SAFE, CLEAN WATER PROGRAM

FEASIBILITY STUDY REPORT

Regional Program Projects Module

PROJECT NAME	Valley Plaza Park Stormwater Capture Project
PROJECT LEAD(S)	Los Angeles Department of Water and Power (LADWP)
SCW WATERSHED AREA	Upper Los Angeles River
PRELIMINARY SCORE	97
TOTAL SCW FUNDING REQUESTED	$ 26,447,000.00
YEAR 1 FUNDING REQUESTED	$ 529,000.00

Submitted On: Thursday, October 15, 2020

Created By: David Pettijohn, Director of Water Resources, Los Angeles Department of Water and Power (Los Angeles Department of Water and Power (LADWP))

OVERVIEW

The objective of the Regional Infrastructure Program under the Safe, Clean Water (SCW) Program is to plan, build, and maintain multi-benefit watershed-based projects that improve water quality and increase water supply and/or enhance communities. A Feasibility Study is required before a project can be submitted for consideration and scoring for funding through the Los Angeles Region Safe, Clean Water (SCW) Program's Regional Infrastructure Program. Each Feasibility Study should provide enough information about a potential project to allow the Watershed Area Steering Committee members to make an informed decision for as to which projects should move forward for consideration for funding. The Minimum Feasibility Study Requirements for the Scoring and Consideration of Regional Infrastructure Program Projects is available at: https://portal.safecleanwaterla.org/projects-module/.

This document is based upon an output from the web-based tool called the 'SCW Regional Projects Module' (https://portal.safecleanwaterla.org/projects-module/). This output summarizes the information and data provided to Regional Projects Module, and also provides an initial estimate of project scoring per the SCW Infrastructure Program Project Scoring Criteria.

IMPORTANT: *ALL SCORING ESTIMATES GENERATED BY THE PROJECTS MODULE ARE PRELIMINARY AND SUBJECT TO REVIEW AND REVISION BY THE SCORING COMMITTEE.*

ORGANIZATIONAL OVERVIEW:

1 GENERAL INFORMATION

This section provides general information on the project including location and project description.

1.1 Overview

The following table provides an overview of the project and the Project Developer(s):

Project Name:	Valley Plaza Park Stormwater Capture Project
Project Description:	Will capture 590 AF per year, improve water quality, enhance the DAC, and mitigate flooding. 50% cost match with strong community support.
SCW Watershed Area:	Upper Los Angeles River
Call for Projects year:	FY21-22
Total SCW Funding Requested:	$ 26,447,000.00
Phase(s) this application is requesting SCW funding for:	Design, Construction
Project Weather Type:	Wet
Project Lead(s):	Los Angeles Department of Water and Power (LADWP)
Additional Project Collaborators:	Los Angeles Department of Public Works Bureau of Engineering (BOE)
Additional Project Collaborators:	Los Angeles Sanitation and Environment (LASAN)
Additional Project Collaborators:	Los Angeles Department of Recreation and Parks (RAP)
Anticipated IPPD:	Los Angeles Department of Water and Power (LADWP)
Is this a non-municipal project?	No
Primary Contact (if differs from submitter):	SCWP Implementation
Primary Contact Email (if differs from submitter):	scwp.implementation@ladwp.com
Secondary Contact (if differs from submitter):	Peter Tonthat, Project Manager, Los Angeles Department of Water and Power
Secondary Contact Email (if differs from submitter):	Peter.Tonthat@ladwp.com

1.2 Project Location

The following table summarizes the project location:

Latitude:	34.1919
Longitude:	-118.4011
Street Address:	12240 Archwood St
City:	Los Angeles
State:	CA
Zip Code:	91606
Municipality:	Los Angeles

Please see the following attachment(s) for a project location map.

Attachments for this Section	
Attachment Name	Description
1.2 - Location - Valley Plaza.pdf	Location information on right-of-way, park needs, and the disadvantaged community.

Will the project provide benefit to a Disadvantaged Community (DAC)?

Yes

If Yes, Distance to nearest DAC.

0

If Yes, Describe how the project will provide benefits to a DAC.

According to data from the Safe, Clean Water Program GIS Tool, the Valley Plaza Park Stormwater Capture Project (Project) is located in a disadvantaged community (DAC), as shown in the Attachment for Section 1.2 (Location). The Project will improve recreational opportunities at the park while creating new local jobs for community members. Educational signage will provide opportunities for members of the community to learn about stormwater and water resources. In addition, the Project will add greenery and provide water quality benefits by reducing pollutants in local runoff from the park and the Project watershed, which is also largely a DAC. Significant water supply benefits will be achieved through groundwater recharge of the underground aquifer, which is used as a water supply source for the area.

The Project will also achieve all seven SCW Program community investment benefits (improved flood mitigation, restoration of parks, enhanced recreational opportunities, increasing shade, carbon sequestration, improved access to waterways, and greening of schools). The potential benefits resulting from these community improvements cannot be understated. Beyond the features oriented toward organized sports and field play, the Project will result in a net increase of at least 181 trees and will replace sod at the park. Added shade will reduce heat island effect, and the added plants will provide air quality benefits to a community that is often beyond attainment for air quality goals according to the South Coast Air Quality Management District. Taken together, the Project will strengthen the community from the inside out.

Based on the Los Angeles Countywide Parks and Recreations Needs Assessment, the area surrounding the Project has very high park needs, as shown in the Attachment for Section 1.2. The study, released in 2016, used a holistic series of metrics (Park Land, Park Access, Park Pressure, Park Amenities and Park Condition) as well as population density data to determine park needs in 188 study areas. By moving beyond a simple analysis of park acreage only, the study was able to take into account the quality of parks that currently exist and factor those qualities into the assessment along with anticipated demand based on population density.

The Project will prioritize local hire and create a significant number of new jobs through construction in addition to some permanent jobs related to operations and maintenance (O&M). During construction, multiplier benefits are expected to be large and benefit local businesses providing services to the prime contractor (specialty trades) and workers (food, PPE). In all cases there will be a preference for local hire, and existing City contracting guidelines will ensure a sizable portion of the construction contract will be subcontracted to qualified Minority-owned Business Enterprises, Woman-owned Business Enterprises, Small Business Enterprises, Emerging Business Enterprises, Disabled Veteran-Business Enterprises, and LGBT Business Enterprises, thereby supporting a wider range of local businesses.

If Yes, Describe how the project will provide water quality benefits to a DAC.

Most of the Project's drainage area is also a DAC. During a storm event, the Project will remove 93 percent of Zinc and 80 percent of E. coli from the runoff of those areas. Trees and vegetation added by the Project will also provide water quality benefits to on-site runoff at the park and in adjacent areas.

If Yes, Describe how the project will provide water supply benefits to a DAC.

The Project will capture and infiltrate 590 acre-feet (AF) per year of stormwater to recharge the aquifer directly underneath the park, which is located in a DAC. Water rights to the aquifer under the park belong to LADWP, which operates several wells throughout the San Fernando Valley. The DAC the Project is in, and the drainage area the Project captures, is served by LADWP. As a result, the additional water supply created by the Project will directly benefit the DAC areas.

If Yes, Describe how the project will provide community investment benefits to a DAC.

The Project will provide all seven community investment benefits defined in the SCW Program (improved flood mitigation, restoration of parks, enhanced recreational opportunities, increasing shade, carbon sequestration, improved access to waterways, and greening of schools). Features related to recreation and vegetation (greening of schools, recreational enhancements, and trees for carbon sequestration and reduction in heat island effect, etc.) will be located at or adjacent to the park, which is located in a DAC. Thus, these benefits will accrue locally. Benefits from enhanced flood projection will be spread out over a larger area, and because the Project, the upstream drainage area, and the downstream watershed are located primarily in a DAC, the additional flood mitigation benefits will accrue to these DAC areas.

If Yes, Describe how the project engaged the benefitting DAC(s) to date.

Because face-to-face community meetings were not possible due to the COVID-19 pandemic, the team held virtual community meetings and prepared informational materials to lead public participants to a survey about landscape renovation concepts and options. The materials included a printed informational mailer that contained the survey, outdoor banners with contacts so the public could find information and the survey online, and an online presentation that included the survey at the end. Section 5.2 (Local Support) provides more information on outreach efforts.

Does this project comply with the anti-displacement policies of the Feasibility Study Requirements?

Yes

If Yes, Describe how anti-displacement policies were considered.

In promoting a healthier environment and improving air quality, green space, and recreation while creating a significant number of local jobs and educational opportunities for the community, the Project will not displace any residents either directly or indirectly, and no affordable housing will be affected by the Project in any way. While the Project will provide community benefits through improved facilities and additional greening at the park, these improvements will be designed to serve the existing community and not spur gentrification. Outreach efforts will engage community members affected by the Project and authorities overseeing gentrification, displacement, and housing affordability, including local non-profit organizations and the City Council District office. The Project will comply with any County-wide displacement policies and any specific anti-displacement requirements associated with other funding sources.

1.3 Project Description

Attachments for this Section	
Attachment Name	Description
1.3 - Description - Valley Plaza.pdf	Project fact sheet.

Which regional water management plan includes the proposed project (SWRP, E/WMP, IRWMP, or other [must identify and justify as equivalent per 18.07.B.1.c.3]):

The Valley Plaza Park Stormwater Capture Project is included in the Upper Los Angeles River (ULAR) Enhanced Watershed Management Program (EWMP) Implementation Plan for compliance, identified as subwatershed IDs 664949, 665249, and 668649 as part of the Stormwater Capture Parks Program. The Project is also included in the ULAR Integrated Regional Water Management Plan (IRWMP). A support letter from the ULAR EWMP Watershed Management Group, included in the Attachment for Section 5.2 (Local Support), confirms that the Project is included in the ULAR EWMP Implementation Plan and that it offers benefits to the disadvantaged community in which it is located.

Provide a detailed description and historical background of the project. Please also state which regional water management plan includes the proposed project (SWRP, E/WMP, IRWMP, or other [must identify and justify as equivalent per 18.07.B.1.c.3]):

The Valley Plaza Park Stormwater Capture Project (Project), included in the ULAR EWMP and IRWMP, is a proposed regional multi-benefit project led by the Los Angeles Department of Water and Power (LADWP) in collaboration with the Los Angeles Department of Public Works Bureau of Engineering (BOE), Los Angeles Sanitation and Environment (LASAN), and Los Angeles Department of Recreation and Parks (RAP). Located in City Council District 2 (CD2), this project is part of the Stormwater Capture Parks Program, which will capture and infiltrate stormwater throughout various parks within the northeastern region of the San Fernando Valley to improve the City of Los Angeles' (City's) water quality and water supply while also providing community enhancements for the park and the disadvantaged community (DAC).

This multi-benefit Project will improve water quality in the Tujunga Wash watershed by implementing nature-based solutions and will increase local water supply by recharging the groundwater basin. The Project will alleviate localized flooding in this area of the San Fernando Valley, which is in very high need of park improvements according to the Los Angeles Countywide Parks and Recreations Needs Assessment. New and improved park amenities, the addition of native vegetation, development of educational signage to promote sustainability awareness, and the creation of new, local jobs will also benefit the local community and are among many other reasons why the Project has been able to secure the support of multiple community-based organizations.

The Project will add a minimum of 181 trees to the park, upgrade athletic equipment with input from the community, include a proposed pedestrian trail along the open channel, and add park benches, hydration stations, and educational signage throughout the park. Other key features include new lighting, permeable pavement and native landscaping for a school parking lot, and replacement and improvement of the irrigation system. Electric vehicle (EV) charging stations are also proposed for the recreation center parking lot. Park improvements will be finalized with input from the community through outreach and engagement. Please refer to the Attachment for Section 2.1 (Configuration) for more details, tables, and figures.

Valley Plaza Park is strategically located at the bottom of two sub-tributary areas. To improve the water quality for the ULAR Watershed while contributing to the groundwater supply, the proposed Project will divert, treat, and infiltrate approximately a total of 590 AF of stormwater annually from a 1,133 acre total drainage area. The Project will comply with any County-wide displacement policies as well as with any specific anti-displacement requirements associated with other funding sources. As currently envisioned, the Project will not displace individuals or buildings, and it will not spur gentrification in the Project area.

2 DESIGN ELEMENTS

This section provides an overview of the project design details.

2.1 Configuration

The following table is a summary of the project configuration:

Project Configuration Summary	
BMP Type:	Infiltration Facility
Infiltration Footprint Area:	3.3 ac
Ponding Depth:	10 ft
Media Layer Depth:	0.01 ft
Media Layer Porosity:	0.4 ft
Underdrain Layer Depth:	0 ft
Underdrain Layer Porosity:	0 ft

Calculated Storage Volume	
Module-generated Storage Volume:	33.0132 ac-ft

Please upload a description and detailed schematic of the project layout including its anticipated footprint and key components such as, but not limited to: inlets, outlets, diversion point, recreational components, nature-based components, pumps, treatment facilities, underdrains, conveyance, above ground improvements, and other project components.

Attachments for this Section	
Attachment Name	Description
2.1 - Configuration - Valley Plaza.pdf	Overview of Project components.

2.2 Capture Area

The size and land uses of the capture area upstream of a project plays an important role in its water quality and water supply benefits. The capture area information here is used by the Module for scoring:

Capture Area Summary	
Capture Area:	1133.3 ac
Impervious Area:	585.9 ac
Pervious Area:	547.4 ac

The following table is a summary of the land use breakdown for the area that drains to the project:

Breakdown of Impervious Acreage in Capture Area

Land Use Type	Percent Impervious	Acres
Single Family Residential	31.7 %	185.7303
Multi Family Residential	11.2 %	65.62079999999999
Commercial	6.2 %	36.3258
Institutional	1.8 %	10.5462
Industrial	17 %	99.60300000000001
Highways and Interstates	10.5 %	61.519499999999994
Secondary Roads and Alleys	21.1 %	123.62490000000001
Vacant	0.5 %	2.9295

The following table is a breakdown of the municipal jurisdictional areas within the project capture area:

Breakdown of the Municipal Jurisdictional Areas within the Project Capture Area		
Municipal	Tributary Percent	Acres
Los Angeles	100 %	1133.3

Attachments for this Section	
Attachment Name	Description
2.2 - Capture Area - Valley Plaza.pdf	Overview of Project capture area, including jurisdictional and land use breakdown.

Has a shapefile of the project capture area has been uploaded to the project?
Yes

2.3 Diversion

Diversion Structures generally apply to 'off-line' regional projects where stormwater is diverted from a major water conveyance (e.g., gravity main) and directed to the project at a predetermined maximum rate. Smaller distributed projects, like bioretention, do not normally utilize these devices.

Does the project have a diversion structure?

Yes

The following table provides details on the diversion type and maximum diversion rate:

Diversion Details	
Type of Diversion	Typical Max Diversion Rate (cfs)
Pumping	80 cfs

Estimated Average Inflow Captured by Project:

0.38 cfs

Description of Diversion:

The Project will contain two diversion structures. The northern diversion will consist of a storm drain drop inlet structure and pump station with flows of up to 30 cfs. The southern diversion will consist of a grated drop inlet and a 3 foot high air inflatable rubber dam within the Central Branch Tujunga Wash. This diversion is anticipated to have a typical maximum diversion rate of 50 cfs. Diversion is anticipated to occur during all dry-weather periods for the nuisance flows while for wet-weather events, it will flow at a continuous combined maximum rate of 80 cfs until the storage is full. The estimated average dry weather inflow captured by the Project is 0.38 cfs. This dry weather inflow was inputted as the "Estimated Average Inflow Captured by Project" based on the SCW Projects Module requirement included in a tooltip in this section. More detail on the diversions, BMPs, conveyance, and pretreatment systems can be found in the Attachment for Section 2.1 (Configuration).

2.4 Site Conditions & Constraints

Please provide an upload for each of the attachments below that describes the methods, outcomes and how the information will be incorporated into the project design.:

The geotechnical site investigation at Valley Plaza Park was conducted between April 13, 2020, and April 29, 2020. Onsite activities consisted of soil boring, sampling, and logging; seismic cone penetration testing (SCPT); and temporary infiltration well installation, testing, and abandonment. The geotechnical investigation found that on-site soil at the site predominantly consists of fine to medium sand with silt (SP-SM and SW-SM) and silty sand (SM). The upper 5 feet, approximately, is believed to consist generally of artificial fills, while the material below consists of young alluvium. Some locations have a greater percentage of silty material in the upper 5 to 20 feet below ground surface (up to 36 percent at one location). Research has shown that the site's historic high groundwater level for Project North and Project South is 55 feet and 45 feet below ground level, respectively, which is about 150 to 190 feet higher than what was recorded during recent groundwater monitoring near the site. These findings are not atypical and are largely attributed to wide-scale drawdown of various aquifers that occurred as a result of regional development throughout the last century. Groundwater was not encountered to the depths explored during the geotechnical site investigation, and, with the suggested data, groundwater will not impact the proposed structures. Based on the geotechnical investigation, the effective drawdown rate is assumed to be 2.3 in/hr for Valley Plaza Park North and 3.7 in/hr for Valley Plaza Park South, averaging at 3 in/hr. The draft Soils Investigation Reports for Valley Plaza Park North and Valley Plaza Park South are included in the Attachment for Section 2.4.1 (Soils Investigation Reports).

For this Project, the Los Angeles County Watershed Management Modeling System (WMMS) was used within the Loading Simulation Program C++ (LSPC) to determine the peak flow and volume for the 85th percentile design storm event and the long-term, 10-year continuous time series (Water Year 2002 to Water Year 2011) for the average annual values. The model explicitly accounts for land uses with unique runoff characteristics (depression storage, initial abstraction, etc.) to generate the 24-hour hydrographs and the peak flow rate and storm volumes. LADWP acknowledges that there are differences between the SCW Projects Module outputs and the modeling results in the Hydrology and Hydraulics Memorandum, which are attributed to different objectives and model versions used. The full Hydrology and Hydraulics Memorandum can be found in the Attachment for Section 2.4.2 (Hydrology & Hydraulics).

To construct the diversion structures within the Central Branch Tujunga Wash, a use agreement with LACFCD is needed. Easements will grant BOE and LASAN permanent access to portions of RAP properties to maintain proposed facilities. Access easements may also be required. Confirmation of conceptual approval by LACFCD is included in the Attachment for Section 2.4.3 (ROW & LACFCD Approval).

As a part of the Project's pre-design phase, a preliminary utility investigation revealed that stormwater, waste water, drinking water, natural gas, and telecommunications infrastructure currently exist at the project site. However, no known utilities interfere with the proposed Project. Please refer to the Attachment for Section 2.4.4 (Utility Investigation) for details and maps on identified utilities. A detailed utility investigation will be conducted during the design phase of the Project for all underground and conflicting utilities not readily identifiable during the pre-design phase.

A preliminary review was conducted based on environmental documents available on the State Water Resources Control Board's (SWRCB) GeoTracker website (2020) that show groundwater monitoring wells both on site (MW 22A and MW-22B) in the central portion of the park and adjacent to the site. These wells are associated with the Hewitt Pit Landfill, a closed municipal solid waste landfill that operated between 1962 and 1975. This former landfill is about 1,000 feet north of the Project in an area bounded by Saticoy Street to the north, Laurel Canyon Boulevard to the east, Raymer Street to the south, and the SR-170 freeway to the west. The landfill was capped and closed in 1975, and no manufacturing or industrial processes have been conducted on the property since. Monitoring wells on-site have shown no presence of volatile organic compounds (VOCs) in laboratory tests and no unusual odors or colors, indicating no potential presence of contamination for any of the soil samples collected.

Does the project involve LACFCD infrastructure, facilities, or right-of-way?

Yes

Please see the following attachments for additional details on geotechnical, hydrology, right-of-way and/or LACFCD, and utility conditions.

Attachments for this Section	
Attachment Name	Description
2.4.1 - Soils Investigation Reports - Valley Plaza.pdf	Soils investigation reports conducted for the Project.

Attachments for this Section	
Attachment Name	Description
2.4.2 - Hydrology & Hydraulics - Valley Plaza.pdf	Preliminary Hydrology & Hydraulics Memorandum.

Attachments for this Section	
Attachment Name	Description
2.4.3 - ROW & LACFCD Approval - Valley Plaza.pdf	Overview of Project right-of-way and confirmation of LACFCD conceptual approval.

Attachments for this Section	
Attachment Name	Description
2.4.4 - Utility Investigation - Valley Plaza.pdf	Preliminary utility investigation conducted for the Project.

2.5 Monitoring

This section provides an overview of monitoring data related to the project.

Has any monitoring data been compiled related to the project?

No

Please provide an overview of the monitoring performed to date:

N/A

Please upload a monitoring plan to measure the effectiveness of the proposed project once completed, including metrics specific to the identified benefits. Also attach supplemental information on monitoring conducted to date, if applicable.

Attachments for this Section	
Attachment Name	Description
2.5 - Monitoring - Valley Plaza.pdf	Monitoring information and example Monitoring Plan.

2.6 O & M

Provide an overview of the plan for how operations and maintenance of the Project will be carried out. Identify the responsible party and describe any technical expertise required for O&M.

As required in the Los Angeles Charter Section 580, the Project’s operations and maintenance commitments are the responsibility of the Los Angeles Department of Public Works, with the Bureau of Sanitation and Environment (LASAN) as the responsible agency. Please refer to the Attachment for Section 2.6 (O&M). An overview of the Project's O&M requirements can also be found in the Attachment for Section 2.6.

Attachments for this Section	
Attachment Name	Description
2.6 - O&M - Valley Plaza.pdf	O&M information and confirmation of responsible agency.

3 WATER QUALITY BENEFITS

This section provides an overview of project elements related to water quality benefits, including calculations used for Section A (Water Quality Benefits) of SCW Project Scoring Criteria.

3.1 MS4 Compliance

Please describe in detail how the project will support achievement of compliance with MS4 Permit including applicable TMDLs, role with Watershed Management Program, etc. Please clearly specify if this project is being developed as part of a Time Schedule Order for the MS4 Permit. SCW funds may be used for projects implemented pursuant to a TSO issued by the LA Regional Water Quality Control Board provided that, at the time the TSO is issued, the project is included in an approved watershed management program developed pursuant to the MS4 Permit:

The Los Angeles County Municipal Separate Storm Sewer System (MS4) permit outlines the process for developing watershed management programs to achieve compliance, such as the ULAR EWMP and IRWMP. The Upper Los Angeles River is subject to the following TMDLs:

- Los Angeles River Nitrogen Compounds and Related Effects.
- Legg Lake Trash.
- Los Angeles River Trash.
- Los Angeles River Metals.
- Los Angeles River Bacteria.
- Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants.
- Los Angeles Area Lakes TMDLs for Lake Calabasas, Echo Park Lake, and Legg Lake.

The Project is part of the Tujunga Wash watershed within the San Fernando Groundwater Basin. Valley Plaza Park and its vicinity is identified in the ULAR EWMP Implementation Plan for compliance and is identified as subwatershed numbers 664949, 665249, and 668649 as part of the Stormwater Capture Parks Program. Please refer to the Attachment for Section 5.2 (Local Support) for a confirmation letter from the ULAR EWMP Watershed Management Group. This Project is also included in the ULAR IRWMP, and it will support the region in meeting compliance goals as established by the MS4 Permit and as issued by the Los Angeles Regional Water Quality Control Board.

3.2 24-hour Storm Capacity

Please enter information below regarding key parameters of the project's capacity. The Module will use those values to estimate the 24-hour capacity:

24-hour Storm Capacity Breakdown	
Effective Draw Down Rate:	3 in/hr
Stormwater Use During 24-hr Design Event:	0 gal

Calculated 24-hour Storm Capacity	
Module-generated 24-hr Capacity:	52.8132 ac-ft
Use Project Developer estimate instead?	No
Custom Value specified by User:	N/A
Please provide a description of methods used to calculate 24-hour capacity, and attach supplemental information with details of the methodology, assumptions and calculations.	N/A

3.3 Event-based Design Details

n this section, details regarding the project inlets and outlets are provided, along with estimates generated for the project design event. The event-based information is envisioned as basic estimates that would be generated during the project design, and will support review of the project details.

Estimated Total Inflow Volume during Design Event:

41.8 ac-ft

Describe the event used for project design. Describe the portion of the peak inflow that would be retained by the project through infiltration, capture, diversion, use, or other means. Tooltip for 'Treatment Description' under outlets:

Because the Project will infiltrate all captured runoff, no outflows are expected during the design storm event. Since the peak of the 85th percentile storm is greater than the diversion rate for the Project, not all runoff will be captured. However, non-diverted runoff for this design event will bypass the Project's diversion and will not be considered to be outflows.

Describe whether and how the 85th percentile is being captured/diverted. If not, is there opportunity to do so? If feasible but not incorporated, explain why. If not feasible, explain why.

For this site and drainage area, it is impractical to fully capture the 85th percentile, 24-hour storm runoff with this Project. The peak flowrate expected for the design event (160 cfs) is far in excess of the cost-effective 80 cfs diversion recommended by the full analysis. Because of this, the Project can only capture a combined 80 cfs from the design event, but the Project has been sized to effectively capture and infiltration all of the volume captured. This capture is made possible by the inclusion of two diversions with drop inlets and pipes designed to convey the optimal flow rates identified in the analysis.

The following tables detail inflow and outflow from the project during the design event:

Inlets	
Estimated Max Inflow Rate (cfs)	Total Inflow (ac-ft)
30 cfs	31.7 ac-ft
50 cfs	10.1 ac-ft

Outlets			
Estimated Max Outflow Rate (cfs)	Treated?	Treatment Description	Percent of Volume Treated (%)
None provided	N/A	N/A	N/A

Describe the methods used to generate estimates:

The WMMS model was used to perform the hydrologic modeling of the Project for the 85th percentile, 24-hour storm. WMMS provides a hydrograph resulting from the specified catchment for peak discharge and volume to a specific diversion point, along with the overall hydrograph shape. WMMS also calculates peak intensity, undeveloped and developed runoff coefficients, time of concentration, peak flow rate, and 24-hour runoff volume. According to the Los Angeles County 85th Percentile, 24-hour rainfall isohyetal map, the average rainfall depth for the drainage area equates to 1.1 inches.

3.4 Long-term Performance

This section present details of the calculation of long term (10-year) water quality benefit for Section A.1.2 (Water Quality Benefit) of SCW Project Scoring Criteria. These estimates were either generated by the Module using a 10-year hourly simulation with the Watershed Management Modeling System (WMMS), or generated by the Project Developer.

The following tables present selected primary and secondary pollutants and calculated reductions for water quality benefit per Section A.1.2 (Water Quality Benefit) of SCW Project Scoring Criteria.

Note: these estimates are based on the hourly 10-year WMMS simulation performed by the Module, or as estimated by the Project Developer.

Primary Pollutant	
Primary Pollutant	Total Zinc
Reduction Method used for Scoring	Method 2 (% Load Reduction)
Justification for selecting Primary Pollutant	Based on the Project's location in the ULAR Watershed and the water quality pollutant combinations described in the ULAR EWMP, the primary pollutant evaluated for the Project was total zinc as identified as the limiting pollutant in the ULAR EWMP (LA River Metals TMDL; 75% by 2020 and 100% by 2024).
Calculated 10-year Pollutant Reduction	92.9
Use Project Developer estimate instead?	No
Own Value	N/A
Justification for using own value	N/A

Secondary Pollutant	
Secondary Pollutant	Bacteria
Reduction Method used for Scoring	Method 2 (% Load Reduction)

Justification for selecting Secondary Pollutant	Based on the Project's location in the ULAR Watershed and the water quality pollutant combinations described in the ULAR EWMP, the secondary pollutant evaluated for the Project was bacteria (LA River Bacteria TMDL; 100% dry-weather by 2030).
Calculated 10-year Pollutant Reduction	80.3
Use Project Developer estimate instead?	No
Own Value	N/A
Justification for using own value	N/A

The following table presents calculated water quality benefit achieved by the project based on the hourly 10-year WMMS simulation performed by the Module, for all the simulated pollutants.

Note: this output includes all pollutants and methods, including those not selected as Primary or Secondary for scoring.

Pollutant Name	Method 1 (% Concentration Reduction)	Method 2 (% Load Reduction)	Method 3 (% Exceedance Reduction)
Total Zinc	45.5 %	92.9 %	N/A
Total Copper	29.6 %	90.8 %	N/A
Total Lead	26.9 %	90.5 %	N/A
Total Nitrogen	32.1 %	91.2 %	N/A
Total Phosphorous	14.9 %	88.9 %	N/A
E.coli	-51.2 %	80.3 %	N/A
Toxics	N/A	N/A	N/A
Chloride	N/A	N/A	N/A
Trash	N/A	N/A	N/A
N/A = Modeling results not available from Projects Module, must be manually generated by user			

The following table presents inflow and outflow details for calculated water quality benefit achieved by the project based on the hourly 10-year WMMS simulation performed by the Module, for all the simulated pollutants.

Note: this output includes pollutants not selected as Primary or Secondary for scoring, and reduction methods not selected for scoring.

Metric	Runoff from Capture Area	Minimally Treated Outflow from Project	Inflow into Project Inlet	Outflow from Project Outlet	Reduction by Project	% Reduction by Project
Runoff Volume (ac-ft)	722.153	88.254	678.157	88.254	589.903	86.986 %
Total Zinc (ug/L)	217.560	114.340	209.860	114.340	95.520	45.516 %
Total Zinc (lbs)	427.238	27.442	387.020	27.442	359.578	92.909 %
Total Copper (ug/L)	56.930	38.310	54.380	38.310	16.070	29.551 %
Total Copper (lbs)	111.807	9.193	100.279	9.193	91.086	90.832 %
Total Lead (ug/L)	36.630	25.160	34.420	25.160	9.260	26.903 %
Total Lead (lbs)	71.925	6.038	63.476	6.038	57.438	90.488 %
Total Nitrogen (mg/L)	4.227	2.920	4.298	2.920	1.378	32.063 %
Total Nitrogen (lbs)	8301.163	700.812	7926.769	700.812	7225.957	91.159 %
Total Phosphorous (mg/L)	0.534	0.457	0.536	0.457	0.080	14.858 %
Total Phosphorous (lbs)	1048.463	109.625	989.376	109.625	879.751	88.920 %
E.coli (#/100mL)	6.104E+004	8.861E+004	5.860E+004	8.861E+004	-3.001E+004	-51.208 %
E.coli (#)	5.436E+014	9.645E+013	4.901E+014	9.645E+013	3.937E+014	80.322 %
Toxics	N/A	N/A	N/A	N/A	N/A	N/A
Chloride	N/A	N/A	N/A	N/A	N/A	N/A
Trash	N/A	N/A	N/A	N/A	N/A	N/A
N/A Modeling results not available from Projects Module, must be manually generated by user						

4 WATER SUPPLY BENEFITS

This section provides an overview of project elements related to water supply benefits, including calculations used for Section B (Significant Water Supply Benefits) of SCW Project Scoring Criteria.

4.1 Water Supply Nexus

Please describe and clearly justify the nexus between water supply and the stormwater and/or urban runoff that is captured/infiltrated/diverted by the Project:

Because this Project uses infiltration to treat and store captured stormwater, its operation is at the nexus of stormwater management and water supply. The Project is located above the San Fernando Groundwater Basin, which is managed by the Upper Los Angeles River Area Watermaster (ULARA Watermaster). The water supply benefit realized by this Project results from an increase in the usable groundwater supply, as opposed to offsetting potable water demand. Refer to the Attachment for Section 4.1 (Nexus) for a visual representation of the anticipated flow regime and how the water supply benefit is realized. LADWP and the ULARA Watermaster have acknowledged that the Project provides a groundwater augmentation benefit. A copy of this confirmation is included in the Attachment for Section 4.1 (Nexus).

Does this project capture water for onsite irrigation use?

No

Description of onsite use by the project:

N/A

Does this project capture water used for water recycling by a wastewater treatment facility?

No

Description of water recycling by the project:

N/A

Is the project connected to a managed water supply aquifer?

Yes

If Yes, managed Aquifer Name:

San Fernando Groundwater Basin

If this project is augmenting groundwater supply, please provide confirmation that the agency managing the groundwater basin concurs with the added benefit.

Attachments for this Section	
Attachment Name	Description
4.1 - Nexus - Valley Plaza.pdf	Confirmation of added supply benefit.

4.2 Benefit Magnitude

Project Scoring Criteria Section B is based upon estimates of annual average water supply benefit. Water supply benefit can include, but is not limited to, water diverted to a separate groundwater recharge facility, into a water treatment plant, to a sanitary sewer to be converted into recycled water, etc. This section provides documentation of estimates of annual average water supply benefit.

Average dry weather inflow to project:

0.38 cfs

Describe the methods used to estimate average dry weather inflow to the project:

The average dry weather inflow was estimated using information from projects submitted to the SCW Projects Module for Fiscal Year 2019-2020 and information provided in the Hydrologic and Hydraulic Memorandum, included in the Attachment for Section 2.4.2 (Hydrology & Hydraulics). A linear regression between reported dry weather flows for these SCW Program projects and the Project drainage area was developed and was applied to the drainage area for this Project.

The following tables present calculated annual inflow the project.

Note these estimates are based on an hourly 20-year hourly WMMS simulation performed by the Module, or as estimated by the Project Developer.

Module-generated annual average inflow to project:	678.157 ac-ft
Use Project Developer estimate instead?	No
Custom Value specified by User:	N/A
Please provide a description of methods used to calculate water supply inflow values	N/A
Supporting PDF	See attached PDF if applicable.

The following tables present calculated annual average capture by the project, which is used for the Section B2 scoring calculation (Benefit Magnitude of SCW Scoring Criteria).

Note these estimates are based on an hourly 20-year hourly WMMS simulation performed by the Module, or as estimated by the Project Developer.

Module-generated annual average capture for water supply:	589.903 ac-ft
Use Project Developer estimate instead?	No

Custom Value specified by User:	N/A
Please provide a description of methods used to calculate water supply benefit	N/A
Supporting PDF	See attached PDF if applicable.

4.3 Cost Effectiveness

Project Scoring Criteria Section B2 incorporates life-cycle costs. The cost-effectiveness for water supply benefit is calculated from other sections in the Module. The calculation for B2 scoring is based on a numerator of life-cycle cost (from Design Elements > Cost) and a denominator of annual average benefit magnitude (from Water Supply > Benefit Magnitude).

Module-generated water supply cost-effectiveness:	$ 4,822.30 per ac-ft
Use Project Developer estimate instead?	No
Custom Value specified by User:	$ N/A
Justification	N/A
Supporting PDF	See attached PDF if applicable.

5 COMMUNITY INVESTMENT & LOCAL SUPPORT BENEFITS

5.1 Community Investment

This section provides an overview of project elements related to community investment benefits, which are used in calculations for Section C (Community Investment Benefits) of SCW Project Scoring Criteria.

The following table details the project's community investment benefits:

Community Investment		
Investment Type	Applicable?	Detailed Description

Does this project improve flood management, flood conveyance, or flood risk mitigation?	Yes	Flood management, mitigation, and conveyance are regional issues in the Los Angeles area, with Los Angeles County and the City of Los Angeles both maintaining regional flood control and mitigation networks. As large as these networks may be, their capacity is limited and can become overwhelmed in larger storm events. As shown in Figure 1 of the Attachment for Section 5.1 (Community Investment Benefits, Local Support, & Nature-Based Solutions), the Project will address a significant number of flooding complaints that have been reported within a two-mile radius of the drainage area and continue to persist under existing conditions. This portion of the San Fernando Valley has a well-documented history of flooding issues that are especially severe during large storm events. The multi-benefit Project will capture 590 AF of stormwater annually, meaning that 590 AF of water is being diverted from the flood control system. Said another way, this Project will add 590 AF of capacity to the system downstream of the Project. In lowering the pressure on the system by removing a significant amount of flow, businesses and residents downstream of the Project should see significantly increased effectiveness of the flood mitigation systems, especially during heavier storm events. The Project is expected to especially benefit the surrounding disadvantaged communities (DAC).

Does this project create, enhance, or restore park space, habitat, or wetland space?	Yes	To enhance park space and improve the habitat for birds and other species, a minimum of 181 additional trees will be planted. Native vegetation will also be added to the nonprofit school that is located on-site. Clustering trees in a grove like configuration will further enhance ecosystem benefits, including wind blocking and noise reduction, which will create a more pleasant environment for students and park goers. The trees will harbor wildlife ranging from birds and squirrels to insects, which with time will create a harmonious ecosystem wherein trees that are in close proximity to each other will enable outputs from one species to serve as inputs for others. Many of these California-native trees will especially provide habitat for native species that are stressed in the urban environment. Where deemed acceptable after careful study, new types of tree species may be introduced. The Project will also lay out new grass throughout the park and a new irrigation system that will facilitate the upkeep and maintenance of greenery to allow continuous active use of the site across the seasons. The Project also offers a number of new recreational opportunities for the surrounding disadvantaged communities, as described below and in the Attachment for Section 5.1.

Does this project improve public access to waterways?	Yes	The existing Los Angeles County Flood Control District (LACFCD) access road, located immediately adjacent to the Central Branch Tujunga Wash waterway, is currently blocked off from park users by a chain link fence that is in poor condition. Improvements will include removing deteriorating fencing to allow the park to extend onto the existing access road and to provide additional native vegetation. By opening up the access road and enhancing it with landscaping and DG pedestrian trails, the Project will expand the park usage and improve access to the waterway. A new fence along the channel will improve safety for park-goers and will be more aesthetically pleasing than the existing fencing. During design, incorporating educational features into the fencing can be explored. Educational signage will be implemented to include factoids about the Los Angeles River's ecology, including plants and wildlife that are currently a part of the river's ecosystem. Figure 2 of the Attachment for Section 5.1 provides a visual of the proposed pedestrian trail and new fencing. Figure 4 illustrates the location of the waterway relative to the park.

Does this project create or enhance new recreational opportunities?	Yes	The Project will upgrade the athletic equipment at the northern end of the park, include a proposed pedestrian trail along the open channel for improved recreation, and add park benches, hydration stations, and educational signage throughout the park. Other key features include new lighting, new sod, and replacement and improvement of the park's irrigation system. Figure 3 and Figure 4 of the Attachment for Section 5.1 provide visual overviews of key recreational improvements. The parking lot of the school located at Valley Plaza Park North is currently in poor condition. The Project proposes to replace and improve the school's parking lot with permeable pavement, incorporating native landscaping throughout the surrounding area. Similarly, the parking lot at Valley Plaza Park South will be replaced with permeable pavement and will feature surrounding native landscaping. As is the case with the other LA park projects that are included in the Stormwater Capture Parks Program, LADWP may supply the parking lot with EV chargers in an effort to encourage a reduction in local carbon emissions. Figure 5 and Figure 7 of the Attachment for Section 5.1 illustrate proposed improvements to these parking lots.

Does this project create or enhance green spaces at school?	Yes	The Project will add trees and California-native vegetation throughout the park, which is expected to benefit the nonprofit school that is located on-site and operated by Volunteers of America. The enhanced greenery will be enjoyed by students, teachers, staff, and parents. The Project also proposes to replace the parking lot for the nonprofit school with permeable pavement and to incorporate native landscaping in the area immediately surrounding the school and parking lot. Figure 3 of the Attachment for Section 5.1 outlines the location of the school relative to the added greenery at the parking lot and throughout the park. Figure 5 provides a more detailed visual representation of the proposed improvements to the parking lot of the school.
Does this project reduce heat local island effect and increase shade?	Yes	In addition to replacing any trees impacted by construction, the Project will add at least 181 trees to provide shade and help reduce the heat island effect. Upon maturity, 181 trees will provide an estimated 90,500 square feet of new canopy, assuming 500 square feet of added canopy per tree. The added trees and vegetation will provide shade and increase carbon sequestration.
Does this project increase shade or the number of trees or other vegetation at the site location?	Yes	Because the Project is located near major highways in a densely populated area, adding trees and vegetation will greatly benefit the community's air quality. According to the US Forest Service Center for Urban Forest Research Tree Carbon Calculator, each tree will sequester approximately 34 pounds of carbon annually. This equates to at least 6,154 pounds annually for the minimum of 181 trees to be added by the Project. Additional sod and added native vegetation will provide additional air quality and carbon sequestration benefits.

5.2 Local Support

Please describe any prior outreach and engagement conducted for this project:

The Project was able to garner support from several organizations because it provides crucial benefits to the disadvantaged community, ranging from improved recreational opportunities to an enhanced local ecosystem with air quality benefits. The Project benefits a broad swath of the community including students, seniors, and families of all socioeconomic backgrounds. This community is considered a disadvantaged community and is in an area underserved by parks. These benefits will be most significant for residents in the community served by the park. Please refer to the Attachment for Section 5.2 for community support letters.

Public outreach has been initiated for the Project. Because face-to-face community meetings are not possible due to the COVID-19 pandemic, the team held virtual community meetings and prepared informational materials to lead public participants to a survey about park renovation landscape concepts and options. The materials include a printed informational mailer that contains the survey, outdoor banners that provide contacts so the public can find information and the survey online, and an online presentation that concludes with the survey. Throughout the planning process, virtual meetings with key stakeholders were held, and coordination for community meetings began either virtually or in traditional face-to-face formats. Please refer to the Attachment for Section 5.1 for a summary table of outreach conducted and sample photos of outreach banners at the parks.

Please describe the Outreach Plan for this project moving forward:

The outreach strategy for the Valley Plaza Park Stormwater Capture Project was centered on identifying appropriate stakeholders and engaging them in the Project's development. LADWP and BOE will reach out to the adjacent neighborhoods, schools, organizations, park users, and community leaders. The public will actively engage and collaborate with the Project team, learning about the possibilities and offering local knowledge and ideas. Public involvement strengthens the stormwater capture projects and influences design improvements to the park and flood control improvements in nearby neighborhoods.

Below is a list of anticipated events for the Project.
- Early 2021 Councilmember Update Briefings.
- Early 2021 Outreach to Neighborhood Council and Key Stakeholders.
- Spring-Summer 2021 Outreach to Park Neighbors and Users.
- Ongoing 2021 Presentations to Groups/Organizations.
- Ongoing 2021 Project Information Online and Other Means.

The Outreach Plan will be in keeping with the watershed planning goals for engagement in DAC areas. Objectives will include:
- Work collaboratively to involve DACs, community-based organizations, and stakeholders in planning efforts to ensure balanced access and opportunity for participation in the planning process.
- Increase the understanding and, where necessary, identify the water management needs of DACs.
- Develop strategies and long-term solutions that appropriately address the identified DAC water management needs.

Amidst the current COVID-19 pandemic, community outreach and engagement plans will require adapting to a safe process for receiving community input from residents and stakeholders. This Project's outreach objectives include encouraging stakeholders and community members to participate, build support for LADWP's Stormwater Capture Parks Program, create new meaningful opportunities for participation, and utilize a hybrid of traditional and innovative outreach methods that meet current COVID-19 pandemic requirements while maximizing community input. To meet the objectives, the outreach program plans on creating an interface with LADWP to develop and manage a community database (including residents and stakeholders) to maintain communication on project progress, disseminate new information, and invite community members to virtual meetings.

Does this demonstrate strong local, community-based support?

Yes

The following table details the support by local, community-based organizations for the project (also see attachments):

Local Support		
Organization Name	Description	PDF
Pacoima Beautiful	Pacoima Beautiful is a grassroots environmental justice organization that provides education, impacts local policy, and supports local arts and culture to promote a healthy and sustainable San Fernando Valley.	Pacoima Beautiful Support Letter
Council for Watershed Health	The council's mission is to advance the health and sustainability of our region's watersheds, rivers, streams and habitats - both in natural areas and urban neighborhoods.	Council for Watershed Health Support Letter
Mountains Recreation and Conservation Authority	The MRCA is dedicated to the preservation and management of local open space and parkland, wildlife habitat, watershed lands, and trails in both wilderness and urban settings, and to ensuring public access to public parkland.	MRCA Support Letter.pdf
Council District 2	Council Member Paul Krekorian, representative for City of Los Angeles Council District 2, has expressed support for the Project.	Council District 2 Support Letter.pdf

ULAR EWMP Watershed Management Group	The ULAR EWMP Watershed Management Group consists of 19 agencies (including 17 Cities) covering 485 square miles of watershed. Electing to work collaboratively with each other, these agencies are developing a comprehensive approach to stormwater management by maximizing capture and use of urban runoff for groundwater recharge while creating green spaces for the community.	ULAR EWMP WMG.pdf

6 NATURE-BASED SOLUTIONS

This section provides an overview of project elements that leverage nature-based solutions, which are used in calculations for Section D (Nature-Based Solutions) of SCW Project Scoring Criteria.

Does this project implement natural processes?

Yes

Natural Processes Description:

The Project is focused on using natural processes to achieve its multi-benefit objectives, using infiltration to convey a large amount of water to the underground aquifer. As it is percolating into the ground, the captured water will undergo a measure of soil-aquifer treatment that will improve water quality. Upon extraction, the water will undergo additional treatment to meet drinking water standards. Adding new grasses, trees, and other vegetation will also enable natural processes to filter surface water flows, uptake atmospheric carbon, and generate oxygen. As the trees grow, they will provide shade to the area, further reducing the heat island effect. These elements are all built around a project that enhances park space through new or upgraded facilities, enhances habitat through additional native vegetation, and improves usable open space through revival of grassy areas throughout the park.

