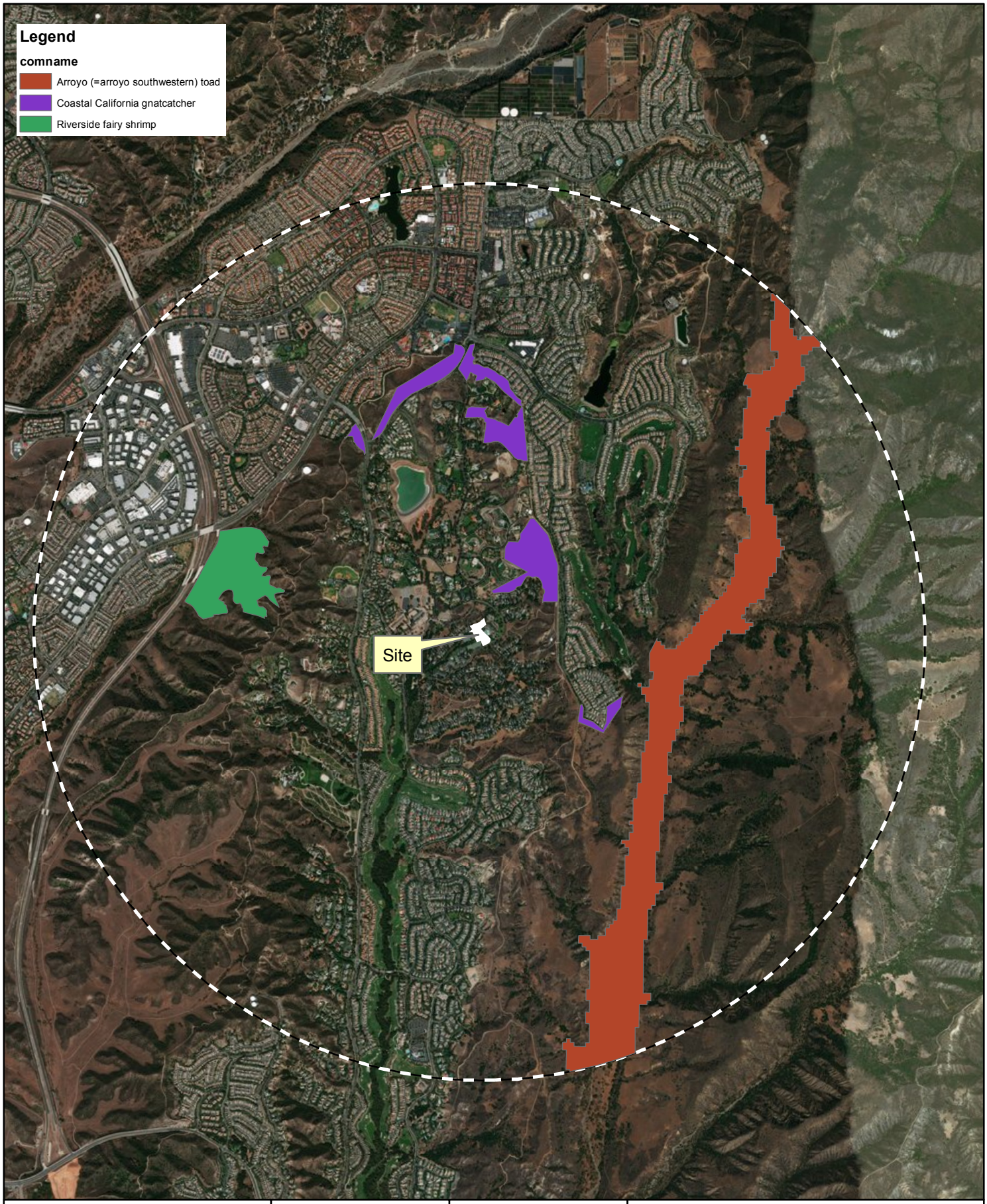
Map Created: Oct 2018

0 780 1,560 2,340 3,120 Feet

Data Source: HUITT-ZOLLARS, ESRI, CNDDB

Coto Village Property

Figure 2. CNDDB Occurrences



Prepared By:

VCS Environmental

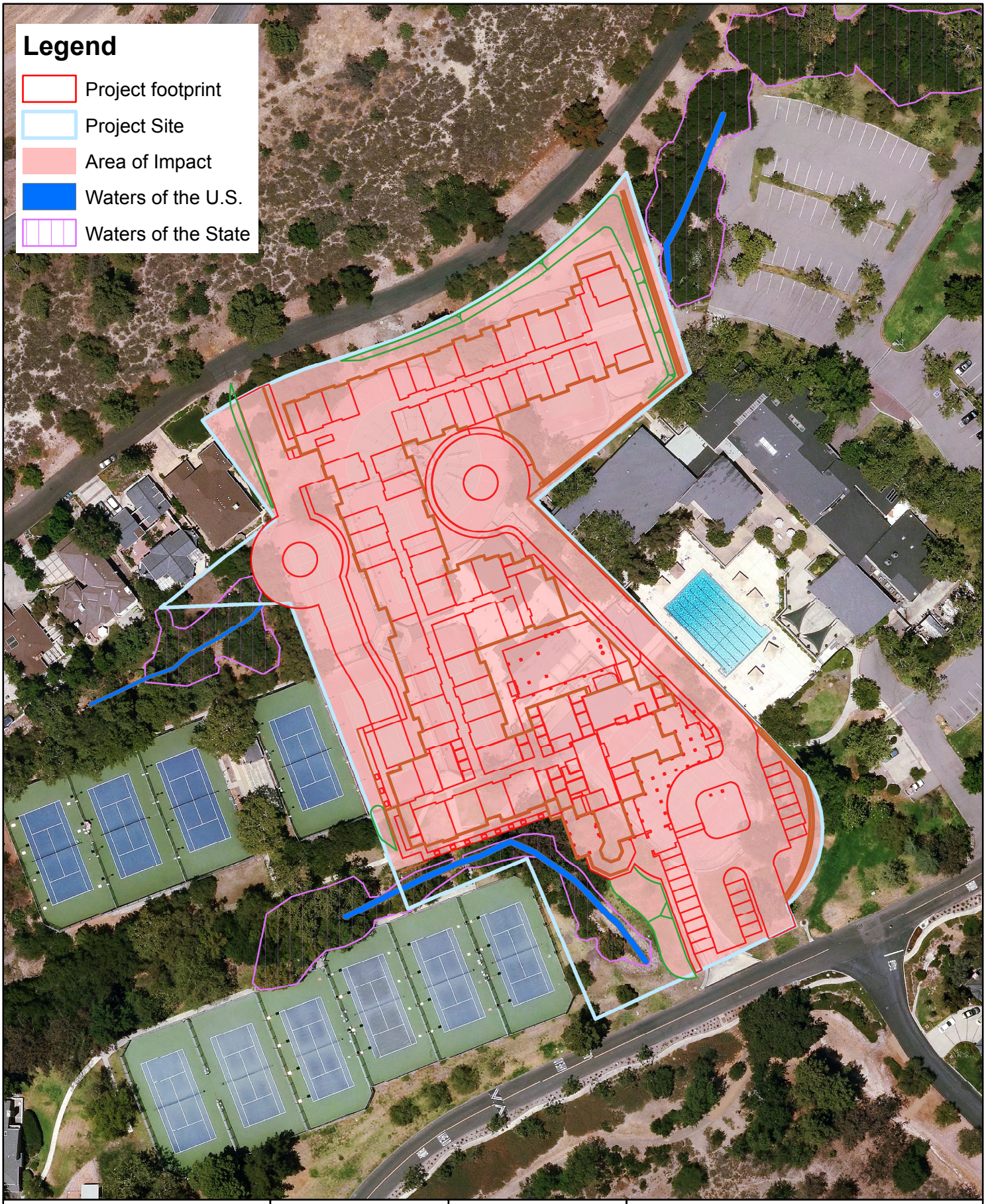
Map Created: Oct 2018

0 780 1,560 2,340 3,120 Feet

Data Source: HUITT-ZOLLARS, ESRI, USFWS

Coto Village Property

Figure 3. USFWS Critical Habitat



Prepared By:
VCS Environmental

Map Created: January 2020

0 50 100 Feet

Data Source: ESRI

Coto De Caza
California Grand Villages Legacy Club

Figure 7

Impacted Area

Attachment I: Geotechnical Report

Preliminary Geotechnical Investigation Report for Entitlement/EIR,
Proposed Legacy Club,
California Grand Villages,
Coto de Caza, County of Orange, California

Prepared For
CGV Coto, LLC.

January 7, 2020

GMU Project No. 18-213-00

23241 Arroyo Vista
Rancho Santa Margarita | CA 92688
949.888.6513 | FX: 949.888.1380 | www.gmugeo.com

TRANSMITTAL

CGV COTO, LLC.
1209 Santiago Drive
Newport Beach, CA 92660

DATE: January 9, 2020

PROJECT: 18-213-00

SUBJECT: Preliminary Geotechnical Investigation Report for Entitlement/EIR, Proposed Legacy Club, California Grand Villages, Coto de Caza, County of Orange, California, dated January 7, 2020

DISTRIBUTION:

Addressee: 1 electronic copy

VCS Environmental
Attn: Mr. Dan Bott (1 electronic copy)

Huitt-Zollars
Attn: Mr. Jeff Okamoto (1 electronic copy)

Table of Contents

INTRODUCTION

PURPOSE

This report presents the findings of our Preliminary Geotechnical Investigation Report (PGIR) for entitlement/EIR, limited subsurface investigation, and site evaluation for the proposed Coto de Caza Luxury Senior Village within the previous Vic Braden Tennis Club property in Coto de Caza, California. The site boundary is presented on Plate 1, Site Location Map. The purposes of this PGIR are to geotechnically characterize the site, identify and discuss potential geotechnical-related development constraints and/or issues, and provide anticipated Geotechnical design considerations. ***Design-specific geotechnical investigation reports containing additional subsurface information will be provided at a later date for final design of the project.***

SCOPE

The scope of our services for the purpose of this PGIR is as follows:

- Background Research and Data Compilation: GMU compiled in-house geologic maps, publications, historic aerial photographs, and other available geotechnical and geological data pertaining to the site.

- Site Reconnaissance: GMU conducted a site reconnaissance to observe existing conditions within the site.

- Limited Subsurface Investigation: GMU performed one day of subsurface investigation in order to observe subsurface conditions and obtain samples for laboratory testing.

- Limited Laboratory Testing: Limited laboratory testing was completed to obtain preliminary engineering properties of the site soils.

- Analyze Data: GMU analyzed the data obtained from our subsurface investigation, laboratory testing, and report review and performed preliminary geotechnical assessment of site conditions and potential geotechnical hazards.

- Preliminary Geotechnical Investigation Report: Prepared this PGIR report pertaining to the existing geotechnical conditions at the site. This report is an update to a previously prepared report dated November 15, 2018.

SITE LOCATION AND DESCRIPTION

The subject site is located on Avenida La Caza in the Coto de Caza Community, California. The site is bordered to the northwest by Via Alondra, to the southeast by Avenida La Caza, to the east by the existing Coto Valley Country Club , and to the west by existing residential homes and tennis courts (Latitude: 33.623; Longitude: -117.5773) see Plate 1 – Location Map. Topographically, the site has flatter areas with rolling slopes that descend to existing drainages. The site was previously the Vic Braden Tennis College and the site still contains several tennis courts, office space structures, walls, fences, and associated improvements.

The proposed development will consist of a two story luxury senior residential village with approximately 110 units. The proposed village will include parking lots, subterranean parking, restaurants and cafes, a pool, porte cochere, patios, common areas, landscaped areas, retaining walls, and other associated improvements. The preliminary grading design consists of 2:1 or flatter perimeter slopes up to approximately 14 feet, cuts of up to approximately 18 feet and fills of up to approximately 14 feet.

SUBSURFACE INVESTIGATION AND LABORATORY TESTING

A limited subsurface investigation was performed consisting of two hollow stem auger drill holes and four hand auger drill holes in order to observe subsurface conditions and collect samples for limited laboratory testing. The locations of the drill holes are shown on Plate 2- Geotechnical Map. The drill holes were logged by an Engineering Geologist and the logs are included in the attached Appendix A. It should be noted that the subsurface investigation was limited due to the presence of existing buildings and improvements.

Limited laboratory testing was performed on samples collected during our subsurface investigation in order to determine preliminary engineering properties of the site soils. The results of laboratory testing are included in the attached Appendix B.

PRELIMINARY GEOTECHNICAL FINDINGS

REGIONAL GEOLOGY

The site is situated in the coastal section of the Peninsular Range Province, a California geomorphic province with a long and active geologic history, including deep marine sedimentation followed by uplift, fluvial and marine erosion, and deposition. The area proposed for development primarily lies

within the upper portion of a tributary canyon which feeds into Gobernadora Canyon which ultimately drains south to the San Juan Creek watershed; see Plate 4 – Regional Geologic Maps.

SUBSURFACE CONDITIONS

Based on our review of available publications and maps, our experience with similar sites in the area, and our limited subsurface investigation, the site is underlain by artificial fill materials, slopewash materials (i.e., alluvium/colluvium/slopewash), and bedrock of the Santiago Formation. The soil and rock materials underlying the site are shown on Plate 2- Geotechnical Map and the predominant materials are described below.

Artificial Fill (Qaf)

Artificial fill of various depths was likely placed within the site when it was graded for the tennis center in the late 1970's. Grading of the site likely consisted of cuts and fills to create flat pads for the tennis courts and structures. Based on available online historic aerial photographs from 1938 to 2018, the main active creeks within the site are about in the same location as they were prior to site development.

Artificial fill was encountered within five of our drill holes to a depth of four feet. However, it is expected that deeper fills are likely present within the site. Where encountered, the artificial fill consists of silty clay and sandy clay with some clayey sand. It was observed to be damp to moist and soft to stiff/moderately dense. The undocumented artificial fill is not considered suitable for support of the proposed improvements and should be removed during remedial grading.

Slopewash (Qsw)

Slopewash materials (i.e., alluvium/colluvium/slopewash) are present within the site and were encountered in one of our hand auger drill holes to a depth of up to at least 15 feet. Where encountered, the slopewash materials consist of moist to wet clayey sand and sandy clay. Based on observations during the site reconnaissance, the slopewash materials may contain few oversized materials (i.e., greater than 6-inches in diameter). The depth and extent of slopewash/alluvial materials within the subject site will be explored in more detail following a future design level subsurface investigation.

Santiago Formation (Tsa)

Bedrock of the Santiago Formation underlies the artificial fill and slopewash materials within the subject site and was encountered within three of our drill holes. Where encountered, the bedrock consists of moderately hard to hard sandstone and silty sandstone with lesser amounts of clayey sandstone.

GEOLOGIC STRUCTURE

Regional geologic structure near the site is characterized by a mostly homoclinal sequence of moderately dipping strata in a generally westerly direction. The Santiago Formation is mostly massive, with localized and poorly defined bedding planes. Because the bedding is most often poorly defined, non-fissile, and discontinuous, slope stability is generally good as compared to other Tertiary sedimentary formations in the area. A regional geologic map showing the site location is included on the attached Plate 4 – Regional Geology.

GROUNDWATER

Groundwater was not encountered during our subsurface investigation. However, based on the saturation of the slopewash materials encountered, perched water may be present at the slopewash/bedrock contact and may be encountered during grading.

Based on the CGS Seismic Hazard Zone Report for the Canada Gobernadora 7.5-minute quadrangle, historic high groundwater levels are mapped as 5 to 10 feet below ground surface within the subject site as shown on the attached Plate 5 – Historic High Groundwater. However, based on our experience in the general area, groundwater is expected to be deeper. Following remedial grading of the subject site, groundwater should not impact the proposed development if care is taken to design for future groundwater fluctuations.

SEISMICITY AND FAULT RUPTURE

The site is not within an Alquist-Priolo Earthquake Fault Zone, and no known active faults cross the site as shown on reviewed geologic maps. The site is located approximately 5.9 miles from the San Joaquin Hills fault, which is capable of generating a maximum earthquake magnitude (Mw) of 7.1. The site is also located about 10.62 miles from the Elsinore fault which is capable of generating a maximum earthquake magnitude (Mw) of 7.9. Given the proximity of the site to these and numerous other active and potentially active faults as shown on the attached Plate 6 – Regional Fault Map, the site will likely be subject to significant earthquake ground motions in the future.

SEISMIC HAZARDS (LIQUEFACTION, SEISMIC SETTLEMENT, LATERAL SPREADING)

Review of the seismic Hazard Zone Maps for the Canada Gobernadora quadrangle indicates that the site is not located within a liquefaction hazard zone and is not located within a zone susceptible to earthquake-induced landslides, as shown on the attached Plate 7 – Seismic Hazard Map. In addition, following remedial grading, the site is expected to be underlain by bedrock of the Santiago

Formation and compacted Certified Engineered Fill, and due to the lack of shallow ground, it is our professional opinion that the potential for liquefaction, seismic settlement, and lateral spreading to impact the proposed development is considered very low.

SLOPE STABILITY

The preliminary site design includes minor cut and fill slopes along the perimeter of the site. These slopes are anticipated to be grossly stable, provided that proper remedial grading is performed. The remedial grading will primarily consist of removal of unsuitable materials to expose competent materials suitable for support of the proposed slopes.

STATIC SETTLEMENT/COMPRESSIBILITY

Following remedial grading, the site will be underlain by engineered fill over bedrock. Given this, the site settlement will be controlled by settlement of new engineered fill. Settlement of Engineered fill will be relatively minor based on the mostly granular composition of the onsite soils and the relatively shallow fills following corrective grading (i.e., <15 feet in depth). Based on prior experience with similar fill conditions, primary and long-term settlement at the site is not expected to exceed the industry standard of practice tolerance of approximately 1 inch total and ½ inch differential over a horizontal distance of about 40 feet.

INFILTRATION

Infiltration testing has not been performed on the site. Following remedial grading of the site, the proposed improvements are expected to be underlain by engineered fill overlying the Santiago Formation bedrock or competent slopewash materials. Due to the planned corrective grading and the presence shallow bedrock, we anticipate that infiltration of stormwater into the site soils may not be feasible, however, once the type, location and depth of infiltration system is selected, this office should be notified to evaluate the feasibility of infiltrating into the site soil.

EXPANSION POTENTIAL

Limited laboratory was performed on samples collected during our subsurface investigation. Based on the results of our testing and our experience with similar site conditions in the area, the onsite soils should be expected to possess a low expansion potential.

CORROSIVE SOILS

Limited laboratory testing has was performed on samples collected during our subsurface investigation. Based on the results of our testing and our experience with similar site conditions in the area, the site is expected to have a negligible sulfate exposure to concrete and corrosive conditions to ferrous metals.

EXCAVATION CHARACTERISTIC

The surficial soils and bedrock formation are expected to require the use of conventional grading and trenching equipment. However, the bedrock formation is moderately hard to hard and is therefore expected to require medium to heavy ripping effort in deeper cuts. Some oversize materials (i.e., greater than 6 inches in diameter) may be encountered. Special handling and placement criteria will be required for all over-sized materials.

CONCLUSIONS

Based on our preliminary and limited evaluation, we conclude that the site is physically suitable for the development and the grading is feasible and practical from a geotechnical standpoint if accomplished in accordance with the California Building Code (CBC), County of Orange requirements, and the preliminary recommendations presented in this preliminary report and future design report(s). A summary of conclusions is as follows:

1. The project area is underlain by artificial fill, slope wash, and bedrock of the Santiago Formation. Shallow corrective grading will be required to support the proposed grading and future improvements. Following this shallow corrective grading, the proposed development will consist of a stable site that is not expected to be affected by landsliding, lateral spreading, subsidence, or collapse.

2. The project area is not underlain by any known active faults.

3. Groundwater is not expected to be encountered or to have a significant impact on site development. However, perched groundwater may be encountered at the bedrock contact.

4. Liquefaction and lateral spreading potential at the site is anticipated to be very low.

5. Site soils within the foundation influence zone are anticipated to have a low expansion potential based on our recent laboratory test results and local experience. Future site improvements can be designed assuming a low expansive condition.

6. A potential for negligible sulfate exposure to concrete (i.e., as defined by the ACI 318) exists at the site. However, supplemental soluble sulfate testing is recommended below proposed improvements upon completion of site corrective grading and precise grading to confirm the preliminary results provided herein.

7. Based on our understanding that the planned structure is anticipated to contain a one-level of subterranean parking, and based on the planned corrective grading and presence of shallow bedrock, we anticipate that the building may be supported on conventional shallow foundation system. However, the type of building foundation will need to be evaluated in a future report once the structure is finalized and actual building loads become available.

8. Preliminary corrosion testing indicates that the on-site soils are corrosive to buried ferrous metals and reinforcing steel. Consequently, any metal exposed to the soil will need protection. In addition, due to high levels of chlorides, steel reinforcement will require proper concrete cover. However, supplemental corrosivity testing is recommended below proposed improvements upon completion of site corrective grading and precise grading and prior to construction to confirm the preliminary results provided herein.

9. Based on the planned corrective grading and presence of shallow bedrock, we anticipate that infiltration of stormwater into the site soils may not be feasible. However, infiltration testing should be performed once the type, location, and depth of infiltration facility is selected.

PRELIMINARY RECOMMENDATIONS/CONSIDERATIONS

PRELIMINARY REMEDIAL GRADING RECOMMENDATIONS

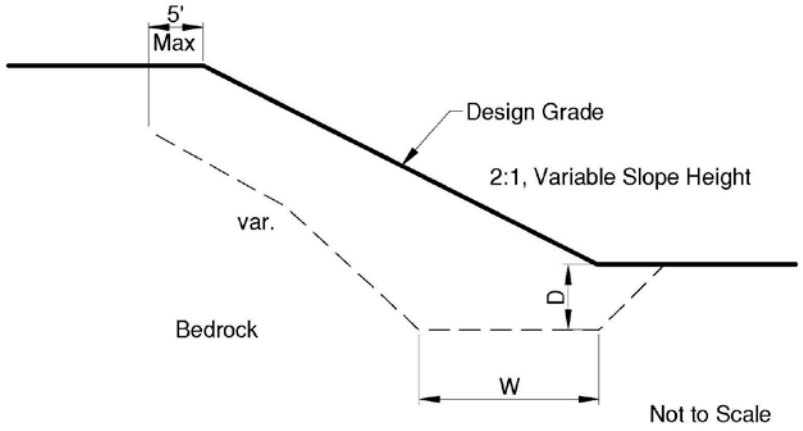
Remedial grading of variable depth will need to be performed to remove any unsuitable undocumented artificial fill and alluvial materials to expose dense, moist, competent alluvial materials or bedrock of the Santiago Formation so that acceptable bearing support for the proposed improvements can be provided. Detailed grading recommendations will be provided in a future Grading Plan Review Report. However, preliminary remedial grading recommendations are outlined below.

General Fill Areas: All topsoil, slopewash materials, and undocumented artificial fill are considered unsuitable for fill support and should be removed below fill areas in order to expose competent in-place bedrock.