Does this project utilize natural materials?

Yes

Natural Materials Description:

Trees and other vegetation will be added throughout the park. There will be a preference for California-native vegetation, which is proposed throughout the park and at the parking lot areas. Refer to Figures 3, 4, 5, and 7 of the Attachment for Section 5.1 (Community Investment Benefits, Local Support, & Nature-Based Solutions) for illustrations of landscaping components that will be added to the park and parking lot areas. All other vegetation added is expected to be California-native and California friendly. Table 2 in the Attachment for Section 5.1 is an example initial tree list, but specific species of trees and other plants will be confirmed during the detailed design phase of the Project. Any introduction of a new type of tree species or vegetation will only be possible after careful study. All planting will be chosen to avoid straining the maintenance capacity of park staff.

Description of how nature-based solutions are utilized to the maximum extent feasible. If nature-based solutions are not used, include a description of what options where considered and why they were not included.

The Project aims to maximize nature based solutions by incorporating vegetation, trees, and green space to the maximum extent feasible.

Permeable pavement enhances water-capture benefits and helps reduce surface runoff. Since the only impervious areas in the Project footprint are the parking lots, which will be replaced with pervious pavement, the Project is removing 100% of the impervious area in the Project footprint. The Project footprint consists of areas where the infiltration galleries will be installed, as these are the only areas that will experience ground-disturbing activities. Refer to Figure 5 and Figure 7 of the Attachment for Section 5.1 for before and after illustrations of the proposed changes to the parking lots at Valley Plaza Park.

The following table details the impermeable area removed by the project:

Removed Impermeable Area by Project

Pre-Project Impervious Area:	Post-Project Impervious Area:
1.35 ac	0 ac

7 COST & SCHEDULE

This section provides an overview of the project's funding and community support, which are used in calculations for Section E (Leverage Funds and Community Support) of SCW Project Scoring Criteria.

7.1 Cost & Schedule

Attachments for this Section	
Attachment Name	Description
7.1 - Cost & Schedule - Valley Plaza.pdf	Estimates of capital cost, annual O&M cost, and Project schedule.

The following tables provide details on the project's phase and annualized costs:

Phase Costs			
Phase	Description	Cost	Completion Date
Design	Design, pre-design, geotechnical, environmental, outreach, permitting, grant applications, grant reporting.	$ 8,425,000.00	12/2021
Construction	Bid & award, construction, construction management, post-construction management, outreach, grant reporting.	$ 45,005,000.00	10/2026
Total Funding:		$ 53,430,000.00	

Annual Cost Breakdown	
Annual Maintenance Cost:	$ 123,850.00
Annual Operation Cost:	$ 0.00
Annual Monitoring Cost:	$ 267,150.00
Project Life Span:	40 years

The following table provide details on calculated life-cycle costs for the project (either calculated the Module, or estimated by the Project Developer**).**

Note: these life-cycle costs are used in Section 4.3 of this output for Water Supply Benefit scoring.

Module-generated Life-Cycle Cost for Project*	$ 61,944,169.19
Module-generated Annualized Cost for Project*	$ 2,844,689.79
Use Project Developer estimate instead?	No
Custom Value specified by User:	N/A
Please provide a description of methods used to calculate Life Cycle costs, and attach supplemental information with details of the methodology, assumptions and calculations:	N/A
Supporting PDF	See attachment if applicable.

*Applies an annual discount rate as a static rate equal to 3.375%. The only costs not included in total life-cycle cost are the dismantling and replacement costs at the end of life.

7.2 Cost Share

Is additional funding being provided as a Cost Share for this project?

Yes

The following is a summary of what other sources of funding were explored and/or why funding could not be secured through these other sources:

LADWP has committed to matching 50 percent of the total capital cost of the Project. The dollar-to-dollar funding match, which will rely on LADWP's general fund, will support the Project as it moves through the construction phase and create a significant number of new jobs while prioritizing local hire. Documentation of leveraged funds is included in the Attachment for Section 7.2 (Cost Share).

LADWP is committed to improving public health and the environment and will continue to seek additional funding sources, such as grants and leveraging internal resources to support this and other stormwater projects in the City. Some alternative funding sources include the Clean Water State Revolving Fund, the Infrastructure State Revolving Fund, the 2014 California State Water Bond (Prop 1), the Integrated Regional Water Management Grant Program, the Title XVI Water Reclamation and Reuse Program, and the Water Infrastructure Finance and Innovation Act. While alternative sources of funding have not been secured as of the date of this report, LADWP is continuing to explore a variety of funding options.

The following table details the additional funding attained for the project:

Additional Funding				
Type of Cost Share	Sub-Phase Description	Funding Amount	Funding Status	PDF
Other	LADWP has committed to matching 50 percent of the total capital cost of the Project conditional upon approval of the SCW Program funding request corresponding to the Project.	$ 26,983,000.00	Commitment Received	7.2 - Cost Share - Valley Plaza.pdf
Total Funding:		$ 26,983,000.00		

7.3 Funding Request

Total funding requested

$ 26,447,000.00

The following table shows the requested schedule of funding (by Year and Phase) to create a summary table. A breakdown for the first five years must be provided. The schedule of funding must also match the Requested Funding. In most cases, the entries will not add up to the estimated Life-Cycle cost, as Applicants are discouraged from including long-term O&M costs beyond five years in the funding request.

Funding Requested by Year & Phase			
Year	SCW Funding Requested	Phase	Efforts during Phase and Year
Year 1	$ 529,000.00	Design	Pre-design, design, geotechnical, environmental, outreach, permitting, grant applications, grant reporting.
Total Year 1	$ 529,000.00		
Year 2	$ 794,000.00	Design	Design, geotechnical, environmental, outreach, permitting, grant applications, grant reporting.
Total Year 2	$ 794,000.00		
Year 3	$ 1,677,000.00	Design	Design, environmental, outreach, permitting, grant applications, grant reporting.
Year 3	$ 439,000.00	Construction	Bid & award, construction.
Total Year 3	$ 2,116,000.00		
Year 4	$ 2,910,000.00	Construction	Construction, construction management.
Total Year 4	$ 2,910,000.00		
Year 5	$ 4,232,000.00	Construction	Construction, construction management.
Total Year 5	$ 4,232,000.00		

Funding requested beyond 5 years	$ 15,866,000.00	Construction	Construction, construction management, post-construction management, grant reporting.
Total Funding requested beyond 5 years	$ 15,866,000.00		
Total Funding:	$ 26,447,000.00		

The Life-cycle costs do not match Total Funding Requested + Cost Share. For many projects this is acceptable because funding requests for O&M and monitoring funding are typically included for first 5-years only (rather than entire life cycle).

8 ADDITIONAL FEASIBILITY INFORMATION

This section presents additional information regarding project feasibility and technical details gathered during project design and feasibility assessment.

8.1 Environmental Documents and Permits

Environmental Documentation:

1. **Identify the lead agency for the Project per CEQA.**
2. **Identify environmental documentation (e.g. EIR, MND, ND, Exemption) that has been completed or will be prepared for the Project.**
3. **Discuss the current status and schedule for preparation and notification of environmental documentation.**
4. **State if NEPA is required and identify the lead agency under NEPA, and environmental document (e.g. EIS, FONSI, Categorical Exclusion) that has been completed or will be prepared for the Project.**

As the lead agency per CEQA, LADWP is developing an MND for the Stormwater Capture Parks Program projects. The MND will outline any environmental issues and define any necessary mitigation. The current status is that the Draft MND is under development by LADWP and is expected to be available for public review in October 2020. It is not anticipated that NEPA would apply, though if any federally derived funding were to be identified for the Project, that funding could trigger a need to complete NEPA documentation. Please refer to the Attachment for Section 8.1 (Environmental Documents & Permits) for more detail.

Permitting:

- **Describe all permit requirements including for the Flood Control permit. Discuss anticipated challenges associated with obtaining permits ie. time and cost. A Flood Control Permit (obtained through epicla.lacounty.gov) is required for any project affecting LACFCD right-of-way and/or facility.**
- **If a Flood Control Permit is required:**
    - **Describe how the project will affect LACFCD right-of-way and/or facility.**
    - **Provide a planning-level schedule showing the time allotted for permit review and issuance in the context of the overall project planning and delivery process**.

The Project includes alteration to an LACFCD right of way and will involve diverting stormwater from the LACFCD system. LADWP has been coordinating with LACFCD staff for all necessary LACFCD permits and will continue to do so during the design phase. Please refer to the Attachment for Section 8.1 (Environmental Documents & Permits) for more detail.

Attachments for this Section	
Attachment Name	Description
8.1 - Environmental Docs & Permits - Valley Plaza.pdf	Supplemental information on environmental work and permitting requirements.

8.2 Vector Minimization

This following provides details on vector minimization strategies.

Does the project have vector minimization plan?

Yes

Provide a description of the vector minimization plan.

Please refer to the Attachment for Section 8.2 (Vector Minimization).

Please see an attachment with proposed vector minimization plan.

Attachments for this Section	
Attachment Name	Description
8.2 - Vector Minimization - Valley Plaza.pdf	Vector minimization guidance.

8.3 Alternatives Studied

Describe alternatives that were considered and evaluated as part of the Project development:

After considering the project size and location, it was determined that Valley Plaza Park North and Valley Plaza Park South would be implemented as two separate phases. During the pre-design phase of Valley Plaza Park North, three alternatives were evaluated. Alternative 2 was the selected alternative discussed in this feasibility study. Alternative 1 suggested diverting and pumping flows up to 50 cfs from the existing storm drain, capturing approximately 540 AF per year and storing flows into three infiltration basins. Alternative 3 is similar to alternative 2, except it incorporates a network of deep drywells in lieu of underground infiltration galleries. This alternative was estimated to provide a stormwater capture of 457 AF per year. Ultimately, alternative 2 was chosen because of its sufficient diversion capture rates, infiltration gallery storage capacity, feasible maintenance requirements, and cost-saving qualities. For Valley Plaza Park South, two alternatives were considered. Alternative 2 incorporated the use of dry wells and an infiltration gallery. Despite adding drywells, the infiltration gallery's storage volume was slightly lower than that of Alternative 1. Ultimately, Alternative 1 was chosen because of its efficient use of park space to capture more stormwater runoff for greater water quality and water supply benefits.

8.4 Effectiveness

Describe the effectiveness of similar types of projects already constructed if applicable:

Examples of successful projects in the City of LA that utilized underground infiltration galleries are Sun Valley Park Drain and Infiltration System Project, Garvanza Park Best Management Practices Project, and Broadway Neighborhood Greenway Project.

8.5 Legal Requirements and Obligations

Describe any legal requirements or obligations that may arise as a result of constructing the Project and how these requirements will be satisfied:

LADWP is committed to fulfilling any obligations that arise from constructing the Project as a result of being awarded funds from the Safe, Clean Water Program.

8.6 Technical Reports

Please upload additional technical reports related to this project not provided above.

8.7 Other

Provide any additional information related to the Project as necessary:

N/A

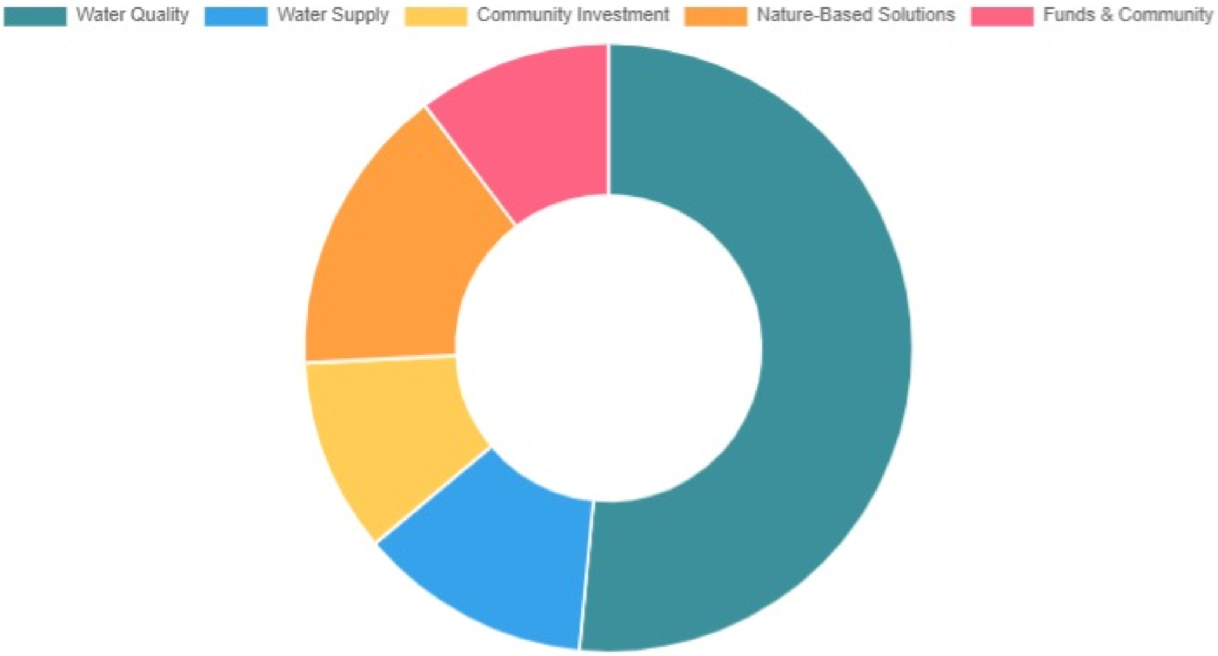
9 SCORING

This section summarizes scoring calculations generated by the Module. All Regional Program Projects must meet the Threshold Score of 60 points or more using the following Project Scoring Criteria to be eligible for consideration.

Note: all scoring estimates are considered preliminary and subject to review and revision by the Scoring Committee.

Preliminary Estimated Project Score:
97 points

The following graphics summarize the project scoring. The first graphic shows the components of the project score, based on the different scoring sections. The second graphic shows the percent of maximum score achieved by the project within each scoring section.


Water Quality
Water Supply
Community Investment
Nature-Based Solutions
Funds & Community


% of maximum score achieved
Water Quality
100
90
80
70
60
50
40
30
20
10
Water Supply
Community Investment
Nature-Based Solutions
Funds & Community

The following table details the scoring calculated for the project, along with the scoring thresholds from the SCW Project Scoring Criteria:

Scoring Section	Project Score	Max Score	Scoring Criteria Thresholds
Water Quality Wet + Dry Weather **Part 1**	20	20	Cost Effectiveness = (24-hour BMP Capacity) / (Construction Cost in $Millions) • <0.4 = 0 points • 0.4-0.6 = 7 points • 0.6-0.8) = 11 points • 0.8-1.0 = 14 points • >1.0 = 20 points
Water Quality Wet + Dry Weather **Part 2**	30	30	Primary Pollutant Reduction: • >50% = 15 points • >80% = 20 points Secondary Pollutant Reduction: • >50% = 5 points • >80% = 10 points
Water Quality Dry Weather Only **Part 1**	N/A	20	For dry weather BMPs only, Projects must be designed to capture, infiltrate, or divert 100% (unless infeasible or prohibited for habitat, etc.) of all tributary dry weather flows.
Water Quality Dry Weather Only **Part 2**	N/A	20	For Dry Weather BMPs Only. Tributary Size of the Dry Weather BMP: • <200 Acres = 10 points • >200 Acres = 20 points
Water Supply Part 1	0	13	• >$2500/ac-ft = 0 points • $2,000–2,500/ac-ft = 3 points • $1500-2,000/ac-ft = 6 points • $1000–1500/ac-ft = 10 points • <$1000/ac-ft = 13 points
Water Supply Part 2	12	12	• <25 ac-ft/year = 0 points • 25 - 100 ac-ft/year = 2 points • 100 - 200 ac-ft/year = 5 points • 200 - 300 ac-ft/year = 9 points • >300 ac-ft/year = 12 points
Community Investment	10	10	• One Benefit = 2 points • Three Benefits = 5 points • Six Benefits = 10 points

Nature Based Solutions	15	15	• Implements natural processes or mimics natural processes to slow, detain, capture, and absorb/infiltrate water in a manner that protects, enhances and/or restores habitat, green space and/or usable open space = 5 points • Utilizes natural materials such as soils and vegetation with a preference for native vegetation = 5 points • Removes Impermeable Area from Project (1 point per 20% paved area removed) = 5 points
Leveraging Funds Part 1	6	6	• >25% Funding Matched = 3 points • >50% Funding Matched = 6 points
Leveraging Funds Part 2	4	4	The Project demonstrates strong local, community-based support and/or has been developed as part of a partnership with local NGOs/CBOs.
Total	**97**	110 / 100	

10 ATTACHMENTS

Attachments are bundled and organized in the following pages, with cover pages between each subsection.

Please note – at a minimum, a feasibility study must attach the following:

- A Location Map
- A Schematic with Proposed Footprint and Key Components
- A Map of the Capture Area (Tributary Map)
- Technical Reports (e.g. soil report, hydrology report, hydraulic study, utility search, survey, PEIR, EIR, monitoring data, etc.)

ATTACHMENTS FOR SECTION 1.3:

PROJECT SUMMARY

FACT SHEET

THE VALLEY PLAZA PARK STORMWATER CAPTURE PROJECT

The Valley Plaza Park Stormwater Capture Project is a proposed regional project led by the Los Angeles Department of Water and Power in collaboration with the Los Angeles Department of Public Works Bureau of Engineering, Bureau of Sanitation, and the Los Angeles Department of Recreation and Parks. This Project is part of the Stormwater Capture Parks Program, which will capture and infiltrate stormwater throughout various parks within the northeastern region of the San Fernando Valley. The goal of this project is to improve the City of Los Angeles' water quality and water supply by pre-treatment and infiltration of stormwater while also providing community enhancements and flood mitigation for the park and the disadvantaged community.

97
POINTS

COUNTY SCORE
Safe Clean Water (SCW) Program

WET WEATHER WATER QUALITY BENEFITS

50/50

52.8 AF
Capacity

93 % Zn
Zinc Removal

80 %
E. coli Removal

SIGNIFICANT WATER SUPPLY BENEFITS

12/25

590 AF/YR
Captured

NATURE BASED SOLUTIONS

15/15

Removes **100%** of impermeable area, adds native vegetation including **~200** Trees and Native Plants

COMMUNITY BENEFITS

10/10

- ✓ Flood Management
- ✓ Park Enhancements
- ✓ New Recreational Opportunities
- ✓ Greening of School
- ✓ Increased Trees and Shade
- ✓ Carbon Reduction
- ✓ Improved Waterway Access

LEVERAGING FUNDS AND COMMUNITY SUPPORT

10/10

Total Project Est = $53M

Community Support

Council for Watershed Health

ULAR

Mountains Recreation & Conservation Authority

Pacoima Beautiful

PAUL KREKORIAN
LOS ANGELES CITY COUNCILMEMBER

ATTACHMENTS FOR SECTION 1.1:

OVERVIEW

ATTACHMENTS FOR SECTION 1.2:

PROJECT LOCATION

1.2 Location

The park is separated in two parts by Vanowen Street: Valley Plaza Park North (Project North) and Valley Plaza Park South (Project South). It is located in the North Hollywood neighborhood of the City of Los Angeles, east of the San Diego Freeway (I-405), east of and adjacent to the Hollywood Freeway (SR-170), north of the Ventura Freeway (US-101), and southwest of the Golden State Freeway (I-5).

Project North is bounded by Laurelgrove Avenue to the east, the Hollywood Freeway to the west, Sherman Way to the north, and Vanowen St to the south. Project South is bounded by St. Clair Avenue to the east, the Hollywood Freeway to the west, Vanowen Street to the north, and Victory Blvd to the south. The project location and bounding streets are depicted in Figure 1. The park is operated by RAP.

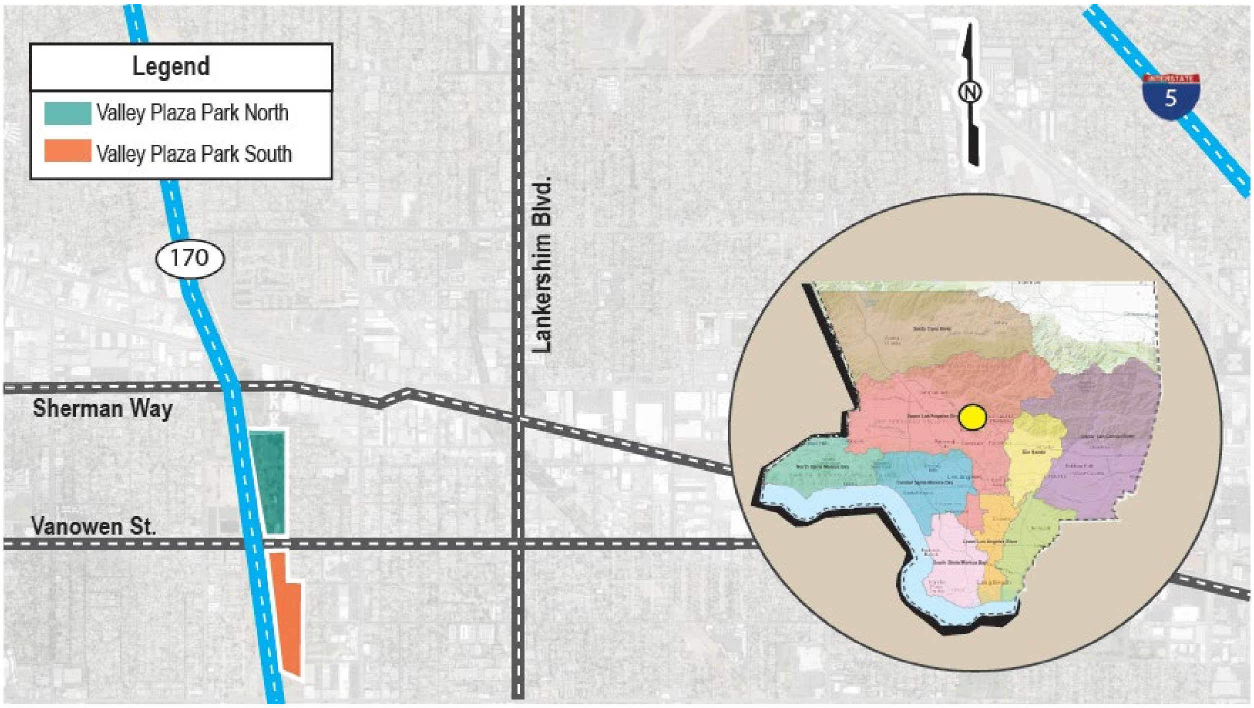


Figure 1 Valley Plaza Park Location & Bounding Streets

Based on the Los Angeles Countywide Parks and Recreations Needs Assessment, the area surrounding the project has very high park needs, as shown in Figure 2. The study, released in 2016, used a series of metrics (Park Land, Park Access, Park Pressure, Park Amenities and Park Condition) holistically to determine the need for park improvements in an area. The study accounts for the quality of parks that do exist and factors those qualities and anticipated population demand into the assessment.

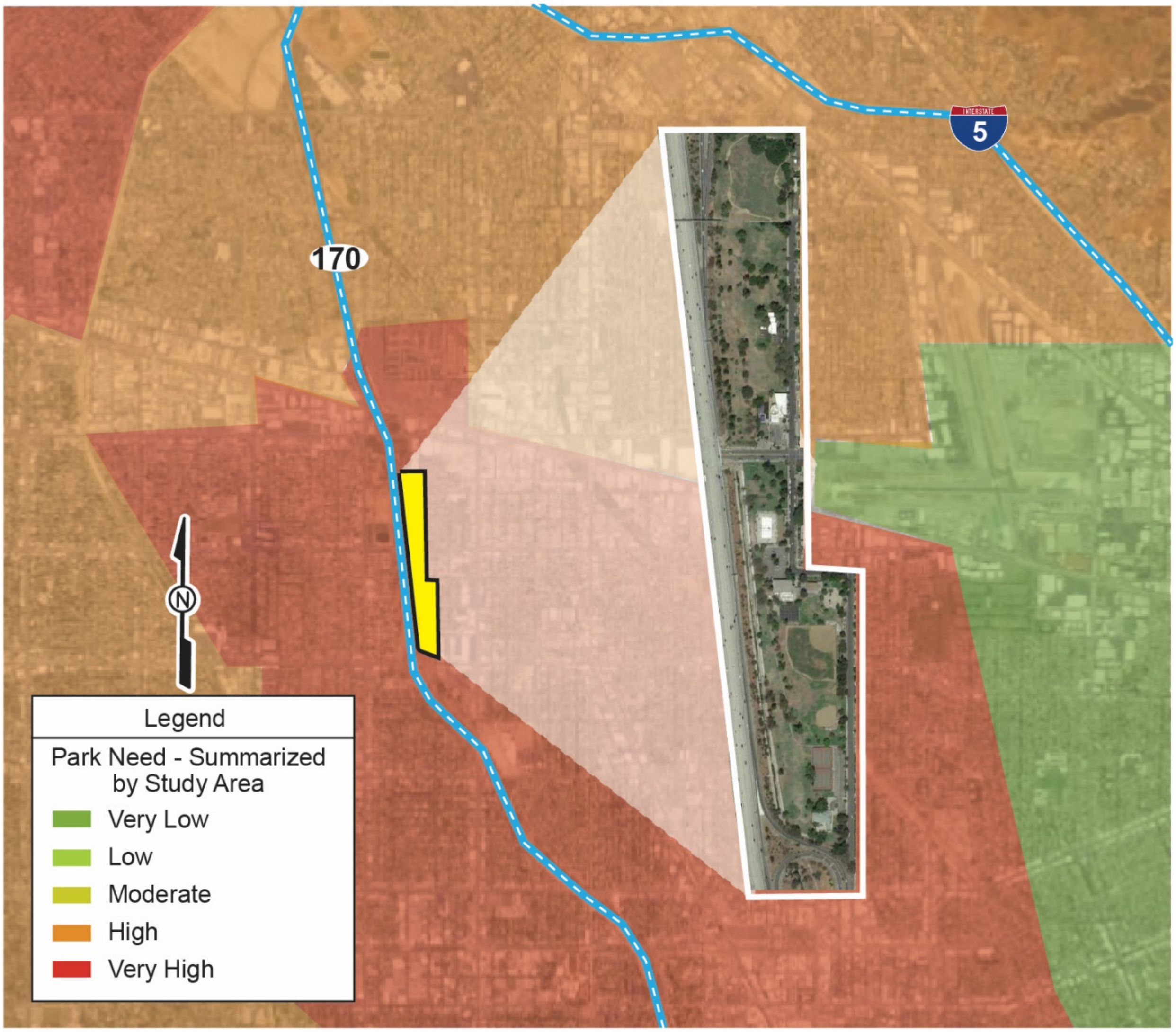


Figure 2 Map of Park Needs Surrounding Valley Plaza Park

1.2.1 The Project in the Context of the Community it Serves (DAC)

Much of the area surrounding Valley Plaza Park is considered a disadvantaged community (DAC) according to data from the SCW Program GIS Tool. DACs are defined as a census block group with an annual median household income of less than 80 percent of the statewide annual median household income. Figure 3 shows the project site and surrounding DAC areas. Across the region, these communities experience hardships such as poverty, high unemployment, air and water pollution, presence of hazardous wastes, and a high incidence of asthma and heart disease. By implementing this project, these burdens can be partially addressed, improving the neighborhood’s quality of life.

Project upgrades could be a new beginning for the surrounding community. In addition to the jobs created by construction, improvements to the park will allow the park to be a community focal point—a place for families to gather, play, and discuss the issues of the day. Strong, well-used community centers can be a base for building stronger communities in their areas.

Improvements to the park will allow the community to gather more often and for diverse recreational and educational opportunities. Improvements to the lighting will improve the experience for night games, providing much-needed after-hours activities for students and their families. Improvements to the various grassy fields will make the site more desirable to use and will therefore bring people together in the service of strengthening the community.

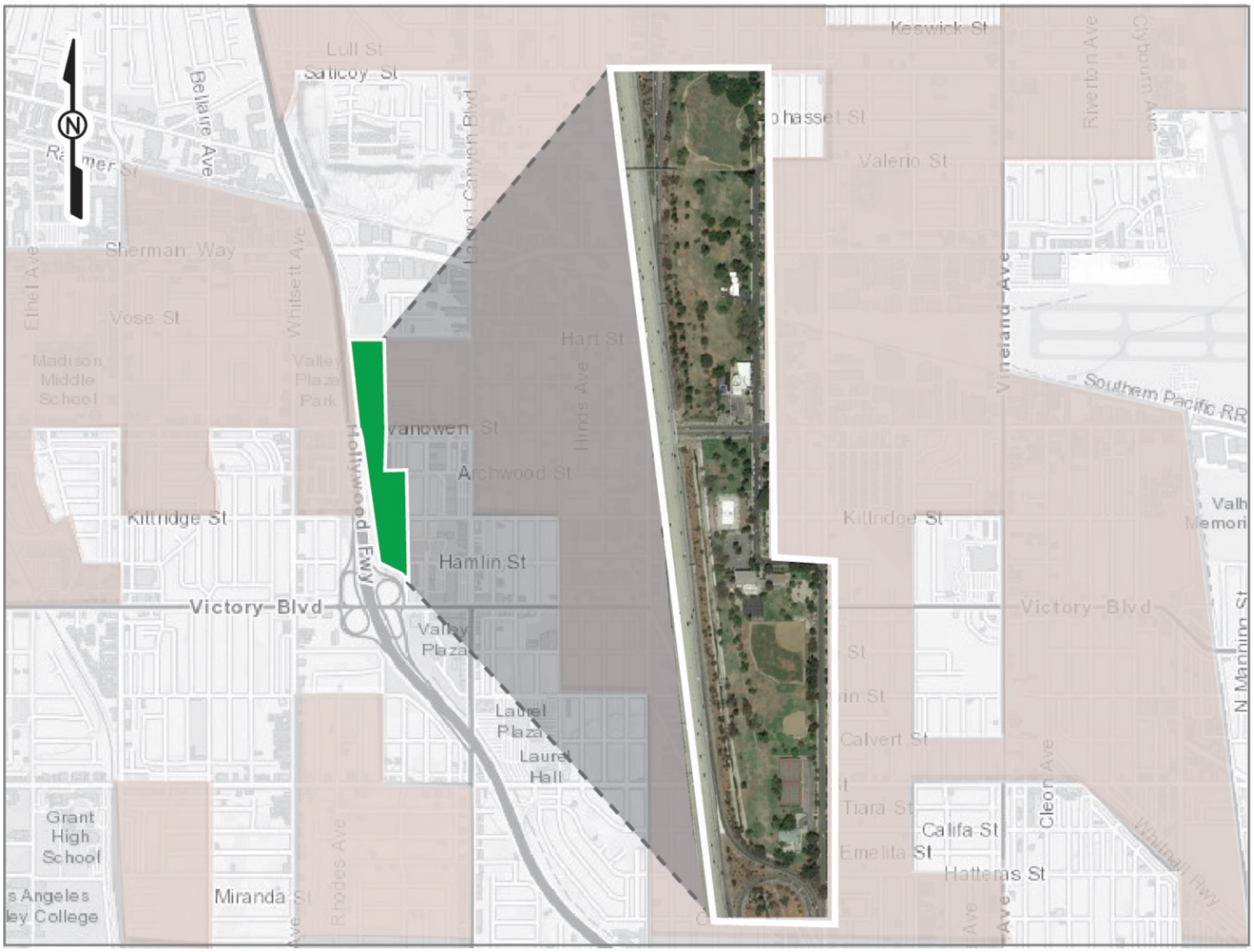


Figure 3 Disadvantaged Communities (Pink) in the Vicinity of Valley Plaza Park

ATTACHMENTS FOR SECTION 2.1:

CONFIGURATION

2.1 Configuration

The Project is divided into two segments: Valley Plaza Park North (Project North) and Valley Plaza Park South (Project South). The proposed best management practices (BMPs) consist of the following elements.

For Project North (features shown on Figure 1):

- One diversion structure: a rectangular 4 feet wide by 2 feet high reinforced concrete box (RCB) with berm and side outlet pipe located at the existing RCB storm drain west adjacent to the park.
- One actuated slide gate and trash rack following the diversion structure within the park area.
- One hydrodynamic separator pretreatment unit within the park area, following the trash rack.
- One sedimentation basin unit prior to the pumping system.
- Two infiltration basins connected via an equalization pipe to have shared capacities (a total surface area of 2.4 acres). Infiltration basin 1 is located underneath the open field adjacent to the intersection of Laurelgrove Avenue and Hartland Street, with an approximate area of 0.56 acres. Infiltration basin 2 is located within the open field, adjacent to Laurelgrove Avenue and Crew Street, with an approximate area of 1.83 acres.
- One pumping system to pump treated runoff to the infiltration basins with an approximate floor plan of 20 feet by 30 feet.
- One sediment forebay located within infiltration basin 2, sized to provide 10 to 20 percent of the total storage volume.

Figure 1 Project North Subsurface Stormwater Project Features

For Project South (features shown on Figure 2):

- One diversion structure with a rubber dam and a grated drop inlet proposed within the Central Branch Tujunga Wash located upstream of the rubber dam. A 36" reinforced concrete pipe (RCP) to allow gravity diversion from the grated drop inlet.
- One hydrodynamic separator located within the park area and upstream of the infiltration gallery.
- One sedimentation basin located within the park area and downstream of the hydrodynamic separator.
- One subsurface infiltration gallery located underneath the open field with an approximate area of 1.1 acres. The depth below ground to the top of the infiltration gallery is approximately 9 feet.

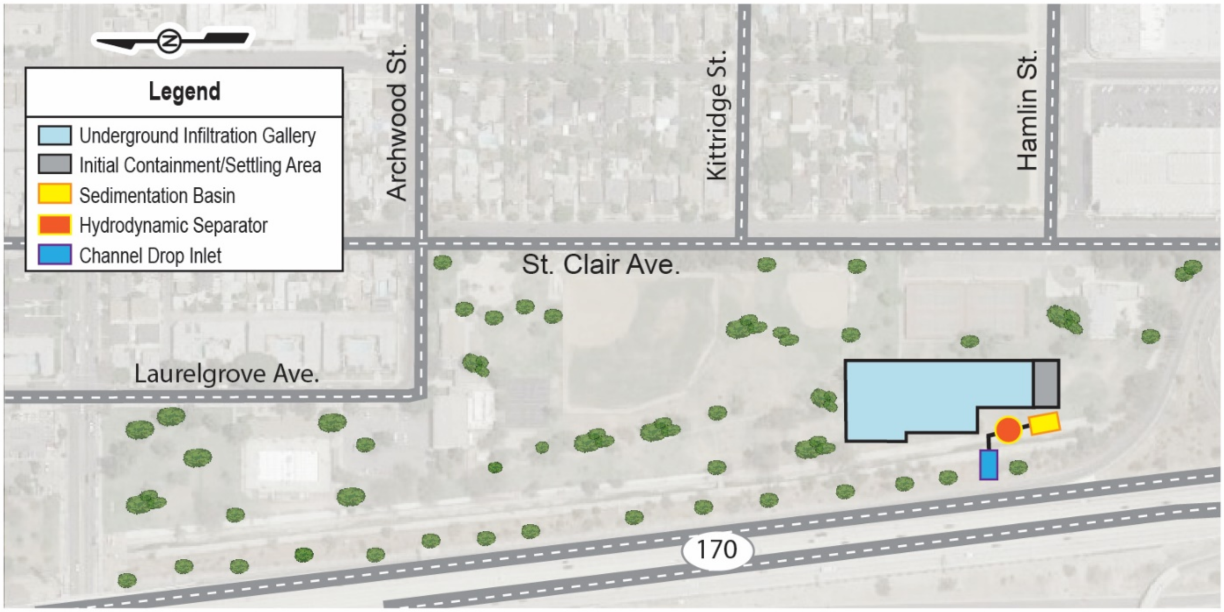


Figure 2 Project South Subsurface Stormwater Project Features

The above ground components of the Project that will be further evaluated during design for both Project North and Project South:

- Addition of durable pedestrian pavements to be used for new pathways.
- Protection of trees located near construction areas and 181 additional trees to be added throughout the park.
- Irrigation systems replaced.
- Replacement of site furniture, which will provide universal access (of width and slope meeting California ADA guidance).
- Replacement of sod throughout the parks.
- Replacement of outdoor fitness equipment/stations adjacent to walking paths.
- Addition of educational signage and improvements along the channel that would allow for pedestrian use, engage the community, and promote sustainability awareness.
- Enhancement of current LACFCD access road along Tujunga Wash to provide additional use as a walking/jogging path.

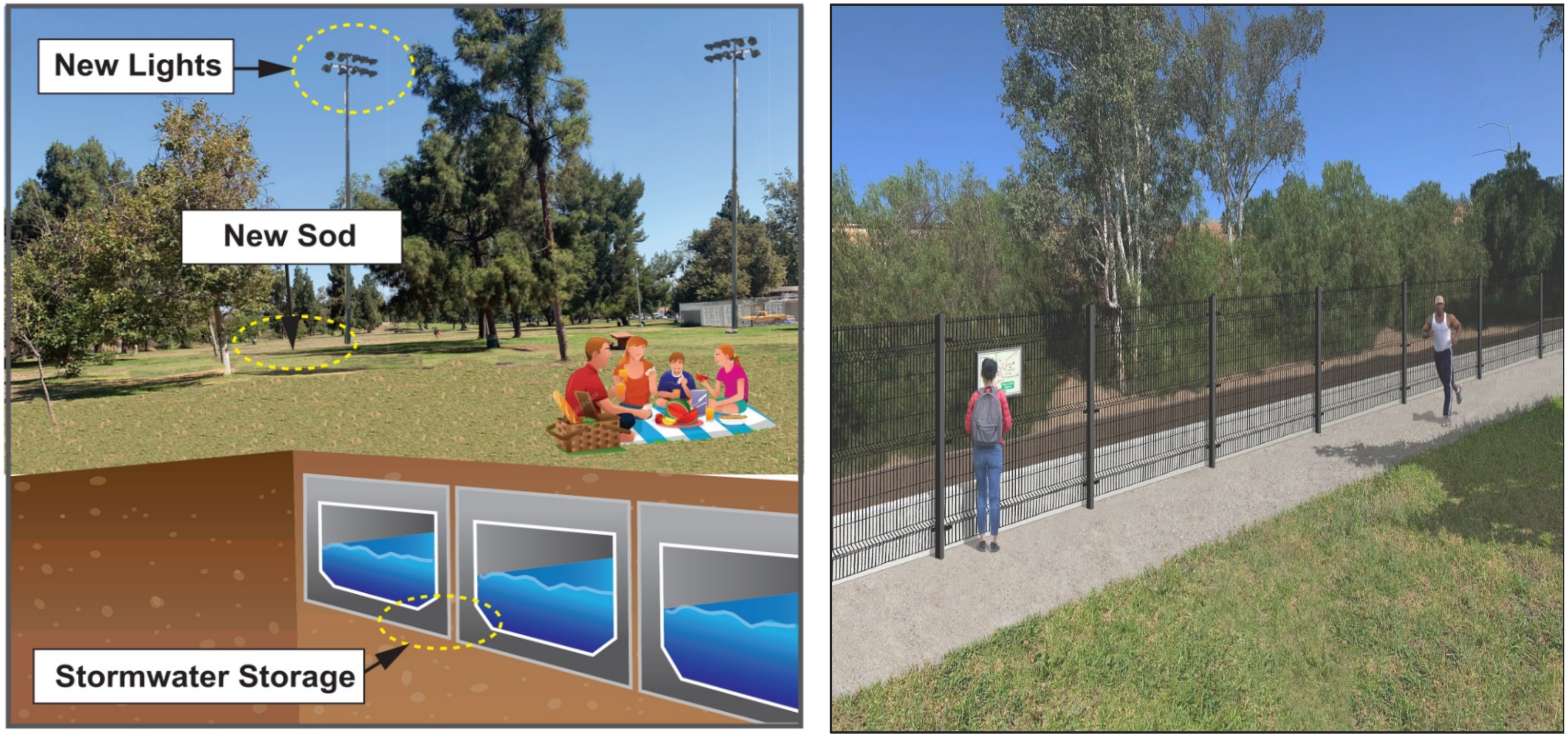


Figure 3 Illustration of Proposed Improvements

Figure 3 provides an illustration for some of these park improvements and Figures 4 and 5 provide an overview of the above ground improvements at Project North and Project South.

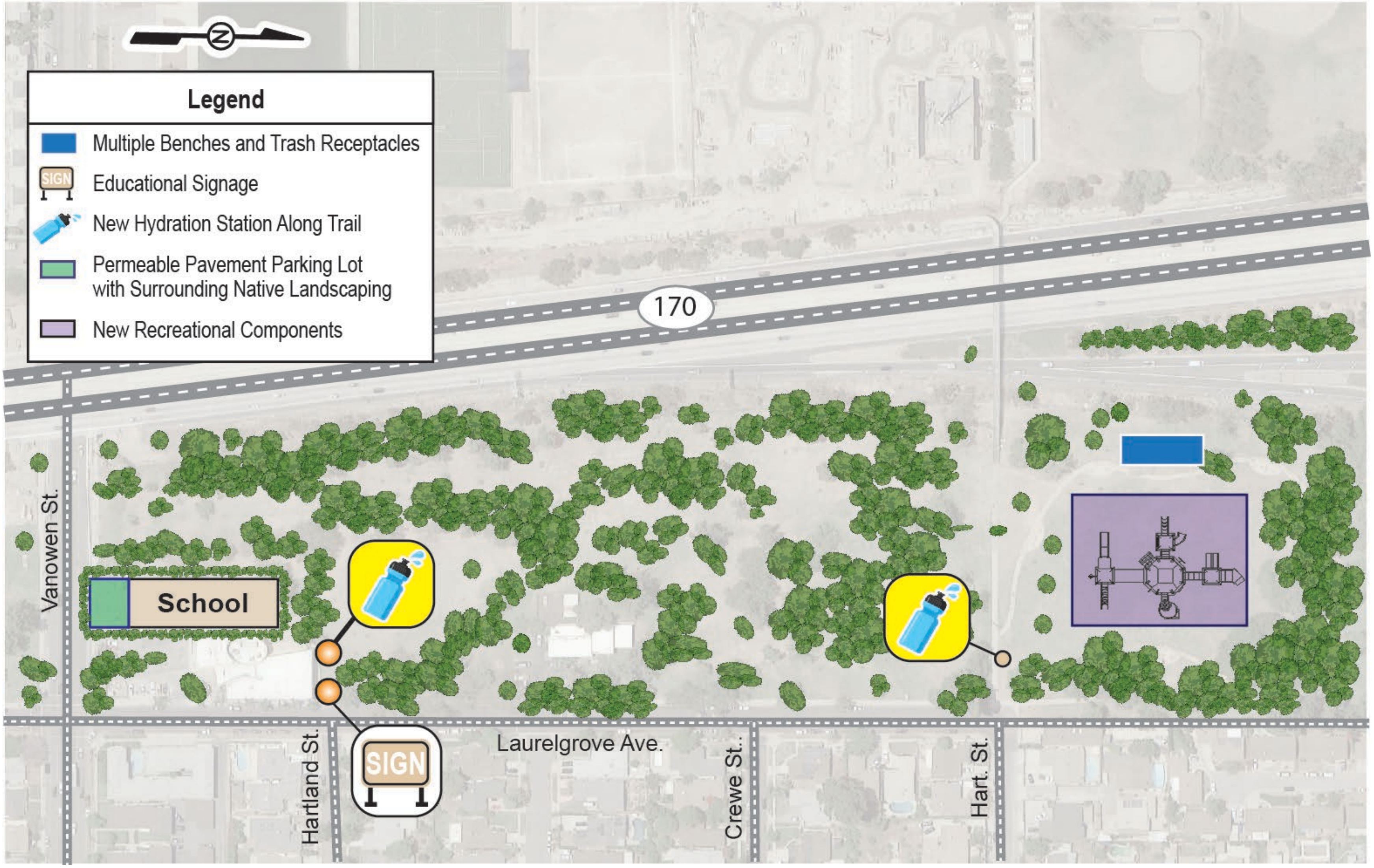


Figure 4 Overview of Above-Ground Project Improvements at Project North

Figure 5 Overview of Above-Ground Project Improvements at Project South

The following are the Project's electrical and instrumentation components:

- Additional site area lighting to match the park's existing lighting pattern.
- New 480V, 3-Phase service from LADWP with step-down transformer and 120/240V subpanel to power new stormwater pumps.
- Pumps with VFDs for increased flexibility and control of diversion operations.
- A Honeywell PLC with Human-Machine Interface (HMI) connected to LASAN's SCADA network.
- An uninterruptible power supply for the control system.
- Replace existing NEMA 3R electrical service enclosure and relocate or replace 240 V electrical service closer to electrical loads for Project South.