Benching should be performed as additional fill is placed against slopes that are 5:1 or steeper. See Plate 8 – Typical Benching and Keyway, for a general detail of toe-of-slope keyway and subsequent benching.

Removals should be completed in a manner which limits the steepness of removal bottoms and therefore limits the differential fill thickness. The recommended criteria for steepness of removal bottoms is 1½:1 or flatter.

2:1 Cut Slopes: Based on the geotechnical conditions present and our experience with similar grading conditions, the proposed 2:1 cut slopes are relatively stable but will require keyways and stabilization fills to improve surficial stability and facilitate landscaping. Keyway locations and dimensions will be discussed in more detail in a future Grading Plan Review Report based on the final grading plan design. However, it is expected that keyways will likely be a minimum of 3 feet deep and 15 feet wide from the toe of slope. The typical keyway and backcut configuration should be as shown below.



TYPICAL KEYWAY BACKCUT IN BEDROCK

2:1 Fill Slopes: Remedial grading should be performed below fill slopes to provide a minimum shear key to support the slope. Fill slope shear key should be a minimum of 3 feet deep from a 1:1 projection out from the toe of the slope and a minimum of 15 feet wide.

Building Pad Over-Excavations: An over-excavation should be performed below the building pads in order to provide uniform engineered fill for support of the proposed

building. For planning purposes, the over-excavation criteria will be a minimum depth shall be three feet below the bottom of the footing.

Street and Landscape Over-Excavations: Streets and landscape areas should be over-excavated to a depth of two feet below finish grade when in a cut condition. At the owner's discretion, additional over-excavation may be performed in order to facilitate underground utility trench excavation, or to improve landscape conditions.

It should be noted that the preliminary recommendations provided herein are approximations based on our reconnaissance study, review of previous geotechnical reports for the site and surrounding areas, and on a limited subsurface exploration. Actual removals may vary depending on the results of future subsurface explorations or based on observations of geologic materials encountered during grading.

PRELIMINARY FOUNDATION DESIGN CONSIDERATION AND SEISMIC PARAMETERS

Structure Seismic Design

Given the lack of subsurface data, the upper 100 feet of subsurface soils within the subject site is estimated to be a "very dense soil and soft rock" profile and designated as a Site Class C (i.e., conservative assumption). The seismic design coefficients based on ASCE 7-16 and 2019 CBC are listed in the following table 1.

Table 1. 2019 CBC Site Categorization and Site Coefficients

Categorization/Coefficient	Design Value
Site Class based on Soil Profile (ASCE 7, Table 20.3-1)	C
Short Period Spectral Acceleration S_s **	1.282
1-sec. Period Spectral Acceleration S_1 **	0.456
Site Coefficient F_a (Table 11.4-1)**	1.200
Site Coefficient F_v (Table 11.4-2)**	1.500
Short Period MCE* Spectral Acceleration S_{MS} **	1.538
1-sec. Period MCE Spectral Acceleration S_{M1} **	0.684
Short Period Design Spectral Acceleration S_{DS} **	1.025
1-sec. Period Design Spectral Acceleration S_{D1} **	0.456
MCE Peak Ground Acceleration (PGA) *	0.531
Site Coefficient F_{PGA} (Table 11.8-1)**	1.200
MCE Peak Ground Acceleration (PGA_M) *	0.637

* *MCE: Maximum Considered Earthquake*
** *Values Obtained from USGS Earthquake Hazards Program website are based on the ASCE7-16 and 2019 CBC and site*

coordinates of N33.623° and W117.5773°.

It should be recognized that much of southern California is subject to some level of damaging ground shaking as a result of movement along the major active (and potentially active) fault zones that characterize this region. Design utilizing the 2019 CBC is not meant to completely protect against damage or loss of function. Therefore, the preceding parameters should be considered as minimum design criteria.

Foundation Design Considerations

The following preliminary foundation design considerations and parameters may be used to preliminarily size and cost foundation systems. ***These recommendations should not be construed as final design recommendations which will be developed following additional subsurface investigations, laboratory testing, and plan review.***

- Foundation System Type: Based on preliminary lab testing indicating EI's <50, a slab-on-grade with conventional foundations appears adequate. A structural stiffened slab may be required if higher EI's are found.
- Bearing Material: Engineered Fill
- Minimum Dimensions: Width: 24 inches
Depth: 24 inches
- Bearing Capacity: 3,000 psf for minimum size
May be increased 20% for each additional foot of width or depth. Maximum: 5000 psf
- Load Resistance: Loads may be resisted by both passive and friction.
Passive resistance: 300 psf/ft
Friction coefficient: 0.35
- Settlement: Static: 1 inch total and ½ inch over 40 feet differential.

CONCRETE

Due to low soil resistivity and high chloride levels, the potential for on-site corrosion to ferrous metals and hence reinforcing steel are very severe. In addition, moderate sulfate levels have been encountered throughout Irvine in the vicinity of the site. Consequently, we recommend using the following:

Structural Elements (i.e., foundations, walls, etc.):

- Cement Type: Type II/V
- Maximum Water Cement Ratio: 0.50

Utilization of ACI 318 moderate sulfate level requirements will also serve to reduce the permeability of the concrete and help minimize the potential of water and/or vapor transmission through the concrete. Wet curing of the concrete per ACI Publication 308 is also recommended.

Non-structural Elements (i.e., flatwork, pavement, etc.)
Concrete mix design shall be selected by the concrete designer such that sulfate and chloride attack mitigations are balanced with shrinkage crack control. Concrete mix design is outside the geotechnical engineer's purview.

The aforementioned recommendations in regards to all concrete (i.e., structural and non-structural) are made from a soils perspective only. Final concrete mix design is beyond our purview. All applicable codes, ordinances, regulations, and guidelines should be followed in regard to designing a durable concrete with respect to the

CORROSION PROTECTION OF METAL STRUCTURES

Metal structures which will be in direct contact with the soil (i.e., underground metal conduits, pipelines, metal sign posts, etc.) and/or in close proximity to the soil (wrought iron fencing, etc.) may be subject to corrosion. The use of special coatings or cathodic protection around buried metal structures has been shown to be beneficial in reducing corrosion potential. Corrosion of ferrous metal reinforcing elements in structural concrete may be reduced by the use of the recommended maximum water/cement ratio for concrete, but may not be eliminated.

The laboratory testing program performed for this project does not address the potential for corrosion to copper piping. In this regard, a corrosion engineer should be consulted to perform more detailed testing and develop appropriate mitigation measures (if necessary).

The above discussion is provided for general guidance in regards to the corrosiveness of the on-site soils to typical metal structures used for construction. Detailed corrosion testing and recommendations for protecting buried ferrous metal and/or copper elements are beyond our purview. If detailed testing is required, a corrosion engineer should be consulted to perform the testing and develop appropriate mitigation measures.

SITE RETAINING WALLS

It is expected that retaining walls may be constructed within the site. Design of these walls will need to account for surcharges from adjacent walls and other structures. Final design of retaining walls will need to be based on future site-specific plans, geotechnical investigation, and analyses. Final recommendations should also be based on the selected wall types and geometry.

FUTURE GEOTECHNICAL STUDIES

Given the preliminary nature of this report, additional geotechnical studies will be needed in the future to support final project design. The future geotechnical studies will need to include supplemental subsurface exploration, laboratory testing, and geotechnical analyses. Detailed and site-specific geotechnical recommendations will need to be provided for all grading, building foundations, walls, both on- and off-site pavements and street improvements, and miscellaneous appurtenant structures. Based on these studies, final geotechnical design recommendations should be provided in a future report.

LIMITATIONS

All parties reviewing or utilizing this report should recognize that the findings, conclusions, and recommendations presented represent the results of our professional geological and geotechnical engineering efforts and judgments based on information obtained from available maps, documents, and publications, and a limited subsurface investigation. Additional fieldwork and laboratory testing would be required to provide Geotechnical grading recommendations and preliminary foundation, retaining wall, and pavement design criteria.

Due to the inexact nature of the state of the art of these professions and the possible occurrence of undetected variables in subsurface conditions, we cannot guarantee that the conditions actually encountered during grading and site construction will be identical to those observed, sampled, and interpreted during our study, or that there are no unknown subsurface conditions which could have an adverse effect on the use of the property. We have exercised a degree of care comparable to the standard of practice presently maintained by other professionals in the fields of geotechnical engineering and engineering geology, and believe that our findings present a reasonably representative description of geotechnical conditions and their probable influence on the grading and use of the property.

This report has not been prepared for the use by other parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes. In addition, the scope of our services did not include a study or evaluation pertaining to the presence of hazardous materials at the site.

CLOSURE

GMU appreciates the opportunity that was provided to perform these services. Should you have any questions, please feel free to contact the undersigned.

Respectfully submitted,

GMU GEOTECHNICAL, INC.

Katie Farrington, M.Sc., PG, CEG 2611
Senior Engineering Geologist

Nadim Sunna, M.Sc., QSP, PE 84197
Senior Engineer

/kmf/18-213-00R_Prelim Investigation (1-7-20)

REFERENCES

(1) Huitt-Zollars, "California Grand Villages Conceptual Grading, Coto de Caza, CA," dated December 19, 2019.

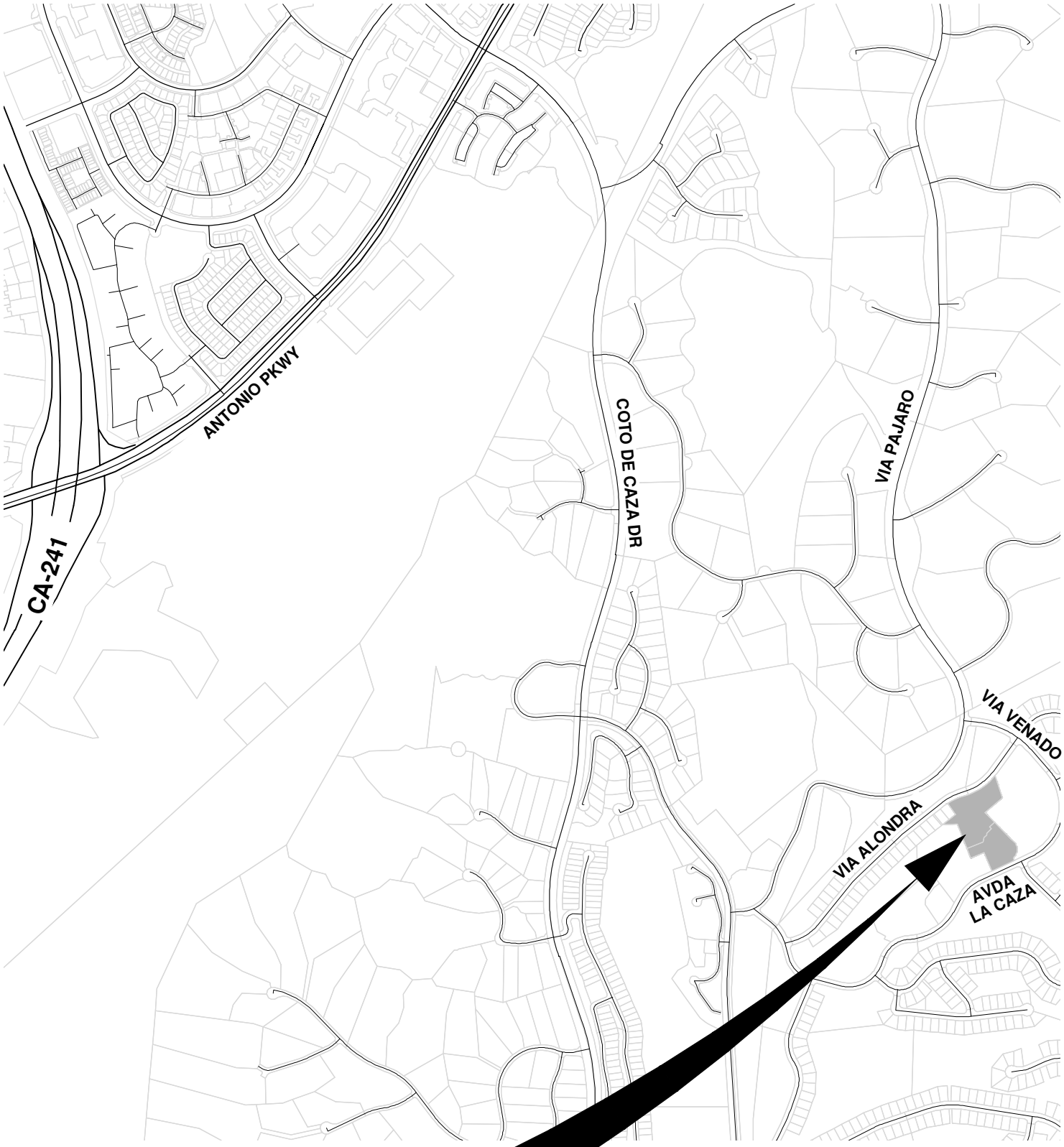
(2) Irwin Partners Architects, *The Legacy Club, California Grand Village, Preliminary Plan* dated December 20, 2019.

(3) State of California Division of Mines and Geology, Seismic Hazards Zone Map of the Canada Gobernadora Quadrangle, dated September 23, 2002.

(4) California Department of Conservation, Division of Mines and Geology, Seismic Hazard Zone Report 063 for the Cañada Gobernadora 7.5-minute Quadrangle, Orange County, California, dated 2002.

(5) United States Geological Survey, Preliminary Geologic Map of the Santa Ana 30x60 Quadrangle, Southern California, Version 2.0, dated 1999.

(6) California Department of Conservation, Division of Mines and Geology, NW ¼ Cañada Gobernadora Quadrangle, Preliminary Report 10, Plate 1, dated 1970.



PROJECT SITE
COTO DE CAZA LUXURY SENIOR VILLAGE

0 1000'

Location Map

GMU	Date: January 7, 2020	Plate 1
	Project No.: 18-213-00	

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GEOTECHNICAL LEGEND

Qaf	ARTIFICIAL FILL
Qsw	SLOPE WASH, CIRCLED WHERE BURIED
Tsa	SANTIAGO FORMATION
DH-2 (18-213-00)	APPROXIMATE LOCATION OF HOLLOW STEM AUGER DRILL HOLE
HA-4 (18-213-00)	APPROXIMATE LOCATION OF HAND AUGER DRILL HOLE
	GEOLOGIC CONTACT
C — C'	GEOTECHNICAL SECTION

VIA ALONDRA

AVENIDA LA CAZA

PROJECT BOUNDARY

PROPOSED 20' PUBLIC STORM DRAIN EASEMENT

PROPOSED 30" HDPE STORM DRAIN

EXISTING STORM DRAIN PIPE 2-30" CMP PIPES (TO BE REMOVED)

EXISTING STORM DRAIN HEADWALL

PROPOSED RETAINING WALL

PEDESTRIAN BRIDGE

FF 2ND FLOOR=886.0
FF 1ST FLOOR=870.0
FF PARKING=859.0

FF LOBBY=870.0

DH-1 (18-213-00)

DH-2 (18-213-00)

HA-1 (18-213-00)

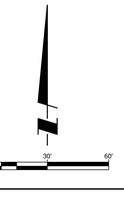
HA-2 (18-213-00)

HA-3 (18-213-00)

HA-4 (18-213-00)

(886.4) EG
883.2 RIM
881.7 FL
0.0' RET
(881.8) EG
1.1' RET
1.5' RET
877.0 RIM
875.5 FL
(877.0) EG
3.0' RET
0.0' RET
878.0 RIM
877.5 FL
(878.0) EG
(876.0) EG
(876.9) EG
(875.9) EG
(875.1) EG
(873.6) EG
869.3 FG
859.0 FS
869.3 FG
870.3 FG
12.1' RET
(871.0) EG
858.9 TC
858.4 FS
(874.0) EG
(871.5) EG
LP
858.7 TC
858.2 FS
(871.0) EG
867.1 TC
866.6 FS
3.9' RET
866.6 TC
866.1 FS
FF PARKING=859.0
(866.7) EG
868.7 FS
868.5 TC
868.0 FS
3.6' RET
(872.6) EG
(872.5) EG
2.1' RET
870.7 TC
870.2 FS
870.0 TC
869.5 FS
(872.2) EG
(863.5) EG
(863.8) EG
869.8 FS
863.5 FS
0" CF
869.9 FS
869.6 FS
12.5' RET
870.6 TC
870.1 FS
871.1 TC
870.6 FS
(861.1) EG
(859.9) EG
869.8 FS
862.0 FS
(863.6) EG
(861.0) EG
11.8' RET
865.8 FS
863.5 EG
870.2 TC
869.7 FS
869.3 TC
868.8 FS
(868.1) FS
870.4 TC
869.9 FS
(869.5) EG
(868.4) FS

Tsa
Qaf
Qsw



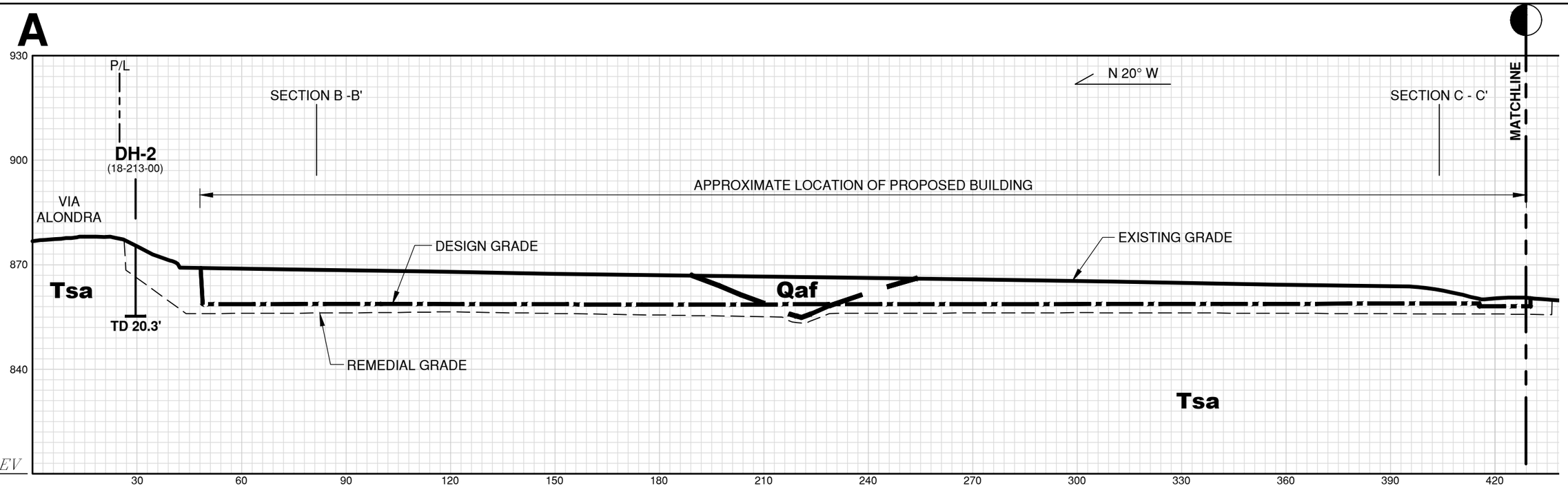
Geotechnical Map

GMU

Date: January 7, 2020

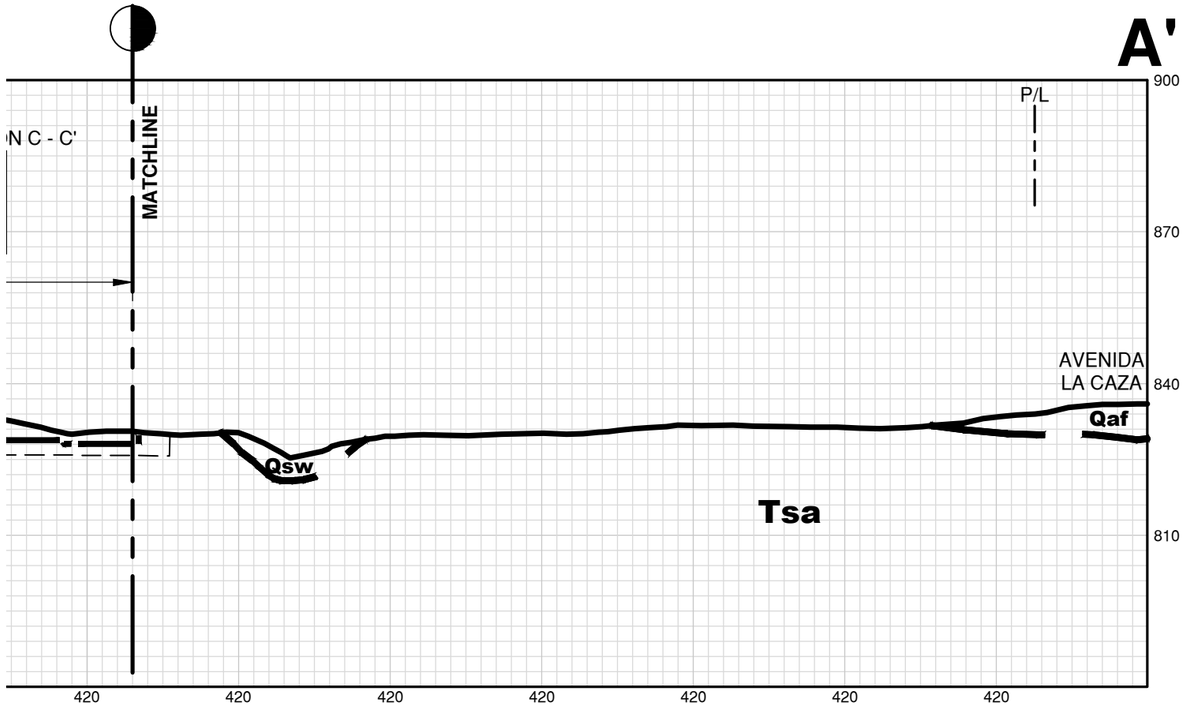
Project No.: 18-213-00

Plate 2



DATUM ELEV
810.0'

GROUP Project Number 18-213-00
SECTION A - A'
SCALE: 1" = 30'



0 30'