The Project consists of multiple infiltration galleries for the two proposed diversions. For the purposes of the SCW Projects Module evaluation, these systems are modeled individually, and the outputs are merged within this feasibility report. The module is not capable of performing calculations on two diversions and multiple storage units within a project and this aggregated method shown herein can be used to represent the infiltration gallery. The parameters are variable across the galleries and are presented in separate columns in Table 1 below with an additional column showing an aggregated volume/footprint that have been aggregated for ease of entry into the SCW Projects Module.

Table 1 Configuration Summary for SCW Projects Module

Component	Dimensions		
	North	South	Combined
Ponding Depth (ft)	10	10	10
Infiltration Footprint Area (ac)	2.2	1.1	3.3
Media Layer Depth (ft)	0.01(1)	0.01(1)	0.01(1)
Media Layer Porosity	0.4	0.4	0.4
Underdrain Layer Depth (ft)	N/A(2)	N/A(2)	N/A(2)
Underdrain Layer Porosity	N/A(2)	N/A(2)	N/A(2)
Additional Components	N/A(2)	N/A(2)	N/A(2)

Notes:

(1) Media layer is not included within the storage calculation but the module does not accept zero values. This is used to represent a close to zero value.

(2) Characteristics described do not apply for infiltration galleries.

The Project will be constructed in two phases to minimize impact to park services. Phase 1 will consist of construction of the stormwater infiltration galleries at Project North. Phase 2 will focus on the activities at Project South. These two are discussed further below.

2.1.1 Phase 1: Project North Configuration

2.1.1.1 Process Description

Dry weather runoff and stormwater from the drainage area will be diverted from the Central Branch Tujunga Wash located west of the Project area. After being intercepted by the diversion structure, the captured runoff would be routed to a hydrodynamic separator, a pump system, a sedimentation basin, and, ultimately, to the infiltration basins connected by an equalization pipe. The second basin would contain a sediment forebay. The captured runoff will percolate and help replenish the groundwater basin. A process flow diagram for the Project proposal is shown in Figure 6.

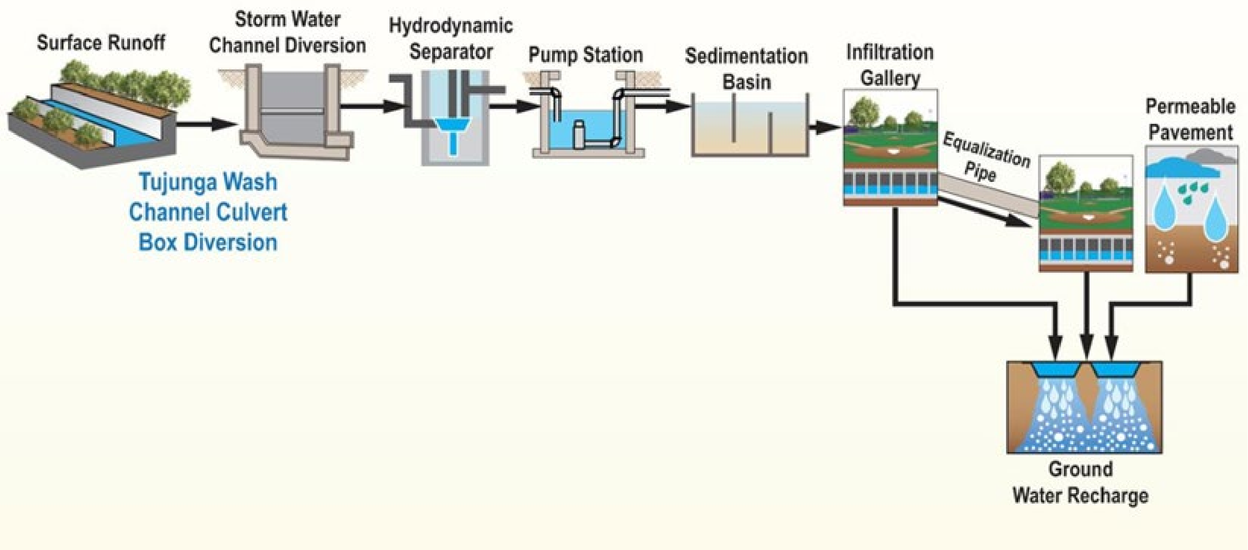


Figure 6 Process Flow Diagram for Project North (Phase 1)

2.1.1.2 Intercept Project Component: Diversion Structure

A diversion structure will be required to intercept and divert flows from the Central Branch Tujunga Wash Culvert Box. It will meet the event-based performance target of providing 30.9 AF of 24-hour stormwater management capacity, diverting flows up to 30 cubic feet per second (cfs).

The proposed diversion structure will consist of a cast-in-place concrete diversion berm inside the existing RCB storm drain with a side diversion 4 feet wide x 2 feet high RCB pipe. Freeboard of at least three inches was added to normal flow depths, providing a proposed berm height of 12 inches.

The cast-in-place diversion berm will minimize the depths of downstream infrastructure, including the slide gate and trash rack vault, the hydrodynamic separator, and the pump station. See Figure 7 for an example of a diversion berm and side outlet pipe detail.

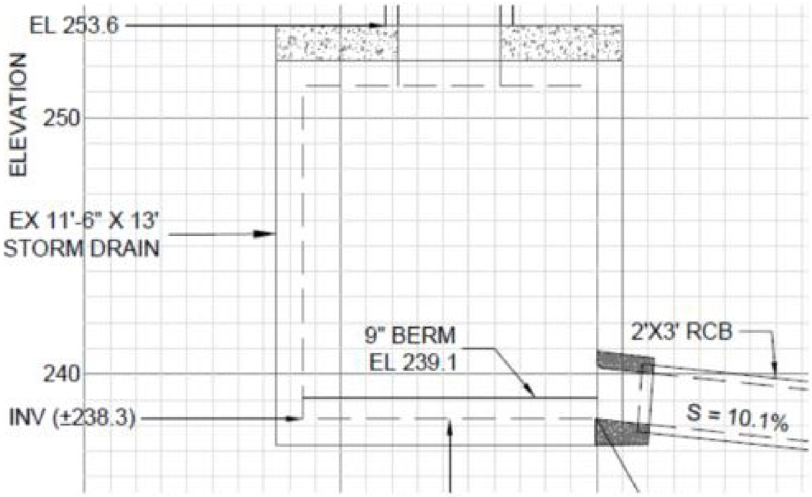


Figure 7 Example Diversion Berm and Side Outlet Pipe Detail

An actuated stainless-steel slide gate is proposed to provide adequate mechanisms for diversion system shut-off. The slide gate will be designed to operate under 15 feet of unseated head and will be electrically actuated. A custom fabricated stainless-steel trash rack and hardware are proposed to provide adequate trash screening prior to flows being routed to the hydrodynamic separator.

The trash rack will be a protruding type to maximize the screen's surface area and will be designed to have openings no greater than 50 percent of the solids passing size rated for the selected stormwater pumps. Refer to Figure 8 for examples of the proposed slide gate and trash rack.

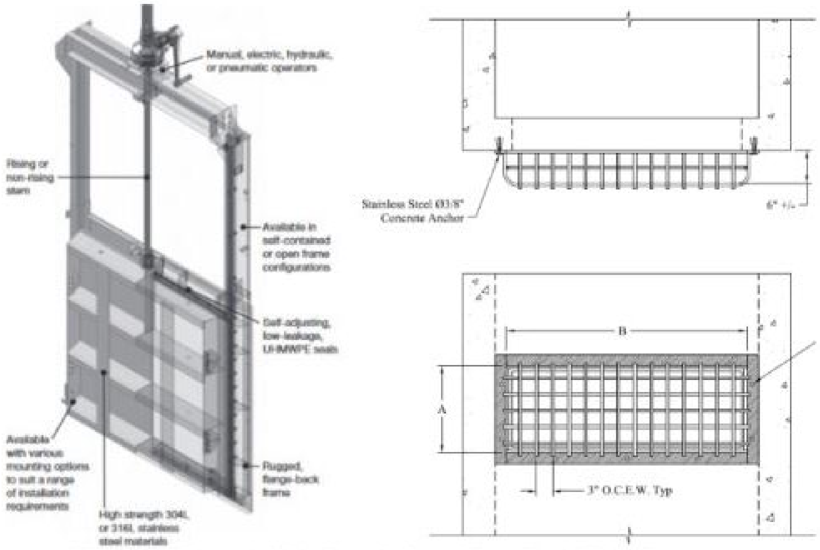


Figure 8 Example Slide Gate (left) and Trash Rack (Right)

2.1.1.3 Treatment Project Component: Hydrodynamic Separator and Sedimentation Basin

Hydrodynamic separators are proposed stormwater BMPs prior to infiltration because they are effective at removing suspended solids, oil and grease, trash, and other debris. The BioClean debris separating baffle box (DSBB) (or approved equivalent) hydrodynamic separator unit is proposed because it has a shallower profile approximately 4 feet below the outlet pipe invert. This option would place the total depth of the structure at approximately 25 to 26 feet below grade. This unit will be sized for the design flowrate and to optimize sediment storage capacity versus total depth. See Figure 9 for an illustration of this unit.

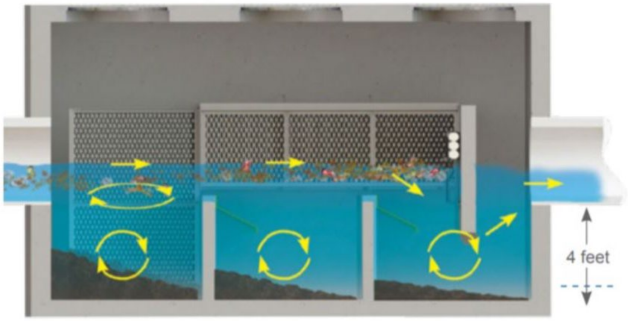


Figure 9 BioClean DSBB Hydrodynamic Separator

Following the pretreatment unit and pump system, a secondary hydrodynamic separator unit is proposed for the sedimentation basin. The Contech continuous deflective separation (CDS) hydrodynamic separator (or approved equivalent) or Jensen's Jensen Deflective Separator (JDS) hydrodynamic separator (or approved equivalent) can remove sediments compared to the traditional storage partition with a weir. Because of its location downstream of the pump station, this unit can be kept at a depth less than 25 feet below grade.

Maintenance is expected to be less intensive than what is required for the BioClean DSBB unit, since it involves two maintenance holes for vacuuming as opposed to the three maintenance holes. This unit will be sized for the design flowrate and to maximize sediment storage capacity to a practical extent. See Figure 10 for examples of the Contech CDS unit and the JDS unit.

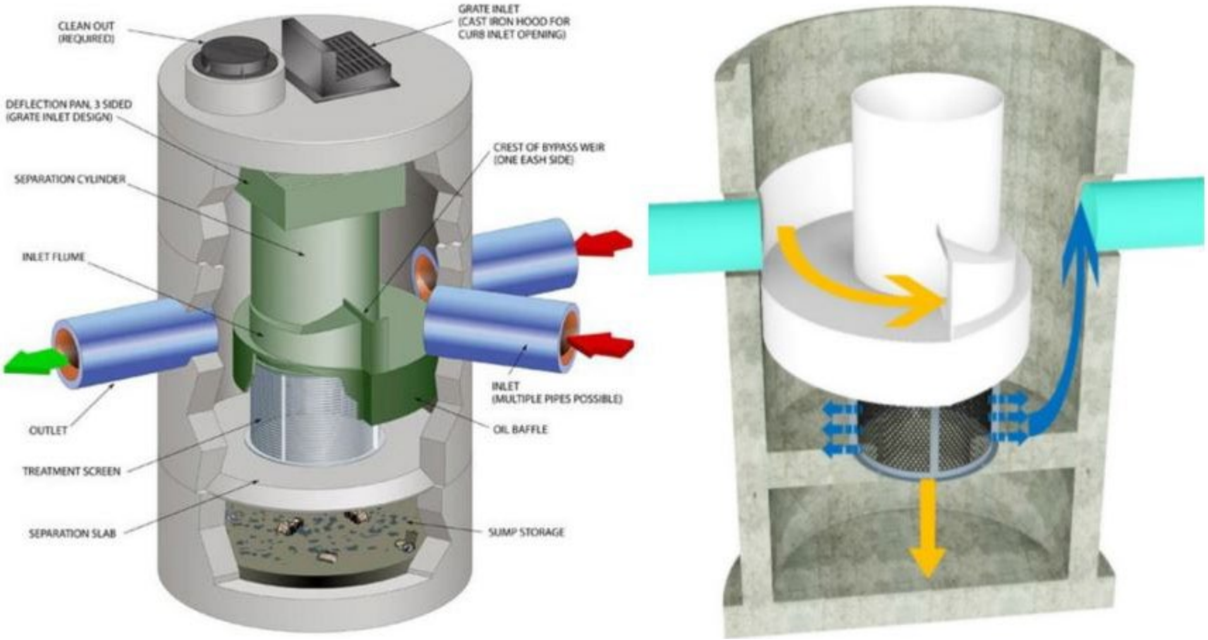


Figure 10 Contech CDS (left) and Jensen JDS (right) Hydrodynamic Separators

2.1.1.4 End Use Project Component: Pump System and Subsurface Infiltration Gallery

Because the pretreatment structures below gradeline are at large depths, a “3+1” pump configuration with a single low-flow pump is proposed to route runoff to the sedimentation basin and infiltration gallery. This configuration will have lower operational costs due to the lower horsepower required for each active pump and a reduction in cycling of pumps under certain low-flow pumping scenarios. The pump station will be designed to Hydraulic Institute (HI) standards and have an approximate floor plan of 20 ft x 30 ft to accommodate station operations.

This Project will use infiltration galleries as the primary means of infiltrating the treated stormwater into the underlying soils. Infiltration gallery systems are underground storage facilities built from modular precast concrete vaults that can be customized in various configurations to meet site-specific constraints. These systems are built with hollowed-out precast concrete bases sitting on top of permeable aggregates to facilitate infiltration.

One advantage of these systems is that they can be installed at various underground depths, allowing the space above to be reutilized. This system will be nearly invisible from above ground and will enable restoration of the park’s recreational facilities after installation.

For Phase 1, two infiltration galleries are proposed, designed to be hydraulically interconnected with an equalization pipe so they can function together. The second infiltration gallery will contain internal baffle walls partitioned within the gallery, typically sized to provide 10 to 20 percent of the total storage volume, to help remove finer sediments. To maximize this Project’s infiltration capacity, the proposed infiltration galleries are 0.56 acres and 1.83 acres.

2.1.2 Phase 2: Project South Configuration

2.1.2.1 Process Description

Wet weather and dry weather runoff will be diverted from the Central Branch Tujunga Wash west of the Project area. After being intercepted by the diversion structure (that includes a rubber dam), captured runoff will flow to a hydrodynamic separator, a sedimentation basin, and, finally, an infiltration basin containing an initial settling area. The captured runoff will percolate and help replenish the groundwater basin.

A process flow diagram for the Project proposal is shown in Figure 11. Project components are consistent with Phase 1.

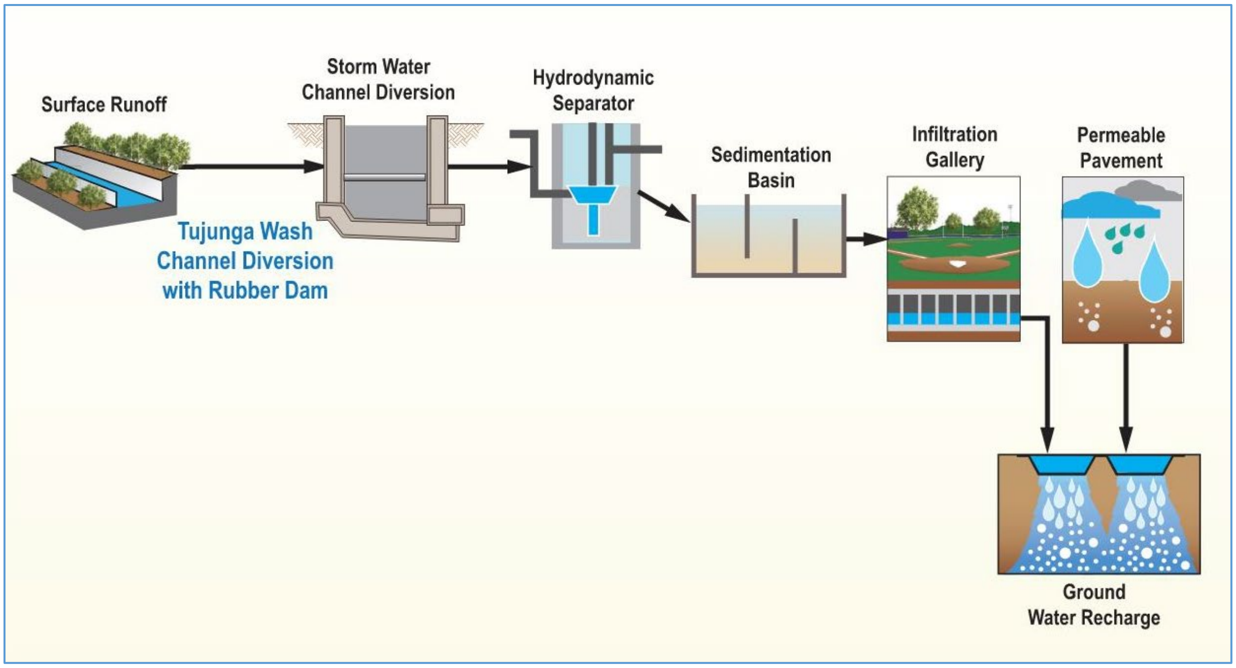


Figure 11 Phase 2 Project South Process Flow Diagram

2.1.2.2 Intercept Project Component: Diversion Structure and Rubber Dam

The diversion structure will completely capture the runoff associated with the 85th percentile storm event, diverting flows at 30 cfs. This structure would consist of an inflatable rubber dam and a grated drop inlet with a 36-inch RCP. The grated drop inlet, located downstream of the rubber dam, shall be the full width of the existing channel.

The rubber dam can be 3 feet tall when fully inflated and will match the width of the channel to impede flows and divert stormwater into the grated drop inlet. The diversion pipes will require a minimum 1 percent slope to maintain the required diversion rate. See Figure 12 for examples of the inflatable rubber dam and the grated drop inlet.

Figure 12 Inflatable Rubber Dam (left) and Grated Drop Inlet (Right)

An actuated valve will be included to respond to the conditions within the underground infiltration gallery, shutting flows off when the storage capacity is exceeded, during emergency situations, if storm drain flows enter a pressure condition, or during peak storm events. The diversion structure will be sloped toward the diversion pipe in order to prevent ponding.

2.1.2.3 Treatment Project Component: Hydrodynamic Separator and Sedimentation Basin

To effectively remove suspended solids, oil and grease, and debris, the Contech CDS or Jensen JDS hydrodynamic separator (or approved equivalent, similar to units presented previously in Figure 10) will be used to reduce migration of gross solids into the underground infiltration basin under high flows. By providing the greatest potential for capture of gross solids and the potential to meet the Trash TMDL, the hydrodynamic separator will greatly improve water quality entering the subsurface infiltration gallery. The chosen unit will be effective up to the maximum capture flow rate.

Downstream of the hydrodynamic separator, the proposed BioClean Kraken Filter (or approved equivalent) sedimentation basin will provide additional treatment of finer sediment removal. This unit uses a cartridge filtration system made up of cylindrical membrane filter cartridges, pressure fitted to a filter coupling. The filter cartridges can treat 0.05 gallons per minute (gpm) per square foot of filtration membrane surface area, and they can be cleaned and reused, providing an easy maintenance process. See Figure 13 for an example of a BioClean Kraken Filter.

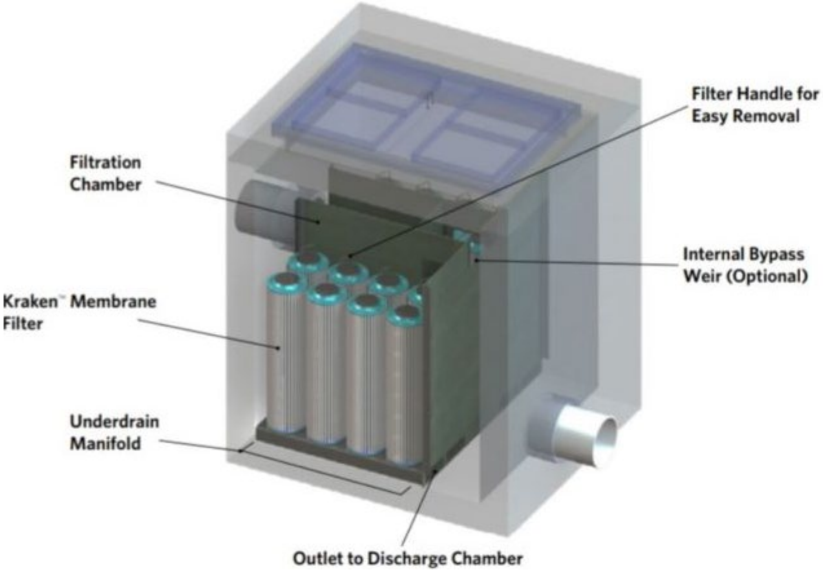


Figure 13 BioClean Kraken Filter

2.1.2.4 End Use Project Component: Subsurface Infiltration Gallery

One infiltration gallery is proposed for Phase 2. Because it has a greater void space of up to 97 percent, the StormPrism System by Precon (or approved equivalent) is the suggested subsurface infiltration gallery. Figure 14 provides examples of the StormPrism System.

The large void space creates an open system, making it easier and more comfortable to maintain. The system can be accessed through maintenance holes, which will be located strategically next to or within access paths. To maximize this Project's infiltration capacity, the infiltration gallery is expected to be 1.1 acres.

Figure 14 Example of StormPrism System

2.1.3 Recreation and Park Improvements

The Project will replace the existing parking lots in the same configuration, except they will be paved with permeable pavement and accented with California-native vegetation. The Project will offer a net increase of a minimum of 181 trees throughout the park. Additional recreation and park improvements are described in Section 2.1 of this attachment and Section 5.1 (Community Investment Benefits) of the feasibility study.

ATTACHMENTS FOR SECTION 2.2:

CAPTURE AREA

2.2 Capture Area

The drainage area for the entire Project is 1,133.3 acres, as shown in Figure 1. The drainage area is entirely contained within the City. This includes surface drainage areas based on ground elevations and the storm drain network. Table 1 provides a summary of the municipal jurisdictional area breakdown for the Project drainage area broken out into the drainage to each portion of the park (North and South).

Table 1 Jurisdictional Drainage Area

Agency	Tributary Percent	Land Area (acres)
City of Los Angeles – Local Project Drainage (Valley Plaza Park North)	81.2%	920.8
City of Los Angeles – Local Project Drainage (Valley Plaza Park South)	18.8%	212.5
Total Watershed Area		1,133.3

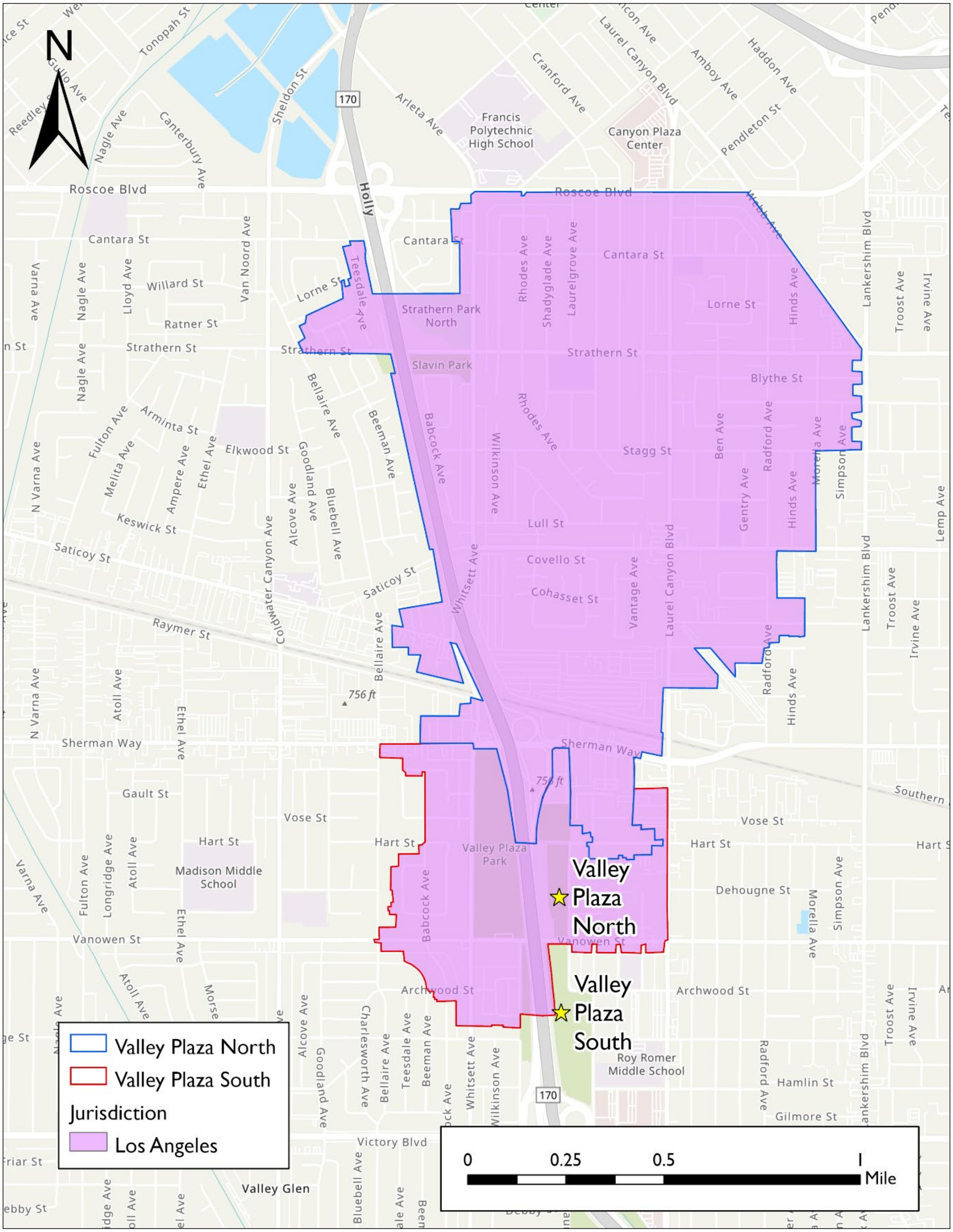


Figure 1 Drainage Area Map

Table 2 lists the land uses, area, and percent of total impervious acreage within the combined drainage area used in the development of the feasibility study. Table 3 provides the land use for each phase. Figure 2 provides the graphical representation of land use for the drainage area of the park. The 2005 land use designations were used to categorize the various land use types within the drainage area; thus, some land uses may have changed designations, redeveloped, and/or new construction completed. Based on the breakdown of land uses, the drainage area has a weighted average of 52 percent imperviousness. The percent of total impervious acreage is the breakdown of the impervious area by land use and adds up to 100 percent of the impervious area (586 acres).

Table 2 Land Use, Area, and Percent of Total Impervious Acreage Summary (Combined)

Land Use Classification	Area (acres)	Impervious Area (acres)	% of Total Impervious Acreage
Single-Family Residential	512.2	185.9	31.7%
Multi-Family Residential	97.0	65.8	11.2%
Commercial	40.5	36.3	6.2%
Institutional	12.9	10.8	1.8%
Industrial	137.3	99.7	17.0%
Transportation	67.9	61.6	10.5%
Secondary Roads	247.5	123.8	21.1%
Vacant	12.5	2.0	0.3%
Agriculture	5.5	0.0	0.0%
TOTAL	1,133.3	585.9	100%

Table 3 Land Use, Area, and Percent of Total Impervious Acreage Summary (Separated)

Land Use Classification	Area (acres)		Impervious Area (acres)		% of Total Impervious Acreage	
	North	South	North	South	North	South
Single-Family Residential	413.9	98.3	159.4	26.5	33.4%	24.5%
Multi-Family Residential	58.0	39.0	33.8	32.0	7.1%	29.5%
Commercial	30.6	9.9	27.1	9.2	5.7%	8.5%
Institutional	10.8	2.1	8.9	1.9	1.9%	1.8%
Industrial	134.6	2.7	97.3	2.4	20.4%	2.2%
Transportation	54.5	13.4	49.4	12.2	10.4%	11.3%
Secondary Roads	202.7	44.8	99.7	24.1	20.9%	22.3%
Vacant	3.2	2.3	0.0	0.0	0.0%	0.0%
Agriculture	12.5	0.0	2.0	0.0	0.4%	0.0%
TOTAL	920.8	212.5	477.6	108.3	100%	100%

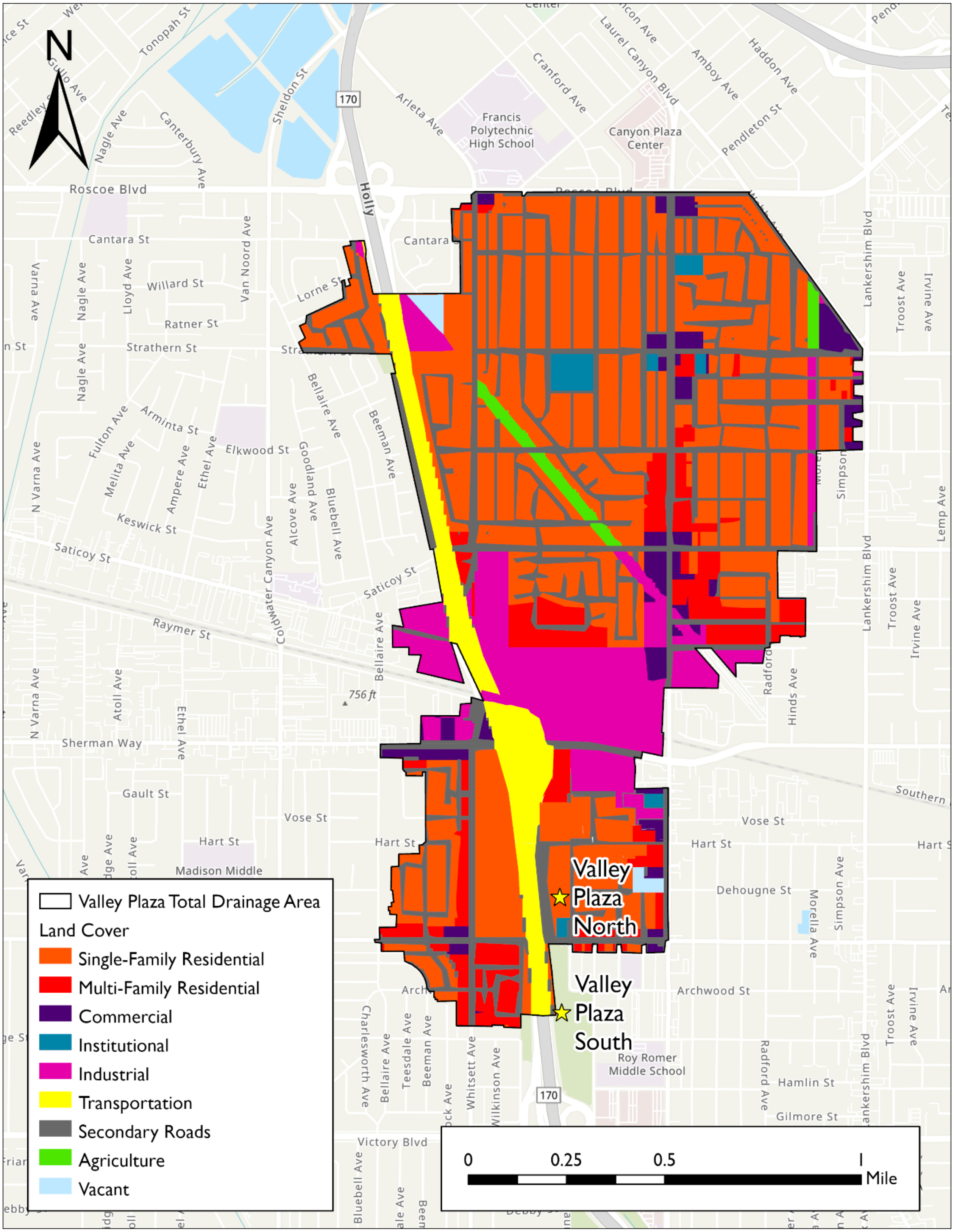


Figure 2 Drainage Area Land Uses

ATTACHMENTS FOR SECTION 2.4:

SITE CONDITIONS & CONSTRAINTS

2.4.1 Soils Investigation Reports

The geotechnical site investigation at Valley Plaza Park was conducted between April 13, 2020, and April 29, 2020 to evaluate the soil and geologic conditions at the Project site and to provide preliminary geotechnical recommendations for pre-design of the proposed stormwater BMPs. The draft Soils Investigation Reports for Valley Plaza Park North and Valley Plaza Park South are included in the following pages.

DRAFT SOILS INVESTIGATION REPORT

Task Order Solicitation (TOS) No. 25
Stormwater Capture Parks Program
Valley Plaza Park North, Los Angeles, CA

Prepared for

Tetra Tech, Inc.
707 Wilshire Boulevard
23rd Floor
Los Angeles, CA 90017

Prepared by

Geosyntec Consultants, Inc.
448 S Hill Street, #1008
Los Angeles, CA 90013

Project LA0590D

May 20, 2020

Draft Soils Investigation Report

Task Order Solicitation (TOS) No. 25
Stormwater Capture Parks Program
Valley Plaza Park North, Los Angeles, CA

Prepared for

Tetra Tech, Inc.
707 Wilshire Boulevard
23rd Floor
Los Angeles, CA 90017

Prepared by

Geosyntec Consultants, Inc.
448 S Hill Street, #1008
Los Angeles, CA 90013

DRAFT	DRAFT
Jeff Fijalka, P.E. Project Engineer	Chris Conkle, P.E., G.E. Senior Engineer

Project Number: LA0590D

20 May 2020

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ACRONYMS AND ABBREVIATIONS

ACI	American Concrete Institute
ASCE	American Society of Civil Engineers
ASTM	American Society of Testing Materials
BOE	Bureau of Engineering
Cal-OSHA	California Occupational Safety and Health Administration
CalGEM	California Geologic Energy Management Division
CalMod	California-modified sampler
CBC	California Building Code
CGS	California Geological Survey
cm/s	centimeters per second
CPT	Cone Penetration Test
DWR	Department of Water Resources
ft	foot/feet
ft bgs	feet below ground surface
GIS	Geographic Information System
GMED	Geotechnical Materials Engineering Division
LACPW	Los Angeles County Public Works
LADBS	Los Angeles Department of Building and Safety
MCEG	Maximum Credible Earthquake Geometric Mean
MCE_R	Maximum Considered Earthquake
mg/kg	milligrams per kilogram
MSL	mean sea level
MTBE	Methyl-tert-butyl ether
PAH	polycyclic aromatic hydrocarbons
PCE	Tetrachloroethene
PGA	peak ground acceleration
PGA_M	peak ground acceleration
PID	photoionization detector
ppm	parts per million
ppb	parts per billion
psf	pounds per square foot
PSI	pounds per square inch
PVC	polyvinyl chloride
RWQCB	Regional Water Quality Control Board
SBT	soil behavior type
SCPT	Seismic Cone Penetration Test
SM	silty sand
SP-SM	sands with silt
SPT	standard penetration test
SR	State Route

SVOC	semi-volatile organic compounds
SWRCB	State Water Resources Control Board
TCE	Trichloroethene
TOS	Task Order Solicitation
UIB	underground infiltration basin
USBR	United States Bureau of Reclamation
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	volatile organic compounds

1. INTRODUCTION

This report presents the results of a geotechnical investigation and summarizes geotechnical design recommendations relating to the Stormwater Capture Parks Program – Valley Plaza Park North, Los Angeles, CA (Project). This report was prepared by Geosyntec Consultants, Inc. (Geosyntec) to support pre-design planning for the Project being carried out by Tetra Tech, Inc. for the City of Los Angeles Bureau of Engineering (City). This work was conducted in accordance with the scope of work, terms, and conditions described in the Subconsultant Services Agreement between Tetra Tech, Inc. and Geosyntec Consultants, dated 29 January 2020.

1.1 Project Background

Valley Plaza Park North (the Site) is located in the East San Fernando Valley in the upper Tujunga Wash Watershed within the San Fernando Groundwater Basin. The park is south of the I-5 freeway and east of the SR-170 freeway in the North Hollywood neighborhood of the City. It is bordered by SR-170 to the west, Sherman Way to the north, Laurelgrove Avenue to the east, and Vanowen Street to the south. Refer to Figure 1 for a map of this location. The park is owned by the City of Los Angeles Department of Recreation and Parks and is one of the several parks within Task Order Solicitation 25 - Stormwater Capture Parks Program. The goal of the program is to alleviate local flooding, increase water supplies through stormwater capture, improve water quality, and provide recreational, social, and economic benefits.

Within the Stormwater Capture Parks Program, the Valley Plaza Park North concept consists of capturing runoff from an approximately 854-acre tributary area and diverting it from the Central Branch of Tujunga Wash (which is owned and maintained by Los Angeles County Public Works (LACPW)) into a 4.1-acre underground infiltration basin (UIB) constructed below the park. The basin is envisioned to store approximately 1,800,000 cubic feet of stormwater.

Valley Plaza Park North is one of nine City-owned parks within the North Hollywood area that are under consideration for inclusion in the Stormwater Capture Parks Program. Site investigations and pre-design studies are underway for each of the parks to assess each site's potential for inclusion in the program.

The conceptual design for Valley Plaza Park North indicates that stormwater will be diverted from an existing buried 12-foot (ft) box culvert that runs along the western boundary of the park between the park and the SR-170 freeway. Per the current design concept, a diversion structure near the southern end of the park will intercept the box culvert and direct water through a series of chambers where it will be lifted by pumping and sent through a sedimentation basin before ending up at the UIB. The Project components include a diversion structure from the box culvert, actuated valve vault, pump station, hydrodynamic separator, flow measuring station, and a series of interconnected underground infiltration galleries that will include an initial containment/settling area. The UIB is envisioned to be constructed using the StormTrap® precast elements in the doubleTrap® configuration to achieve the required volumes. The base of the UIB is planned to be on the order of 16 to 20 ft below existing ground surface (ft bgs). A concept-level illustration of the primary Project features is presented in Figure 2.

No at-grade stormwater conveyance or treatment features, other than access manholes, are planned, and the disturbed park facilities will generally be replaced in kind.

1.2 Purpose and Scope of Investigation

This soils investigation report was prepared to support the pre-design planning of the proposed stormwater infiltration facilities at Valley Plaza Park North. An assessment of groundwater levels, subsurface conditions, infiltration capacity, and other general geotechnical and soils parameters necessary for pre-design planning were the focus of the investigation performed. In addition to a description of subsurface conditions encountered, this report presents geotechnical recommendations relevant to the Project improvements planned at the time of this report.

Geosyntec's scope included field explorations, field testing, laboratory testing, engineering analyses and evaluations, development of geotechnical recommendations, and preparation of this report. The field exploration and field testing were carried out by Geosyntec personnel with the assistance from several subcontractors working under contract with Tetra Tech, Inc. Hollow-stem auger drilling, sampling, and SPT testing was performed by Martini Drilling. Geotechnical laboratory testing of select soil samples was performed by California Testing and Inspection, and soil chemical testing was performed by Project X Corrosion Engineers.

The results of our investigation were used to develop the geotechnical discussion, conclusions, and recommendations presented in this report regarding:

- Geologic and seismic setting;
- Surface and subsurface conditions;
- Potential geologic hazards;
- Infiltration;
- Groundwater mounding;
- Design groundwater level;
- Seismic design parameters;
- Earthwork;
- Foundations;
- Surface drainage and features;
- UIB floor slabs;
- Retaining walls;
- Utility trenches;
- Corrosion potential;
- Earthwork construction observation and testing;
- Site monitoring and maintenance; and
- Construction considerations.

The discussions, conclusions, and recommendations presented herein are specifically focused on the infiltration facilities described in this report and are not intended for other future land uses or non-stormwater structures.

1.3 Relevant Code and Standards

This report was prepared in general accordance with the following codes, standards, and manuals:

- 2019 California Building Code, Title 24, Part 2 (CBC, 2019); and
- 2017 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, American Society of Civil Engineers (ASCE 7-16).

2. GEOTECHNICAL FIELD INVESTIGATION

2.1 Investigation Summary

The geotechnical site investigation at Valley Plaza Park North was conducted between 14 April and 28 April 2020. Onsite activities consisted of soil boring, sampling, and logging, in addition to temporary infiltration well installation, testing, and abandonment. More specifically, the site exploration consisted of the following:

- Three hollow-stem auger borings (VPN-HSA-2, -4, and -8) to depths between approximately 31.5 to 52 ft bgs;
- Five hollow-stem auger borings (VPN-HSA-1, -3, -5, -6, and -7) to depths between approximately 31.5 to 53 ft bgs, with the installation of temporary infiltration test wells; and
- Five constant-head infiltration tests performed in the five temporary wells.

A summary of the field explorations is represented in Table 1. Investigation locations are depicted on the Site map contained in Figure 3.

2.2 Exploratory Borings

Geotechnical borings were advanced using a truck-mounted drill rig outfitted with a hollow-stem auger. At each boring location, a standard penetration test (SPT) was performed at 5-ft intervals to measure blow counts (N-values) and collect drive samples. Additionally, a California-modified sampler (CalMod) was used to collect ring samples. Relatively undisturbed and bulk samples were obtained at selected intervals from the borings and logged by a Geosyntec engineer. During logging, samples were screened with a photoionization detector (PID) to provide information on potential contamination. A log of each borehole is presented in Appendix A. Select soil samples were transported to the laboratory for geotechnical and soil chemical testing, as described later in this Section.

Five of the hollow-stem auger borings were converted to temporary infiltration test wells, and the remaining three hollow-stem boreholes were backfilled with a mixture of cement-bentonite grout and capped with native soils. Soil cuttings from each boring were placed into steel drums and temporarily left on site for environmental profiling prior to offsite disposal at a permitted disposal facility.

2.3 Temporary Well Construction and Field Infiltration Testing

Following completion of drilling and sampling, select boreholes were converted to infiltration wells using the following procedure:

- A 2-in diameter PVC well screen with 0.02-inch slots was placed into the boring from 19 ft to 29 ft bgs (for borehole VPN-1), from 15 ft to 25 ft bgs (for borehole VPN-3), from 35 ft to 45 ft bgs (for borehole VPN-5), from 20 ft to 30 ft bgs (for borehole VPN-6), and from 40 ft to 50 ft bgs (for borehole VPN-7).
- A solid PVC pipe with no perforations was installed in the upper region of each borehole above the screened length.
- A 3-in thick filter sand pack (Cemex Lapis Lustre #3 Sand) was placed around the slotted pipe section at each borehole.
- A 2-ft thick layer of Bentonite chips was used to fill annular space above the screened section of pipe to isolate it from the borehole annulus above (and a 2-ft thick layer of Bentonite chips was also used to fill the space under the screened section of pipe to isolate it from the borehole below at locations where the boring was originally extended beyond the infiltration well depth and then partially backfilled prior to well construction).
- Native backfill was used to fill the annular space above the Bentonite chips to the top of each well.

Three infiltration test wells were constructed with screened intervals at relatively shallow depths of 15 to 30 ft bgs to assess in-situ hydraulic conductivity in the soil zone directly below the proposed UIB. Two wells were constructed with deeper screened intervals (35 to 50 ft bgs) to assess hydraulic conductivity of deeper soil layers. Screen depths were adjusted in the field based on a visual-manual classification of the soil samples obtained from each boring, with preference given to soil layers with relatively lower fines contents.

A constant-head infiltration test was conducted at each of the five boring locations in general accordance with United States Bureau of Reclamation test method USBR 7300-89, as presented in the County of Los Angeles Administrative Manual GS200.2 [GMED, 2017]. At each location, after first saturating the zone immediately around the borehole (for a minimum of one hour), water was added to the borehole at a measured rate using a mechanical water meter and a stopwatch. The flow of water delivered to the test well was adjusted to maintain a relatively constant water level within the standpipe. Cumulative volume measurements were recorded at regular intervals until the rate of flow necessary to maintain constant head remained stable for a period of at least 30 minutes. A digital data logger was used to continuously record the water level in the well. At the end of each constant head test, falling water head within the well was recorded by the data logger after the supply of water was shut off.

Upon completion of infiltration tests, all temporary wells were abandoned by pulling out the PVC casing and screen, over-drilling the borehole down to the bottom of the temporary well, and backfilling with bentonite and Portland cement to near ground surface. Native soil was placed in the upper 1 to 2 ft of each abandoned well.

2.4 Geotechnical Laboratory Testing

Geotechnical laboratory soil testing of selected representative soil samples was performed to evaluate in-situ moisture and density, gradation, plasticity, consolidation, sand equivalent, and shear strength characteristics of in-situ soils. The results of this testing were used to aid in soil classification and evaluation of the engineering properties of the soils. Results of the laboratory testing program, along with the applicable ASTM test standard, are summarized in Table 2, with full results included in Appendix B. The results of this geotechnical laboratory testing program were used to corroborate field classifications and assist in selecting inputs for geotechnical evaluations.

2.5 Soil Chemical Laboratory Testing

Additionally, analytical testing was performed to profile the chemical composition of the soil for assessment of its potential to create a corrosive environment for onsite features constructed at or below grade. The suite of tests performed includes sulfates, chlorides, resistivity, pH, redox, sulfide, nitrate, and ammonium, in addition to several other anion and cation tests. A summary of the results of this testing can be found in Table 3. Full laboratory test results are presented in Appendix C.

2.6 Environmental Laboratory Testing

During sample logging at boring HSA-2, PID readings ranging between 0.2 and 17.6 parts per million (ppm) were recorded for soil samples collected from depths between 20 and 50 ft bgs. A portion of the sample collected from depth of 25 ft bgs at this boring location was placed in a jar and shipped to Eurofins Calscience to test for the presence of volatile organic compounds (VOCs) according to EPA Test Method 8260B. Laboratory test results indicate that none of the VOCs included in the screening were detected. Laboratory test data are provided in Appendix D.

Additionally, a reading of 0.1 ppm was recorded from the sample collected from depth of 15 ft bgs at HSA-6. No other PID detections were observed for any of the other samples collected from the Site. No unusual odors or colors indicating the potential presence of contamination were noted for any of the soil samples collected.

3. SITE CONDITIONS

3.1 Geological Setting

The San Fernando Valley is located within the Transverse Ranges Geomorphic Province of Southern California. The Valley is bounded to the north by the San Gabriel and Santa Susana Mountains, to the east by the Verdugo Mountains, to the south by the Santa Monica Mountains, and to the west by the Simi Hills [Yerkes et al., 2005]. Formation of the Valley began in the Early-Middle Miocene (~15-18 Ma.) as movement along the San Andreas Fault system caused rotation of the Transverse Ranges Province and uplift of the Santa Monica Mountains [Langenheim et al., 2011]. Basin-filling sediments are sourced from the surrounding ranges and consist primarily of silt, sand, and gravel derived from crystalline basement rocks of Proterozoic and Mesozoic age [Hitchcock and Willis, 2000].

The stratigraphy of the San Fernando Valley consists, from oldest to youngest, of the Tertiary Topanga, Modelo, Towsley, and Fernando Formations, the Quaternary Saugus and Pacoima Formations, and ten recognized units of unnamed Quaternary alluvial sediments [Yerkes, et al., 2005; Hitchcock and Wills, 2000].

Figure 4 shows the location of the Site on a regional geologic map. The park is situated within the historic flood plain of the Central Branch Tujunga Wash [Hitchcock and Wills, 2000]. Hitchcock and Willis describe the surficial geology in the vicinity of the Site as recent wash deposits consisting of sand and silty sand, underlain by Holocene alluvial fan deposits consisting of sand and silty sand with minor clay. Borehole logs from nearby groundwater monitoring wells at the Hewitt Landfill RWQCB cleanup site, approximately 1,400 ft to the north, confirm subsurface conditions generally matching the above descriptions to depths up to 404 ft bgs [Golder, 2017]. Beneath the park the base of the Saugus Formation is approximately 2,300 ft b [Langenheim et al., 2011].

3.2 Seismic Setting

The Transverse Ranges Geomorphic Province is seismically active. Ongoing deformation associated with movement along the San Andreas Fault, at the boundary of the North American and Pacific tectonic plates, is distributed through the region on a network of primarily strike-slip, thrust, and reverse faults.

A list of significant regional Quaternary faults is provided in Table 4, organized by proximity to the Site [U.S. Geological Survey (USGS) and California Geological Survey (CGS), 2020]. The first column in the table lists the names of significant nearby faults or fault zones. The second column lists the age of activity of each fault. Late Quaternary activity indicates that a fault has slipped in the last 130,000 years. Latest Quaternary activity indicates that a fault has slipped in the last 15,000 years. Historic activity as per the USGS/CGS indicates that a fault has slipped in the last 150 years. Columns 3 and 4 provide a generalized description of the orientation (strike and dip) of each fault. Quantitative estimates of average strike and average dip from the USGS/CGS database are provided where available. Column 5 lists the sense of motion of each fault. Columns 6 and 7 list the distance and direction from the Site to the surface expression or surface projection of each fault. Four listed faults have experienced relatively recent seismic activity.

- January 17, 1994, slip on the Northridge Hills Blind Thrust generated the 6.7 moment magnitude Northridge Earthquake, with an epicenter approximately 7.9 miles west of the Site [SCEDC, 2013a].
- October 1, 1987, slip on the Puente Hills Blind Thrust generated the 5.9 local magnitude Whittier Narrows Earthquake, with an epicenter approximately 21 miles southeast of the Site [SCEDC, 2013b].
- February 9, 1971, slip on the Sierra Madre Fault Zone (San Fernando Section) generated the 6.5 moment magnitude San Fernando Earthquake, with an epicenter approximately 15 miles north of the Site [SCEDC, 2013c].
- January 9, 1857, slip on the southern section of the San Andreas Fault generated the 7.9 moment magnitude Fort Tejon Earthquake, with an epicenter approximately 155 miles northwest of the Site [SCEDC, 2013d].

3.3 Site History

Aerial photos of the Site taken as early as the mid-1940’s indicate that the Site lay undeveloped along the eastern bank of the Tujunga Wash prior to development as a park in the 1970’s. Portions of the site may have been located within the bottom or along the banks of the Tujunga Wash before the installation of channelization features that helped define the eastern boundary of the waterway. During the 1960’s, the wash was diverted into a series of lined canals and buried box culverts, and the SR-170 freeway was constructed generally along the original wash alignment [UCSB, 2020].

A review of environmental documents available on the State Water Resources Control Board’s (SWRCB) GeoTracker website [2020] shows groundwater monitoring wells both on site and adjacent to the Site. These wells are associated with the Hewitt Pit Landfill (Landfill). This is a closed municipal solid waste landfill that operated between 1962 and 1975. This former landfill is about 1,000 ft north of the Site in an area bounded by Saticoy Street to the north, Laurel Canyon Boulevard to the east, Raymer Street to the south, and the SR-170 freeway to the west.

The Landfill was capped and closed in 1975, and there have not been any manufacturing or industrial processes conducted on the property since closure of the Landfill. Monitoring wells located on the Site were reported on the GeoTracker website as being sampled as recently as 15 January 2020. Two monitoring wells, MW-22A and MW-22B are nested together at the same location. Both wells are associated with the Hewitt Landfill clean-up, and both are managed by Vulcan Materials. The nested well location is shown on Figure 3.

Sampling information posted on the GeoTracker website indicates that groundwater is about 240 ft bgs and reported the following detections for contaminants of concern in the January 2020 sampling event:

PARAMETER	MW-22A RESULTS	MW-22B RESULTS	UNITS
1,2,3-Trichloropropane	0.0032	0.0077	ppb
Bromodichloromethane	Not Detected	0.067	ppb
1,2-Dichloroethane	0.16	0.31	ppb
Arsenic	0.45	0.349	ppb
1,1-Dichloroethane	0.85	0.4	ppb
Dichlorodifluoromethane	3.8	0.42	ppb
cis-1,2-Dichloroethene	2.2	0.85	ppb
Methyl-tert-butyl ether (MTBE)	1.1	0.87	ppb
Chloroform	1.1	1.1	ppb
Perchlorate	1.4	1.4	ppb
Tetrachloroethene (PCE)	13	4.3	ppb
Chromium	5.85	6.43	ppb
Chromium, Hexavalent	6	6.7	ppb
1,4-Dioxane	24	8.6	ppb
1,1-Dichloroethene	6.6	12	ppb
n-Nitrosomorpholine	13	14.1	ppt
Trichloroethene (TCE)	24	22	ppb

ppb: part per billion (ug/l)
ppt: parts per trillion (ng/l)

The Site is under the oversight of the Los Angeles Regional Water Quality Control Board (RWQCB) Region 4, and there are a number of land use restrictions for the Hewitt Pit Landfill site. Activities that may disturb the monitoring wells (i.e., MW-22B) require approval of the RWQCB. It would also be appropriate to consider briefing the RWQCB on the planned stormwater capture project to understand if there are concerns related to contaminant movements.

3.4 Surface Conditions

The Site consists of two parcels situated along both the north (4.7 acres) and south (10.6 acres) sides of an east- to west-trending asphalt concrete walking path that traverses the Site at Hart Street and provides access to a pedestrian overpass over the SR-170 freeway. In the south parcel, there are two structures: Valley Plaza Public Library at the southeast corner; and Valley Sports Office on the east side. The north parcel of the Site is bounded by the Marquee apartment homes at Sherman Way to the north. The proposed UIB are situated on both parcels.

In general, the Site is relatively flat in east-west direction, and it has a gentle slope in the north-south direction with an overall relief of approximately 15 ft. The Site elevation ranges from approximately +736 ft above Mean Sea Level (MSL) (by the Marquee apartment homes to the north end) to + 721 ft MSL (by the Valley Plaza Public Library at the south end). Along the west side of the Site, there is an existing storm drain that is bordered by the SR-170 embankment and Sherman Way Exit ramp. The freeway embankment rises approximately 10 and 20 ft above the Site with a side slope between approximately 5:1 horizontal to vertical (H:V) and 3:1 (H:V).

The Site is actively used as a recreational park with mostly grass cover and some shrubs and trees.

Available site drawings indicate a 42-in diameter storm drain running east-west in the area of Hart St. and a 10.5-ft x 12-ft box culvert. The geophysical utility locating performed in support of the drilling activities detected the presence of relatively shallow irrigation lines throughout the park.

3.5 Subsurface Conditions

3.5.1 Soils

A review of the boring logs and geotechnical laboratory test data from samples collected at the eight hollow-stem auger borings indicate that the subsurface at Valley Plaza Park North predominantly consists of fine to medium Sand with Silt (SP-SM and SW-SM) and Silty Sand (SM). The upper approximately 5 ft is believed to consist generally of artificial fills while the material below consists of young alluvium. Some locations have a greater percentage of silty material in the upper 5 to 20 ft bgs (up to up to 36 percent at one location). Based on the observed SPT blow counts, silty sand layers in the upper 25 ft have generally loose to medium-dense relative density; whereas, silty sand layers below depth of 25 ft generally become dense to very dense. Soil samples collected were generally brown in color and were slightly to moderately moist at the time of our investigation.

Cross sections of the Site developed to illustrate inferred subsurface stratigraphy are provided in Figures 5 and 6. An idealized subsurface profile, developed based on observations made during the geotechnical site investigation and the interpretation of laboratory test results, is presented in Table 5.

3.5.2 Groundwater

Groundwater monitoring reports compiled in the California State Water Resources Control Board (SWRCB) GeoTracker database [2020], Sustainable Groundwater Management Act Data Viewer [2020], and LA County Public Works (PW) Groundwater Well Database [2020] document depth to groundwater as observed in monitoring wells near the Site. According to the reports available from these sources, measured groundwater depths ranged from approximately 194 ft to 242 ft bgs between the years 2008 and 2018 at monitoring wells located between 150 ft and 2.4 miles from the Site.

Figure 7 contains an excerpt from a California Geological Survey map of "historic high" groundwater elevations in the Van Nuys 7.5-Minute Quadrangle [CGS, 1997]. Information provided on this figure indicates that the "historic high" groundwater level at the Site was approximately 55 ft bgs. This groundwater level is on the order of 140 ft to 190 ft higher than what was recorded during the recent ground water monitoring. These findings are not atypical, as the current groundwater elevation throughout many parts of the Los Angeles County is often tens of feet, and in some areas, hundreds of feet below historic high levels. This phenomenon is largely attributed to wide-scale drawdown of various aquifers that occurred as a result of regional development throughout the last century.

Groundwater was not encountered to the depths explored during the Geosyntec site investigation described in this report, and no surface springs or seeps were observed at the Site. However, groundwater levels, including regional and perched groundwater, can be influenced by seasonal variations in rainfall and irrigation, ocean tides, groundwater pumping, subsurface stratigraphy, topography, and other environmental conditions and are subject to variation.

4. GEOLOGIC HAZARDS

The geologic hazards considered as part of this investigation include surface fault rupture, strong ground shaking, liquefaction, lateral spreading, collapsible soils, expansive soils, tsunami, oil extraction, methane gas, subsidence, and other geologic hazards.

4.1 Surface Fault Rupture

Surface fault rupture is the offset or rupturing of the ground surface by relative displacement across a fault during an earthquake. Typically, Alquist-Priolo Zones are used to identify project sites susceptible to surface fault rupture. However, the California Geological Survey has not identified Alquist-Priolo Earthquake Fault Zones for the Van Nuys Quadrangle [CGS, 1998] where the Site is located. Based on the Quaternary fault and fold database for the United States [USGS and CGS, 2020], no active or potentially active faults (defined as exhibiting displacement within the last 11,000 years and 1.6 million years, respectively) are known to underlie or project toward the Site. The nearest identified faults are an unnamed possible fault in North Hollywood, the nearest projection of which is located approximately 2.1 miles south of the Site, and the Verdugo fault, the nearest projection of which is located approximately 2.5 miles northeast of the Site. In light of this, surface fault rupture is not believed to pose a hazard to the proposed Project.

4.2 Strong Ground Shaking

The Site is situated within a seismically active region and will likely experience moderate to severe ground shaking in response to a large magnitude earthquake occurring on a local or more distant active fault during the expected lifespan of the Project. As a result, seismically induced ground shaking in response to an earthquake occurring on a nearby active fault, such as the Sierra Madre fault zone, the Hollywood fault, the Mission Hills fault zone, the Verdugo fault, and the Northridge Hills fault, or a more distant regional fault, such as the San Andreas fault, is considered to be one of the primary geologic hazards affecting the Project.

4.3 Liquefaction

Soil liquefaction is a phenomenon that may occur during seismic loading when loose, saturated materials experience a significant loss of shear strength. The cyclic undrained loading induced by an earthquake increases the pore water pressure due to the contractive tendency of the loose material. This decreases the effective stress, resulting in a decrease in shear strength and stiffness. If the pore water pressure becomes equal to the total stress, the effective stress becomes zero, and liquefaction may be triggered. Manifestations of soil liquefaction may include sand boils, surface settlements and tilting in level ground, as well as lateral spreading and global instability (flow slides) in areas of sloping ground. The impact of liquefaction on structures can include loss of bearing capacity, liquefaction-induced total and differential settlement, and increased lateral and uplift pressures on buried structures.

The CGS Seismic Hazard Zone Map [CGS, 1998] for the vicinity of the Site is shown in Figure 8. The CGS map indicates that the Site is not within an area where the historical occurrence of liquefaction, or local geological, geotechnical, and groundwater conditions indicate a potential for permanent ground displacement such that mitigation would be required. A site-specific liquefaction evaluation is therefore not required. As such, no further evaluation of liquefaction was conducted.

Infiltration of treated stormwater at the Site has the potential to produce a localized increase in groundwater elevations. The scope of this investigation did not include an assessment of impacts to liquefaction susceptibility for substantially increased groundwater elevations.

4.4 Lateral Spreading

When liquefaction occurs, sloping ground or soils near a vertical face can potentially move as a mass downslope or towards the vertical face, applying lateral forces to structures and their foundations, and potentially imposing large deformations.

When lateral spreading occurs, spreading of greatest magnitude generally occurs nearest the free face and gradually diminishes with distance from the free face. Typically, portions of a site that may be impacted within a zone that extends away from the free face, a distance approximately 50 times the height of the free face, are considered to have a potential for lateral spread.

Where lateral spreading occurs, soils may also directly impose lateral loads on deep foundations and buried structures. Buried structures may move in response to these loads, resulting in serviceability concerns.

Since the Site is not situated within a Liquefaction Hazard Zone as identified by CGS, lateral spreading potential was not further investigated.

4.5 Dry Sand Settlement

Soil materials above the analysis groundwater level may be subject to dry settlement during earthquake shaking due to densification. The seismically induced dry sand settlement for free-field conditions was estimated using the SPT-based procedure of Tokimatsu and Seed [1987] and is contained in Appendix E. A further discussion of this evaluation and the results relative to the proposed improvements is presented in Section 5.

4.6 Collapsible Soils

Collapsible soil is most commonly observed in sediments that are loosely deposited, separated by coatings or particles of clay or carbonate, then subject to saturation. Infiltration of treated stormwater at the Site will result in a temporary and periodic rise in the groundwater elevation, and this rise in groundwater could change the soil structure by dissolving or deteriorating the inter-granular contacts between the sand particles. However, soils encountered at and below the proposed depth of infiltration are generally medium dense to very dense and do not exhibit signs of significant clay or carbonate bonding between particles. Hydrocollapse beneath the proposed infiltration features is not therefore not anticipated.

4.7 Expansive Soils

As discussed in Section 3.5 (Subsurface Conditions), the Site is generally underlain by sand intermixed with varying amounts of non-plastic silt. The potential for expansive behavior for these types of soil is considered very low. No significant, potentially expansive high-plasticity clay or silt layers were identified in the explorations.

4.8 Tsunami

Based on the physiographic setting of the Site, the distance to the ocean, Site elevation, and review of California Tsunami Inundation Maps [State of California, 2009], the potential for flooding from seismically induced tsunamis is low.

4.9 Oil Extraction

Based on available data from the California Geologic Energy Management Division (CalGEM) Well Finder tool [2020], the Site is located outside an area with significant well development. No existing or abandoned wells were identified within one mile of the Site boundaries. Based on the location of the Site outside of an identified oil field and lack of wells reported in the immediate vicinity of the Site, the possibility of encountering an oil well during construction is considered low.

4.10 Methane Gas

The Site is adjacent to a mapped City of Los Angeles Methane Buffer Zone. A methane survey was carried out by Ninyo & Moore between the dates of 16 April and 22 April 2020. The Methane Survey report prepared by Ninyo & Moore dated 15 May 2020 presents their findings as follows:

> *Methane concentrations and soil gas pressures detected at the site correspond to Municipal Ordinance No. 175790 methane mitigation design levels for planned structures in City of Los Angeles Methane Zone and Methane Buffer Zones. The Design Methane Concentration, Design Soil Gas Pressure, and associated Methane Design Level are as follows:*

Location	**Design Maximum Methane Concentration (ppm)**	**Percent of Lower Explosive Limit (LEL)**	**Design Soil Gas Pressure**	**Ord #175790 Methane Design Level**
MS-5	200	0%	0	Level II
Notes: ppm – parts per million LEL – methane = 50,000 ppm % – percent				

> *The site is not located in a Methane Zone, or Methane Buffer Zone, but is adjacent to a Methane Buffer Zone. Per Section 91.7104.3.6 of the City of Los Angeles Municipal Code Ordnance No. 175790, buildings located in a Methane Buffer Zone, shall not be required to provide any methane mitigation system if the Design Pressure is less than or equal to two inches of water pressure and qualifies as a Site Design Level I or II. Since this site is a Site Design Level II with soil gas pressure less than two inches of water column, no methane mitigation system is required for the proposed building footprints.*

4.11 Subsidence

Subsidence is the gradual settling of the ground surface with little to no horizontal movement which can be caused by many factors such as fluid (i.e., oil or groundwater) extraction, mining operations, or karst terrain. Within Southern California, extraction of large fluid volumes (such as water, oil, or gas) from thick layers of poorly consolidated sediments is the principal cause of subsidence. The potential for subsidence due to karst, pseudo karst, or mining features is considered very low in relation to the geologic setting and absence of large or commercial subsurface mining within the Site area. Groundwater extraction in the Los Angeles Basin prior to the 1970s contributed to the subsidence, but the majority of the subsidence resulted from oil and gas production [Chilinger, 2004]. The subsidence hazard in the Los Angeles Basin has largely been mitigated by fluid injection into various oil fields, and subsidence in this area is no longer an issue. The Site is located outside an oil field, and subsidence is not considered a hazard to the proposed construction.

4.12 Other Geologic Hazards

Other potential geologic hazards that could affect the Site include landslides, volcanic activity, and seiches. Given the relatively level topography of the Site, landslides are not considered a potential hazard. Seiches typically occur when enclosed bodies of water are seismically shaken to generate oscillations and waves, resulting in overtopping. No enclosed water bodies are located adjacent to or upgradient of the immediate Site area, and seiches are not considered a potential hazard. Given the geologic setting of the Site, volcanic activity is not likely to pose an impact on the Project.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Subsurface Infiltration

5.1.1 Field Estimates of Hydraulic Conductivity

Geosyntec used two separate methodologies to estimate the hydraulic conductivity at each infiltration test well. The first method, developed by Hvorslev and outlined by Fang [1991] and Massmann [2004] employs a formula for a well point in uniform soil.

The second estimation method, presented by the U.S. Bureau of Reclamation (USBR) [2001], is often used for gravity permeability tests and assumes that the constant head maintained within the well during testing is at a level below the top of screened section of pipe (Method 1).

Based on these two methods, the estimated hydraulic conductivity ranges from approximately $2x10^{-3}$ centimeters per second (cm/s) to $6x10^{-3}$ cm/s. The field measurements obtained at each test location are summarized in Table 6.

5.1.2 Design Infiltration Rate

The materials in which the stormwater will infiltrate classify predominantly as Silty Sands (SM) and Sands with Silt (SP-SM) and (SW-SM). As described above, based on the results of field infiltration testing, the range of hydraulic conductivity for the in-situ soil varies between $2x10^{-3}$ cm/s and $6x10^{-3}$ cm/s.

Test values are understood to vary widely, not only based on soil type (i.e., particle size, distribution, and density), but are also significantly affected by equipment and environmental variations, even if following standardized testing procedures. A reduced infiltration rate is typically selected for design based on anticipated infiltration performance, considering the variability in results from the field evaluations, potential for subsurface variability, and potential for long-term siltation.

A hydraulic conductivity of 3.2×10^{-3} cm/s, the geometric mean of the measured conductivity values, was selected to represent the subsurface conditions at the depths envisioned for infiltration at the Site. Following Los Angeles County guidance [County of Los Angeles, 2017], a reduction factor of 2 was applied to this measured value because the infiltration testing was performed in cased wells. The recommended design infiltration rate is 1.6×10^{-3} cm/s (2.2 in/hr. This infiltration rate is consistent with the typical range for the soil types encountered at the Site.

A reduction factor to account for long-term system performance has not been applied to the recommended design infiltration rate. The stormwater infiltration facility designer should consider an appropriate reduction factor (typically between 1.0 and 3.0), based on the level of de-siltation and/or pre-filtration provided, and the planned operation and maintenance program.

5.2 Design Groundwater Level

As described in Section 3.5.2, the groundwater level below the site is typically more than about 150 ft bgs. However, the infiltration galleries will create a locally elevated groundwater level when the galleries are in use. Therefore, the groundwater level for design of UIB and the facilities adjacent to the UIB (pump station, etc.) should be considered to be at the base of the nearest infiltration gallery.

During operation of the facility, water may accumulate in backfill soils surrounding the UIB in response to filling. Care should be taken in the design and operation of facilities to provide for appropriate drainage of surrounding backfill so that a differential head is not produced in the event of a drawdown of the water in the UIB.

5.3 Groundwater Mounding

When evaluating the operating practices for long-term infiltration facility operation, the potential for changes in groundwater conditions, including groundwater mounding, to occur in the surrounding area should be considered. For typical sites these changes have the potential to include the following impacts:

- Reduction in the infiltration rate and storage capacity for further stormwater infiltration;
- Seepage and ponding in low lying areas;
- Saturation of slopes, increasing potential for slope instability; and
- Effects on the geotechnical properties of granular soils (i.e., potential for liquefaction, collapse, increased lateral loads against buried structures, and buoyancy effects).

The mounding should be actively monitored and controlled to limit these potential adverse effects.

Although a specific assessment of mounding and mounding effects was not within the scope of this investigation, as a general consideration, if groundwater mounding is controlled below the historic high groundwater level of approximately 55 ft bgs, geotechnical impacts to the subsurface soils are not expected to be significant.

5.4 Seismic Design Parameters

Seismic design parameters were developed in accordance with the 2019 California Building Code (CBC) and the American Society of Civil Engineers (ASCE) Standard 7-16. The center of the park at a latitude and longitude of 34.197 degrees North and 118.402 degrees West was used to evaluate the minimum seismic design parameters presented in Table 7. The structural designer may utilize more conservative values at their discretion.

Site classification for seismic design was carried out following the guidelines of ASCE 7-16 Chapter 20 based on the characteristics of the upper 100 ft of the Site profile. The Site was characterized using field penetration resistance measurements from eight geotechnical borings performed at the Site. The average field penetration resistance, evaluated according to Equation 20.4-2 [ASCE 7-16], is 34 blows per foot, which corresponds with Site Class D “stiff soil.”

Seismic design parameters for buildings and other structures at the Site were developed following the guidelines of ASCE 7-16 Chapter 11. In accordance with ASCE 7-16, the risk-targeted maximum considered earthquake (MCE_R) ground motion parameters, S_S and S_1, which incorporate a target risk of structural collapse equal to 1% in 50 years, were determined for the Site. These mapped ground motion parameters were used to determine the MCE_R ground motion parameters adjusted for Site class effects, S_{MS} and S_{M1}, with appropriate site coefficients for Site Class D. The design ground motion parameters, S_{DS} and S_{D1}, were then determined as 2/3 of the site adjusted MCE_R ground motion parameters.

Table 7 summarizes the seismic design parameters for buildings and other structures at the Site. The site adjusted MCE_G peak ground acceleration used for dry sand settlement analysis is also included in Table 7. Note that ASCE 7-16 Section 11.4.8 requires that sites classified as Site Class D with an S_1 greater than or equal to 0.2 perform a site-specific ground motion hazard analysis.

Although the Site meets the criteria for this requirement, a site-specific ground motion hazard analysis was not performed, which is permitted per Exception #2 in ASCE 7-16 Section 11.4.8.

This exception states that a ground motion hazard analysis is not required provided that the value of the seismic response coefficient C_s is determined by Eq. (12.82) for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for $T_L \geq T > 1.5T_s$ or Eq. (12.8-4) for $T > T_L$. Geosyntec recommends that structural design of relevant project components include calculation of Cs and use in analysis and design as required by Exception #2 of Section 11.4.8.

5.5 Earthwork

Site earthwork will generally consist of excavations for underground facilities, foundation excavations, and backfill of utility trenches. Earthwork should be performed in accordance with City of Los Angeles Department of Public Works Bureau of Engineering (BOE) Master Specifications, BOE Standard Plans, BOE-Approved Products and Material Lists, City of Los Angeles approval conditions, the recommendations of this report, the Standard Specifications for Public Works Construction “Greenbook,” the Standard Specifications for Public Works Construction, “Brown book,” and California Occupational Safety and Health Administration (Cal-OSHA) safety requirements. A preconstruction conference should be held at the Site with the City, the contractor, civil engineer, and geotechnical engineer in attendance. Existing structures identified by the City to remain should be protected in place during earthwork construction.

5.5.1 Site Preparation

Debris and vegetative matter in the Project area should be cleared and properly disposed of off site. Existing infrastructure within areas to be improved should be properly demolished and disposed or dismantled and relocated. Existing utilities should be terminated or relocated as necessary.

Soils containing organic matter should be stockpiled separately on site for potential use as topsoil during Site restoration. Separate stockpiles should also be maintained for excavated soils that meet or may not meet the requirements for select fill and free-draining fill for potential differing re-use purposes.

Excavation bottoms should be observed, tested or proof rolled, and approved by a representative of the geotechnical engineer in preparation to receive foundations or before placement of overlying engineered fill. Loose or soft soil within the proposed grading area, as identified by the geotechnical consultant during earthwork and foundation excavation, should be excavated or scarified as required, moisture conditioned, and then recompacted before placing additional fill or preparing subgrade. Soil containing organic or other deleterious matter, if encountered, should be properly disposed of off site.

5.5.2 Remedial Grading

A majority of the Site is mantled by undocumented fill. The borings performed during the referenced investigations encountered undocumented fill to a depth of approximately 5 ft below ground surface. Localized deeper fill areas may be present. We are not aware of any elements of the proposed infiltration facilities that would be founded on this fill.

There may be miscellaneous at-grade features, such as signage and fitness equipment, that may be supported in this undocumented fill on a case by case basis.

5.5.3 Bulking and Shrinkage

The undocumented fill materials and the alluvial deposits are anticipated to shrink between 10% and 15% when excavated and recompacted [Horner, 1988]. These estimates for bulking and shrinkage are intended for planning preliminary earthwork quantities. Contingencies should be made for balancing earthwork quantities based on actual bulking and shrinkage values at the time of earthwork operations.

5.5.4 Fill and Backfill Materials

Except as specified by manufacturers of the precast infiltration gallery, other substructure component fill materials for this project should be select fill, defined as granular native or import soil that contains at least 40 percent of material, by dry weight, less than ¼ inch in size. Select fill should not contain rocks or hard lumps greater than 3 inches in maximum dimension. In addition, select fill should have an expansion index less than 30, a liquid limit less than 30, and a plasticity index less than or equal to 15, and without perishable, spongy, deleterious, or otherwise unsuitable material. The lab testing conducted on this project indicates that much of the onsite materials will meet the requirements for select fill.

5.5.5 Fill Placement and Compaction

Except as specified by manufacturers of the precast infiltration gallery, other substructure component fill should be moisture conditioned and compacted between 0 and 3 percent above the optimum moisture contents in layers that do not exceed 8-inch loose lifts for heavy equipment compaction, and 4-inch loose lifts for hand-held equipment compaction. Each lift of fill should be compacted to a minimum 90 percent relative compaction unless otherwise specified. Relative compaction is defined as the ratio (in percent) of the in-place dry density to the maximum dry density determined using the latest version of ASTM D 1557 as the compaction standard. Fill placed should demonstrate a moisture content within 3 percent of optimum moisture content determined with ASTM D 1557.

5.5.6 Permanent Fill and Cut Slopes

We understand that current surface grades will generally remain the same at the completion of the planned construction. As such, no permanent cut and fill slopes are planned.

5.5.7 Surface Drainage and Features

The ground surface should be sloped to provide positive drainage. The final Site grades should be planned so that surface drainage can accommodate the anticipated potential settlements during facility operation. No permanent structures or vegetation with significant root depth should be constructed over the top of the infiltration facilities or within a 2:1 (H:V) slope up from the base of the infiltration facilities.

5.6 Hardscape Recommendations

The placement of hardscape elements (such as walkways) shall be designed to promote positive drainage away from structures and/or slopes.

5.6.1 Concrete Slab-on-Grade

Concrete slabs cast on-grade may be used within the Site. Concrete slabs should be designed in accordance with requirements and procedures described in 2019 CBC Section 1808.

5.6.2 Asphalt Pavement

No areas of asphalt pavement are envisioned as part the conceptual facility layout and thus recommendations for this type of pavement are not included in this report.

5.7 Underground Infiltration Basin (UIB)

The UIB is envisioned to be constructed using the StormTrap® precast concrete elements in the doubleTrap® configuration to achieve the required volumes. The base of the UIB is planned to be on the order of 16 to 20 ft bgs. These precast concrete components should be installed and backfilled in accordance with the manufacturer's recommendations. The manufacturer should also consider soil and vehicle surcharge above the UIB consistent with the project requirements.

An allowable bearing pressures of 3,000 psf can be used at the base of the UIB. The UIB should be designed to accommodate a static settlement of about 1.5 to 2 inches and differential settlements of about 1/2 of this amount. The UIB is comprised of individual precast components, and the manufacturer should provide for lateral resistance in their design consist with the structural behavior of the UIB. We recommend that resistance to lateral loads be provided by frictional resistance along the bottom of the UIB. An allowable friction coefficient of 0.4 may be used with the dead load to compute the frictional resistance of the UIB. If passive pressure is needed for the UIB to resist lateral loads, it should be evaluated on a case by case basis.

5.7.1 Estimated Seismic Induced Settlements

Estimates of seismic-induced differential settlements for the UIB were conducted in accordance with the two-level evaluation approach described in P/BC 2020-151 "Liquefaction Analysis Guidelines," with evaluations conducted on reduced (2/3) PGA_M which is considered consistent with other design criteria for the project as well as the PGA_M that was conducted for reference only. For the 2/3 PGA_M analysis, the predominant earthquake magnitude was developed consistent with a 10% probability of exceedance in 50 years (475-year return period).

In the (2/3) PGA_M case, the estimated seismically induced dry sand settlement at the ground surface ranged from 1/2 to 1 inch. Approximately ½ this value should be considered for differential settlement over 30 ft. The estimated total and differential dry sand settlement at the anticipated foundation level of approximately 16 ft to 20 ft bgs is expected to be of a similar magnitude. The detailed calculations for dry sand settlement are shown in Appendix E.

5.8 Other Buried Structures

Other underground structures included in the concept-level facility configuration (Figure 2) include an RCB diversion structure, actuated vault valve, hydrodynamic separator, and sedimentation basin, in addition to vaults for pumps and flow measuring devices. Assuming mat-type foundations with base of footings greater than 5 ft bgs , a bearing capacity of 3,000 psf can be used in the design of these features. Total static settlement is estimated to be less than 1.5 inch.

5.8.1 Lateral Pressure

Other than the UIB, buried structures should be designed for the following vertical and lateral pressure cases:

- Case 1: Maximum Vertical (140 H1) and Minimum Horizontal Earth Pressure (36 H2); and
- Case 2: Maximum Vertical (140 H1) and Maximum Horizontal Earth Pressure (120 H2),

where in the above, H1 (in feet) is the earth cover from top of buried structure to ground surface and H2 (in feet) varies, representing the height from any locations of the vertical side wall to the ground surface, and the calculated pressures are in psf. These recommendations are consistent with the Caltrans recommendations used for buried culverts. The vertical earth pressure on top of slab is derived from the weight of the prism of soil above the top slab and the amplification by the soil-structure interaction factor. The lateral soil pressure on walls reflects a large range of variation due to uncertainties in soil profiles around the buried structure. The uncertainties can come from many reasons, such as soils that are compacted around walls during backfill or because of a lack of drainage measures outside the buried structure.

Surface loads associated with lighter weight maintenance vehicles, if allowed and/or expected, can be modeled using a live load equivalent to 2 ft of additional soil cover, equivalent to an infinite surcharge of 250 psf. Surface loads associated with heavy equipment will need to be assessed on case-by-case basis. Distribution of loads from the high-contact surface load (e.g., heavy equipment tire load) to the top of the buried structure can be estimated using a 2:1 vertical:horizontal role, where the stress on the surface decreases with depth by distributing the total load over an increasing area with depth, with the area boundaries increasing at an 2:1 vertical:horizontal rate in all directions.

Seismic impacts are expected to be limited for buried structures with spans less than 20 ft.

5.8.2 Allowable Sliding Coefficient and Passive Resistance

Resistance to lateral loads on foundations other than the UIB may be provided by passive resistance along the outside face of foundations and frictional resistance along the bottom of foundations. The allowable passive resistance may be taken as (6.7*H2.8) psf/ft (where H is the depth of the footing below surrounding grade in feet) for foundations poured neat against the excavated foundation soils. This allowable passive resistance value incorporates a factor of safety of 2. An allowable friction coefficient of 0.4 may be used with the dead load to compute the frictional resistance of foundations. If frictional and passive resistances are combined, the allowable friction coefficient should be reduced to 0.3. The upper 12 inches of soil should be neglected in passive pressure calculations in areas where there will be pavement that extends from the outside edge of the foundation to a horizontal distance equal to three times the foundation depth. The resistance from passive pressure should also be neglected where utilities or similar excavations may occur in the future.

5.9 Utility Trenches

Trench backfill is defined as material placed in a trench starting 6 inches above the crown of pipe, and bedding is all material placed in a trench below the backfill. Pipe trench backfill should conform to the recommendations presented in this report and Section 306-1.3 of the "Greenbook" and "Brownbook." Unless concrete bedding is required around utility pipes, free-draining clean sand should be used as bedding. Compaction of backfill by water jetting should not be permitted.

5.10 Corrosion Potential

Based on the criteria established by the County of Los Angeles [2013], soils are considered corrosive when soluble sulfate concentrations in the soil are equal or greater than 2,000 ppm (or mg/kg), or chloride concentrations in the soil are equal or greater than 500 ppm (or mg/kg), or the pH value of the soil is equal or less than 5.5, or soil's minimum resistivity value is less than 1,000 ohm-centimeters. Soil chemical test results from the soil sample collected from Valley Plaza Park North indicate that the measured values (provided in Table 3 for reference) are well outside the ranges typically considered harmful or deleterious to foundation elements. A review of ACI-318-11 [2011], Table 4.2.1 and 4.3.1 also indicates no restriction on the planned concrete type based on the chloride and sulfate concentrations in the tested soil sample.

5.11 Methane Evaluation

As indicated in Section 4.10, a methane survey of the Site was performed by Ninyo & Moore. Facility designers should consult the 15 May 2020 Ninyo & Moore [2020] report for information regarding required methane mitigations.

5.12 Site Monitoring and Maintenance

5.12.1 Pre-Construction Survey

We recommend that a pre-construction survey of the Site and the vicinity be performed. The survey should consist of photos and notes to document existing conditions of Site features prior to initiation of construction activities.

5.12.2 Pre-Saturation

Geosyntec recommends that a pre-saturation program be developed and implemented for all regional-scale infiltration facilities for the purpose of confirming expectations related to subsurface infiltration, hydrocollapse, and groundwater mounding. Pre-saturation should generally be performed within the UIB excavation at an elevation near the planned base of excavation, and ground surface elevation monitoring should take place before and after the application of saturation water. The pre-saturation program should include detailed requirements for water application, saturation elevation, water volumes, timing of water delivery, and site monitoring

5.12.3 Settlement Monitoring

Settlement may be experienced at the Site associated with the planned project. A network of surface settlement monuments should be installed around the Site, along adjacent roadways, and in the neighboring developments. These settlement monuments should be monitored, and the results evaluated before construction, during construction, after construction prior to infiltrating stormwater, and quarterly during the first year of facility operation. Additional monitoring frequency should be developed based on the initial observations.

5.12.4 Groundwater Monitoring

A groundwater monitoring program should be considered to evaluate potential ground water mounding associated with the planned project. The groundwater monitoring program would typically consist of at least six groundwater monitoring wells installed around the perimeter of the Site, to include two monitoring wells along each north-south boundary and one well along each east-west boundary. Monitoring wells located in the southern and southeastern areas of the Site should be situated adjacent to the existing office and library buildings.

Data on groundwater levels would typically be collected and evaluated monthly during each rainy season for the first five years of facility operation to confirm that groundwater mounding, if present, remains below a depth of 55 ft bgs..

5.12.5 Site Monitoring and Maintenance

The proposed facilities will require maintenance for continued functionality. The design of these features will provide for access, cleanout, security, monitoring, and instrumentation, as necessary. We recommend that an operations and maintenance plan be developed as part of the design and implemented by the City. This operations and maintenance plan should detail the requirements and frequency of monitoring, action levels, and potential responses. For example, monitoring for surficial settlement or ponded water, and regrading if depressions or surface water ponding is noted. Additionally, documentation and communication regarding location of the infiltration facility features will be important for future development so that the functionality of the Project is not disrupted by future Site activities.

6. CONSTRUCTION CONSIDERATIONS

6.1 Earthwork Construction Observation and Testing

Variations in subsurface conditions will likely be encountered during Project construction. Continuing engagement of the geotechnical engineer should be considered to help ensure that the project is constructed in accordance with the intent of the engineering design and with respect to actual geotechnical conditions encountered during construction.

6.2 Temporary Slopes

The design, excavation, and safety of temporary slopes and their maintenance during construction are the responsibility of the contractor. The contractor should have their geotechnical or geological professional evaluate the soil conditions encountered during excavation to determine permissible temporary slope inclinations and other measures required by Cal-OSHA (California Occupational Safety and Health Administration). For planning purposes, based on the materials observed in the borings, the design of temporary slopes for planning purposes may assume Type C conditions. Existing infrastructure within a 2:1 (H:V) line projected up from the toe of temporary slopes should be monitored for potential movement during construction. The top of excavations should be graded to prevent runoff from entering the excavation.

6.3 Temporary Shoring

Shoring design is the responsibility of the contractor, and specific details of onsite temporary excavation and support are not known at this time. The contractor should retain a qualified engineer to design temporary shoring systems. The shoring parameters presented in the following subsection are for planning purposes only. The contractor should develop independent soil parameters for final shoring design, and prior to construction, Geosyntec should review the shoring design plans. Existing infrastructure within a 2:1 (H:V) line projected up from the excavation toe should be monitored for potential movement during construction. The top of all excavations should be graded to prevent runoff from entering the excavation. During construction, shoring system deflection should be monitored weekly or more frequently. In addition, the structures should be periodically inspected for signs of distress. In the event that distress or settlement is noted, an investigation should be performed, and corrective measures should be taken to prevent continued or worsened distress or settlement.

Shoring should be designed to resist the pressure exerted by the retained soils, plus additional lateral forces from surface loads near the top of the excavation. For planning purposes, active and ultimate passive earth pressures can be estimated using an equivalent fluid weight of 40 and 360 pcf, respectively. For spaced soldier piles extending below the bottom of the excavation, total resistance can be calculated by using twice the width of the piles, to account for the three-dimension effect of pile-soil interaction. Uniform surface loads can be applied as additional uniform horizontal earth pressures equal to one-half of the vertical surface load. Hydrostatic loads are not expected, as groundwater level is below the expected maximum depth of excavation.

The shape of apparent pressures behind the shoring will vary depending on the shoring system, with triangular for cantilever system to close to uniform for braced or tie-backed systems. Detailed calculations should be performed by the contractor following guidance such as Trenching and Shoring Manual by Caltrans (1988) or recommendations provided in AAHSTO LRFD Bridge Design Specifications (2017).

7. UNCERTAINTY AND LIMITATIONS

The report and other materials resulting from Geosyntec's effort is not intended to be suitable for reuse on any project site other than the currently proposed development area as it may not contain sufficient or appropriate information for such uses. If this report or portions of this report are provided to contractors or included in specifications, it should be understood that they are provided for information only.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the information presented in this report are based on the assumption that the data obtained during our investigation are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

The investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, either expressed or implied, is included or intended in our report.

8. REFERENCES

ASCE (2017) "*Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE7-16)*", American Society of Civil Engineers.

California Geologic Energy Management Division (CalGEM) (2020). Well Finder tool. https://maps.conservation.ca.gov/doggr/wellfinder/#openModal/-118.94276/37.12009/6, accessed May 2020.

California Geological Survey (CGS) (1997) "*Seismic Hazard Zones Report for the Van Nuys 7.5 Minute Quadrangle*."

California Geological Survey (CGS) (1998). *Seismic Hazard Zone Report 022 for Baldwin Park 7.5-Minute Quadrangle, Los Angeles County, California,* Department of Conservation, Division of Mines and Geology.

California Geological Survey (CGS) (1998) "*Seismic Hazard Zones Map for the Van Nuys 7.5 Minute Quadrangle*."

Caltrans (1988), "*Trenching and Shoring Manual*" Office of Structure Construction, California Department of Transportation.

CBC (2019) *"2019 California Building Code,"* California Building Standards Commission.

Chilinger, G.V, and Endres, B. (2004) *"Environmental Hazards Posed by the Los Angeles Basin Urban Oilfields: An Historical Perspective of Lessons Learned,"* Environmental Geology 47: 302-317.

Fang, H.Y. (1991) *"Foundation Engineering Handbook,"* Second Edition, Van Host and Reinhold.

GMED (2017) Administrative Manual GS200.2, *"Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration,"* Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division (GMED), dated June 30.

Golder Associates (2017) "*Well Installation Report, Hewitt Site, 7245-7361 Laurel Canyon Boulevard, North Hollywood District, City of Los Angeles, California*." March.

Hitchcock, C.S., and Wills, C.J. (2000) "*Quaternary Geology of the San Fernando Valley, Los Angeles County, California.*" California Division of Mines and Geology. Map Sheet MS 50. 1:48,000.

Horner, P.C. (1988) "Earthworks," Telford, London, United Kingdom.

LA County Public Works (LACPW) (2013) *"Manual for the Preparation of Geotechnical Reports,"* Geotechnical and Materials Engineering Division, Los Angeles County Department of Public Works, 99 p. plus appendices.

Langenheim, V.E., Wright, T.L., Okaya, D.A., Yeats, R.S., Fuis, G.S., Thygesen, K., and Thybo, H. (2011) *"Structure of the San Fernando Valley region, California: Implications for Seismic Hazard and Tectonic History."* Geosphere 7(2): 528-572.

Massmann, J. (2003) *"A Design Manual for Sizing Infiltration Ponds,"* Final Research Report, Research Agreement No. Y8265, Implementation of Infiltration Ponds Research, prepared for Washington State Transportation Commission, Department of Transportation and in cooperation with U.S. Department of Transportation Federal Highway Administration, WA-RD 578.2, October.