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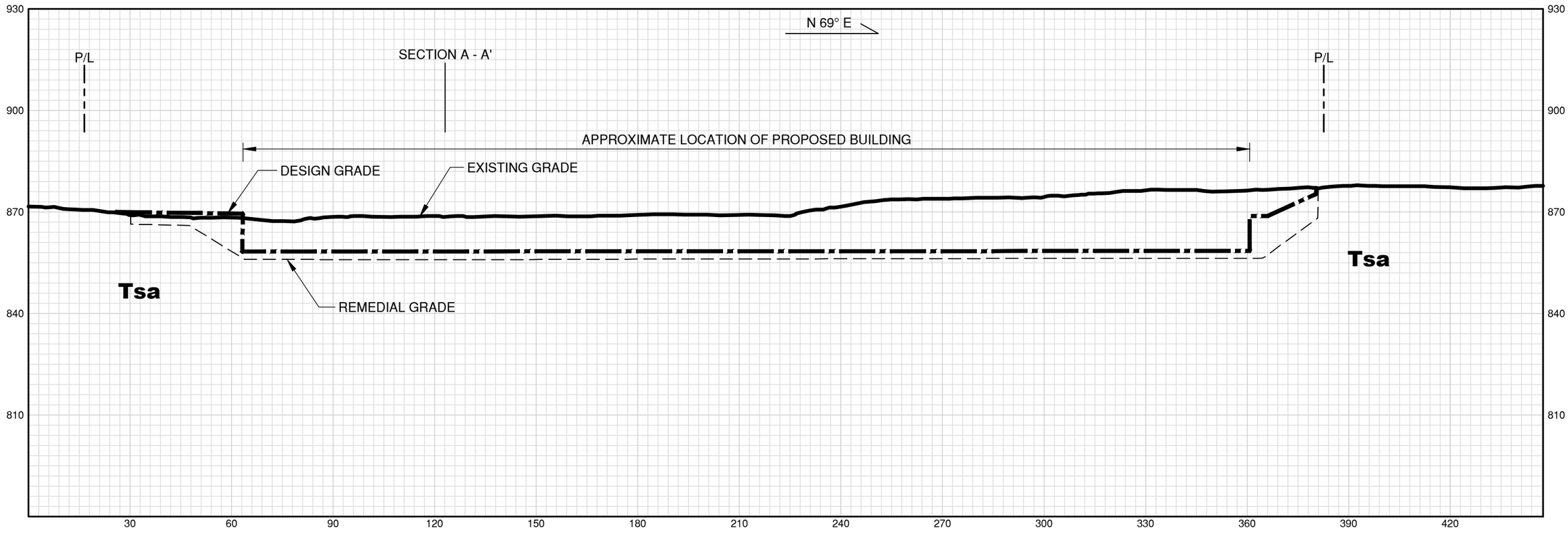
Geotechnical Section A - A'

GMU

Date:	January 7, 2020
Project No.:	18-213-00

Plate 3.1



DATUM ELEV
780.0'

GROUP Project Number 18-213-00
SECTION B - B'
SCALE: 1" = 30'

0 30'

Geotechnical Section B - B'

GMU	Date: January 7, 2020	Plate 3.2
	Project No.: 18-213-00	

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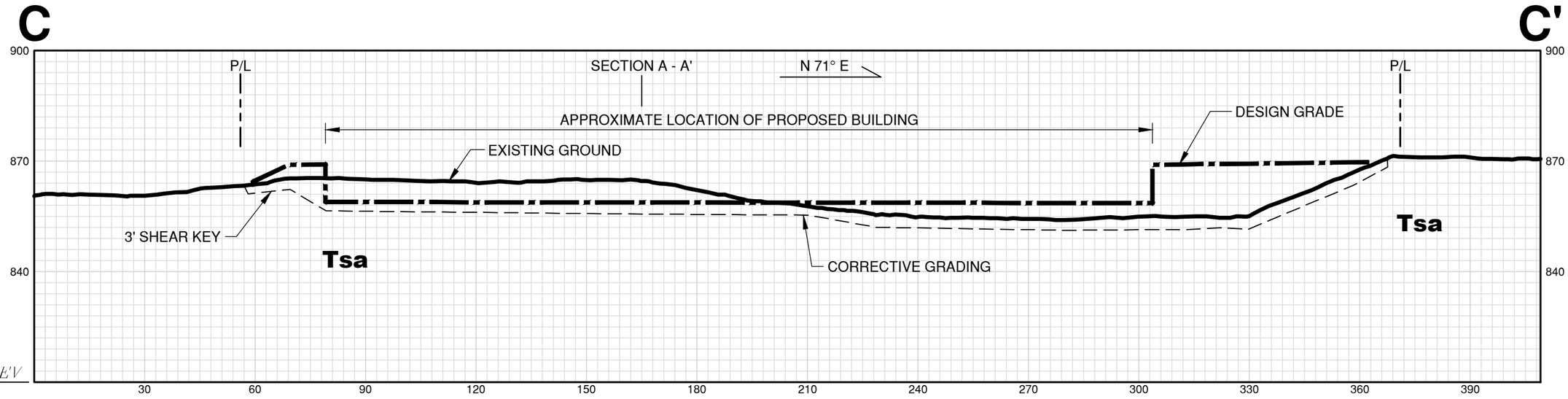


GROUP Project Number 18-213-00
SECTION C - C'
SCALE: 1" = 30'

0 30'

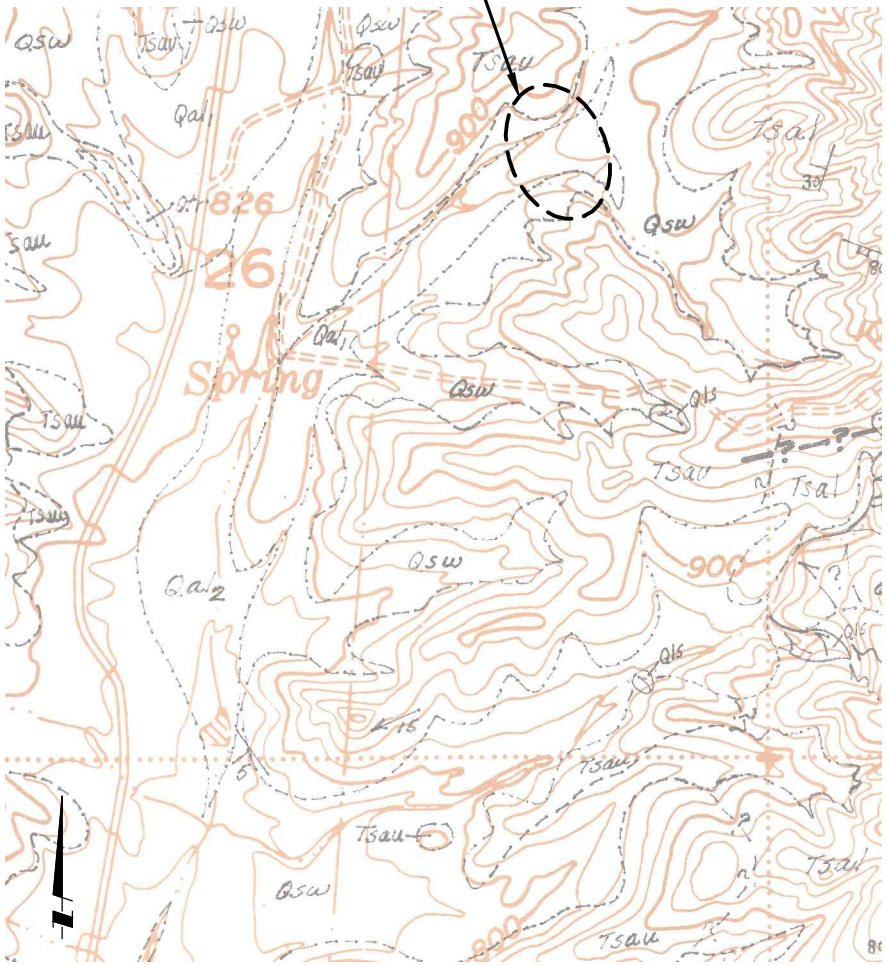
Geotechnical Section C - C'