Massmann, J. (2004) Technical Report, "*An Approach For Estimating Infiltration Rates For Stormwater Infiltration Dry Wells*", prepared for Washington State Transportation Commission, Department of Transportation and in cooperation with U.S. Department of Transportation Federal Highway Administration, WA-RD 589.1.

Ninyo & Moore (2020) Technical Report, "*Methane Survey for Valley Plaza Park*," prepared by Ninyo & Moore, dated May 15.

Ordonez, G.A. (2005) *"SHAKE2000 – A Computer Program for the 1-D Analysis of Geotechnical Earthquake Engineering Problems,"* GeoMotions, LLC, Lacey, Washington.

State of California (2009) *"Tsunami Inundation Map for Emergency Planning,"* Venice Quadrangle, County of Los Angeles; produced by California Emergency Management Agency.

State Water Resources Control Board (SWRCB) (2020) GeoTracker online database, https://geotracker.waterboards.ca.gov/. Accessed May 2020.

Southern California Earthquake Data Center (SCEDC), 2013a. "Significant Earthquakes and Faults, Northridge Earthquake." California Institute of Technology, https://scedc.caltech.edu/significant/northridge1994.html. Last update 31 January 2013.

Southern California Earthquake Data Center (SCEDC), 2013b. "Significant Earthquakes and Faults, Whittier Narrows Earthquake." California Institute of Technology, https://scedc.caltech.edu/significant/whittier1987.html. Last update 31 January 2013.

Southern California Earthquake Data Center (SCEDC), 2013c. "Significant Earthquakes and Faults, San Fernando Earthquake." California Institute of Technology, https://scedc.caltech.edu/significant/sanfernando1971.html. Last update 31 January 2013.

Southern California Earthquake Data Center (SCEDC), 2013d. "Significant Earthquakes and Faults, Fort Tejon Earthquake." California Institute of Technology, https://scedc.caltech.edu/significant/forttejon1857.html. Last update 31 January 2013.

Tokimatsu and Seed (1987) *"Evaluation of Settlements in Sand Due to Earthquake Shaking,"* Journal of Geotechnical Engineering, Vol. 113, No. 8, August.

UC Santa Barbara (UCSB) (2020) Frame Finder Online Tool, UCSB Library. http://mil.library.ucsb.edu/ap_indexes/FrameFinder/. Accessed May 2020.

U.S. Bureau of Reclamation (2001) *“Engineering Geology Field Manual,”* Second Edition U.S. Department of the Interior.

U.S. Geological Survey (USGS) and California Geological Survey (CGS) (2020) “Quaternary fault and fold database for the United States,” accessed April 22, 2020, at: https://www.usgs.gov/natural-hazards/earthquake-hazards/faults.

Yerkes, R.F., R.H. Campbell, R. Alvarez, and K. Bovard, 2005. “Preliminary Geologic Map of the Los Angeles 30' X 60' Quadrangle, Southern California.” United States Geological Survey. Open-File Report OF-2005-1019. 1:100,000.

TABLES

Table 1
Summary of Field Explorations
Valley Plaza Park North - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Exploration Name	Exploration Type	Apporximate Surface Elevation (feet, MSL)[1]	Depth Advanced (feet)	Date Advanced	Performed By
VN-HSA-1	Hollow-Stem Auger	723	31.5	4/14/2020	Geosyntec
VN-HSA-2	Hollow-Stem Auger	725	52	4/16/2020	Geosyntec
VN-HSA-3	Hollow-Stem Auger	727	31.5	4/14/2020	Geosyntec
VN-HSA-4	Hollow-Stem Auger	729	31.5	4/15/2020	Geosyntec
VN-HSA-5	Hollow-Stem Auger	731	53	4/15/2020	Geosyntec
VN-HSA-6	Hollow-Stem Auger	733	32	4/14/2020	Geosyntec
VN-HSA-7	Hollow-Stem Auger	724	51.5	4/14/2020	Geosyntec
VN-HSA-8	Hollow-Stem Auger	729	31.5	4/15/2020	Geosyntec

Notes:

1. MSL = Mean Sea Level.

Table 2
Summary of Geotechnical Laboratory Test Results
Valley Plaza Park North - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Sample Information				USCS Classification (3,4)	USCS Name (3,4)	Sieve Analysis			Atterberg Limits (5)			Moisture-Density Porosity Tests (6)			Consolidated Undrained Triaxial Strength (7)		Other Tests (8)
						ASTM D6913 / D1140			ASTM D4318			ASTM D2937			ASTM D4767		
Boring ID	Sample ID	Sample Type (1)	Depth (ft bgs) (2)			Gravel (%)	Sand (%)	Silt & Clay (#200) (%)	Liquid Limit LL	Platic Limit PL	Plasticity Index PI	Dry Density (pcf)	Moisture Content (%)	Moist Unit Weight (pcf)	Pre-Consolidation Stress (psf)	S_u (psf)	
VN-HSA-1	B-1	Bulk	1-5	SM	Silty Sand				NP	NP	NP		5.3				
VN-HSA-1	S-1	SPT	5-6.5	SM													SE = 81
VN-HSA-1	S-3	SPT	15-16.5	SM	Silty Sand				NP	NP	NP		4.9				
VN-HSA-1	S-4	SPT	20-21.5	SP-SM	Poorly-graded Sand with Silt			9.7					8.0				
VN-HSA-1	S-5	SPT	25-26.5	SM	Silty Sand	10.0	49.0	41.0					4.3				
VN-HSA-1	S-6	SPT	30-31.5	SM									3.5				
VN-HSA-2	S-3	SPT	15-16.5	SW	Well-graded Sand with Gravel	23.0	72.7	4.3					3.2				
VN-HSA-2	S-4	SPT	20-21.5	SW-SM	Well-graded Sand with Silt			5.2					3.6				SE = 81
VN-HSA-2	S-6A	Cal Mod	30.5-31	SW-SM	Well-graded Sand with Silt							114.6	4.2	119.4			
VN-HSA-2	S-6B	Cal Mod	31-31.5	SM								119.5	3.1	123.2			
VN-HSA-2	S-7A	Cal Mod	32-32.5	SM								108.4	2.9	111.5			
VN-HSA-2	S-7B	Cal Mod	32.5-33	SM								104.3	5.2	109.7			
VN-HSA-2	S-10	SPT	45-46.5	SW-SM	Well-graded Sand with Silt and Gravel	36.0	57.0	7.0					1.8				
VN-HSA-3	S-2B	SPT	10.6-11.5	SM	Silty Sand			34.0					4.0				
VN-HSA-3	S-3	SPT	15-16.5	SP	Poorly-graded Sand	3.0	93.2	3.8					2.1				
VN-HSA-3	S-4A	Cal Mod	20.5-20.75	SP-SM	Poorly-graded Sand with Silt							109.0	4.5	113.9			
VN-HSA-3	S-4A	Cal Mod	20.75-21	SM	Silty Sand							114.3	7.0	122.3			
VN-HSA-3	S-5B	SPT	25.9-26.5	SP-SM	Poorly-graded Sand with Silt			5.3					2.8				
VN-HSA-3	S-6	SPT	30-31.5	SP-SM													SE = 64
VN-HSA-4	S-2	SPT	10-11.5	SM	Silty Sand			36.0					13.3				
VN-HSA-4	S-3A	Cal Mod	15.5-16	SM	Silty Sand				NP	NP	NP	107.9	9.5	118.2			
VN-HSA-4	S-3B	Cal Mod	16-16.5	SM								104.5	14.9	120.1			1D
VN-HSA-4	S-4	SPT	20-21.5	SM													SE = 43
VN-HSA-4	S-5	SPT	25-26.5	SW-SM	Well-graded Sand with Silt	10.0	84.7	5.3					4.0				
VN-HSA-4	S-6	SPT	30-31.5	SW-SM	Well-graded Sand with Silt			5.8					4.6				
VN-HSA-5	S-1A	SPT	5-5.5	SM	Silty Sand				NP	NP	NP		13.8				
VN-HSA-5	S-1B	SPT	5.5-6.5	SM													SE = 76
VN-HSA-5	S-3	SPT	15-16.5	SM	Silty Sand			17.0					9.0				
VN-HSA-5	S-5	SPT	25-26.5	SM									2.5				
VN-HSA-5	S-6	SPT	30-31.5	SW	Well-graded Sand	8.0	87.8	4.2					3.8				
VN-HSA-5	S-7A	Cal Mod	35.5-36	SM	Silty Sand							132.2	3.1	136.3			
VN-HSA-5	S-8	SPT	40-41.5	SP	Poorly-graded Sand with Gravel	47.0	48.1	4.9					1.7				
VN-HSA-5	S-10	SPT	50-51.5	GP-GM	Poorly-graded Gravel with Silt and Sand	47.0	46.9	6.1					2.1				
VN-HSA-6	B-1	SPT	1-5	SM					NP	NP	NP		8.4				
VN-HSA-6	S-2B	SPT	11-11.5	SP	Poorly-graded Sand			3.7					2.6				
VN-HSA-6	S-4	SPT	20-21.5	SP-SM									5.5				
VN-HSA-6	S-5	SPT	25-26.5	SP-SM	Poorly-graded Sand with Silt	2.0	92.5	5.5					4.6				
VN-HSA-7	S-2	SPT	10-11.5	SP	Poorly-graded Sand	5.0	90.6	4.4					7.4				
VN-HSA-7	S-3	SPT	15-16.5	SP	Poorly-graded Sand			0.9					6.3				
VN-HSA-7	S-4	SPT	20-21.5	SP	Poorly-graded Sand	0.0	95.4	4.6					3.4				
VN-HSA-7	S-5	SPT	25-26.5	SP									3.3				
VN-HSA-7	S-6	SPT	30-31.5	SP	Poorly-graded Sand			4.2					3.2				
VN-HSA-7	S-8B	Cal Mod	41-41.5	SP-SM								120.5	4.2	125.6			
VN-HSA-7	S-9	SPT	45-46.5	SP-SM									3.0				SE = 64
VN-HSA-8	S-1B	SPT	5.3-6.5	SP	Poorly-graded Sand			2.5					6.0				
VN-HSA-8	S-4	SPT	20-21.5	SP-SM	Poorly-graded Sand with Silt			7.5					6.5				
VN-HSA-8	S-5A	Cal Mod	25.5-26	SP-SM								106.9	5.5	112.8			
VN-HSA-8	S-6	SPT	30-31.5	SW	Well-graded Sand	13.0	83.1	3.9					4.3				

Notes

1. Cal Mod = California Modified ring sampler; SPT = Standard Penetration Test Drive sample; Shelby = Shelby tube sample; Bulk = Bulk bag sample
2. bgs = Below Ground Surface
3. USCS = Unified Soil Classification System
4. UCSC Classification and Name based on laboratory test results (where available).
5. NP = Non-plastic
6. pcf = pounds per cubic foot
7. psf = pounds per square foot
8. 1-D = One-dimensional consolidation test (ASTM D2435); SE = Sand Equivalent test (ASTM D2419)

Table 3
Summary of Soil Chemical Test Results
Valley Plaza Park North - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Boring ID	Sample ID	Depth (ft BGS)	USCS Classification	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51	ASTM G200	SM 4500-S2-D	ASTM D4327	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D6919	ASTM D4327	ASTM D4327	SM-2320B
				Sulfates		Chlorides		Min. Resistivity		pH	Redox	Sulfide	Nitrate	Ammonium	Lithium	Sodium	Potassium	Magnesium	Calcium	Flouride	Phosphate	Bicarbonate
				(mg/kg)	(wt %)	(mg/kg)	(wt %)	**As Received** (Ohm-cm)	**Minimum** (Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
VN-HSA-3	S-1	5-6.5	SM	9.3	0.0009	5.1	0.0005	80,400	26,130	7.48	235	0.36	7.4	ND	ND	20.9	0.8	1.4	9.2	1.3	1.4	96.4

Notes:
ft BGS = feet below ground surface
ND = 0 = Not Detected
mg/kg = milligrams per kilogram (parts per million) of dry soil weight

Table 4
Regional Quaternary Faults
Valley Plaza Park North - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Fault	Activity	Average Strike	Average Dip	Sense of Slip	Distance	Direction
Unnamed Possible North Hollywood Fault	Latest Quaternary	WSW	Unspecified	Unspecified	2.1 mi	SSE
Verdugo Fault	Late Quaternary	NW	NE	Reverse	2.5 mi	NE
Northridge Hills Fault	Late Quaternary	NW	Unspecified	Unspecified	4.5 mi	NW
Sierra Madre Fault Zone (San Fernando Section)	Historic	085°	50° N	Thrust	6.1 mi	NNE
Mission Hills Fault Zone	Late Quaternary	W	Unspecified	Reverse	6.5 mi	NNW
Hollywood Fault	Latest Quaternary	076°	Vertical	Left-Lateral	6.9 mi	SSE
Northridge Blind Thrust	Historic	ESE	35° S	Thrust	7.9 mi	N
Santa Monica Fault	Latest Quaternary	086°	30°-70° N	Reverse	9.0 mi	S
San Gabriel Fault Zone	Late Quaternary	NW	70° NE - Vertical	Right-Lateral	10 mi	NNE
Puente Hills Blind Thrust	Historic	WNW	29° N	Thrust	25 mi	SE
San Andreas Fault Zone	Historic	293°	Vertical	Right-Lateral	29 mi	NNE

Table 5
Idealized Subsurface Profile
Valley Plaza Park North - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Layer (I.D.)	Approximate Depth to Top of Layer (ft bgs)	Description	Fines Content (%)	$(N_1)_{60}$-Value (Range)	Estimated Range of Unit Weight (pcf)	ϕ' (deg)	c' (psf)
Artificial Fill	0	Silty Sand (SM)	-(1)		110-125		
1	5	Silty Sand (SM)	15-35	7-44	110-125		
2	13	Sand, Sand with Silt and Silty Sand (SP) & (SP-SM & SW-SM) & (SM)	5-20	11-48	115-125		
3	25	Sand with Silt and Silty Sand (SP-SM & SW-SM) & (SM)	4-10, 35-45	33-70+	110-120		
4	30	Sand, Sand with Silt and Silty Sand (SW) & (SP-SM & SW-SM) & (SM)	4-15	25-70+	115-125	38.0	300
5	40	Sand with Silt and Gravel (SM) & (SW-SM & SP-SM)	5-15	>50	120-130		
6	50	Gravel and Sand (GP-GM)	6	>45			
7	52	Sand with Silt and Silty Sand (SP-SM) & (SM)	-(1)	>50	120-130		

Notes:

1. No laboratory test data for this layer.

Table 6
Summary of Field-Measured Hydraulic Conductivity
Valley Plaza Park North - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Borehole Nr.	Date Tested	Depth of Screened Interval	Soil Type in the Screened Interval	Estimated Hydraulic Conductivity using USBR method (cm/s)	Estimated Hydraulic Conductivity using Hvorslev Method (cm/s)
VPN-HSA-1	4/16/2020	19ft to 29ft	SM	5.6E-03	3.9E-03
VPN-HSA-3	4/17/2020	15.9ft to 25ft	SM	6.1E-03	9.5E-03
VPN-HSA-6	4/20/2020	20ft to 30ft	SM	2.9E-03	3.0E-03
VPN-HSA-5	4/20/2020	35ft to 45ft	SM	3.1E-03	2.1E-03
VPN-HSA-7	4/16/2020	40ft to 50ft	SM	5.8E-03	2.2E-03

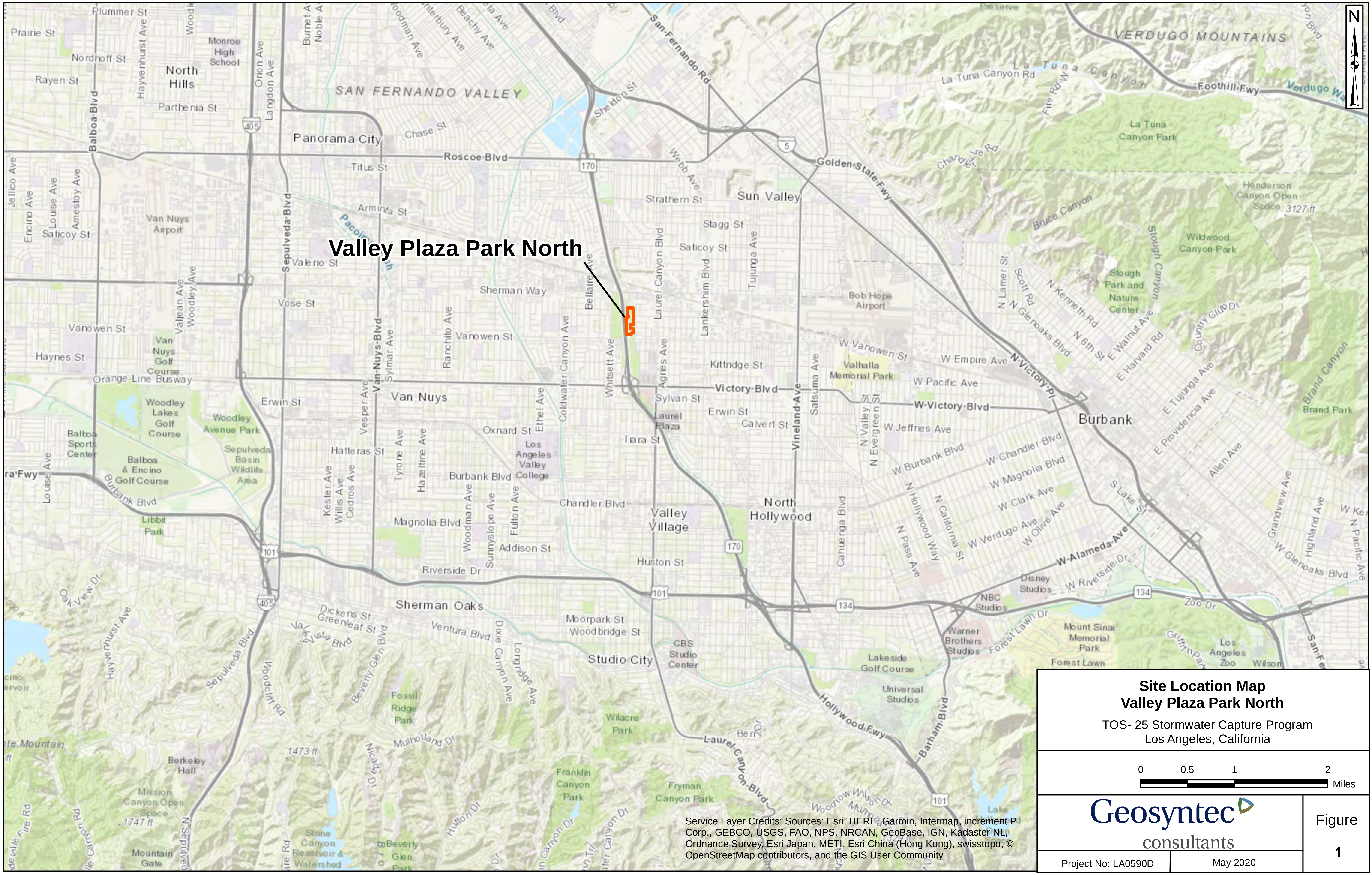
Table 7
Seismic Design Parameters
Valley Plaza Park North - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Seismic Hazard Parameter	**Value**
Approximate Site Latitude	34.197° N
Approximate Site Longitude	118.402° W
Average Standard Penetration Resistance of the top 100 ft, $\bar{N}$	34 blows/ft
Site Class	D
Mapped Short Period Spectral Response Acceleration, $S_s^{(1)}$	1.958 g
Mapped 1-second Spectral Response Acceleration, $S_1^{(1)}$	0.664 g
Short Period Site coefficient (at 0.2-s period), F_a	1
Long Period Site coefficient (at 1.0-s period), F_v	1.7
Site-modified Short Period Spectral Response Acceleration, S_{MS}	1.958 g
Site-modified 1-second Spectral Response Acceleration, S_{M1}	1.129 g
Design Short Period Spectral Response Acceleration, S_{DS}	1.305 g
Design 1-second Spectral Response Acceleration, S_{D1}	0.753 g
Mapped MCE_G Peak Ground Acceleration, $PGA^{(1)}$	0.798 g
Site Coefficient, F_{PGA}	1.1
Site Class Adjusted MCE_G Peak Ground Acceleration, PGA_M	0.878 g

(1) Value obtained from SEAOC/OSHPD Seismic Design Map Tool (https://seismicmaps.org/)

FIGURES

DRAFT - FOR DISCUSSION PURPOSES ONLY



Site Location Map
Valley Plaza Park North

TOS- 25 Stormwater Capture Program
Los Angeles, California

0 0.5 1 2
Miles

Geosyntec
consultants

Project No: LA0590D

May 2020

Figure
1

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

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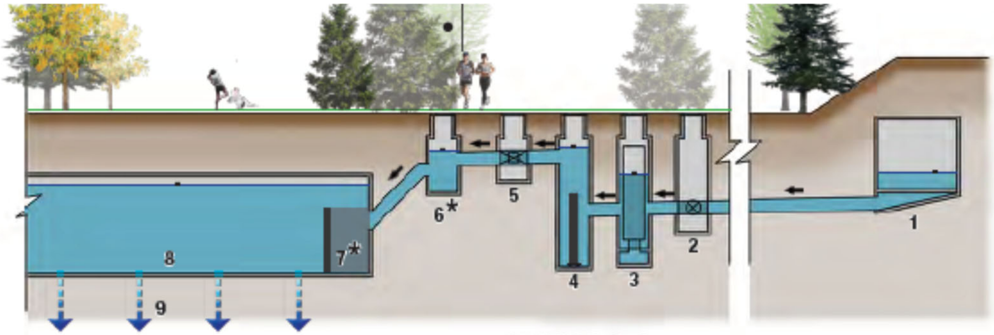

SECTION A-A

SECTION COMPONENT KEY

1 RCB Diversion Structure
2 Actuated Valve Vault
3 Hydrodynamic Separator
4 Pump
5 Flow Measuring Device
6 Sedimentation Basin*
7 Initial Containment/Settling Area*
8 Underground Infiltration Basin
9 Groundwater Infiltration/Recharge

ENGINEERING CITY OF LOS ANGELES | TETRA TECH

Conceptual Site Plan
Valley Plaza Park North
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

Figure
2

Project No: LA0590D
MAY 2020

OCSD-11x17NL4-With Scale and North Arrow.doc

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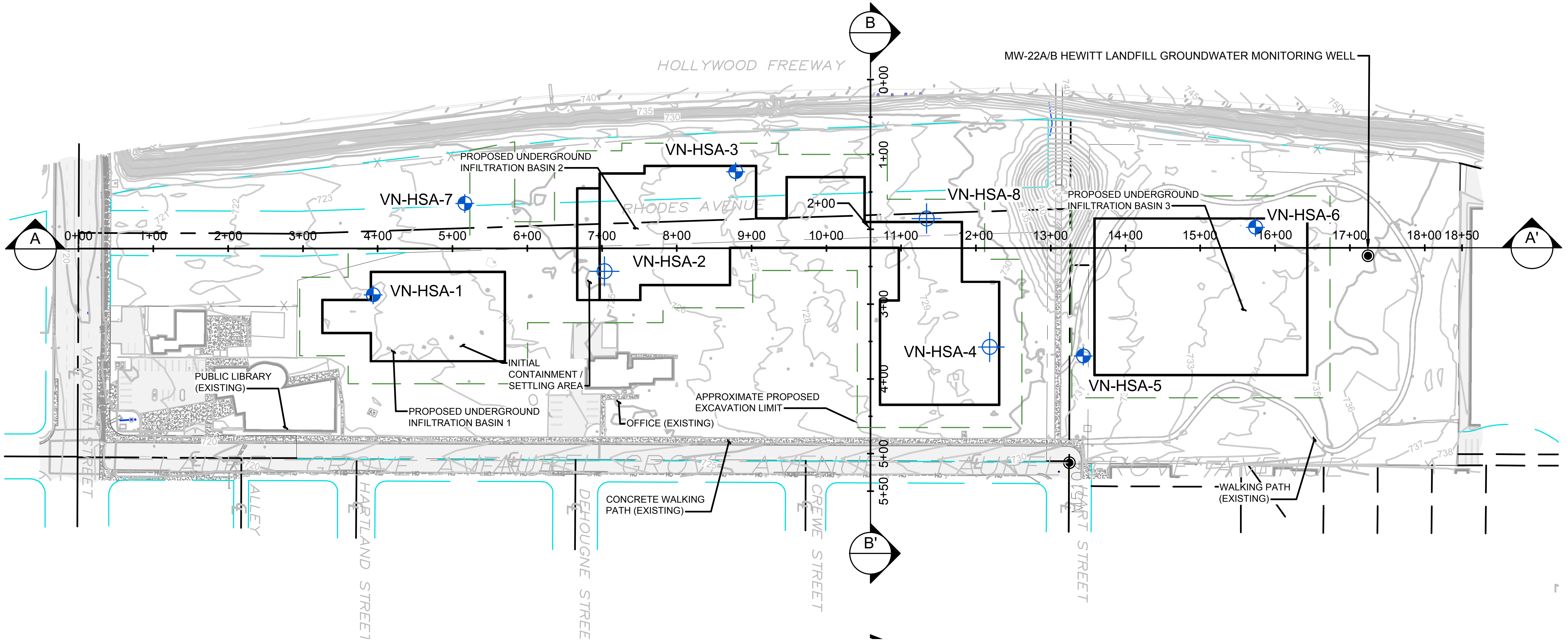

LEGEND

—— 731 ——	EXISTING GROUND MAJOR CONTOUR (5')
————	EXISTING GROUND MINOR CONTOUR (1')
—— — — ——	PROPERTY LINE
—— — ——	EXISTING ROADWAY CENTERLINE
—— ——	RIGHT-OF-WAY
—— x ——	EXISTING FENCE LINE
— — — —	APPROXIMATE LIMITS OF EXCAVATION FOR CONCEPTUAL FACILITY CONFIGURATION
⊕	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
●	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)

NOTES:

1. COORDINATE SYSTEM CCS83, ZONE 5 (2017.5). VERTICAL DATUM NAVD88.
2. CONTOURS AND EXISTING FEATURES ARE BASED ON TOPOGRAPHIC SURVEY MAP PROVIDED BY CALVADA SURVEYING INC., DATED MARCH 30, 2020.
3. FACILITY LAYOUT DEPICTED IS A PRELIMINARY CONCEPT DEVELOPED BY TETRA TECH.
4. INVESTIGATION LOCATIONS ARE APPROXIMATE AND WERE NOT SURVEYED.

0 150'
SCALE IN FEET

SITE MAP
VALLEY PLAZA PARK NORTH
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec consultants

PROJECT NO: LA0590D
MAY 2020

FIGURE
3

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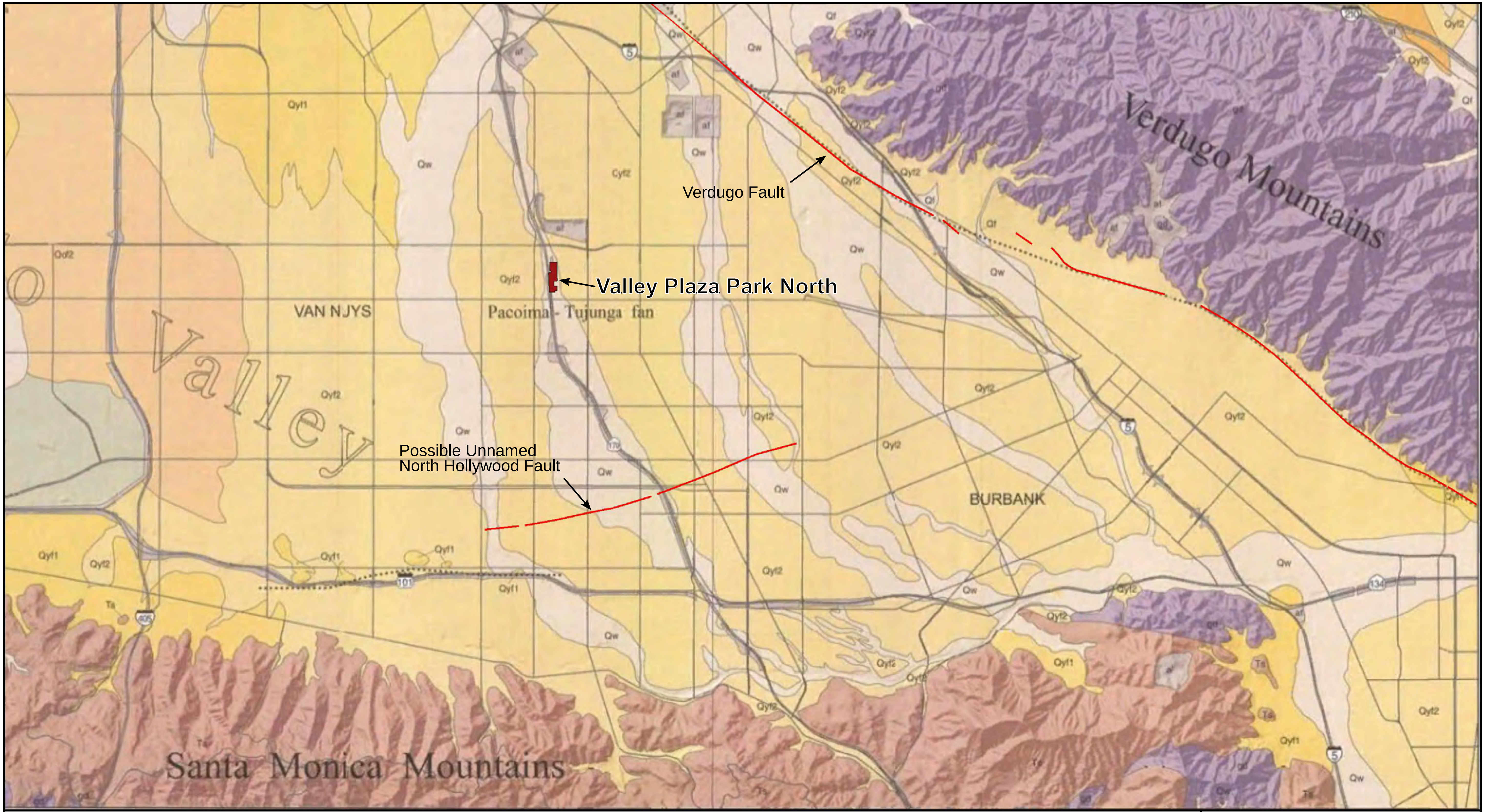


LEGEND

af Artificial fill

Qa Anthropogenic basin deposits

Qw Active wash deposits

Qf Active alluvial fan deposits

Qyf2, Qyf1 } Holocene alluvial fan deposits

Qof2, Qof1 } Late Pleistocene - Holocene alluvial fan deposits

Qyof2, Qvoa1, Qyof1 } Late Pleistocene - Holocene alluvium/ alluvial fan deposits

Qpa Quaternary Pacoima Formation

Qs Quaternary Saugus Formation

Ts Tertiary sedimentary rocks

gd Crystalline rocks

— Quaternary fault

1 MILE

SCALE

Geologic map source: Hitchcock, C.S., and C.J. Wills (2000) "Quaternary Geology of the San Fernando Valley, Los Angeles County, California"
Fault map source: USGS, CGS (2020) "Quaternary fold and fault database for the United States"

N

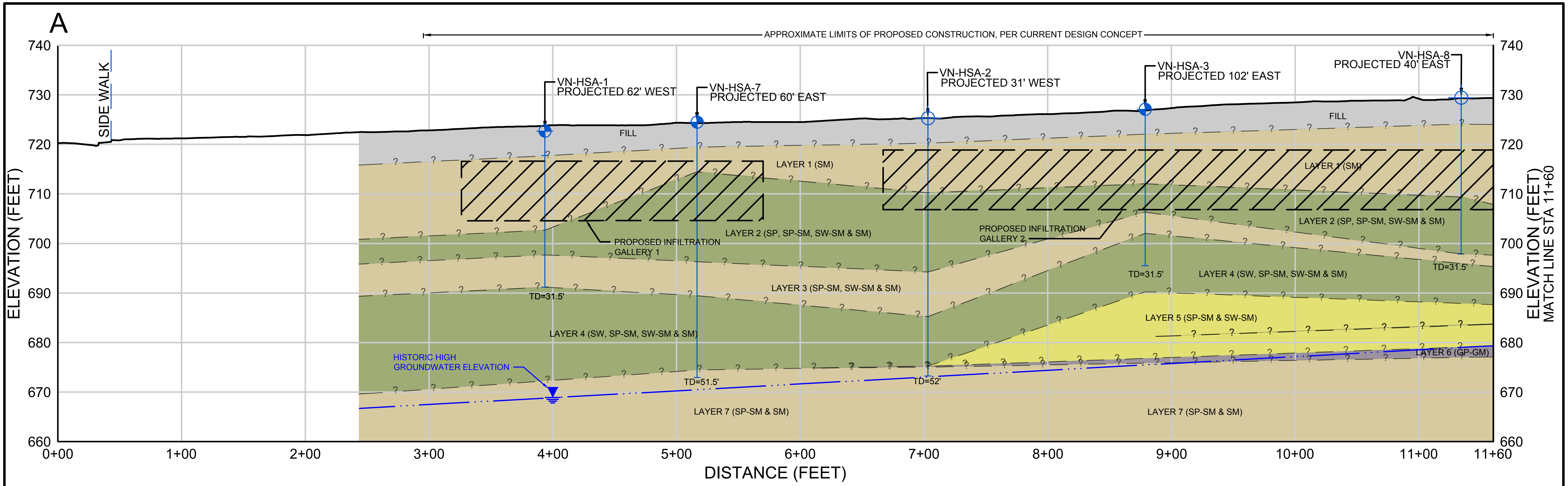
Geologic Map
Valley Plaza Park North
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

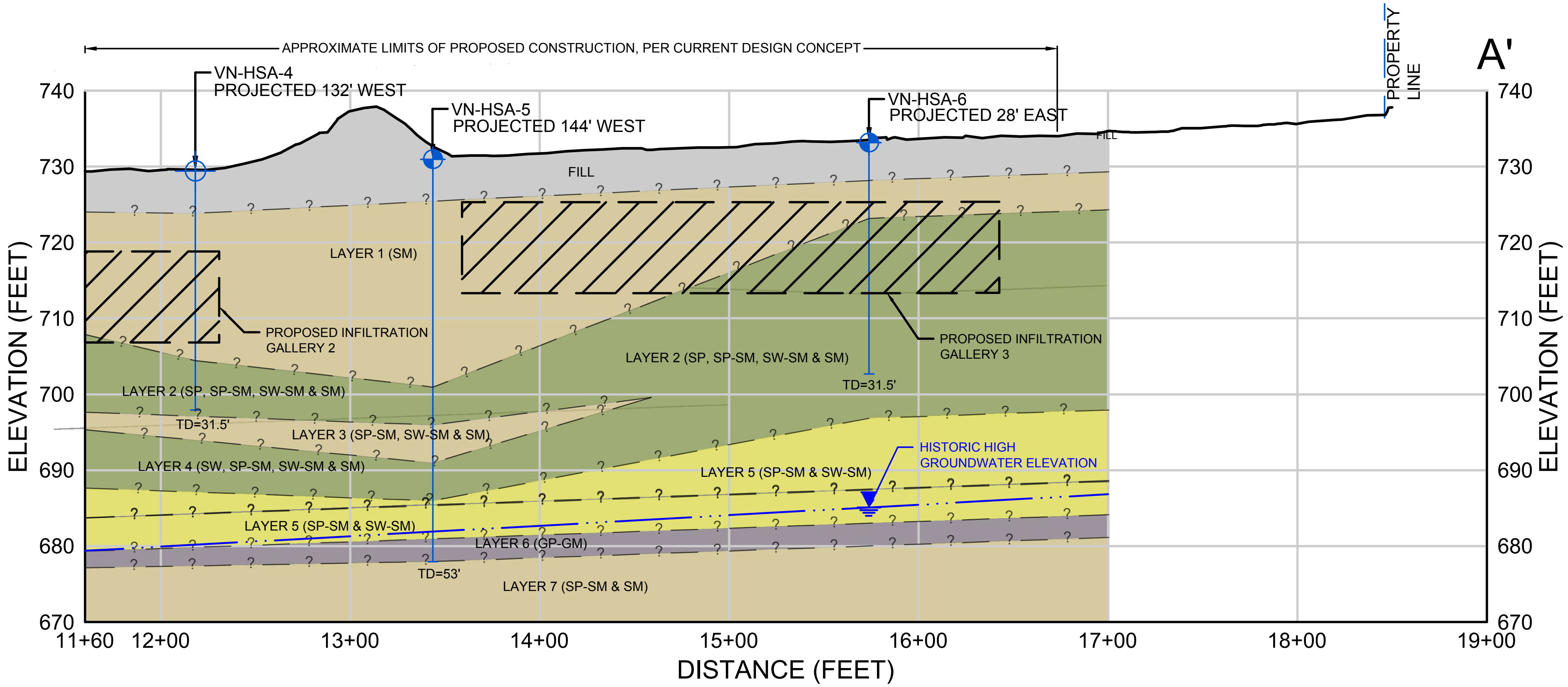
Figure
4

Project No: LA0590D

MAY 2020



GEOLOGIC CROSS SECTION A-A' STA 0+00 TO 11+60



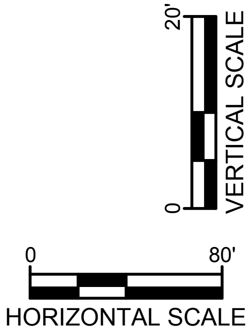
GEOLOGIC CROSS SECTION A-A' STA 11+60 TO 19+00

LEGEND

- ▨ ARTIFICIAL FILL
- ▨ SILTY SAND
- 🟩 SAND, SILTY SAND
- 🟨 SAND, SILT AND GRAVEL
- ▨ GRAVEL AND SAND
- ⌖ HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
- ● HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 5 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.



CROSS SECTION A-A'
VALLEY PLAZA PARK NORTH
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec consultants

FIGURE
5

PROJECT NO: LA0590D
MAY 2020

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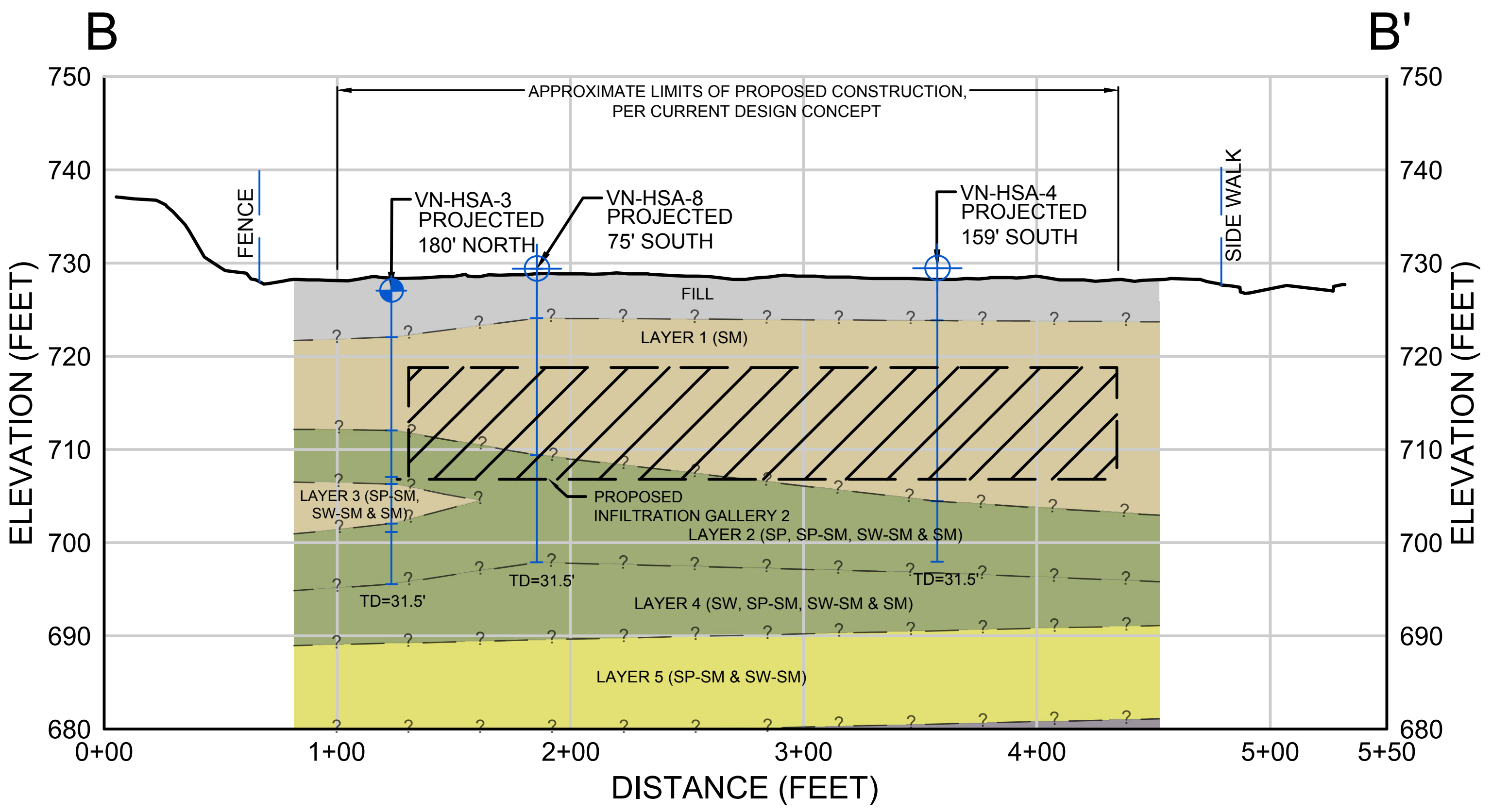

GEOLOGIC CROSS SECTION B-B'

LEGEND

⬜ ARTIFICIAL FILL

🟫 SILTY SAND

🟩 SAND, SILTY SAND

🟨 SAND, SILT AND GRAVEL

🟪 GRAVEL AND SAND

⊕ HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)

● HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 5 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.