GMU

Date: January 7, 2020

Project No.: 18-213-00

Plate 3.3

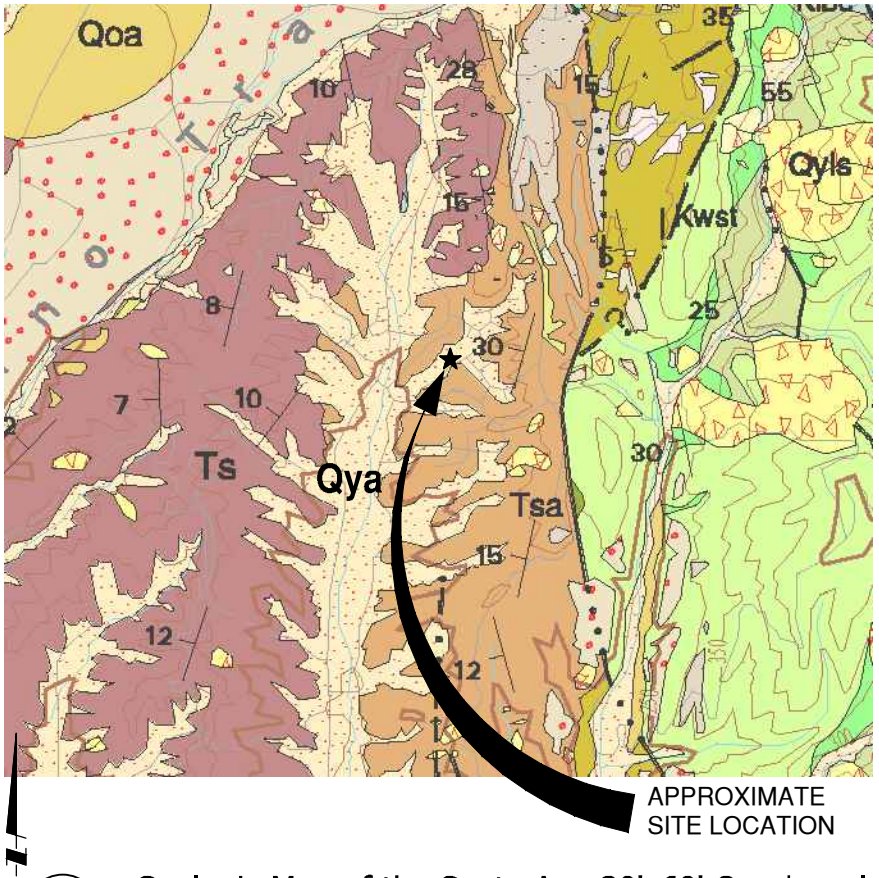


1 NW 1/4 Canada Gobernadora Quadrangle

Scale: 1" = 10,000

LEGEND

Qal	ALLUVIUM
Qsw	SLOPEWASH
Tsau	SANTIAGO FORMATION, UPPER MEMBER



2 Geologic Map of the Santa Ana 30'x60' Quadrangle

Scale: 1:200,000

LEGEND

Qya	YOUNG ALLUVIUM DEPOSITS
Tsa	SANTIAGO FORMATION

Regional Geologic Map

GMU

Date: January 7, 2020

Project No.: 18-213-00

Plate 4

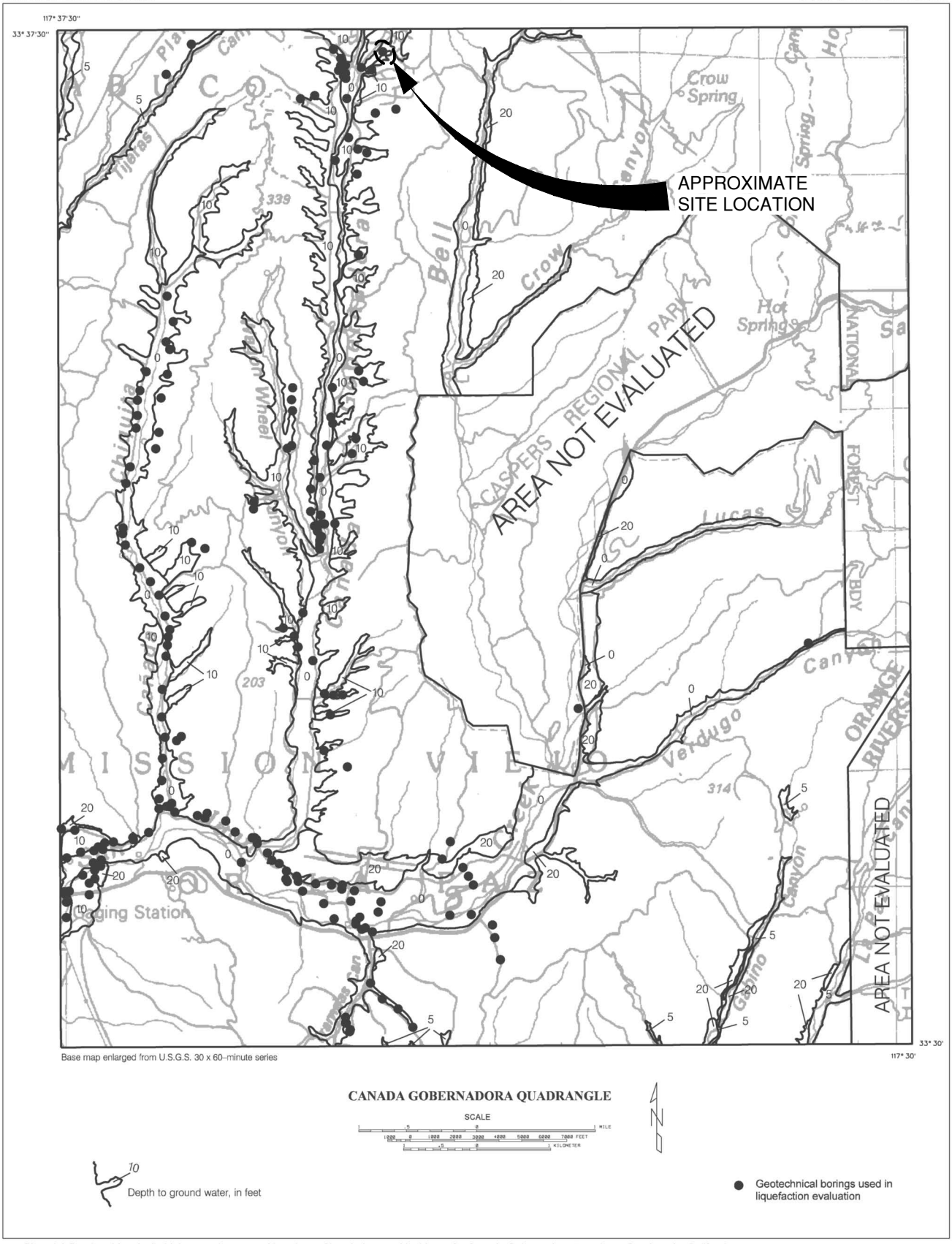
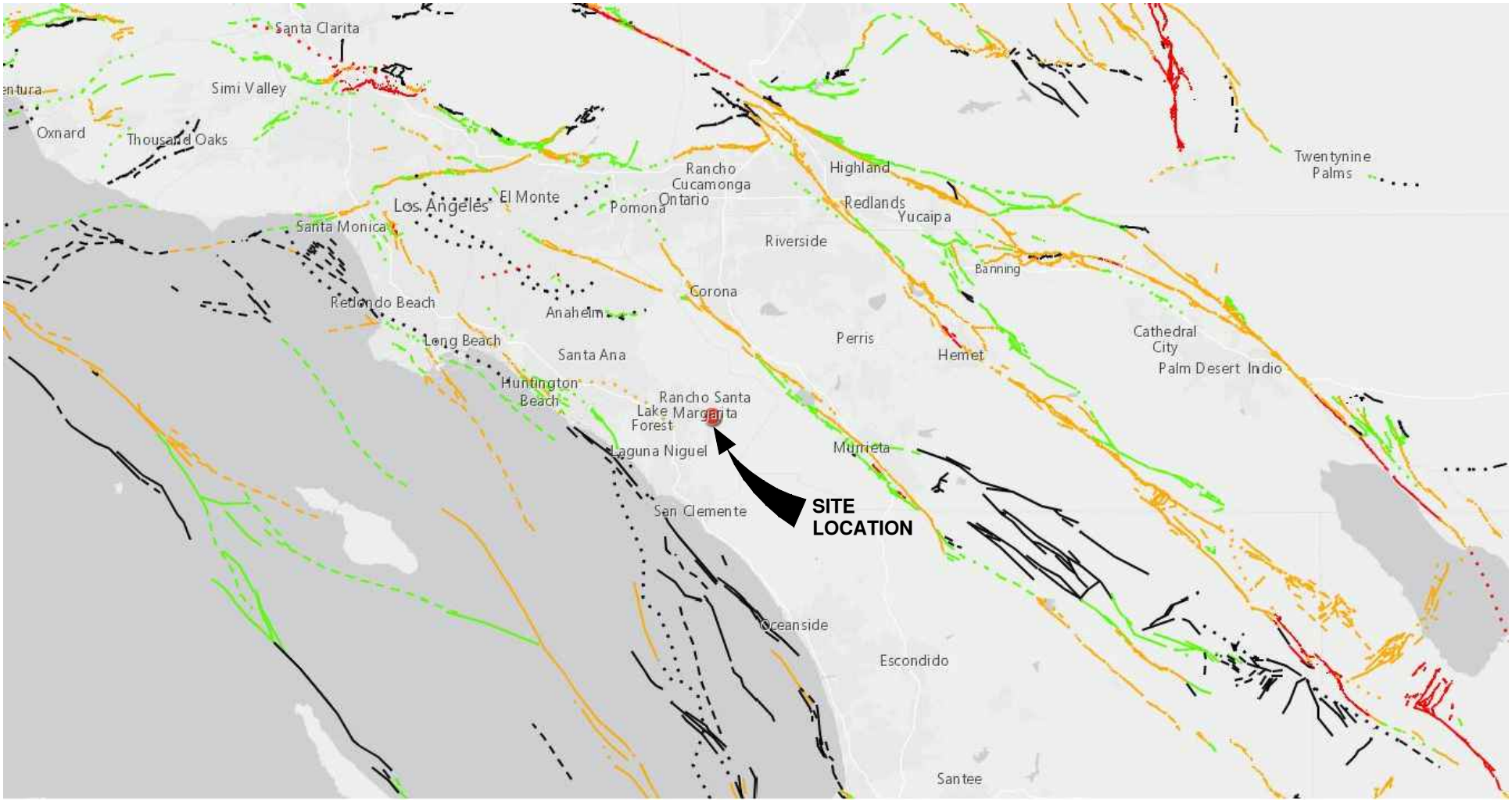


Plate 1.2 Depth to historically high ground water and locations of boreholes used in this study, Canada Gobernadora 7.5-minute Quadrangle, California

Historic High Groundwater

GMU	Date: January 7, 2020	Plate 5
	Project No.: 18-213-00	

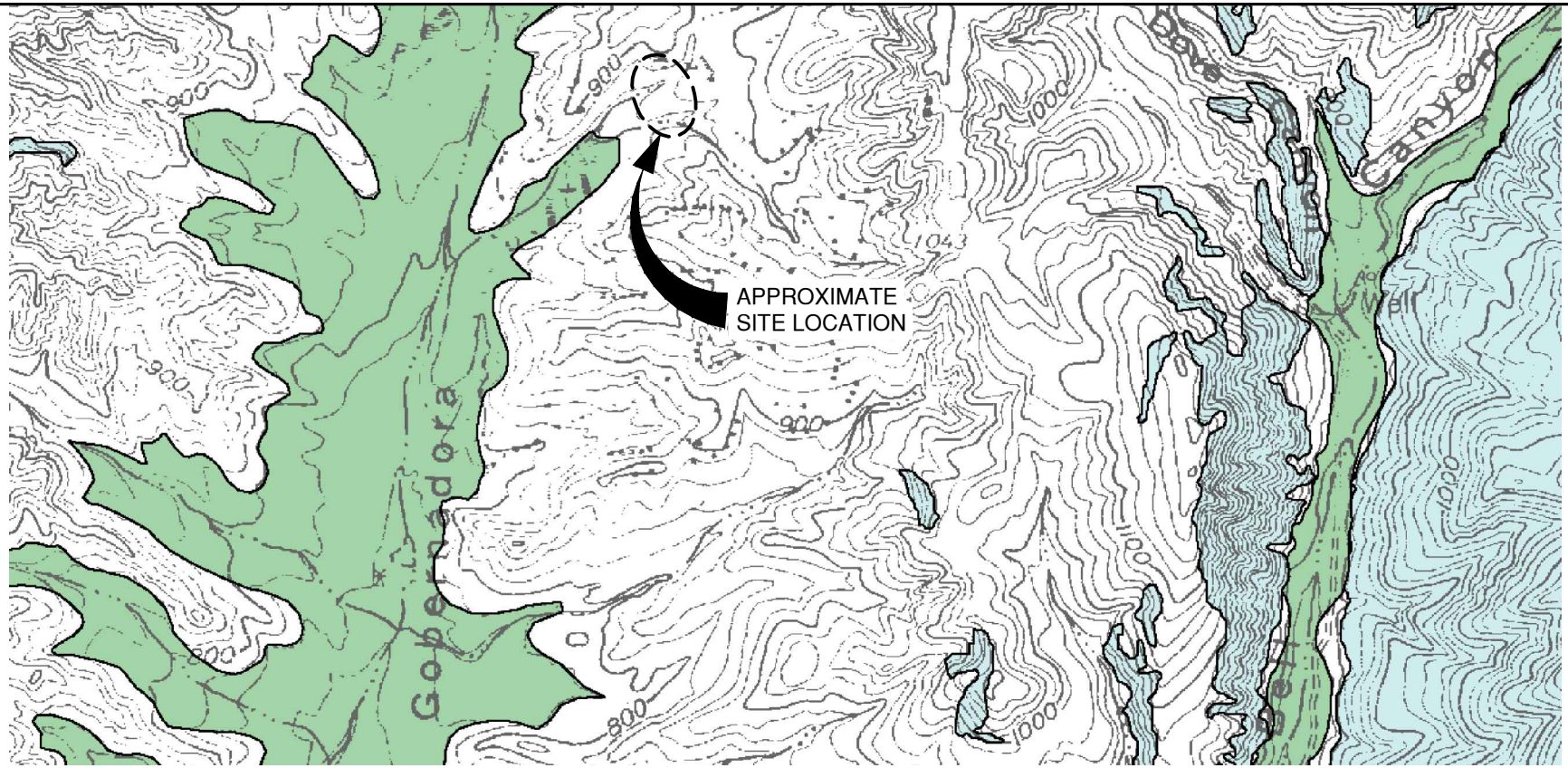


NOT TO SCALE

Regional Fault Map

GMU	Date: January 7, 2020	Plate 6
	Project No.: 18-213-00	

DRAWING: q:\2018\18-213-00\dwg\1821300_plate 6_regional fault map.dwg PLOTTED: 1/7/2020 3:38 PM BY: Jmeza



MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

NOTE: Seismic Hazard Zones identified on this map may include developed land where delineated hazards have already been mitigated to city or county standards. Check with your local building/planning department for information regarding the location of such mitigated areas.