20'
0
VERTICAL SCALE

0 80'
HORIZONTAL SCALE

CROSS SECTION B-B'
VALLEY PLAZA PARK NORTH
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec
consultants

FIGURE
6

PROJECT NO: LA0590D
MAY 2020

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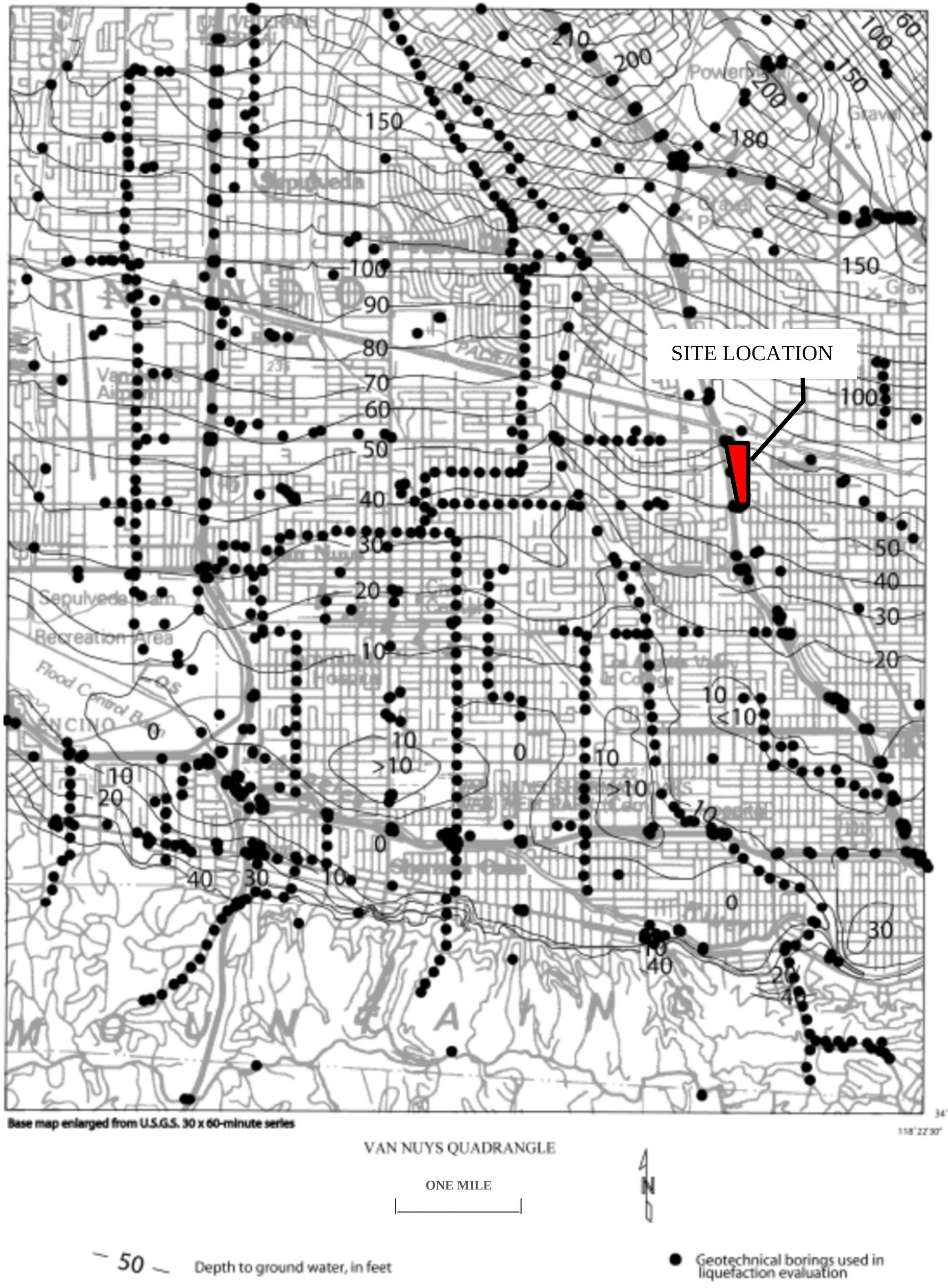


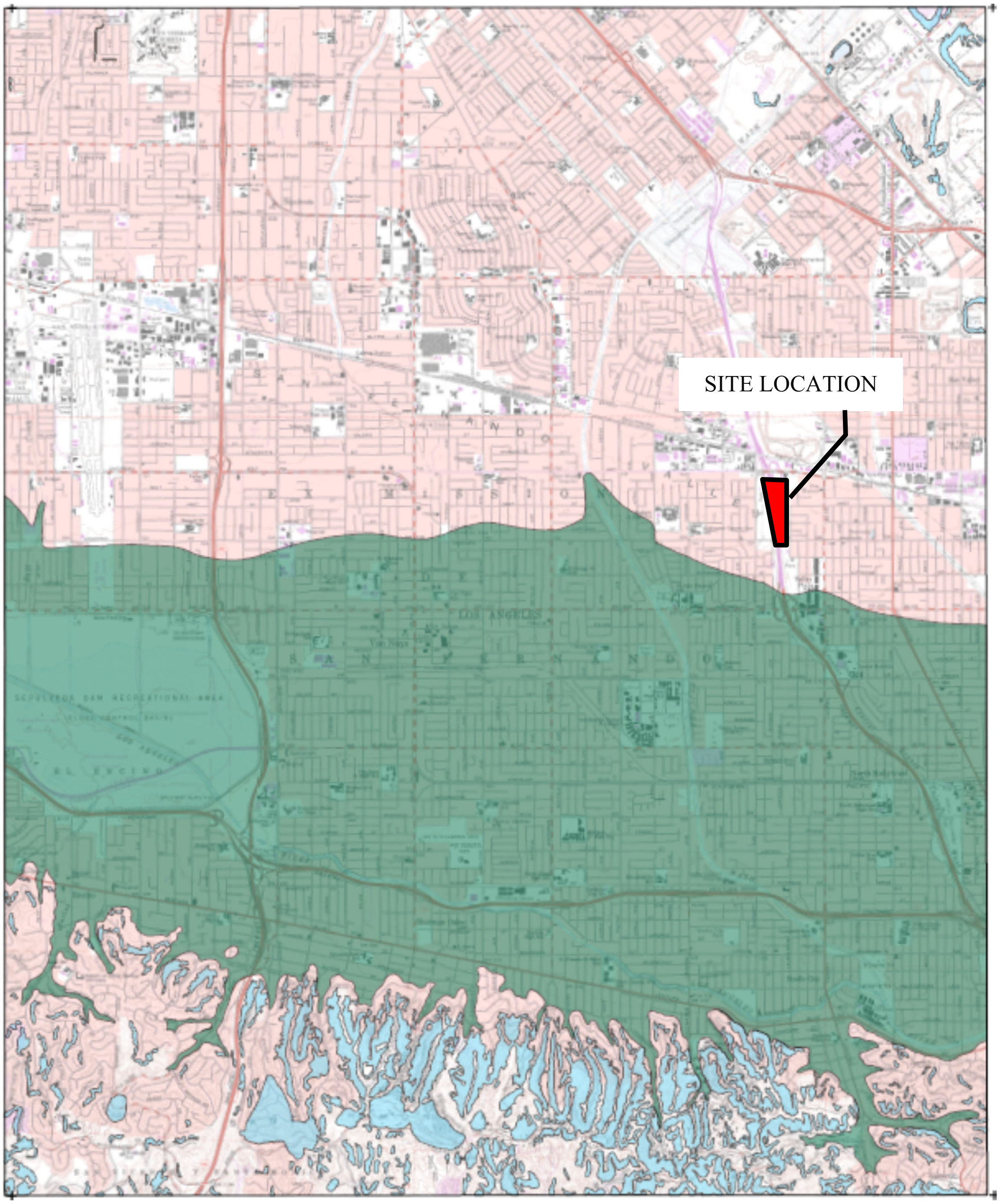
NOTE: IMAGE EXTRACTED FROM SEISMIC HAZARD ZONE REPORT FOR THE VAN NUYS 7.5-MINUTE QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA (CGS 1997)

Historic High Groundwater
Valley Plaza Park North
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec
consultants

Figure
7

Project No: LA0590D
MAY 2020



SEISMIC HAZARD ZONES

🟩 **Liquefaction Zones**
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water 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 Landslide Zones**
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: IMAGE EXTRACTED FROM MAP OF EARTHQUAKE ZONES OF REQUIRED INVESTIGATION, VAN NUYS QUADRANGLE (CGS 1998)

Seismic Hazard Zone Map
Valley Plaza Park North
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

Figure
8

Project No: LA0590D
MAY 2020

OCSD-8x11NP4-With Scale and North Arrow.docx

APPENDIX A
Boring Logs

Geosyntec consultants
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Suite 150
Huntington Beach, CA 92648
Tel: (714) 969-0800
Fax: (714) 969-0820

PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
PROJECT LOCATION Los Angeles, CA
PROJECT NUMBER LA0590D

KEY SHEET - CLASSIFICATIONS AND SYMBOLS

GS FORM:
KEY/SYMBOLS 01/04

EMPIRICAL CORRELATIONS WITH STANDARD PENETRATION RESISTANCE N VALUES *

	N VALUE * (BLOWS/FT)	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS/SQ FT)
FINE GRAINED SOILS	0 - 2	VERY SOFT	<0.25
	3 - 4	SOFT	0.25 - 0.50
	5 - 8	FIRM	0.50 - 1.00
	9 - 15	STIFF	1.00 - 2.00
	16 - 30	VERY STIFF	2.00 - 4.00
	31 - 50	HARD	>4.00
	>50	VERY HARD	

	N VALUE * (BLOWS/FT)	RELATIVE DENSITY
COARSE GRAINED SOILS	0 - 4	VERY LOOSE
	5 - 10	LOOSE
	11 - 30	MEDIUM DENSE
	31 - 50	DENSE
	>50	VERY DENSE

* ASTM D 1586; NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 IN. O.D., 1.4 IN. I.D. SAMPLER ONE FOOT.

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

MAJOR DIVISIONS			SYMBOLS	DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL COARSER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO.4 SIEVE	CLEAN GRAVELS LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES APPRECIABLE AMOUNT OF FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL -SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO.4 SIEVE	CLEAN SANDS LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES APPRECIABLE AMOUNT OF FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL FINER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT

NOTE: DUAL SYMBOLS USED FOR BORDERLINE CLASSIFICATIONS

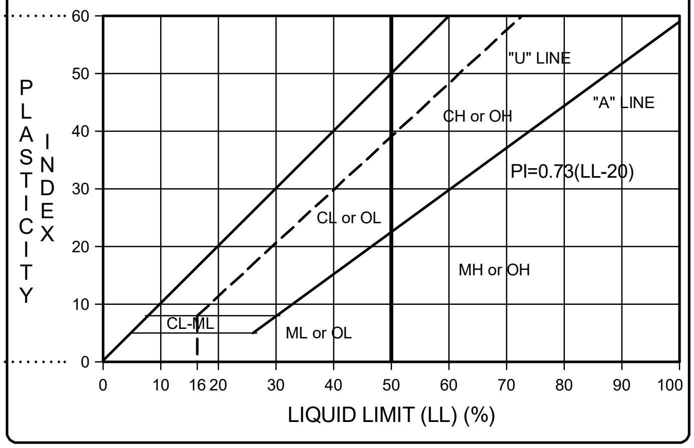
PARTICLE SIZE IDENTIFICATION

USCS (SOILS ONLY) *		SEDIMENTARY (ROCK ONLY)	
BOULDER	>300 mm	BOULDER	>256 mm
COBBLE	75 - 300 mm	COBBLE	64 - 256 mm
GRAVEL: COARSE	20 - 75 mm	PEBBLE	4 - 64 mm
GRAVEL: FINE	4.75 - 20 mm	GRANULE	2 - 4 mm
		SAND: V. COARSE	1 - 2 mm
SAND: COARSE	2 - 4.75 mm	SAND: COARSE	0.5 - 1 mm
SAND: MEDIUM	0.42 - 2 mm	SAND: MEDIUM	0.25 - 0.5 mm
SAND: FINE	0.074 - 0.42 mm	SAND: FINE	0.125 - 0.25 mm
		SAND: V. FINE	0.063 - 0.125 mm
SILT/CLAY	<0.074 mm	SILT	0.004 - 0.063 mm
		CLAY	<0.004 mm

* WELL GRADED - HAVING WIDE RANGE OF GRAIN SIZES AND APPRECIABLE AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES
* POORLY GRADED - PREDOMINANTLY ONE GRAIN SIZE, OR HAVING A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING

PERCENTAGE OF PARTICLE TYPE IN DECREASING ORDER OF PARTICLE SIZE (GRAVEL,SAND,FINES)

PLASTICITY CHART



OTHER MATERIAL SYMBOLS

- Conglomerate
- Sandstone
- Silty Sandstone
- Clayey Sandstone
- Sandy Siltstone
- Siltstone
- Claystone
- Clayey Siltstone/ Silty Claystone
- Sandy Claystone
- Granitic/Intrusive
- Volcanic/Extrusive
- Metamorphic
- Limestone
- Dolomite
- Glacial Till
- Landslide Debris
- Marker Bed
- Artificial Fill
- Refuse
- Concrete/Asphalt

WELL SYMBOLS

- CONCRETE
- GROUT
- BENTONITE SEAL
- TRANSITION SAND
- SAND PACK
- GRAVEL PACK
- NATIVE/SLUFF
- CENTRALIZER

SAMPLE TYPE AND OTHER SYMBOLS

- BULK SAMPLE
- STANDARD PENETRATION TEST
- MODIFIED CALIFORNIA SAMPLE
- CORE SAMPLE
- SHELBY TUBE
- DRIVE SAMPLE

∇ Water Level at Time Drilling, or as Shown
▼ Static Water Level
◇ Pump Inlet
◀ Loss of Drilling Fluid
MSL: Mean Sea Level
AGS: Above Ground Surface
BGS: Below Ground Surface
BTOC: Below Top of Casing
HSA: Hollow Stem Auger

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VN-HSA-1 **SHEET** 1 **OF** 2
START DRILL DATE Apr 14, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 14, 20 **GROUND SURF.** 722.69
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
				SAMPLE								LABORATORY RESULTS						ATTERBERG LIMITS		
	722	Silty SAND (SM): dark brown; moist; fine to medium sand; (5,75,20); non-plastic; 1/4 in. to 3/4 in. gravel; trace roots.								1250										
	721			B-1					0.0		Hand auger to 5-ft. b.g.s.					5.3		NP	NP	NP
	720																			
	719																			
	718																			
5	717	Silty SAND (SM): brown; moist; fine to medium sand; (0,80,20): medium dense; non-plastic; trace 1/4 in. gravel and roots.		S-1		4 7 8	15	100	0.0	1255										
	716																			
	715																			
	714										Hard drilling.									
	713																			
10	712	Decrease in fines content; (10,75,15); 1/2 in. to 1 in. gravel; no roots.		S-2		6 13 9	22	83	0.0	1300										
	711	at 11.2 ft. - 2 in. gravel bed. Increase in fines content; (0,80,20); no gravel.																		
	710																			
	709																			
	708																			
15	707	Decrease in fines content; (5,80,15); 1/4 in. to 3/4 in. gravel.		S-3		5 8 9	17	89	0.0	1303						4.9		NP	NP	NP
	706																			
	705																			
	704										Hard drilling.									
	703																			
20	702	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (0,90,10); loose; non-plastic; trace gravel.		S-4		3 4 6	10	100	0.0	1306				9.7		8.0				
	701																			
	700																			
	699																			
	698																			
25	697	Silty SAND (SM): brown; moist; fine to coarse sand; (10,49,41); medium dense; non-plastic; 1/4 in. to 1 in. gravel.		S-5		12 14 16	30	100	0.0	1310				41.0	10	4.3				
	696	at 25.6 ft. - 2 in. gravel bed.																		
	695																			
	694																			
	693																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan

NORTHING 34.19503
EASTING -118.40161
COORDINATE SYSTEM:

REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-1 **SHEET** 2 **OF** 2
START DRILL DATE Apr 14, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 14, 20 **GROUND SURF.** 722.69
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE							COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS								
				SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)		DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	692	Decrease in fines content; (5,75,20); dense; 1/4 in. to 1/2 in. gravel.		S-6		14 19 19	38	78	0.0	1314						3.5				
	691	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1317										
	690																			
	689																			
35	688																			
	687																			
	686																			
	685																			
	684																			
40	683																			
	682																			
	681																			
	680																			
	679																			
45	678																			
	677																			
	676																			
	675																			
	674																			
50	673																			
	672																			
	671																			
	670																			
	669																			
55	668																			
	667																			
	666																			
	665																			
	664																			
60	663																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan

NORTHING 34.19503
EASTING -118.40161
COORDINATE SYSTEM:

REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-2 **SHEET** 1 **OF** 2
START DRILL DATE Apr 16, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 16, 20 **GROUND SURF.** 725.24
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
		Silty SAND (SM): brown; moist; fine to coarse sand; (0,70,30); non-plastic; trace gravel.							0742										
	724		B-1					0.0		Hand auger to 5-ft. b.g.s.									
5	720	Silty SAND (SM): brown; moist; fine to coarse sand; (5,75,20); medium dense; non-plastic; 1/4 in. to 1/2 in. gravel.	S-1		4 6 6	12	100	0.0	0747										
10	715	Increase in fines content; (5,70,25); 1/4 in. gravel.	S-2		4 6 9	15	94	0.0	0751										
15	710	Well-graded SAND with Gravel (SW): brown; moist; fine to coarse sand; (23,73,4); medium dense; non-plastic; 1/4 in. to 1 in. gravel.	S-3		7 14 11	25	83	0.0	0756	Hard drilling.			4.3	23.0	3.2				
20	705	Well-graded SAND with Silt (SW-SM): brown; moist; fine to coarse sand; (10,85,5); dense; non-plastic; 1/4 in. to 1 in. gravel.	S-4		10 14 18	32	67	12.7	0801	Hard drilling.			5.2		3.6				
25	700	Increase in fines content; moist to wet; (5,85,10); 1/4 in. to 1/2 in. gravel.	S-5		8 15 18	33	100	17.6	0804										
30																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan **REVIEWER** S. Siciliano, P.G., C.E.G.

NORTHING 34.19588
EASTING -118.40172
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VN-HSA-2 **SHEET** 2 **OF** 2
START DRILL DATE Apr 16, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 16, 20 **GROUND SURF.** 725.24
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DESCRIPTION: 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)

COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
		Very dense; 1/4 in. gravel.	S-6		15			4.7	0809										
			S-6A		28		100				114.6				4.2				
	694	Silty SAND (SM): brown; moist; fine to coarse sand; (0,75,25); very dense; non-plastic.	S-6B		50/5		100												
			S-7		28			0.5	0813										
	693	Decrease in fines content; (10,75,15); 1/4 in. to 1 in. gravel.	S-7A		30		100												
			S-7B		50/5		100												
	692																		
	691																		
35	690	Becomes dark brown; medium dense.	S-8		6 11 13	24	100	0.2	0824	35 to 53 ft b.g.s - 1 in. to 3 in. pebbles observed.									
	689																		
	688																		
	687																		
	686																		
40	685	Well-graded SAND with Silt and Gravel (SW-SM): brown; moist; fine to coarse sand; (30,60,10); very dense; non-plastic; 1/4 in. to 1 in. gravel.	S-9		13 25 31	56	89	0.8	0830	Hard drilling - 40 to 43 ft. b.g.s.									
	684																		
	683																		
	682																		
	681																		
45	680	Increase in gravel content; (36,57,7). at 45.5 ft. - 2 in. gravel bed. at 46 ft. 1 in. gravel bed.	S-10		29 25 30	55	100	1.5	0835	Hard drilling - 45 to 48 ft. b.g.s.			7.0	36.0	1.8				
	679																		
	678																		
	677																		
	676																		
50	675	2" gravel pieces. Silty SAND (SM): brown; moist; fine to coarse sand; (5,75,20); very dense; non-plastic; 1/4 in. to 1/2 in. gravel.	S-11		50/5	REF	100	1.7	0844	Hard drilling - 50 to 52 ft. b.g.s.									
	674																		
	673	Terminated Boring at 52 ft. below ground surface due to refusal. After completion of drilling, borehole was backfilled with high-solids cement-bentonite slurry.							0848	Refusal.									
	672																		
	671																		
55	670																		
	669																		
	668																		
	667																		
	666																		
60																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
REVIEWER S. Siciliano, P.G., C.E.G.

NORTHING 34.19588
EASTING -118.40172
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-3 **SHEET** 1 **OF** 2
START DRILL DATE Apr 14, 20
FINISH DRILL DATE Apr 14, 20
LOCATION Los Angeles, CA
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D
ELEVATION DATA:
GROUND SURF. 727.05
TOP OF CASING

DESCRIPTION: 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)

COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	726	Silty SAND (SM): brown; moist; fine to medium sand; (5,80,15); non-plastic; 1/4 in. to 3/4 in. gravel; trace roots.							1000										
			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	725 724 723																		
5	722	Silty SAND (SM): brown; moist; fine to medium sand; (0,85,15); medium dense; non-plastic; trace gravel; 1/2 in. to 1 in. gravel in the upper 0.2 ft.	S-1		3 4 8	12	100	0.0	1008										
	721 720 719 718																		
10	717	Increase in fines content; (5,75,20); non-plastic; 1/4 in. to 1/2 in. gravel.	S-2A		3	6	100	0.0	1013										
	716	at 10.3 ft. - 3 in. clay seam with wood pieces/organics.	S-2B		3 3		100						34.0		4.0				
	715	Silty SAND (SM): brown; moist; fine to medium sand; (0,66,34); loose; non-plastic.																	
	714 713																		
15	712	Poorly-graded SAND (SP): brown; moist; predominantly fine-grained with medium to coarse sand; (3,93,4); medium dense; non-plastic; 1/4 in. to 1/2 in. gravel.	S-3		5 8 9	17	83	0.0	1016				3.8	3.0	2.1				
	711 710 709 708																		
20	707	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (5,85,10); non-plastic; 1/4 in. gravel.			10	22		0.0	1019										
	706		S-4A		12		100				109.0				4.5				
			S-4B		22		100				114.3				7.0				
	705	Silty SAND (SM): brown; moist; fine to coarse sand; (5,75,20); dense; non-plastic; 1/4 in. gravel.																	
	704 703																		
25	702	1/2 in. to 1 in. gravel/rock fragments.	S-5A		19	65	44	0.0	1023	Hard drilling - 25 to 27-ft b.g.s.									
	701	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (5,90,5); very dense; non-plastic; 1/4 in. to 1/2 in. gravel.	S-5B		35 30		100						5.3		2.8				
	700 699 698																		
30																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.19636
EASTING -118.40216
COORDINATE SYSTEM:
REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-3 **SHEET** 2 **OF** 2
START DRILL DATE Apr 14, 20
FINISH DRILL DATE Apr 14, 20
ELEVATION DATA:
GROUND SURF. 727.05
TOP OF CASING
LOCATION Los Angeles, CA
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

				SAMPLE								LABORATORY RESULTS								
																		ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	696	Increase in fines content; (5,85,10); medium dense; 1/4 in to 3/4 in. gravel.	▨	S-6	◸	6 11 16	27	100	0.0	1027	Hard drilling.									
	695	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1032										
	694																			
	693																			
35	692																			
	691																			
	690																			
	689																			
	688																			
40	687																			
	686																			
	685																			
	684																			
	683																			
45	682																			
	681																			
	680																			
	679																			
	678																			
50	677																			
	676																			
	675																			
	674																			
	673																			
55	672																			
	671																			
	670																			
	669																			
	668																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.19636
EASTING -118.40216
COORDINATE SYSTEM:
REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-4 **SHEET** 1 **OF** 2
START DRILL DATE Apr 15, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 15, 20 **GROUND SURF.** 729.43
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	729	Silty SAND (SM): dark brown; moist; fine to medium sand; (0,70,30); non-plastic; trace gravel and roots.								0958										
	728			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	727																			
	726																			
	725																			
5	724	Decrease in fines content; (0,80,20).		S-1A		7	18	100	0.0	1002										
	723	Silty SAND (SM): brown; moist; fine to coarse sand; (5,75,20); medium dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-1B		9 9		100												
	722	at 6.2 ft. - 1 in. gravel bed.																		
	721																			
	720																			
10	719	Silty SAND (SM): brown; moist; fine to medium sand; (0,64,36); very loose; non-plastic; rapid dilatancy.		S-2		1 2 2	4	100	0.0	1007				36.0		13.3				
	718																			
	717																			
	716																			
	715																			
15	714	Decrease in fines content; (0,70,30); medium dense; trace gravel.				5	16		0.0	1012										
	713			S-3A S-3B		9 15						107.9 104.5				9.5 14.9		NP	NP	NP
	712																			
	711																			
	710																			
20	709	Decrease in fines content; (5,70,25); 1/4 in. gravel.		S-4		4 5 8	13	100	0.0	1017										
	708																			
	707																			
	706																			
	705																			
25	704	Well-graded SAND with Silt (SW-SM): brown; moist; fine to coarse sand; (10,85,5); medium dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-5		9 14 15	29	94	0.0	1022				5.3	10.0	4.0				
	703																			
	702																			
	701																			
	700																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan

NORTHING 34.19730
EASTING -118.40139
COORDINATE SYSTEM:

REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

Geosyntec consultants

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VN-HSA-4 **SHEET** 2 **OF** 2
START DRILL DATE Apr 15, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 15, 20 **GROUND SURF.** 729.43
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

				SAMPLE								LABORATORY RESULTS								
																		ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	699	Increase in sand content; (0,94,6); dense; trace 1/4 in. gravel.		S-6		9 13 18	31	94	0.0	1027				5.8		4.6				
	698																			
		Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite slurry.								1031										
	697																			
	696																			
	695																			
35	694																			
	693																			
	692																			
	691																			
	690																			
40	689																			
	688																			
	687																			
	686																			
	685																			
45	684																			
	683																			
	682																			
	681																			
	680																			
50	679																			
	678																			
	677																			
	676																			
	675																			
55	674																			
	673																			
	672																			
	671																			
	670																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan **REVIEWER** S. Siciliano, P.G., C.E.G.

NORTHING 34.19730
EASTING -118.40139
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-5 **SHEET** 1 **OF** 2
START DRILL DATE Apr 15, 20
FINISH DRILL DATE Apr 15, 20
ELEVATION DATA:
GROUND SURF. 730.95
TOP OF CASING
LOCATION Los Angeles, CA
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
		Silty SAND (SM): dark brown; moist; fine to coarse sand; (5,65,30); 1/4 in. to 3/4 in. gravel; trace roots.								0728										
	730			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	729																			
	728																			
	727																			
5	726	Increase in fines content; (5;60;35); non-plastic; 1/2 in. to 1 in. gravel.		S-1A		4	11	100	0.0	0738								NP	NP	NP
	725	Silty SAND (SM): brown; moist; fine to coarse sand; (0,85,15); medium dense; non-plastic; trace 1/4 in. gravel.		S-1B		5 6		100												
	724																			
	723										Hard drilling.									
	722																			
10	721	Increase in fines content; (10,70,20); very dense; 1/4 in. to 1 1/4 in. gravel.		S-2		24 50/0	50/0-REF	50	0.0	0740	Hard drilling.									
	720																			
	719																			
	718																			
	717																			
15	716	No gravel; (0,83,17); loose.		S-3		2 3 5	8	100	0.0	0749				17.0		9.0				
	715																			
	714																			
	713																			
	712																			
20	711	Increase in gravel content; (10,75,15); medium dense; 1/4 in. to 1 in. gravel.		S-4		8 10 11	21	94	0.0	0754										
	710																			
	709																			
	708																			
	707																			
25	706	Decrease in gravel content; (5,80,15); dense.		S-5		9 17 18	35	100	0.0	0759						2.5				
	705																			
	704																			
	703																			
	702																			
30	701																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.19764
EASTING -118.40135
COORDINATE SYSTEM:
REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING **VN-HSA-5** **SHEET** **2** **OF** **2**
START DRILL DATE Apr 15, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 15, 20 **GROUND SURF.** 730.95
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	LABORATORY RESULTS: MAX. DRY DENSITY (pcf)	LABORATORY RESULTS: PERCENT FINES (%)	LABORATORY RESULTS: PERCENT GRAVEL (%)	LABORATORY RESULTS: MOIST. CONTENT (%)	LABORATORY RESULTS: OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
	700	Well-graded SAND (SW): brown; moist; fine to coarse sand; (8,88,4); dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-6		8 16 19	35	100	0.0	0807				4.2	8.0	3.8				
	699																			
	698																			
	697																			
35	696																			
	695	Silty SAND (SM): brown; moist; fine to coarse sand; (10,75,15); very dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-7 S-7A S-7B		24 42 42	56	100 100		0812		132.2				3.1				
	694																			
	693										Hard drilling - 38 to 43 ft. b.g.s.									
	692																			
40	691																			
	690	Poorly-graded SAND with Gravel (SP): brown; moist; predominantly fine-grained with medium to coarse sand; (47,48,5); very dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-8		50/5	REF	50	0.0	0817				4.9	47.0	1.7				
	689																			
	688																			
	687																			
45	686																			
	685	Silty SAND with Gravel (SM): brown; moist; fine to coarse sand; (15,70,15); very dense; non-plastic; 1/4 in. to 1 in. gravel. at 45.5 ft. - 1 1/2 in. gravel bed.		S-9		16 50/1	50/1	100	0.0	0822	Hard drilling 45 to 53 ft. b.g.s. 45 to 53 ft b.g.s - 1 in. to 4 in. pebbles observed.									
	684																			
	683																			
	682																			
50	681																			
	680	Poorly Graded GRAVEL with Sand (GP-GM): brown; moist; fine to coarse sand; (47,47,6); very dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-10		50/5	REF	78	0.0	0830				6.1	47.0	2.1				
	679																			
	678																			
	677	Terminated Boring at 53 ft. below ground surface due to refusal. After completion of drilling, borehole was converted to infiltration test well.								0838	Refusal.									
55	676																			
	675																			
	674																			
	673																			
	672																			
60	671																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.19764
EASTING -118.40135
COORDINATE SYSTEM:
REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VN-HSA-6 **SHEET** 1 **OF** 2
START DRILL DATE Apr 14, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 14, 20 **GROUND SURF.** 733.19
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DESCRIPTION: 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)

COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
		Silty SAND (SM): dark brown; moist; fine to medium sand; (0,70,30); non-plastic; trace gravel and roots.								0856										
	732			B-1					0.0		Hand auger to 5-ft. b.g.s.					8.4		NP	NP	NP
	731																			
	730																			
	729																			
5	728	Silty SAND (SM): brown; moist; fine to coarse sand; (0,85,15); loose; non-plastic.		S-1		2 3 3	6	100	0.0	0900										
	727																			
	726																			
	725																			
	724																			
10	723	Poorly-graded SAND (SP) - brown; moist; predominantly fine-grained with medium to coarse sand; (5,90,5); loose; non-plastic; 1/4 in. to 1/2 in. gravel.		S-2A		3 4	9	100	0.0	0904										
	722			S-2B		5		100						3.7		2.6				
	721	No gravel; (0,96,4).																		
	720																			
	719																			
15	718	(0,95,5); medium dense; trace gravel.		S-3		6 9 9	18	94	0.1	0908										
	717																			
	716																			
	715																			
	714																			
20	713	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (5,90,10); dense; non-plastic; 1/4 in. gravel; trace roots.		S-4		6 14 20	34	89	0.0	0911						5.5				
	712																			
	711																			
	710																			
	709																			
25	708	(2,92,6); no roots.		S-5		8 14 18	32	100	0.0	0914				5.5	2.0	4.6				
	707																			
	706																			
	705																			
	704																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan **REVIEWER** S. Siciliano, P.G., C.E.G.

NORTHING 34.19827
EASTING -118.40192
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VN-HSA-6 **SHEET** 2 **OF** 2
START DRILL DATE Apr 14, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 14, 20 **GROUND SURF.** 733.19
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
		2" gravel piece.		S-6		50/2	REF	2	0.0	0919										
	702																			
	701	Terminated Boring at 32 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								0923										
	700																			
	699																			
35	698																			
	697																			
	696																			
	695																			
	694																			
40	693																			
	692																			
	691																			
	690																			
	689																			
45	688																			
	687																			
	686																			
	685																			
	684																			
50	683																			
	682																			
	681																			
	680																			
	679																			
55	678																			
	677																			
	676																			
	675																			
	674																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan **REVIEWER** S. Siciliano, P.G., C.E.G.

NORTHING 34.19827
EASTING -118.40192
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-7 **SHEET** 1 **OF** 2
START DRILL DATE Apr 14, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 14, 20 **GROUND SURF.** 724.45
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE							COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS								
				SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)		DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	724	Silty SAND (SM): dark brown; moist; fine to medium sand; (5,80,15); non-plastic; 1/4 in. to 1/2 in. gravel; trace roots.								1111										
	723			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	722																			
	721																			
	720																			
5	719	Silty SAND (SM): brown; moist; fine to medium sand; (0,80,20); medium dense; non-plastic; trace gravel and roots.		S-1		3 4 8	12	100	0.0	1116										
	718																			
	717																			
	716																			
	715																			
10	714	Poorly-graded SAND (SP): brown; moist; predominantly fine-grained with medium to coarse sand; (5,91,4); medium dense; non-plastic; 1/4 in. gravel.		S-2		48 15 9	24	67	0.0	1119				4.4	5.0	7.4				
	713																			
	712																			
	711																			
	710																			
15	709	Decrease in fines content; (0,99,1).		S-3		3 6 7	13	100	0.0	1123				0.9		6.3				
	708	at 16.4 ft. - 1 in. gravel bed.																		
	707																			
	706																			
	705																			
20	704	Increase in fines content; (0,95,5).		S-4		4 9 9	18	89	0.0	1127				4.6	0.0	3.4				
	703																			
	702																			
	701																			
	700																			
25	699	Increase in gravel content; (5,90,5); 1/4 in. to 1/2 in. gravel.		S-5		10 10 10	20	83	0.0	1131						3.3				
	698	at 25.6 ft. - 1/2 in. gravel bed.																		
	697																			
	696																			
	695																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan **REVIEWER** S. Siciliano, P.G., C.E.G.

NORTHING 34.18537
EASTING -118.40201
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

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GS FORM:
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BOREHOLE LOG

BORING VN-HSA-7 **SHEET** 2 **OF** 2
START DRILL DATE Apr 14, 20
FINISH DRILL DATE Apr 14, 20
LOCATION Los Angeles, CA
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D
ELEVATION DATA:
GROUND SURF. 724.45
TOP OF CASING

DESCRIPTION: 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)

COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS	LABORATORY RESULTS: DRY DENSITY (pcf)	LABORATORY RESULTS: MAX. DRY DENSITY (pcf)	LABORATORY RESULTS: PERCENT FINES (%)	LABORATORY RESULTS: PERCENT GRAVEL (%)	LABORATORY RESULTS: MOIST. CONTENT (%)	LABORATORY RESULTS: OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
	694	Increase in gravel content; (10,86,4); dense; 1/4 in. to 1 in. gravel.		S-6		10 15 16	31	100	0.0	1136				4.2		3.2				
	693																			
	692																			
	691																			
	690																			
35	689	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (5,85,10); dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-7		11 16 18	34	67	0.0	1141										
	688																			
	687	at 36.4 ft. - 1 in. gravel bed.																		
	686																			
	685																			
40	684	No gravel; (0,90,10); very dense.				23			0.0	1147	Hard drilling - 40 to 48 ft. b.g.s.									
	683	Increase in gravel content; (10,80,10); 1/4 in. to 3/4 in. gravel.		S-8A S-8B		37 50/3		100 100				120.5				4.2				
	682																			
	681																			
	680																			
45	679	(10,80,10); 1/4 in. to 1 in. gravel.		S-9		26 50/5	50/5	100	0.0	1156										
	678																			
	677																			
	676																			
	675																			
50	674	Poorly-graded SAND with Silt and Gravel (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (20,70,10); very dense; non-plastic; 1/4 in. to 1 1/2 in. gravel.		S-10		47 50/2	50/2	56	0.0	1205	Hard drilling 50 to 51.5 ft. b.g.s.									
	673									1210										
	672	Terminated Boring at 51.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.																		
	671																			
	670																			
55	669																			
	668																			
	667																			
	666																			
	665																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
REVIEWER S. Siciliano, P.G., C.E.G.
NORTHING 34.18537
EASTING -118.40201
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

DRAFT - FOR DISCUSSION PURPOSES ONLY

Geosyntec consultants

2100 Main St
Suite 150
Huntington Beach, CA 92648
Tel: (714) 969-0800
Fax: (714) 969-0820

GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VN-HSA-8 **SHEET** 1 **OF** 2
START DRILL DATE Apr 15, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 15, 20 **GROUND SURF.** 729.39
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	729	Silty SAND (SM): dark brown; moist; fine to medium sand; (0,75,25); non-plastic; trace 1/4 in. gravel.								1120										
	728			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	727																			
	726																			
	725																			
5	724	Poorly-graded SAND (SP): brown; moist; predominantly fine-grained with medium to coarse sand; (0,97,3); loose; non-plastic.		S-1A		3	10	100	0.0	1124										
	723			S-1B		4 6		100						2.5		6.0				
	722																			
	721																			
	720																			
10	719	Increase in gravel content; (5,90,5); medium dense; 1/4 in. to 1 in. gravel.		S-2		5 7 8	15	83	0.0	1128										
	718																			
	717																			
	716																			
	715																			
15	714	No gravel; (0,95,5).		S-3		4 5 7	12	100	0.0	1132										
	713																			
	712																			
	711																			
	710																			
20	709	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (5,87,8); medium dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-4		5 7 10	17	100	0.0	1136				7.5		6.5				
	708																			
	707																			
	706																			
	705																			
25	704	(5,85,10); dense; 1/4 in. gravel.				15	45		0.0	1140										
				S-5A		24		100				106.9				5.5				
	703			S-5B		44		100												
	702																			
	701																			
	700																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan

NORTHING 34.19706
EASTING -118.40196
COORDINATE SYSTEM:

REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

Geosyntec consultants

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VN-HSA-8 **SHEET** 2 **OF** 2
START DRILL DATE Apr 15, 20
FINISH DRILL DATE Apr 15, 20
LOCATION Los Angeles, CA
PROJECT TOS #25 - Valley Plaza Park North Stormwater Capture
NUMBER LA0590D
ELEVATION DATA:
GROUND SURF. 729.39
TOP OF CASING

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	699	Well-graded SAND (SW): brown; moist; fine to coarse sand; (13,83,4); medium dense; non-plastic; 1/4 in. to 3/4 in. gravel.	▨	S-6		11 15 14	29	94	0.0	1145				3.9	13.0	4.3				
	698																			
	697	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite slurry.								1150										
	696																			
	695																			
35	694																			
	693																			
	692																			
	691																			
	690																			
40	689																			
	688																			
	687																			
	686																			
	685																			
45	684																			
	683																			
	682																			
	681																			
	680																			
50	679																			
	678																			
	677																			
	676																			
	675																			
55	674																			
	673																			
	672																			
	671																			
	670																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.19706
EASTING -118.40196
COORDINATE SYSTEM:
REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

APPENDIX B

Geotechnical Laboratory Testing Data

CALIFORNIA TESTING & INSPECTIONS
Geotechnical and Construction Materials Testing Laboratory

Project: TOS-25 Valley Plaza Park North Stormwater Capture
Project Number: 200-20043-20001-02(LA0590D)
Date: 4/21/2020
Sample ID: 846
Sampled:

Date Tested: 4/21/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 4/23/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Brown, Moist, some roots	(SM) Silty Sand, Light Brown, Moist	(SM) Silty Sand, Moist, Yellowish Brown	(SM) Silty Sand, Brown, Moist	(SM) Silty Sand, Moist, Yellowish Brown	(SP-SM) Poorly graded Sand, Moist, Dense, Medium Course	(SM) Silty Sand, Moist, Yellowish Brown	Bottom 3 rings: (SP-SM) Poorly Graded sand with Silt, Moist, Dense	Top 3 Rings: (SM) Silty Sand, Yellowish Brown, Stiff
BORING #	VN-HSA-1	VN-HSA-1	VN-HSA-1	VN-HSA-1	VN-HSA-2	VN-HSA-2	VN-HSA-3	VN-HSA-3	VN-HSA-3
DEPTH (ft)	1-5	15-16.5	20-21.5	30-31.5	20-21.5	30.5-31	10.6-11.5	20.5-21	20.5-21
SAMPLE #	B-1	S-3	S-4A	S-6	S-4	S-6A	S-2B	S-4A	S-4A
HEIGHT OF SAMPLE	NT	NT	NT	NT	NT	5	NT	3	2
WEIGHT OF SAMPLE (g)	NT	NT	NT	NT	NT	941.41	NT	544.78	383.65
TARE (g)	96.3	68.3	65.7	100.5	45.8	46.05	45.4	45.34	45.42
TARE + SAMPLE WET (g)	462.5	234.2	209.6	346.6	117.8	182.51	157.3	186.62	178.77
TARE + SAMPLE DRY (g)	444	226.4	198.9	338.3	115.3	176.98	153	180.5	170.0
MOISTURE CONTENT (%)	5.3	4.9	8.0	3.5	3.6	4.2	4.0	4.5	7.0
DRY DENSITY (pcf)	NT	NT	NT	NT	NT	114.6	NT	109.0	114.3
PASSING #200 (%)	NT	NT	9.7	NT	5.2	NT	34	NT	NT
PLASTIC INDEX (%)	NP	NP	NT	NT	NT	NT	NT	NT	NT

NT: Not Tested | NP: Non Plastic

CALIFORNIA TESTING & INSPECTIONS

Geotechnical and Construction Materials Testing Laboratory

Project: TOS-25 Valley Plaza Park North Stormwater Capture
Project Number: 200-20043-20001-02(LA0590D)
Date: 4/21/2020
Sample ID: 846
Sampled:

Date Tested: 4/21/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 4/23/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Dark Brown, Moist, Firm	(SM-SP) Silty Sand, Moist, Brown	(SM) Silty Sand, Dr. Brown, Moist	(SM) Silty Sand, Moist, Yellowish Brown	(SP-SM) Poorly Graded Sand with Silt, Brown, Moist, Dense, Medium Coarse Agg. 1" rock	(SP-SM) Poorly Graded Sand with Silt, Brown, Moist, Dense, ~1" Rock at bottom	(SP) Poorly Graded Sand, Light Yellowish Brown, frim, Medium Coarse, Rock 1" bottom ~1 1/2" Rock
BORING #	VN-HSA-3	VN-HSA-4	VN-HSA-4	VN-HSA-4	VN-HSA-5	VN-HSA-5	VN-HSA-5	VN-HSA-7	VN-HSA-8
DEPTH (ft)	25.9-26.5	10-11.5	15-16.5	30-31.5	5-5.5	15-16.5	35.5-36	41-41.5	25.5-26
SAMPLE #	S-5B	S-2	S3A	S-6	S-1A	S-3	S7A	S8B	S5A
HEIGHT OF SAMPLE	NT	NT	5	NT	NT	NT	4	4	3
WEIGHT OF SAMPLE (g)	NT	NT	933.47	NT	NT	NT	834.35	782.49	540.67
TARE (g)	61.2	60.6	45.45	61.7	60.6	68.2	60.06	61.61	62.3
TARE + SAMPLE WET (g)	176.7	209.9	177.23	290.2	263.5	176.2	327.25	213	225.57
TARE + SAMPLE DRY (g)	173.6	192.4	165.8	280.2	238.9	167.3	319.3	206.9	217
MOISTURE CONTENT (%)	2.8	13.3	9.5	4.6	13.8	9.0	3.1	4.2	5.5
DRY DENSITY (pcf)	NT	NT	107.9	NT	NT	NT	132.2	120.5	106.9
PASSING #200 (%)	5.3	36	NT	5.8	NT	17	NT	NT	NT
PLASTIC INDEX (%)	NT	NT	NP	NT	NP	NT	NP	NT	NT

NT: Not Tested | NP: Non Plastic

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park North Stormwater Capture**

Client: **Geosyntec Consultants**

Attention To: K. Viswanathan

Location: See Below

Date Sampled: 4/14/2020-4/16/2020

Date of Report : 5/11/20

Project No. : 200-20043-20001-02 (LA0590D)

Reported By: L. Valle

Reviewed By: L. Valle

Sample Number :	#846	#846						
Sample Location :	VN-HSA-1, S-2	VN-HSA-1, S-5						
Depth:	5-6.5'	25-26.5'						
Gradation (ASTM D6913)								
Percent Passing Sieve Size								
2"	-							
1 ½"	-	100%						
1"	-	96%						
3/4"	-	96%						
1/2"	-	94%						
3/8"	-	92%						
#4	-	90%						
#10	-	85%						
#30	-	71%						
#40	-	64%						
#50	-	56%						
#100	-	46%						
#200	-	41%						
Moisture content (ASTM D 2216)	NT	4.3%						
Wash #200 (ASTM D 1140)	NT							
Liquid Limit (ASTM D 4318)	NT	NT						
Plastic limit (ASTM D 4318)	NT	NT						
Plastic Index (ASTM D 4318)	NT	NT						
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT						
Sand Equivalent (ASTM D2419)	81	NT						
Visual Soil Classification	Medium grained Silty Sand (SM-SP)	Sandy Elastic Silt (ML)						

Comments: NP: Non-Plastic

NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

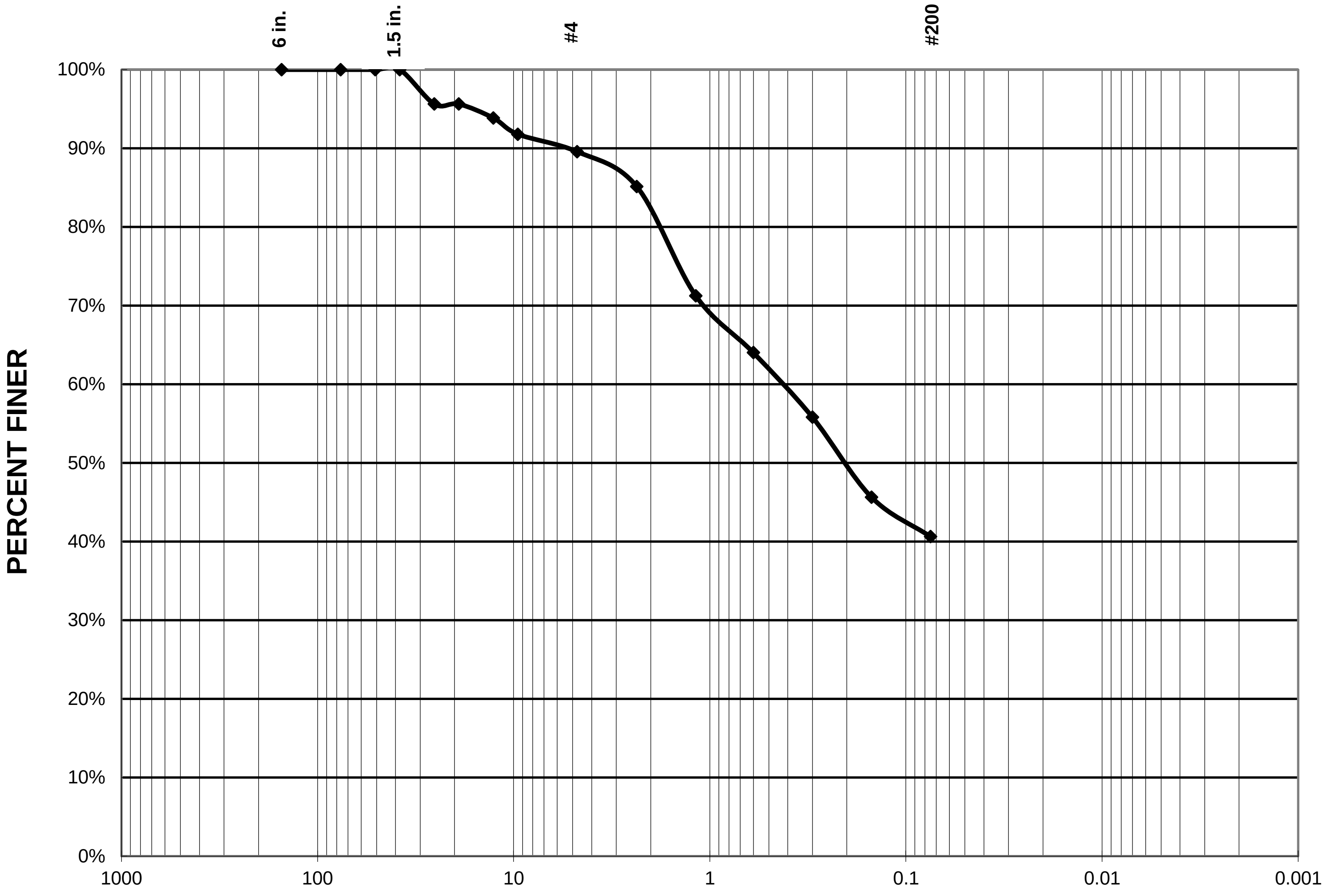
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



GRAIN SIZE - mm

ASTM D-6913

TEST SUMMARY

% GRAVEL = 10%

% SAND = 49%

% SILT & CLAY = 41%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA 1 @ 25-26.5', S-5

Soil Description: Sandy Elastic Silt (ML)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-1 S-5***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park North Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-02 (LA0590D)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

Sample Number :	#846	#846	#846				
Sample Location :	VN-HSA-2, S-3	VN-HSA-2, S-4	VN-HSA-2, S-10				
Depth:	15-16.5'	20-21.5'	45-46.5'				
Gradation (ASTM D6913)		NT					
Percent Passing Sieve Size							
2"		-					
1 ½"		-	100%				
1"	100%	-	97%				
3/4"	94%	-	89%				
1/2"	86%	-	79%				
3/8"	83%	-	75%				
#4	77%	-	64%				
#10	64%	-	50%				
#30	32%	-	28%				
#40	24%	-	22%				
#50	16%	-	17%				
#100	8.5%	-	11%				
#200	4.3%	-	7%				
Moisture content (ASTM D 2216)	3.2%	3.6%	1.8%				
Wash #200 (ASTM D 1140)	NT	5.2%	NT				
Liquid Limit (ASTM D 4318)	NT	NT	NT				
Plastic limit (ASTM D 4318)	NT	NT	NT				
Plastic Index (ASTM D 4318)	NT	NT	NT				
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT				
Sand Equivalent (ASTM D2419)	NT	81	NT				
Visual Soil Classification	(SW) Well-Graded Sand with Gravel	(SM) Silty Sand, Moist, Yellowish Brown	(SW-SM) Well-Graded Sand w/Silt and Gravel				

Comments: NP: Non-Plastic
NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

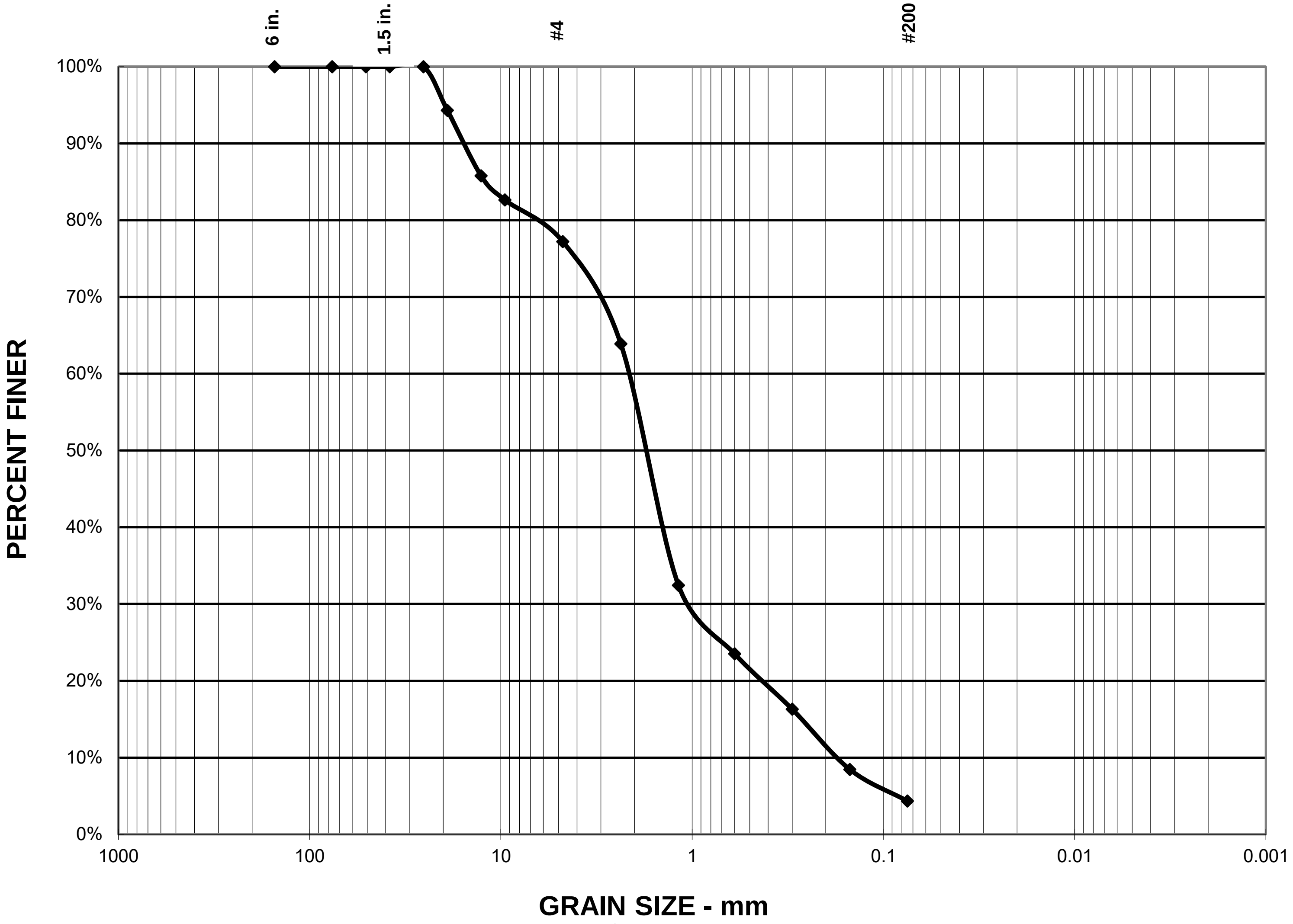
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL =	23%
% SAND =	73%
% SILT & CLAY =	4%

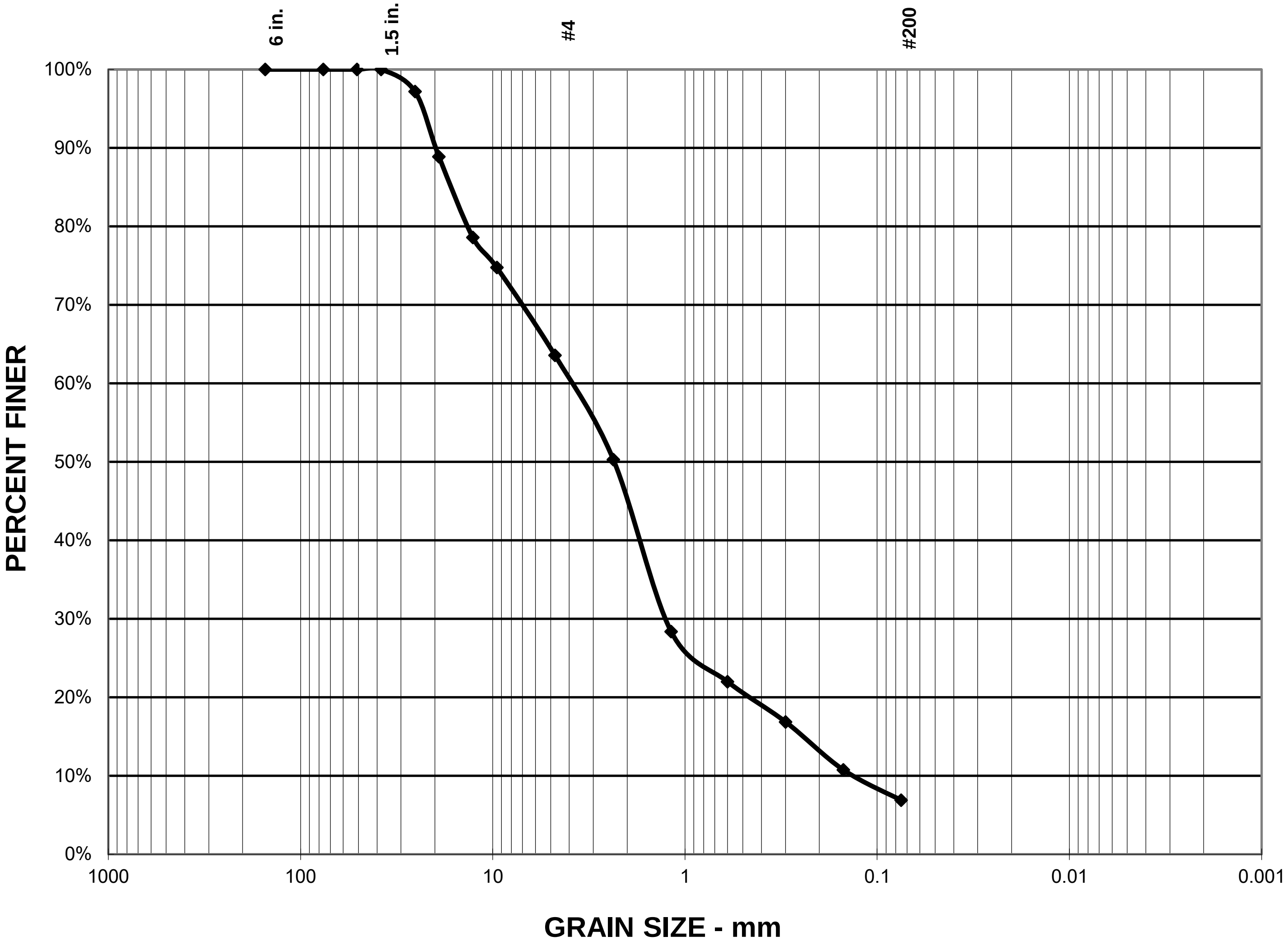
Project No.:	200-20043-20001-02 (LA0590D)
Project Name:	TOS-25 Valley Plaza Park North Stormwater Capture
Date sampled:	4/14/20-4/16/2020
Location:	VN-HSA-2 @ 15-16.5', S-3
Soil Description:	Well-Graded Sand w/Gravel (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA2, S-3***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 36%

% SAND = 57%

% SILT & CLAY = 7%

Project No.:	200-20043-2 0001-02 (LA0590D)
Project Name:	TOS-25 Valley Plaza Park North Stormwater Capture
Date sampled:	4/14/20-4/16/2020
Location:	VN-HSA-2 @ 45-46.5', S-10
Soil Description:	Well-graded Sand w/Silt and Gravel (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-2 S-10***

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California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park North Stormwater Capture**

Date of Report : 5/11/20

Client: **Geosyntec Consultants**

Project No. : 200-20043-20001-02 (LA0590D)

Attention To: K. Viswanathan

Reported By: L. Valle

Location: See Below

Date Sampled: 4/14/2020-4/16/2020

Reviewed By: L. Valle

Sample Number :	#846	#846					
Sample Location :	VN-HSA-3 @ 15-16.5', S-3	VN-HSA-3 S-6					
Depth:	15-16.5	30-31.5					
Gradation (ASTM D6913) **Percent Passing Sieve Size**							
2"	-	-					
1 ½"	-	-					
1"	-	-					
3/4"	100%	-					
1/2"	98%	-					
3/8"	98%	-					
#4	97%	-					
#10	92%	-					
#30	44%	-					
#40	28%	-					
#50	18%	-					
#100	8.0%	-					
#200	3.8%	-					
Moisture content (ASTM D 2216)	2.1%	NT					
Wash #200 (ASTM D 1140)		NT					
Liquid Limit (ASTM D 4318)	NT	NT					
Plastic limit (ASTM D 4318)	NT	NT					
Plastic Index (ASTM D 4318)	NT	NT					
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT					
Sand Equivalent (ASTM D2419)	NT	64					
Visual Soil Classification	(SW) Well-Graded Sand	(SM) Silty Sand, Brown, Moist					

Comments: NP: Non-Plastic

NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

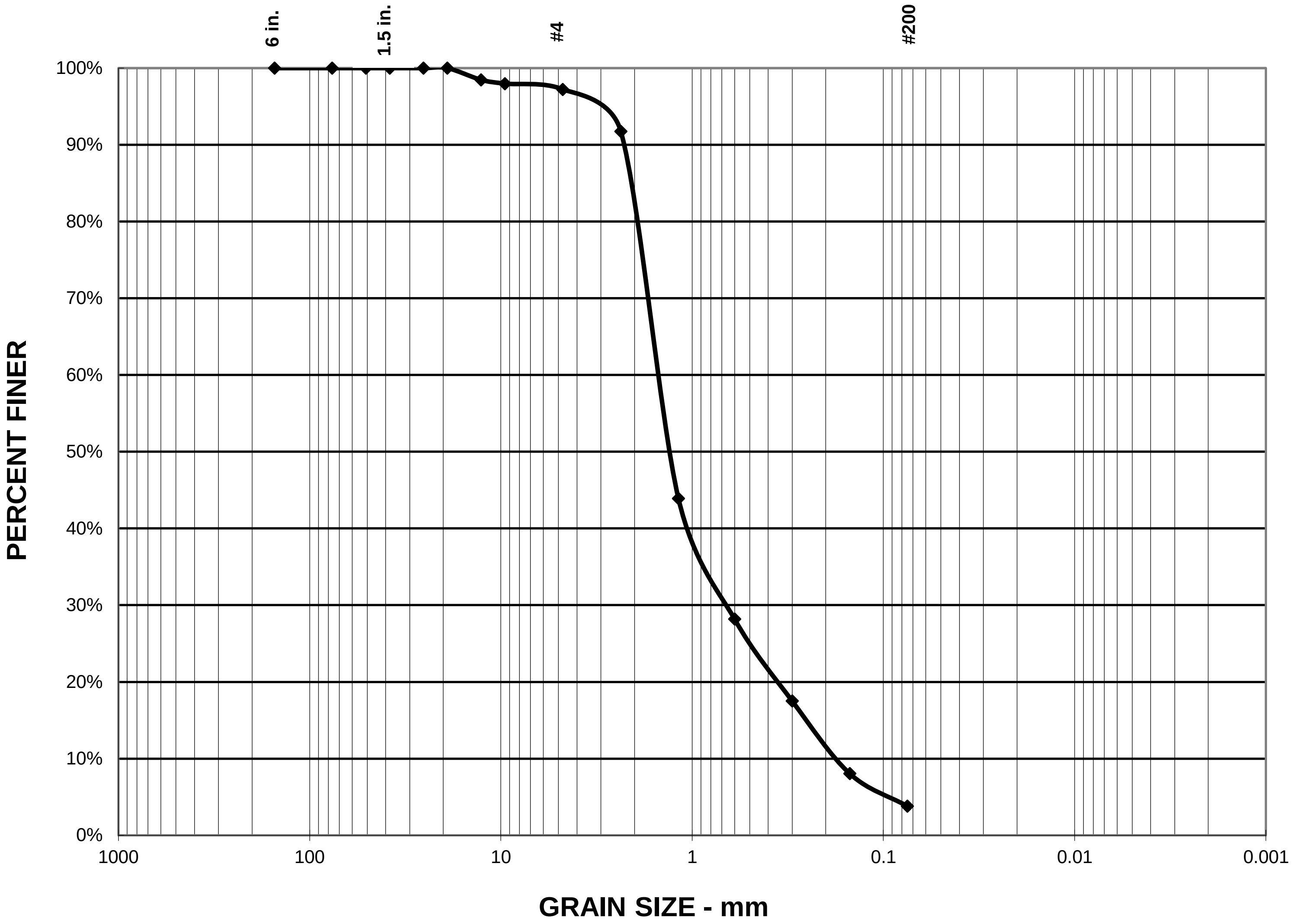
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 3%

% SAND = 93%

% SILT & CLAY = 4%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-3 @ 15-16.5', S-3

Soil Description: Well-Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-3 S-3***

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California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park North Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-02 (LA0590D)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

Sample Number :	#846	#846					
Sample Location :	VN-HSA-4 S-4	VN-HSA-4 S-5					
Depth:	20-21.5	25-26.5					
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-					
1 ½"	-	-					
1"	-	100					
3/4"	-	96					
1/2"	-	95					
3/8"	-	94					
#4	-	90					
#10	-	79					
#30	-	41					
#40	-	29					
#50	-	20					
#100	-	10					
#200	-	5.3					
Moisture content (ASTM D 2216)	NT	4%					
Wash #200 (ASTM D 1140)	NT	NT					
Liquid Limit (ASTM D 4318)	NT	NT					
Plastic limit (ASTM D 4318)	NT	NT					
Plastic Index (ASTM D 4318)	NT	NT					
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT					
Sand Equivalent (ASTM D2419)	43%	NT					
Visual Soil Classification	(SM) Silty Sand, Yellowish Brown, Moist	(SW) Well-Graded Sand					

Comments: NP: Non-Plastic
NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

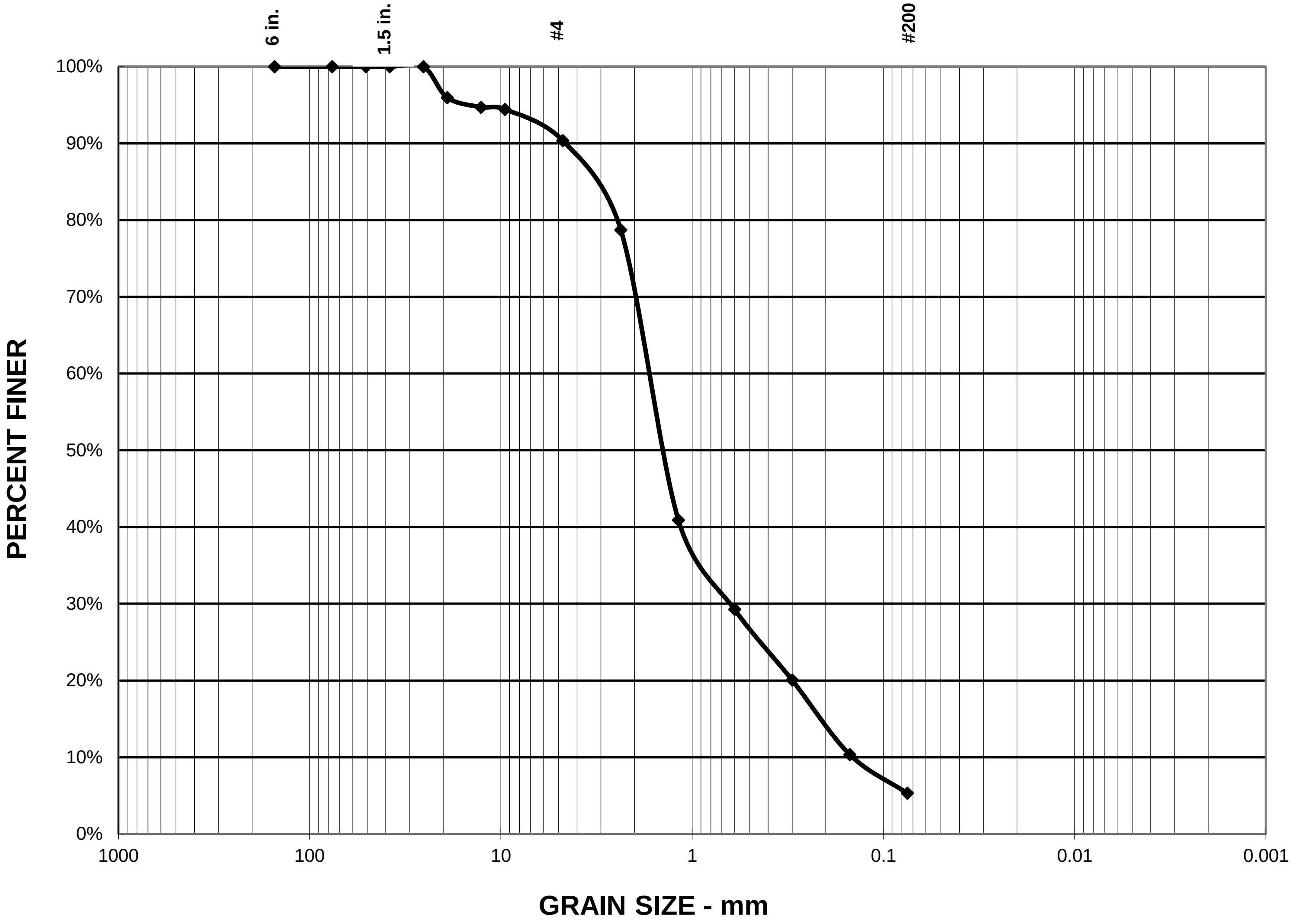
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 10%

% SAND = 85%

% SILT & CLAY = 5%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-4 @25-26.5',S-5

Soil Description: Well-Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-4 S-5***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park North Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-02 (LA0590D)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

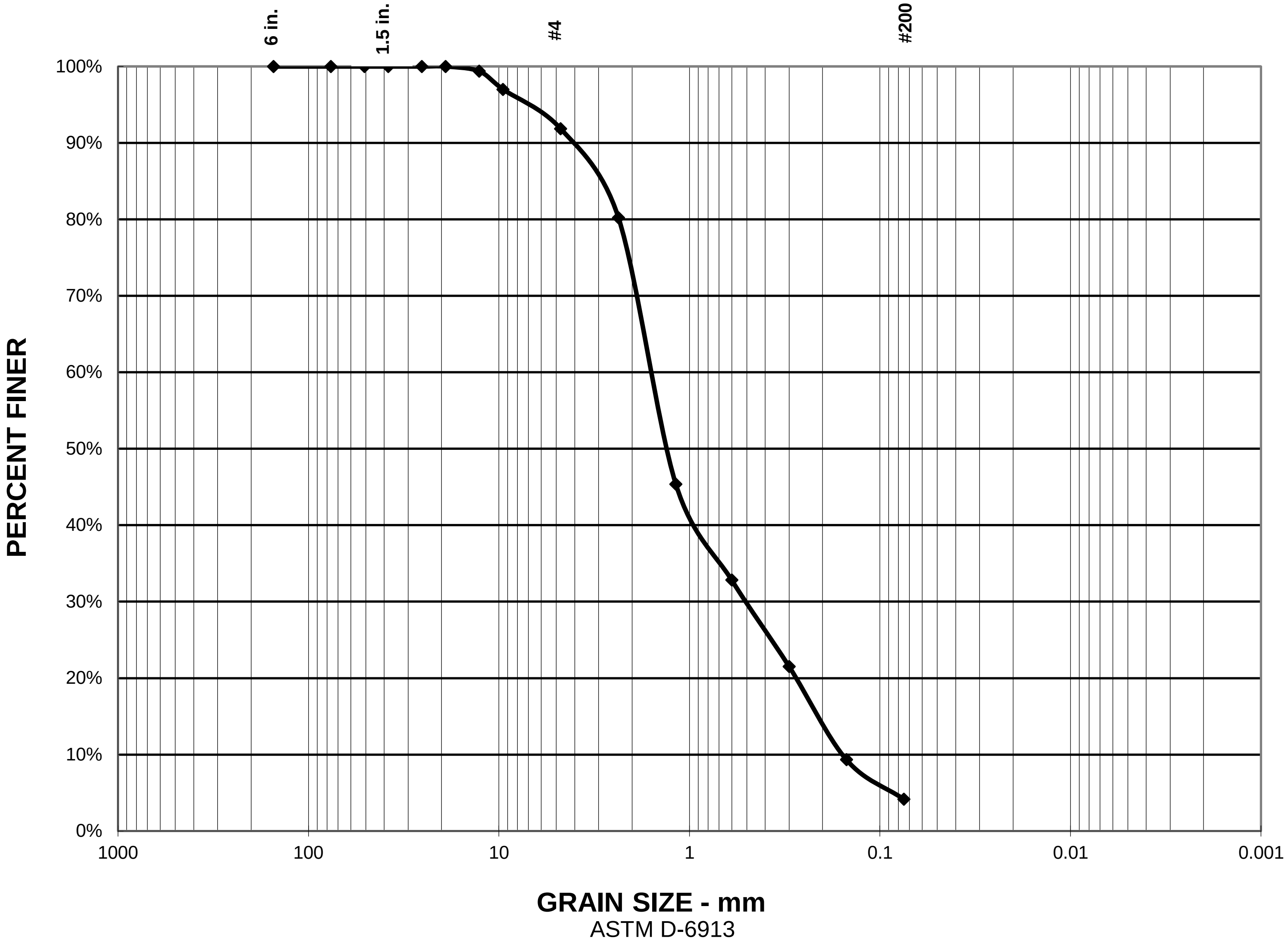
Sample Number :	#846	#846	#846	#846	#846		
Sample Location :	VN-HSA-5 S-1B	VN-HSA-5 S-5	VN-HSA-5 S-6	VN-HSA-5 S-8	VN-HSA-5 S-10		
Depth:	5.5-6.5	25-26.5	30-31.5	40-41.5	50-51.5		
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-	-		
1 ½"	-	-	-	-	-		
1"	-	-	-	100%	100%		
3/4"	-	-	100%	85%	84%		
1/2"	-	-	99%	72%	70%		
3/8"	-	-	97%	65%	66%		
#4	-	-	92%	53%	53%		
#10	-	-	80%	42%	41%		
#30	-	-	45%	23%	24%		
#40	-	-	33%	17%	19%		
#50	-	-	22%	13%	15%		
#100	-	-	9.3%	7.7%	10%		
#200	-	-	4.2%	4.9%	6.1%		
Moisture content (ASTM D 2216)	NT	2.5%	3.8%	1.7%	2.1%		
Wash #200 (ASTM D 1140)	NT	NT					
Liquid Limit (ASTM D 4318)	NT	NT	NT	NT	NT		
Plastic limit (ASTM D 4318)	NT	NT	NT	NT	NT		
Plastic Index (ASTM D 4318)	NT	NT	NT	NT	NT		
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT	NT		
Sand Equivalent (ASTM D2419)	76%	NT	NT	NT	NT		
Visual Soil Classification	(SM-SP) Silty Sand, Moist, Brown	(SM-SP) Silty Sand w/Gravel, Moist, Lt.Brown	(SW) Well Graded Sand	(SW) Well Graded Sand	(SW) Well Graded Sand		

Comments: NP: Non-Plastic
NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature
Fabiola Jaque-Diaz, P.E., Project Manager
Print Name/Title
5/11/2020
Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL =	8%
% SAND =	88%
% SILT & CLAY =	4%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-5 @30-31.5', S-6

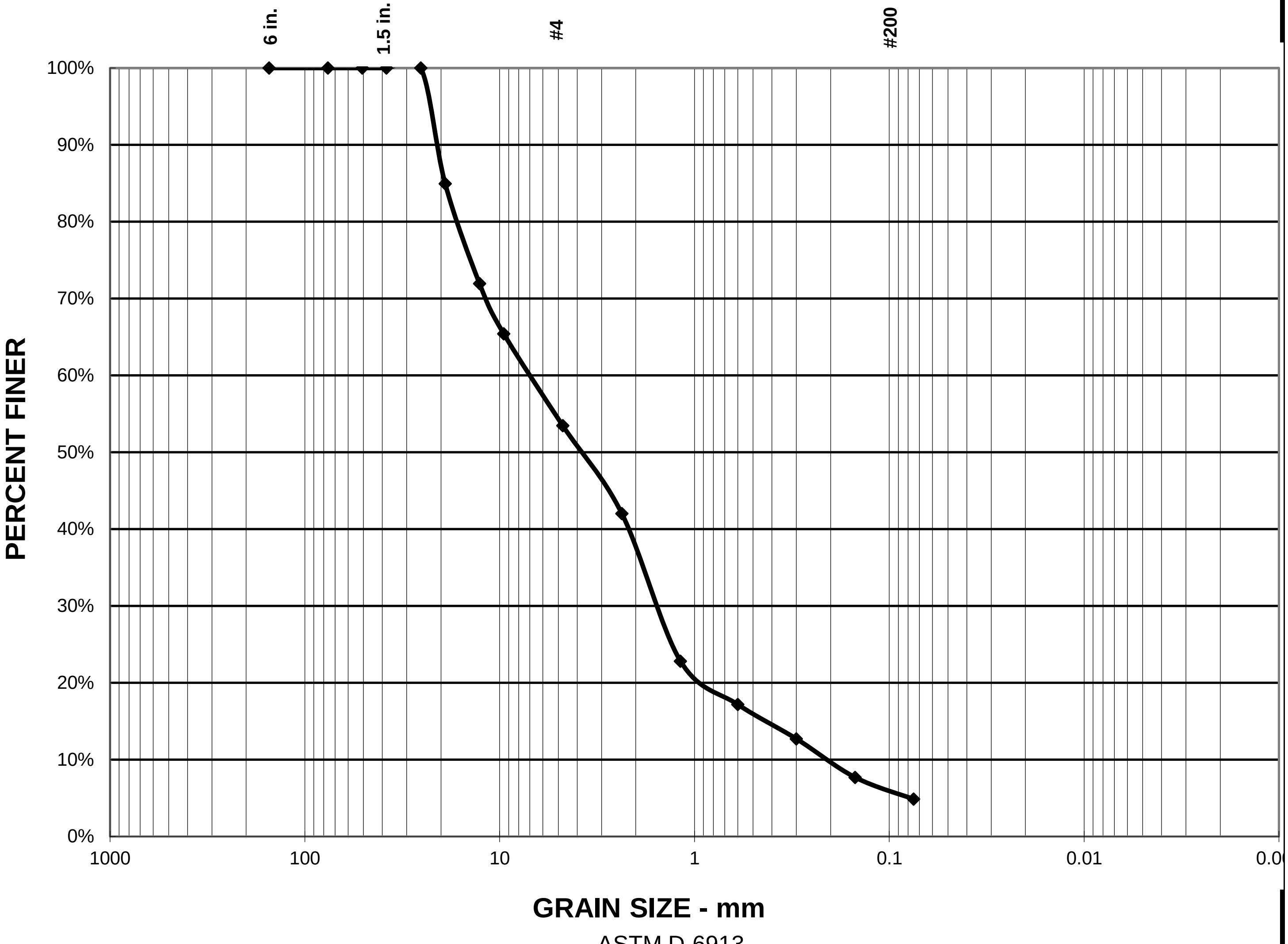
Soil Description: Well Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-5 S-6***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 47%

% SAND = 49%

% SILT & CLAY = 5%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-5 @ 40-41.5', S-8

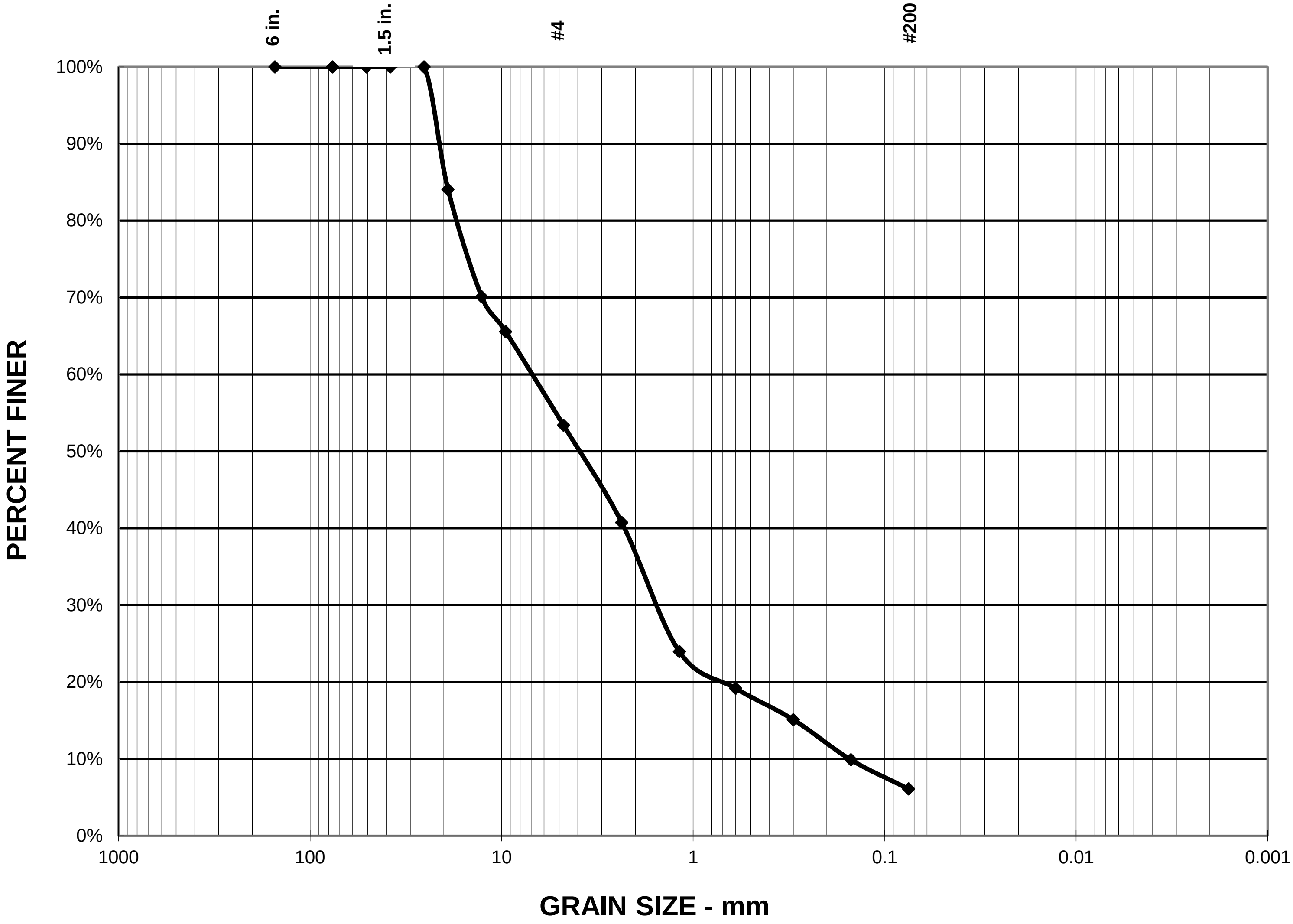
Soil Description: Well Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-5 S-8***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

% GRAVEL = 47%

% SAND = 47%

% SILT & CLAY = 6%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-5 @50-51.5', S-10

Soil Description: Well Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-5 S-10***

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California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park North Stormwater Capture**

Date of Report : 5/11/20

Client: **Geosyntec Consultants**

Project No. : 200-20043-20001-02 (LA0590D)

Attention To: K. Viswanathan

Reported By: L. Valle

Location: See Below

Date Sampled: 4/14/2020-4/16/2020

Reviewed By: L. Valle

Sample Number :	#846	#846	#846	#846			
Sample Location :	VN-HSA-6 B-1	VN-HSA-6 S-2B	VN-HSA-6 S-4	VN-HSA-6 S-5			
Depth:	1-5	11-11.5	20-21.5	25-26.5			
Gradation (ASTM D6913) **Percent Passing Sieve Size**							
2"	-	-	-	-			
1 ½"	-	-	-	-			
1"	-	-	-	-			
3/4"	-	-	-	-			
1/2"	-	-	-	-			
3/8"	-	-	-	100%			
#4	-	-	-	98%			
#10	-	-	-	90%			
#30	-	-	-	60%			
#40	-	-	-	48%			
#50	-	-	-	34%			
#100	-	-	-	14%			
#200	-	-	-	5.5%			
Moisture content (ASTM D 2216)	8.4%	2.6%	5.5%	4.6%			
Wash #200 (ASTM D 1140)	NT	3.7%	NT				
Liquid Limit (ASTM D 4318)	NP	NT	NT	NT			
Plastic limit (ASTM D 4318)	NP	NT	NT	NT			
Plastic Index (ASTM D 4318)	NP	NT	NT	NT			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Visual Soil Classification	(SM-SP) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Lt. brown	(SW-SM) Well Graded Sand W/Silt			

Comments: NP: Non-Plastic

NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

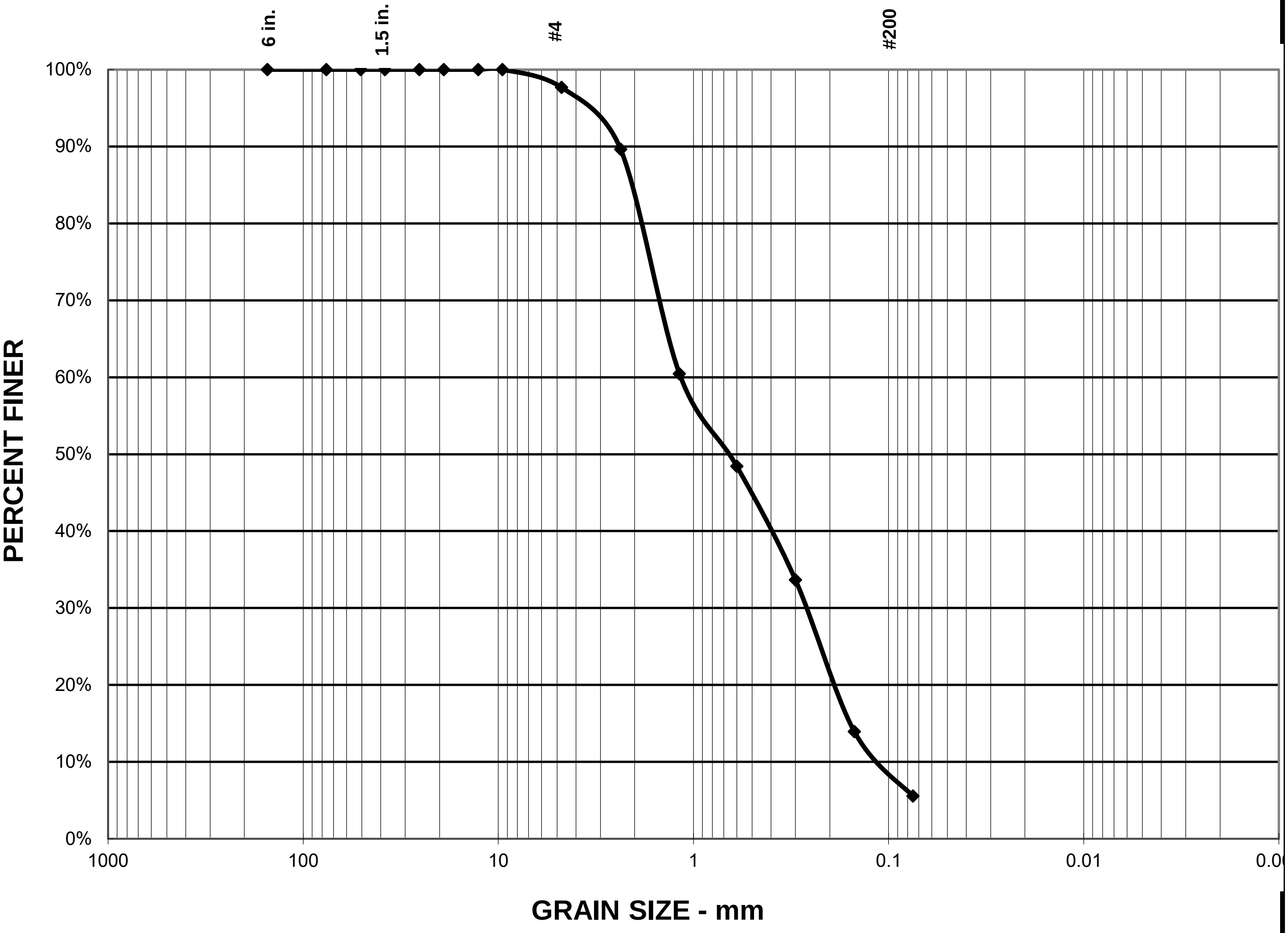
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 2%

% SAND = 92%

% SILT & CLAY = 6%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-6 @ 25-26.5', S-5

Soil Description: Well Graded Sand w/Silt (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-6 S-5***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

Project Name: **TOS-25 Valley Plaza Park North Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-02 (LA0590D)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

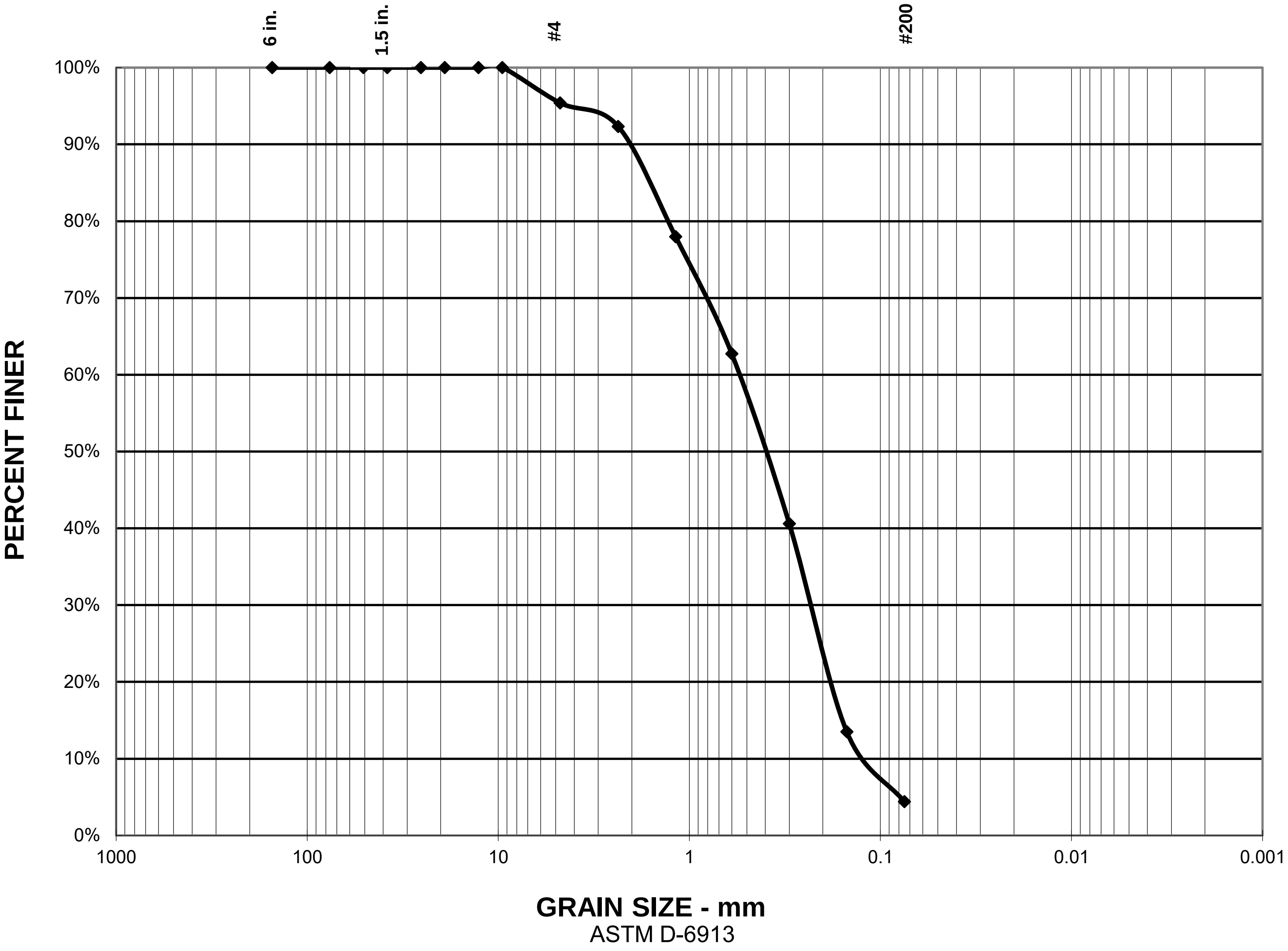
Sample Number :	#846	#846	#846	#846	#846	#846	
Sample Location :	VN-HSA-7 S-2	VN-HSA-7 S-3	VN-HSA-7 S-4	VN-HSA-7 S-5	VN-HSA-7 S-6	VN-HSA-7 S-9	
Depth:	10-11.5	15-16.5	***20-21.5***	***25-26.5***	***30-31.5***	45-46.5	
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-	-	-	
1 ½"	-	-	-	-	-	-	
1"	-	-	-	-	-	-	
3/4"	-	-	-	-	-	-	
1/2"	-	-	-	-	-	-	
3/8"	100%	-	-	-	-	-	
#4	95%	-	100	-	-	-	
#10	92%	-	97	-	-	-	
#30	78%	-	53	-	-	-	
#40	63%	-	35	-	-	-	
#50	41%	-	21	-	-	-	
#100	14%	-	9.7	-	-	-	
#200	4.4%	-	4.6	-	-	-	
Moisture content (ASTM D 2216)	7.4%	6.3%	3.4%	3.3%	3.2%	3.0%	
Wash #200 (ASTM D 1140)	NT	0.9%		NT	4.2%	NT	
Liquid Limit (ASTM D 4318)	NT	NT	NT	NT	NT	NT	
Plastic limit (ASTM D 4318)	NT	NT	NT	NT	NT	NT	
Plastic Index (ASTM D 4318)	NT	NT	NT	NT	NT	NT	
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT	NT	NT	
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT	NT	64.0%	
Visual Soil Classification	(SW) Well Graded Sand	(SP) Sand, Moist, Brown	(SW) Well Graded Sand	(SM) Silty Sand, Moist, Yellowish Brown	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Brown	