NOT TO SCALE

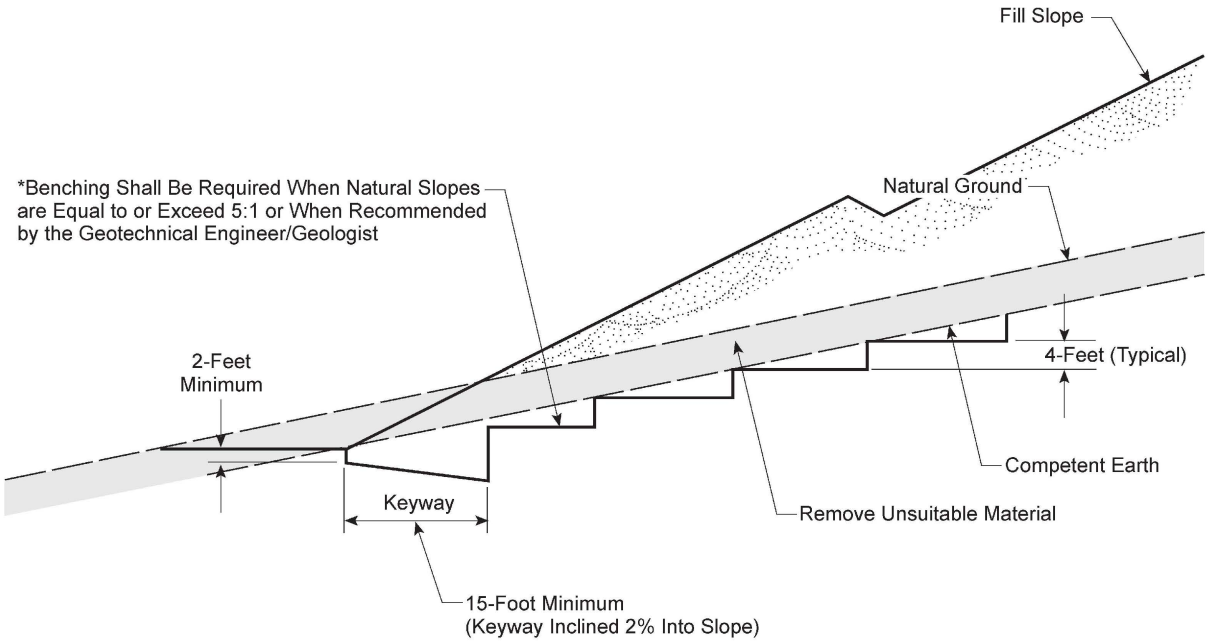
Seismic Hazard Zone Map

GMU

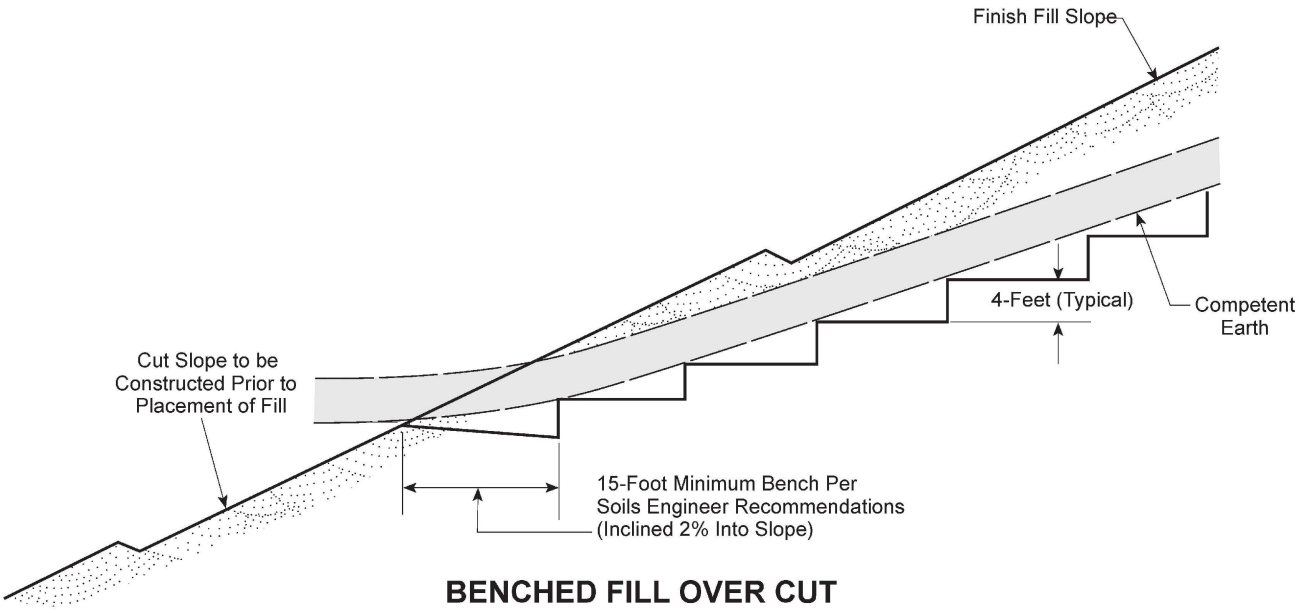
Date: January 7, 2020

Project No.: 18-213-00

Plate 7



BENCHED FILL OVER NATURAL



BENCHED FILL OVER CUT

GMU

TYPICAL BENCHING AND KEYWAY

Plate
8

APPENDIX A

Geotechnical Exploration Procedures and Logs

APPENDIX A

GMU GEOTECHNICAL EXPLORATION PROCEDURES AND LOGS

Our exploration at the subject site consisted of two hollow stem auger drill holes and four hand auger drill holes. The estimated locations of the explorations are shown on Plate 2- – Geotechnical Map. Our drill holes were logged by a Certified Engineering Geologist and drive and bulk samples of the excavated soils were collected. "Undisturbed" samples were taken using a 3.0-inch outside-diameter drive sampler which contains a 2.416-inch-diameter brass sample sleeve 6 inches in length. Blow counts recorded during sampling from the drive samples are shown on the drill hole logs. The logs of each drill hole are contained in this Appendix A, and the Legend to Logs is presented as Plates A-1 and A-2.

The geologic and engineering field descriptions and classifications that appear on these logs are prepared according to Corps of Engineers and Bureau of Reclamation standards. Major soil classifications are prepared according to the Unified Soil Classification System as modified by ASTM Standard No. 2487. Since the descriptions and classifications that appear on the Log of Borings and Test Pits are intended to be that which most accurately describe a given interval of a boring or test pit (frequently an interval of several feet), discrepancies do occur in the Unified Soil Classification System nomenclature between that interval and a particular sample in that interval. For example, an 8-foot-thick interval in a log may be identified as silty sand (SM) while one sample taken within the interval may have individually been identified as sandy silt (ML). This discrepancy is frequently allowed to remain to emphasize the occurrence of local textural variations in the interval.

MAJOR DIVISIONS			Group Letter	Symbol	TYPICAL NAMES
COARSE-GRAINED SOILS More Than 50% Retained On No.200 Sieve Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	**GRAVELS** 50% or More of Coarse Fraction Retained on No.4 Sieve	Clean Gravels	GW		Well Graded Gravels and Gravel-Sand Mixtures, Little or No Fines.
			GP		Poorly Graded Gravels and Gravel-Sand Mixtures Little or No Fines.
		Gravels With Fines	GM		Silty Gravels, Gravel-Sand-Silt Mixtures.
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures.
	SANDS More Than 50% of Coarse Fraction Passes No.4 Sieve	Clean Sands	SW		Well Graded Sands and Gravelly Sands, Little or No Fines.
			SP		Poorly Graded Sands and Gravelly Sands, Little or No Fines.
		Sands With Fines	SM		Silty Sands, Sand-Silt Mixtures.
			SC		Clayey Sands, Sand-Clay Mixtures.
FINE-GRAINED SOILS 50% or More Passe The No.200 Sieve Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	**SILTS AND CLAYS** Liquid Limit Less Than 50%		ML		Inorganic Silts, Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts With Slight Plasticity.
			CL		Inorganic Clays of Low To Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
			OL		Organic Silts and Organic Silty Clays of Low Plasticity
	SILTS AND CLAYS Liquid Limit 50% or Greater		MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silts.
			CH		Inorganic Clays of High Plasticity, Fat Clays.
			OH		Organic Clays of Medium To High Plasticity, Organic Silts.
HIGHLY ORGANIC SOILS			PT		Peat and Other Highly Organic Soils.

The descriptive terminology of the logs is modified from current ASTM Standards to suit the purposes of this study

ADDITIONAL TESTS

DS = Direct Shear
HY = Hydrometer Test
TC = Triaxial Compression Test
UC = Unconfined Compression
CN = Consolidation Test
(T) = Time Rate
EX = Expansion Test
CP = Compaction Test
PS = Particle Size Distribution
EI = Expansion Index
SE = Sand Equivalent Test
AL = Atterberg Limits
FC = Chemical Tests
RV = Resistance Value
SG = Specific Gravity
SU = Sulfates
CH = Chlorides
MR = Minimum Resistivity
pH
(N) = Natural Undisturbed Sample
(R) = Remolded Sample
CS = Collapse Test/Swell-Settlement

GEOLOGIC NOMENCLATURE

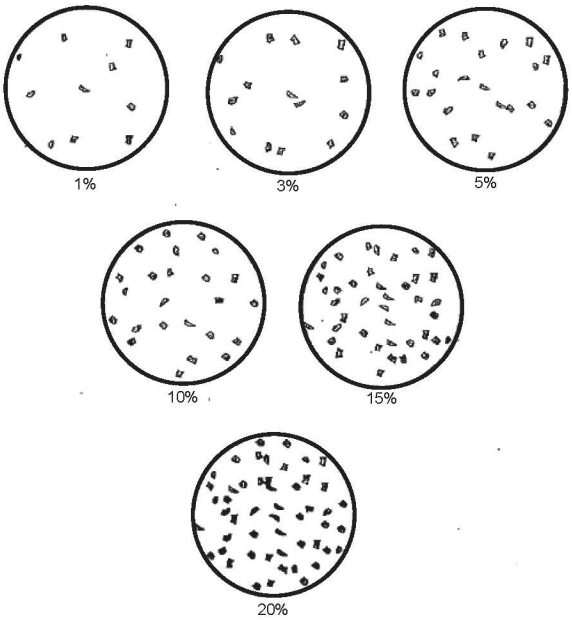
B = Bedding C = Contact J = Joint
F = Fracture Flt = Fault S = Shear
RS = Rupture Surface = Seepage
= Groundwater

SAMPLE SYMBOLS

Undisturbed Sample (California Sample)
Undisturbed Sample (Shelby Tube)
Bulk Sample
Unsuccessful Sampling Attempt
SPT Sample

5
10 Blows per 6-Inches Penetration
15

10: 10 Blows for 12-Inches Penetration
6/4": 6 Blows for 4-Inches Penetration
P: Push
(13): Uncorrected Blow Counts ("N" Values) for 12-Inches Penetration- Standard Penetration Test (SPT)



LEGEND TO LOGS

ASTM Designation: D 2487
(Based on Unified Soil Classification System)

Plate
A-1

P8-11/16/2012

SOIL DENSITY/CONSISTENCY

FINE GRAINED

Consistency	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Soft	Easily penetrated by thumb, exudes between fingers	<2	<3
Soft	Easily penetrated one inch by thumb, molded by fingers	2-4	3-6
Firm	Penetrated over 1/2 inch by thumb with moderate effort	4-8	6-12
Stiff	Penetrated about 1/2 inch by thumb with great effort	8-15	12-25
Very Stiff	Readily indented by thumbnail	15-30	25-50
Hard	Indented with difficulty by thumbnail	>30	>50

COARSE GRAINED

Density	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Loose	Easily penetrated with 0.5" rod pushed by hand	<4	<5
Loose	Easily penetrated with 0.5" rod pushed by hand	4-10	5-12
Medium Dense	Easily penetrated 1' with 0.5" rod driven by 5lb hammer	10-30	12-35
Dense	Dificult to penetrat 1' with 0.5" rod driven by 5lb hammer	31-50	35-60
Very Dense	Penetrated few inches with 0.5" rod driven by 5lb hammer	>50	>60

BEDROCK HARDNESS

Density	Field Test	SPT (#blows/foot)
Soft	Can be crushed by hand, soil like and structureless	1-30
Moderately Hard	Can be grooved with fingernails, crumbles with hammer	30-50
Hard	Can't break by hand, can be grooved with knife	50-100
Very Hard	Scratches with knife, chips with hammer blows	>100

MODIFIERS

Trace	1%
Few	1-5%
Some	5-12%
Numerous	12-20%
Abundant	>20%

GRAIN SIZE

Description		Sieve Size	Grain Size	Approximate Size
Boulders		>12"	>12"	Larger than a basketball
Cobbles		3-12"	3-12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4-3"	3/4-3"	Thumb-sized to fist-sized
	Fine	#4-3/4"	0.19-0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10-#4	0.079-0.19"	Rock-salt-sized to pea-sized
	Medium	#40-#10	0.017-0.079"	Sugar-sized to rock salt-sized
	Fine	#200-#40	0.0029-0.017"	Flour-sized to sugar-sized
Fines		passing #200	<0.0029"	Flour-sized and smaller

MOISTURE CONTENT

Dry- Very little or no moisture
Damp- Some moisture but less than optimum
Moist- Near optimum
Very Moist- Above optimum
Wet/Saturated- Contains free moisture

GMU

LEGEND TO LOGS

ASTM Designation: D 2487
(Based on Unified Soil Classification System)

Plate

A-2

Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole DH-1

Sheet 1 of 2

Date(s) Drilled	**12/10/19**	Logged By	**WD**	Checked By	**KF**
Drilling Method	**Hollow Stem Auger**	Drilling Contractor	**2R Drilling**	Total Depth of Drill Hole	**20.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**8**	Approx. Surface Elevation, ft MSL	**867.0**
Groundwater Depth [Elevation], feet		Sampling Method(s)	**Open drive sampler with 8-inch sleeve, Bulk**	Drill Hole Backfill	**Native**
Remarks				Driving Method and Drop	**140 lb donut hammer**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
865	0		**ARTIFICIAL FILL (Qaf)** abundant organics and rock fragments		SILTY CLAY (CL-ML); brown and grayish brown, damp, moderately stiff						
			SANTIAGO FORMATION (Tsa)		SILTY SANDSTONE (SM); brown, damp, hard, fine grained sand, moderately cemented		11 28 43	140	8	128	
	5		Rare roots		SILTY SANDSTONE (SM); brown, damp, hard, fine grained sand, trace clay		30 50/6"	140	7	128	
860											
	10				CLAYEY SANDSTONE (CL); pale brown, damp, hard, fine grained sand, trace medium grained sand		21 21 22	140	13	120	
855											
	15				POORLY GRADED SANDSTONE (SP); pale yellowish gray, damp, hard, fine grained sand, weakly cemented		50/6"	140	4	108	
850											

DH_REV3 18-213-00.GPJ GMULAB.GPJ 1/9/20

GMU

Drill Hole DH-1

Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole DH-1

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA			TEST DATA		
						SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			cont. to be **SANTIAGO FORMATION (Tsa)**		cont. to be POORLY GRADED SANDSTONE (SP); pale yellowish brown, damp, hard, fine to medium grained sand, weakly cemented		50/4"	140	5	108	
					Total Depth = 20.5 No Groundwater No Caving						

Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole DH-2

Date(s) Drilled	12/10/19	Logged By	WD	Checked By	KF
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	20.3 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	867.0
Groundwater Depth [Elevation], feet		Sampling Method(s)	Open drive sampler with 8-inch sleeve, Bulk	Drill Hole Backfill	Native
Remarks				Driving Method and Drop	140 lb donut hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf)		SANDY CLAY (CL); brown and yellowish brown, moist, dense, medium grained sand						
865			**SANTIAGO FORMATION (Tsa)**		SILTY SANDSTONE (SM); grayish brown, damp, hard, fine to medium grained sand, moderately well cemented		28 50/6"	140	5	124	
	5				SILTY SANDSTONE (SM); mottled brown, pale brown, and gray, damp, hard, fine grained sand moderately well cemented		28 50/6"	140	5	120	
860											
	10				POORLY GRADED SANDSTONE (SP); pale gray with orange, some brown mottles, hard, fine to medium grained sand, moderately cemented		45 50/3"	140	8	124	
855											
	15				POORLY GRADED SANDSTONE (SP); pale grayish yellow, damp, hard, fine to medium grained sand, moderately cemented		50/5"	140	9	125	
850											

DH_REV3 18-213-00.GPJ GMULAB.GPJ 1/9/20

Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole DH-2

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA			TEST DATA		
						SAMPLE	NUMBER OF BLOWS / 6"	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					cont. to be POORLY GRADED SANDSTONE (SP); pale gray, damp, hard, weakly cemented, fine grained sand Total Depth = 20.25' No Groundwater No Caving	■	50/3"	140	6	108	

DH_REV3 18-213-00.GPJ GMULAB.GPJ 1/9/20

GMU

Drill Hole DH-2

Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole HA-1

Sheet 1 of 1

Date(s) Drilled	**12/10/19**	Logged By	**WD**	Checked By	**KF**
Drilling Method	**Hand Auger**	Drilling Contractor	**GMU**	Total Depth of Drill Hole	**6.0 feet**
Drill Rig Type		Diameter(s) of Hole, inches	**3.25**	Approx. Surface Elevation, ft MSL	**868.0**
Groundwater Depth [Elevation], feet		Sampling Method(s)		Drill Hole Backfill	**Native**
Remarks				Driving Method and Drop	

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
865			**ARTIFICIAL FILL (Qaf)**								
	5		**SLOPEWASH (Qsw)**		SILTY SAND (SM); pale brown, moist, medium grained sand, trace gravel						
					Total Depth = 6.0' Refusal on Cobbles and Gravel No Groundwater No Caving						

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GMU

Drill Hole HA-1

Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole HA-2

Sheet 1 of 1

Date(s) Drilled **12/10/19**	Logged By **WD**	Checked By **KF**
Drilling Method **Hand Auger**	Drilling Contractor **GMU**	Total Depth of Drill Hole **2.0 feet**
Drill Rig Type	Diameter(s) of Hole, inches **3.25**	Approx. Surface Elevation, ft MSL **866.0**
Groundwater Depth [Elevation], feet	Sampling Method(s)	Drill Hole Backfill **Native**
Remarks		Driving Method and Drop

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
865			**ARTIFICIAL FILL (Qaf)** organic matter		SILTY CLAY (CL); grayish brown, moist, moderately stiff, scattered gravel						
					Total Depth = 2.0' Practical Refusal No Groundwater No Caving						

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Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole HA-3

Date(s) Drilled: **12/10/19**	Logged By: **WD**	Checked By: **KF**
Drilling Method: **Hand Auger**	Drilling Contractor: **GMU**	Total Depth of Drill Hole: **6.0 feet**
Drill Rig Type:	Diameter(s) of Hole, inches: **3.25**	Approx. Surface Elevation, ft MSL: **864.0**
Groundwater Depth [Elevation], feet:	Sampling Method(s):	Drill Hole Backfill: **Native**
Remarks:		Driving Method and Drop:

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ARTIFICIAL FILL (Qaf) rare organic matter		CLAYEY SAND (SC); brown, moist, moderately soft, fine to medium grained sand, scattered gravel	X					EI, FC
860	5		**SANTIAGO FORMATION (Tsa)**		SILTY SANDSTONE (SM); pale yellowish brown, moist, fine grained sand, trace medium and coarse grained sand						
					Total Depth = 6.0' No Groundwater No Caving						

Project: Coto Legacy Club
Project Location: 23333 & 23335 Ave. La Caza, Coto de Caza
Project Number: 18-213-00

Log of Drill Hole HA-4

Date(s) Drilled: **12/10/19**	Logged By: **WD**	Checked By: **KF**
Drilling Method: **Hand Auger**	Drilling Contractor: **GMU**	Total Depth of Drill Hole: **15.5 feet**
Drill Rig Type:	Diameter(s) of Hole, inches: **3.25**	Approx. Surface Elevation, ft MSL: **865.0**
Groundwater Depth [Elevation], feet:	Sampling Method(s):	Drill Hole Backfill: **Native**
Remarks:		Driving Method and Drop:

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS / 6"	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			SLOPEWASH (Qsw)		CLAYEY SAND (SC); brownish gray with orangish brown staining, very moist, stiff, fine to medium grained sand						
					Becomes dark gray, more clayey						
					SANDY CLAY (CL); minor white and orangish brown mottles, moist, very stiff						
860	5				CLAYEY SAND (SC); brown, moist, stiff						
					Becomes paler with depth						
											EI, FC
					Becomes paler brown, rare gravel						
855	10				Becomes very moist to wet						
					Becomes less clayey, fine grained sand						
					CLAYEY SAND (SC); brown, very moist, stiff, fine grained sand						
850	15										
					Total Depth = 15.5' No Groundwater No Caving						

APPENDIX B

Geotechnical Laboratory Procedures and Test Results

APPENDIX B-1

GMU GEOTECHNICAL LABORATORY PROCEDURES AND TEST RESULTS

MOISTURE AND DENSITY

Field moisture content and in-place density were determined for select 6-inch sample sleeve of undisturbed soil material obtained from the drill holes. The field moisture content was determined in general accordance with ASTM Test Method D 2216 by obtaining one-half the moisture sample from each end of the 6-inch sleeve. The in-place dry density of the sample was determined by using the wet weight of the entire sample.

At the same time the field moisture content and in-place density were determined, the soil material at each end of the sleeve was classified according to the Unified Soil Classification System. The results of the field moisture content and in-place density determinations are presented on the right-hand column of the Log of Drill Hole and are summarized on Tables B-1 and B-2. The results of the visual classifications were used for general reference.

EXPANSION TESTS

To provide a standard definition of one-dimensional expansion, a test was performed on typical on-site materials in general accordance with ASTM Test Method D 4829. The result from this test procedure is reported as an "expansion index". The results of this test are contained in Appendix B and also Tables B-1 and B-2.

CHEMICAL TESTS

The corrosion potential of typical on-site materials under long-term contact with both metal and concrete was determined by chemical and electrical resistance tests. The soluble sulfate test for potential concrete corrosion was performed in general accordance with California Test Method 417, the minimum resistivity test for potential metal corrosion was performed in general accordance with California Test Method 643, and the concentration of soluble chlorides was determined in general accordance with California Test Method 422. The results of these tests are contained in Appendix B and also Tables B-1 and B-2.

TABLE B
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Satur-ation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2µ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
DH-1	2.5	864.5	Tsa	SC	7.9	128	72															
DH-1	5	862.0	Tsa	SC	6.6	128	60															
DH-1	10	857.0	Tsa	SC	12.9	120	91															
DH-1	15	852.0	Tsa	SM	3.7	108	18															
DH-1	20	847.0	Tsa	SM	5.2	108	26															
DH-2	2.5	864.5	Tsa	SC	4.6	124	36															
DH-2	5	862.0	Tsa	SC	5.0	120	35															
DH-2	10	857.0	Tsa	SM	7.7	124	61															
DH-2	15	852.0	Tsa	ML	9.1	125	74															
DH-2	20	847.0	Tsa	SM	5.5	108	27															
HA-3	0	864.0	Qaf	SC													6		7.5	94	696	1100
HA-4	8	857.0	Qsw	SC													33		6.9	130	624	1368

GMU_TABLE_SOIL_LAB_DATA 18-213-00.GPJ FNC AB GWGN01.GDT 1/9/20

Project: Coto Legacy Club
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