Comments: NP: Non-Plastic
NT: Not Tested
Sample VN-HSA-7 S-4, S-5 and S-6 noted as marked on bags

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature
Fabiola Jaque-Diaz, P.E., Project Manager
Print Name/Title
5/11/2020
Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 5%

% SAND = 91%

% SILT & CLAY = 4%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-7 @10-11.5', S-2

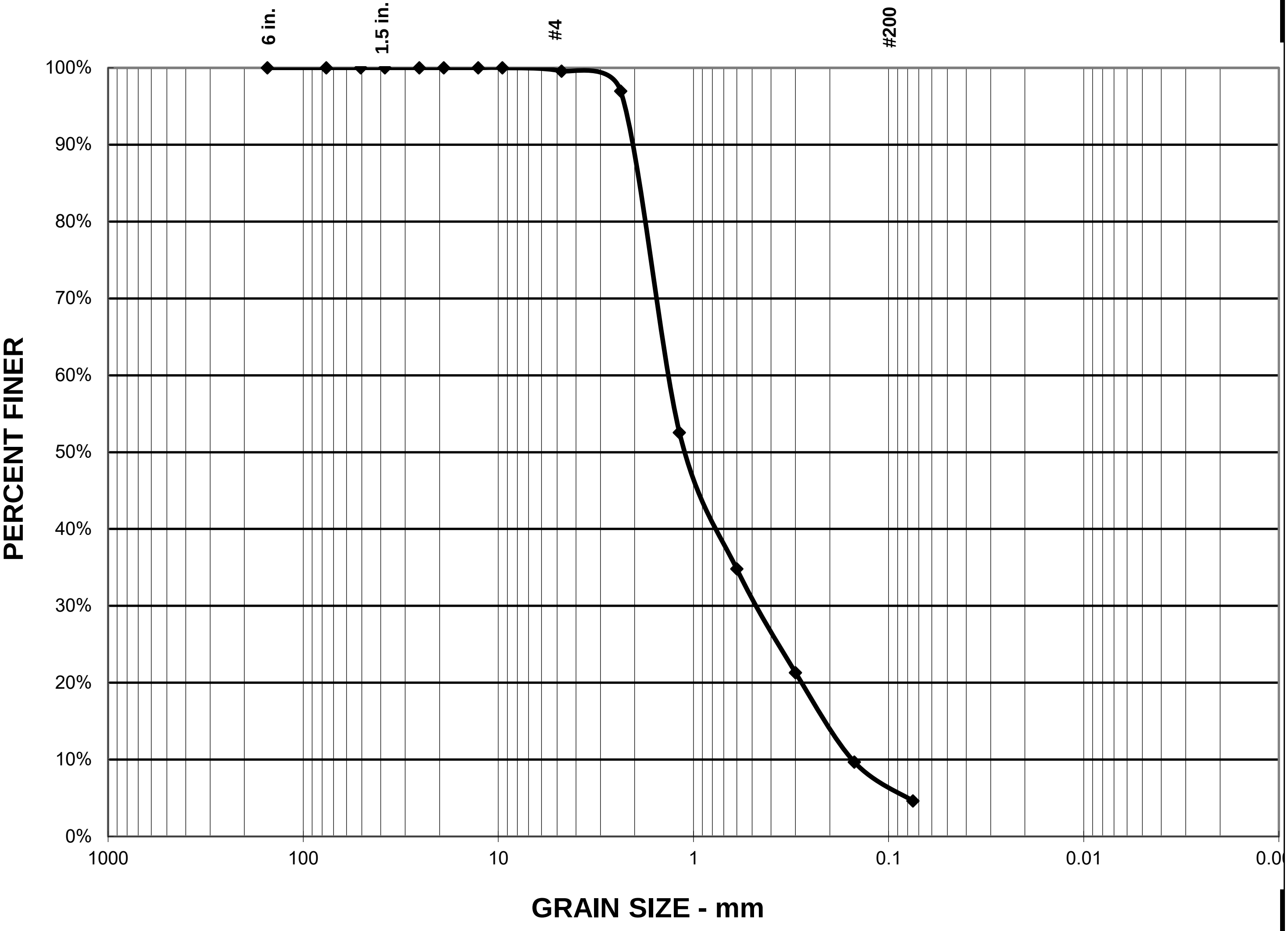
Soil Description: Well Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-7 S-2***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 95%

% SILT & CLAY = 5%

Project No.: 200-20043-20001-02 (LA0590D)

Project Name: TOS-25 Valley Plaza Park North Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-7 @20-21.5', S-4

Soil Description: Well Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-7 S-4***

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California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name:	**TOS-25 Valley Plaza Park North Stormwater Capture**	Date of Report :	5/11/20
Client:	**Geosyntec Consultants**	Project No. :	200-20043-20001-02 (LA0590D)
Attention To:	K. Viswanathan	Reported By:	L. Valle
Location:	See Below Date Sampled: 4/14/2020-4/16/2020	Reviewed By:	L. Valle

Sample Number :	#846	#846	#846				
Sample Location :	VN-HSA-8 S-1B	VN-HSA-8 S-4	VN-HSA-8 S-6				
Depth:	5.3-6.5	20-21.5	30-31.5				
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-				
1 ½"	-	-	-				
1"	-	-	100				
3/4"	-	-	97				
1/2"	-	-	95				
3/8"	-	-	94				
#4	-	-	87				
#10	-	-	70				
#30	-	-	31				
#40	-	-	23				
#50	-	-	17				
#100	-	-	8.2				
#200	-	-	3.9				
Moisture content (ASTM D 2216)	6.0%	6.5%	4.3%				
Wash #200 (ASTM D 1140)	2.5%	7.5%					
Liquid Limit (ASTM D 4318)	NT	NT	NT				
Plastic limit (ASTM D 4318)	NT	NT	NT				
Plastic Index (ASTM D 4318)	NT	NT	NT				
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT				
Sand Equivalent (ASTM D2419)	NT	NT	NT				
Visual Soil Classification	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Brown	(SW) Well Graded Sand				

Comments: NP: Non-Plastic

NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

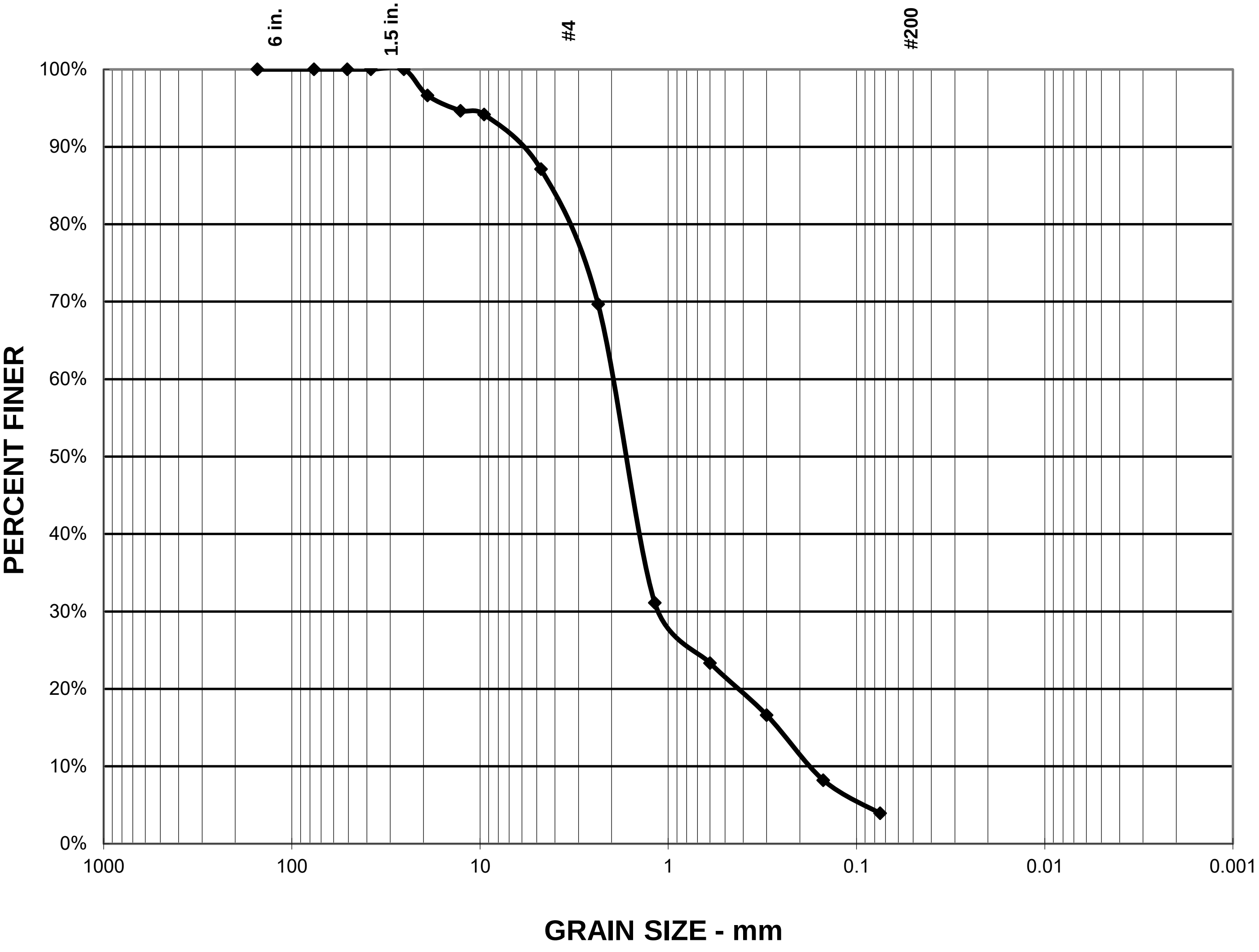
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 13%

% SAND = 83%

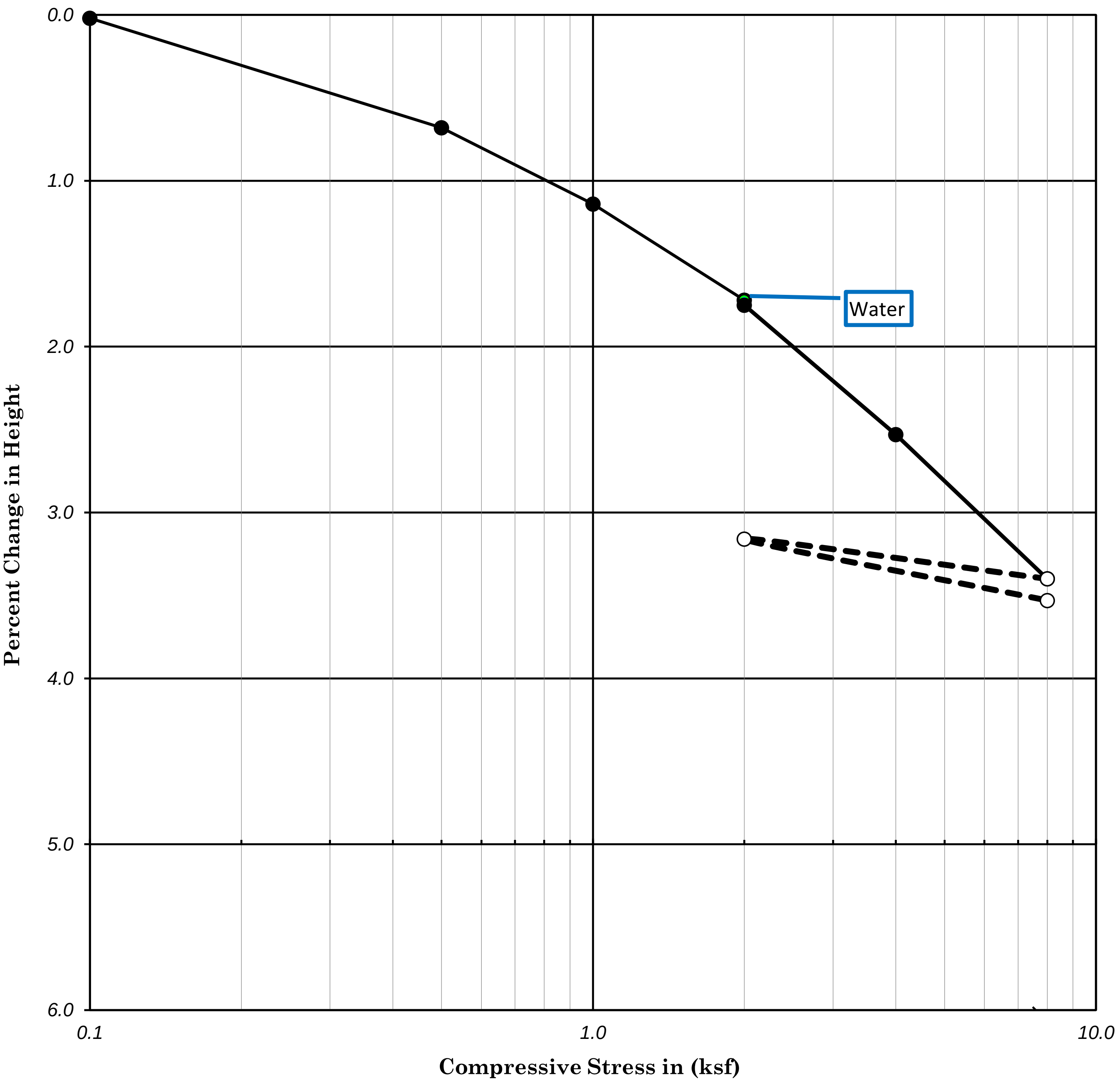
% SILT & CLAY = 4%

Project No.: 200-20043-20001-02 (LA0590D)
Project Name: TOS-25 Valley Plaza Park North Stormwater Capture
Date sampled: 04/30/20
Location: VN-HSA-8 @30-31.5', S-6
Soil Description: Well Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VN-HSA-8 S-6***



						Moisture Content (%)	Dry Density (pcf)	Percent Saturation	Void Ratio
Boring No.	: VS-HSA-4	**Liquid Limit :**	N.T.						
Sample No.	: S-3B	**Plastic Limit :**	N.T.						
Depth	(ft) : 16'-16.5'	**Plastic Index :**	N.T.	**Initial**		14.9	104.5	65.6	0.61
		Specific Gravity :	2.70	**Final**		21.3	108.4	100.00	0.56

Description: Silty Sand (SM)

TOS-25 Valley Plaza Park North Stormwater Capture

Project No. : 200-20043-200001-02 **Date :** 05/12/20

CONSOLIDATION TEST

(ASTM D-2435)

Drawing No. : HSA-4

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	TOS-25 ValleyPlazaPark South Stormwater Capture	Tested by:	ST	Date:	05-07-20
Project No.:	200-20043-20001-02 (LA0590D)	Input Data by:	JP	Date:	05-08-20
Boring No.:	VN-HSA-2	Reviewed by:	AP	Date:	05-15-20
Sample No.:	S-6B				

Depth (feet): 31-31.5 Sample Type: Mod Cal Confining Pressure = 3.5 psi (See Remarks below)

Soil Description: Sand w/silt

Diameter (in)	2.411	2.425	2.418	Avg. =	2.418
Height (in)	5.033	5.021	5.038	Avg. =	5.031

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	4.592	4.591
Moisture Content (%)	3.09	15.34
Wet Weight (gms)	173.46	977.41
Dry Weight (gms)	169.79	867.36
Container Weight (gms)	50.90	149.94
Density and Saturation		
Wet Weight (gms)	747.07	
Container Weight (gms)	0.00	
Wet Density (pcf)	123.2	
Dry Density (pcf)	119.5	
Initial Void Ratio	0.410	
% Saturation	20.3	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 98

Consolidation			
Cell Pressure (psi) =	63.5	Initial Burette Ht.(cm)=	67.2
Back Pressure(psi) =	60.0	Final Burette Ht.(cm)=	66.0
Eff. Consol. Stress (psi) =	3.5	Final Height (in)=	5.016
Induced OCR =	2.9	Initial Volume (cu.in)=	23.101
Change in Ht. of Specimen (in) =	0.0151	Final Volume (cu.in) =	23.028

Shear		At Failure	
Rate of Deformation (in/min)=	0.004	Max. Deviator Stress (ksf) =	24.31
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	7.03
Failure Mode:	Bulging Failure	Eff. Major Principal stress (ksf) =	31.34
		Axial Strain (%) =	15.59

Remarks: This sample was consolidated to 2/3 of in-situ vertical effective stress and rebounded to 3.5 psi.

AP Engineering and Testing, Inc.
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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	TOS-25 ValleyPlazaPark South Stormwater Captu	Tested by:	ST	Date:	05-07-20
Project No.:	200-20043-20001-02 (LA0590D)	Input Data by:	JP	Date:	05-08-20
Boring No.:	VN-HSA-2	Reviewed by:	AP	Date:	05-09-20
Sample No.:	S-7A				
Depth (feet):	32-32.5	Sample Type:	Mod Cal	Confining Pressure = 15.0 psi	
Soil Description:	Sand w/silt				

Diameter (in)	2.419	2.416	2.415	Avg. =	2.417
Height (in)	5.035	5.057	5.050	Avg. =	5.047

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	4.587	4.562
Moisture Content (%)	2.87	19.98
Wet Weight (gms)	169.20	911.32
Dry Weight (gms)	165.91	784.70
Container Weight (gms)	51.46	150.85
Density and Saturation		
Wet Weight (gms)	677.75	
Container Weight (gms)	0.00	
Wet Density (pcf)	111.5	
Dry Density (pcf)	108.4	
Initial Void Ratio	0.554	
% Saturation	14.0	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 96

Consolidation			
Cell Pressure (psi) =	75.0	Initial Burette Ht.(cm)=	70.0
Back Pressure(psi) =	60.0	Final Burette Ht.(cm)=	66.9
Eff. Consol. Stress (psi) =	15.0	Final Height (in)=	5.033
Induced OCR=	1.0	Initial Volume (cu.in)=	23.152
Change in Ht. of Specimen (in) =	0.0139	Final Volume (cu.in) =	22.963

Shear		At Failure	
Rate of Deformation (in/min)=	0.004	Max. Deviator Stress (ksf) =	22.47
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	6.80
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	29.27
		Axial Strain (%) =	15.28

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	TOS-25 ValleyPlazaPark South Stormwater Captu	Tested by:	ST	Date:	05-07-20
Project No.:	200-20043-20001-02 (LA0590D)	Input Data by:	JP	Date:	05-08-20
Boring No.:	VN-HSA-2	Reviewed by:	AP	Date:	05-09-20
Sample No.:	S-7B				
Depth (feet):	32.5-33	Sample Type:	Mod Cal	Confining Pressure = 45.0 psi	
Soil Description:	Sand w/silt				

Diameter (in)	2.423	2.426	2.420	Avg. =	2.423
Height (in)	5.049	5.024	5.034	Avg. =	5.035

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	4.611	4.548
Moisture Content (%)	5.22	21.65
Wet Weight (gms)	137.03	900.91
Dry Weight (gms)	132.74	766.11
Container Weight (gms)	50.59	143.41
Density and Saturation		
Wet Weight (gms)	668.75	
Container Weight (gms)	0.00	
Wet Density (pcf)	109.7	
Dry Density (pcf)	104.3	
Initial Void Ratio	0.616	
% Saturation	22.9	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 98

Consolidation

Cell Pressure (psi) =	95.0	Initial Burette Ht.(cm)=	80.0
Back Pressure(psi) =	50.0	Final Burette Ht.(cm)=	72.6
Eff. Consol. Stress (psi) =	45.0	Final Height (in)=	5.006
Induced OCR =	1.0	Initial Volume (cu.in)=	23.218
Change in Ht. of Specimen (in) =	0.0291	Final Volume (cu.in) =	22.767

Shear		At Failure	
Rate of Deformation (in/min)=	0.004	Max. Deviator Stress (ksf) =	25.97
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	7.74
Failure Mode: Bulging Failure		Eff. Major Principal stress (ksf) =	33.71
		Axial Strain (%) =	15.78

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name: TOS-25 ValleyPlazaPark South Stormwater Captur
Project No.: 200-20043-20001-02 (LA0590D)
Boring No.: VN-HSA-2
Sample No.: S-6B
Depth (feet): 31-31.5
Sample Type: Mod Cal
Soil Description: Sand w/silt

Cell Pressure: 63.5 psi
Back Pressure : 60.0 psi
Consolidation Pressure : 3.5 psi
Initial Sample Height: 5.031 in
Initial Area of Sample: 4.592 sq. in.
Final Sample Ht.* (L): 5.016 in
Final Sample Area (A)*: 4.591 sq. in.
Induced OCR= 2.9

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Stress Ratio (S1'/S3')	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
63.5	0	0.000	60.0	1.00	0.00	0.00	0.00	0.00	0.50
63.5	23	0.005	60.5	2.63	0.71	0.10	0.07	0.35	0.79
63.5	30	0.010	60.5	3.20	0.95	0.20	0.07	0.47	0.91
63.5	36	0.015	60.5	3.59	1.13	0.30	0.07	0.57	1.00
63.5	43	0.020	60.4	3.99	1.34	0.40	0.06	0.67	1.12
63.5	48	0.025	60.3	4.23	1.49	0.50	0.04	0.75	1.21
63.5	54	0.030	60.1	4.46	1.67	0.60	0.02	0.84	1.32
63.5	58	0.035	60.0	4.61	1.82	0.70	0.00	0.91	1.41
63.5	64	0.040	59.8	4.78	2.00	0.80	-0.02	1.00	1.53
63.5	70	0.045	59.7	4.91	2.17	0.90	-0.05	1.08	1.64
63.5	75	0.050	59.5	5.01	2.34	1.00	-0.08	1.17	1.75
63.5	143	0.100	56.8	5.57	4.39	1.99	-0.46	2.19	3.15
63.5	172	0.118	55.6	5.61	5.25	2.36	-0.64	2.63	3.77
63.5	235	0.159	52.6	5.54	7.12	3.18	-1.06	3.56	5.13
63.5	301	0.199	49.3	5.42	9.05	3.96	-1.55	4.53	6.58
63.5	368	0.238	45.7	5.28	11.01	4.74	-2.06	5.50	8.07
63.5	431	0.278	42.0	5.13	12.76	5.54	-2.59	6.38	9.47
63.5	487	0.316	38.6	4.99	14.32	6.30	-3.08	7.16	10.74
63.5	546	0.355	35.1	4.89	15.92	7.07	-3.59	7.96	12.05
63.5	602	0.395	31.9	4.82	17.40	7.87	-4.05	8.70	13.25
63.5	644	0.433	29.1	4.72	18.45	8.63	-4.45	9.23	14.18
63.5	688	0.471	26.5	4.67	19.56	9.38	-4.83	9.78	15.11
63.5	731	0.511	24.1	4.63	20.58	10.18	-5.17	10.29	15.96
63.5	762	0.549	22.2	4.58	21.29	10.95	-5.44	10.65	16.59
63.5	798	0.586	20.2	4.55	22.11	11.68	-5.73	11.05	17.28
63.5	827	0.626	18.6	4.52	22.71	12.49	-5.96	11.35	17.81
63.5	846	0.666	17.2	4.45	23.00	13.27	-6.16	11.50	18.16
63.5	869	0.702	16.5	4.46	23.45	14.00	-6.27	11.72	18.49
63.5	898	0.741	15.6	4.47	23.99	14.78	-6.40	12.00	18.90
63.5	918	0.782	14.7	4.46	24.31	15.59	-6.53	12.16	19.19

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	TOS-25 ValleyPlazaPark South Stormwater Capture	Cell Pressure:	75.0	psi
Project No.:	200-20043-20001-02 (LA0590D)	Back Pressure :	60.0	psi
Boring No.:	VN-HSA-2	Consolidation Pressure :	15.0	psi
Sample No.:	S-7A	Initial Sample Height:	5.047	in
Depth (feet):	32-32.5	Initial Area of Sample:	4.587	sq. in.
Sample Type:	Mod Cal	Final Sample Ht.* (L):	5.033	in
Soil Description:	Sand w/silt	Final Sample Area (A)*:	4.562	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Stress Ratio (S1'/S3')	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
75.0	0	0.000	60.0	1.00	0.00	0.00	0.00	0.00	2.16
75.0	60	0.005	61.8	2.00	1.90	0.10	0.26	0.95	2.85
75.0	80	0.010	62.9	2.43	2.51	0.20	0.41	1.25	3.00
75.0	93	0.015	63.6	2.78	2.92	0.30	0.52	1.46	3.10
75.0	103	0.020	64.0	3.03	3.23	0.40	0.57	1.61	3.20
75.0	113	0.025	64.2	3.30	3.56	0.50	0.61	1.78	3.33
75.0	122	0.030	64.3	3.49	3.82	0.60	0.62	1.91	3.45
75.0	131	0.035	64.4	3.68	4.11	0.70	0.63	2.05	3.58
75.0	139	0.040	64.3	3.82	4.34	0.79	0.62	2.17	3.71
75.0	146	0.045	64.2	3.93	4.55	0.89	0.61	2.28	3.83
75.0	153	0.050	64.1	4.03	4.78	0.99	0.58	2.39	3.97
75.0	227	0.100	61.3	4.56	7.03	1.99	0.18	3.52	5.49
75.0	296	0.150	57.9	4.68	9.05	2.98	-0.30	4.53	6.99
75.0	348	0.189	55.2	4.71	10.58	3.76	-0.69	5.29	8.14
75.0	400	0.227	52.6	4.73	12.04	4.52	-1.07	6.02	9.25
75.0	448	0.267	49.9	4.70	13.39	5.30	-1.46	6.70	10.31
75.0	495	0.305	47.3	4.68	14.68	6.05	-1.82	7.34	11.32
75.0	542	0.344	44.9	4.67	15.93	6.83	-2.18	7.97	12.31
75.0	582	0.382	42.5	4.63	16.98	7.59	-2.52	8.49	13.17
75.0	621	0.422	40.2	4.59	17.96	8.38	-2.85	8.98	13.99
75.0	657	0.460	38.2	4.56	18.86	9.13	-3.14	9.43	14.72
75.0	687	0.498	36.3	4.51	19.55	9.89	-3.41	9.77	15.34
75.0	717	0.538	34.6	4.47	20.20	10.68	-3.65	10.10	15.91
75.0	743	0.576	33.2	4.44	20.76	11.44	-3.87	10.38	16.40
75.0	769	0.614	31.8	4.43	21.31	12.21	-4.06	10.66	16.87
75.0	787	0.653	30.6	4.38	21.62	12.97	-4.24	10.81	17.20
75.0	808	0.692	29.5	4.36	22.00	13.74	-4.39	11.00	17.55
75.0	826	0.730	28.6	4.34	22.29	14.51	-4.52	11.15	17.83
75.0	840	0.769	27.8	4.31	22.47	15.28	-4.64	11.24	18.04

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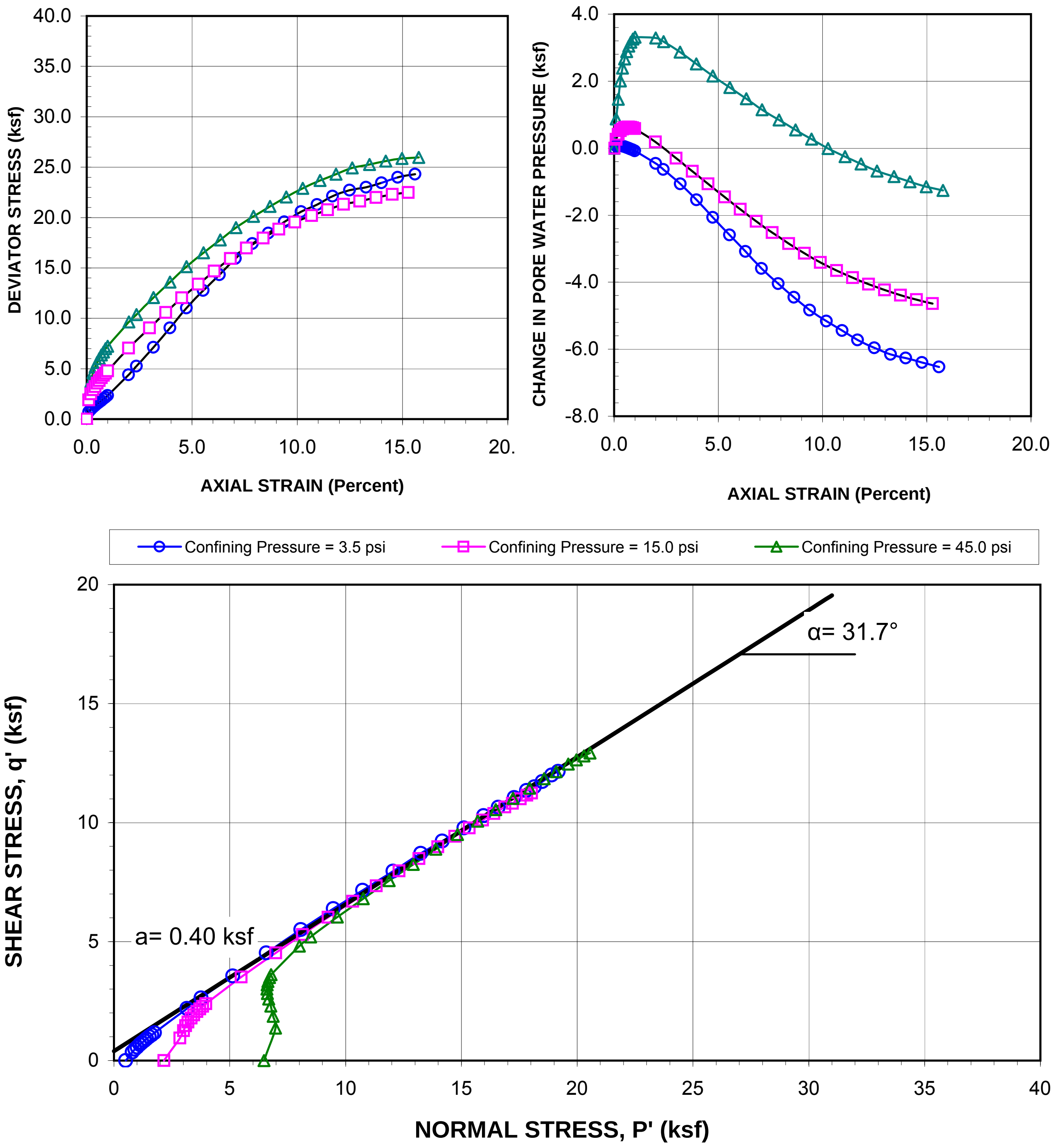
CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name: TOS-25 ValleyPlazaPark South Stormwater Captur
Project No.: 200-20043-20001-02 (LA0590D)
Boring No.: VN-HSA-2
Sample No.: S-7B
Depth (feet): 32.5-33
Sample Type: Mod Cal
Soil Description: Sand w/silt

Cell Pressure: 95.0 psi
Back Pressure : 50.0 psi
Consolidation Pressure : 45.0 psi
Initial Sample Height: 5.035 in
Initial Area of Sample: 4.611 sq. in.
Final Sample Ht.* (L): 5.006 in
Final Sample Area (A)*: 4.548 sq. in.
Induced OCR= 1.0

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Stress Ratio (S1'/S3')	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
95.0	0	0.000	50.0	1.00	0.00	0.00	0.00	0.00	6.48
95.0	86	0.005	56.1	1.49	2.74	0.10	0.87	1.37	6.97
95.0	118	0.010	60.1	1.74	3.72	0.20	1.46	1.86	6.88
95.0	145	0.015	63.9	2.02	4.59	0.30	2.00	2.29	6.77
95.0	164	0.020	66.6	2.27	5.18	0.40	2.39	2.59	6.68
95.0	179	0.025	68.5	2.48	5.63	0.50	2.67	2.81	6.63
95.0	191	0.030	70.0	2.67	6.01	0.60	2.88	3.01	6.61
95.0	202	0.035	71.2	2.85	6.36	0.70	3.05	3.18	6.61
95.0	212	0.040	72.0	3.01	6.66	0.80	3.17	3.33	6.64
95.0	223	0.045	72.6	3.17	6.99	0.90	3.26	3.49	6.72
95.0	231	0.050	73.0	3.28	7.23	1.00	3.31	3.61	6.78
95.0	310	0.100	72.8	4.02	9.63	2.00	3.29	4.81	8.01
95.0	336	0.119	72.1	4.15	10.38	2.37	3.18	5.19	8.49
95.0	393	0.159	69.9	4.34	12.05	3.17	2.87	6.03	9.64
95.0	447	0.198	67.5	4.43	13.60	3.95	2.51	6.80	10.77
95.0	501	0.237	64.9	4.49	15.11	4.74	2.15	7.56	11.89
95.0	552	0.278	62.6	4.53	16.50	5.55	1.81	8.25	12.92
95.0	599	0.318	60.2	4.55	17.77	6.34	1.47	8.88	13.89
95.0	646	0.355	58.0	4.56	19.00	7.09	1.14	9.50	14.84
95.0	690	0.397	55.8	4.57	20.13	7.92	0.84	10.06	15.70
95.0	730	0.436	53.8	4.56	21.10	8.71	0.55	10.55	16.48
95.0	769	0.475	51.9	4.55	22.03	9.48	0.27	11.02	17.23
95.0	806	0.514	49.9	4.53	22.90	10.27	-0.01	11.45	17.94
95.0	841	0.555	48.3	4.52	23.69	11.08	-0.25	11.84	18.57
95.0	870	0.593	46.7	4.49	24.29	11.85	-0.47	12.15	19.10
95.0	900	0.632	45.3	4.48	24.91	12.62	-0.68	12.46	19.62
95.0	922	0.672	44.1	4.45	25.27	13.43	-0.85	12.64	19.97
95.0	943	0.711	43.0	4.42	25.61	14.20	-1.01	12.80	20.29
95.0	960	0.750	42.0	4.39	25.85	14.98	-1.15	12.93	20.56
95.0	974	0.790	41.3	4.36	25.97	15.78	-1.26	12.98	20.72



Project Name:	TOS-25 ValleyPlazaPark South Stor	Sample Type:	Mod Cal
Project No.:	200-20043-20001-02 (LA0590D)	Soil Description:	Sand w/silt
Boring No.:	VN-HSA-2	Avg. Dry Unit Weight (pcf):	110.7
Sample No.:	S-6B ,S-7A ,S-7B	Avg. Initial Moisture Content (%):	3.7
Depth (feet):	31-31.5 ,32-32.5 ,32.5-33	Confining Pressures:	3.5, 15.0, 45.0 psi

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

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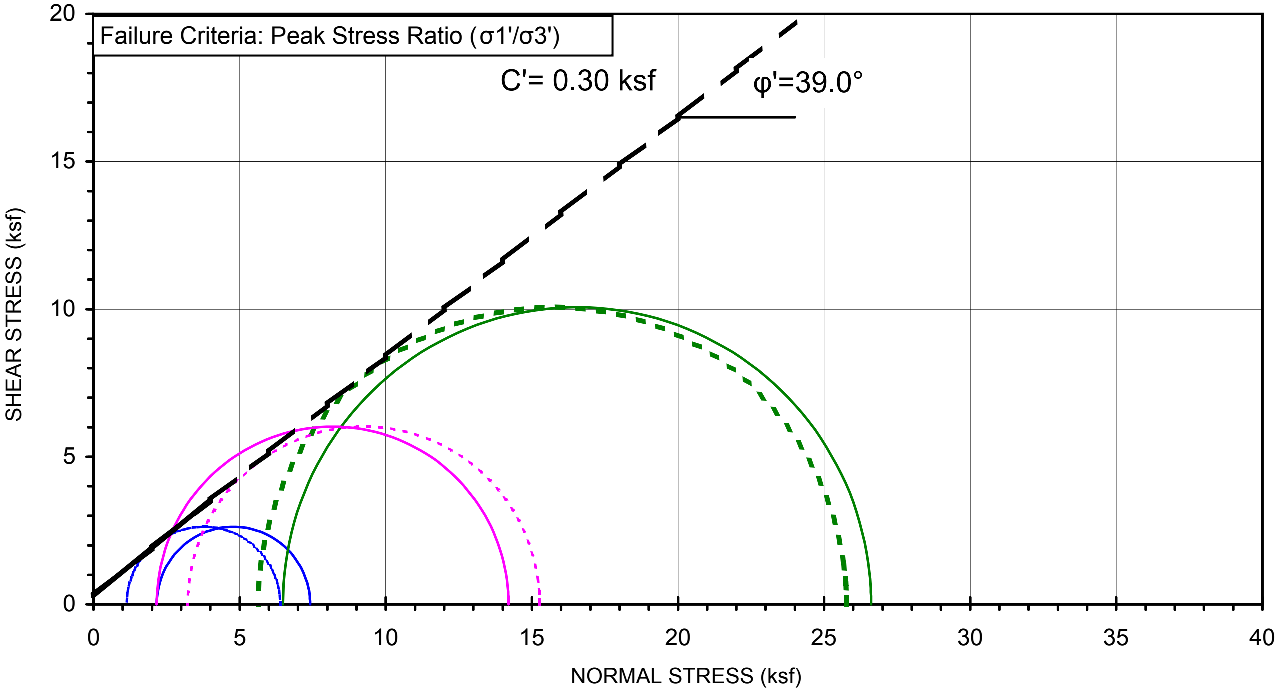

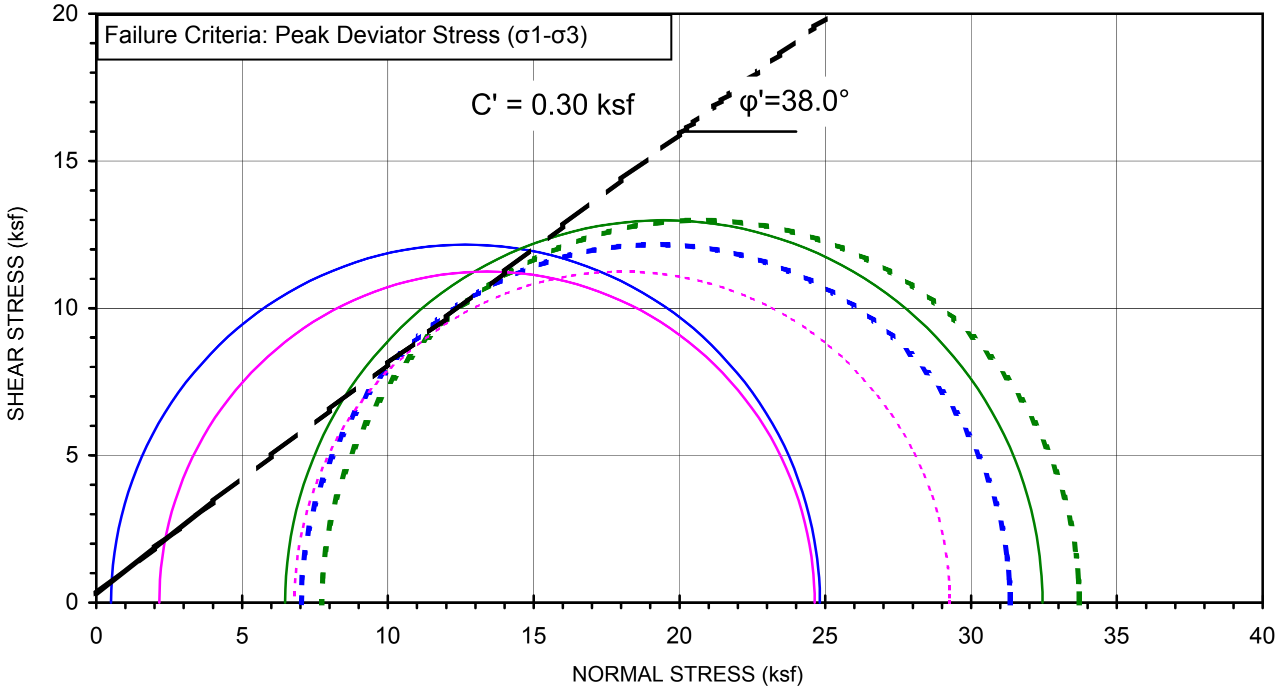

Project Name:	TOS-25 ValleyPlazaPark South Stormwat	Sample Type:	Mod Cal
Project No.:	200-20043-20001-02 (LA0590D)	Soil Description:	Sand w/silt
Boring No.:	VN-HSA-2	Avg. Dry Unit Weight (pcf):	110.7
Sample No.:	S-6B ,S-7A ,S-7B	Avg. Initial Moisture Content (%):	3.7
Depth (feet):	31-31.5 ,32-32.5 ,32.5-33	Confining Pressures:	3.5, 15.0, 45.0 psi

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

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Geosyntec consultants

engineers | scientists | innovators

DRAFT SOILS INVESTIGATION REPORT

Task Order Solicitation (TOS) No. 25
Stormwater Capture Parks Program
Valley Plaza Park South, Los Angeles, CA

Prepared for

Tetra Tech, Inc.
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Los Angeles, CA 90017

Prepared by

Geosyntec Consultants, Inc.
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Los Angeles, CA 90013

Project LA0590C

June 3, 2020

Draft Soils Investigation Report

Task Order Solicitation (TOS) No. 25
Stormwater Capture Parks Program
Valley Plaza Park South, Los Angeles, CA

Prepared for

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Prepared by

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DRAFT	DRAFT
Jeff Fijalka, P.E.	Chris Conkle, P.E., G.E.
Project Engineer	Senior Engineer

Project Number: LA0590C

June 3, 2020

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ACRONYMS AND ABBREVIATIONS

ACI	American Concrete Institute
ASCE	American Society of Civil Engineers
ASTM	American Society of Testing Materials
BOE	Bureau of Engineering
Cal-OSHA	California Occupational Safety and Health Administration
CalGEM	California Geologic Energy Management Division
CalMod	California-modified sampler
CBC	California Building Code
CRR	cyclic resistance ratio
CGS	California Geological Survey
CFR	Code of Federal Regulations
cm/s	centimeters per second
CPT	Cone Penetration Test
CSR	cyclic stress ratio
ft	foot/feet
ft bgs	feet below ground surface
in./hr	inches per hour
LACPW	Los Angeles County Public Works
mg/kg	milligrams per kilogram
MCEG	Maximum Credible Earthquake Geometric Mean
$\mathrm{MCE_R}$	Maximum Considered Earthquake
MSL	mean sea level
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
O&M	Operations and Maintenance
$\mathrm{PGA_M}$	peak ground acceleration
PID	photoionization detector
ppm	parts per million
psf	pounds per square foot
PSI	pounds per square inch
PVC	polyvinyl chloride
SBT	soil behavior type
SCPT	Seismic Cone Penetration Test
SOHP	State Office of Historic Preservation
SPT	standard penetration test
SWRCB	State Water Resources Control Board
TOS	Task Order Solicitation
UIB	underground infiltration basin
USACE	U. S. Army Corps of Engineers
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey

1. INTRODUCTION

This report presents the results of a geotechnical investigation and summarizes geotechnical design recommendations relating to the Stormwater Capture Parks Program – Valley Plaza Park South, Los Angeles, CA (Project). This report was prepared by Geosyntec Consultants, Inc. (Geosyntec) to support pre-design planning for the Project being carried out by Tetra Tech, Inc. for the City of Los Angeles Bureau of Engineering (City). This work was conducted in accordance with the scope of work, terms, and conditions described in the Subconsultant Services Agreement between Tetra Tech, Inc. and Geosyntec Consultants, dated 29 January 2020.

1.1 Project Background

Valley Plaza Park South (the Site) is located in the East San Fernando Valley in the upper Tujunga Wash Watershed within the San Fernando Groundwater Basin. The park is south of the I-5 freeway and east of the SR-170 freeway in the North Hollywood neighborhood of the City. It is bordered by SR-170 to the west, Vanowen Street to the north, St. Claire Avenue to the east, and Victory Boulevard to the south. Refer to Figure 1 for a map of this location. The park is owned by the City of Los Angeles Department of Recreation and Parks and is one of the several parks within Task Order Solicitation 25 - Stormwater Capture Parks Program. The goal of the program is to alleviate local flooding, increase water supplies through stormwater capture, improve water quality, and provide recreational, social, and economic benefits.

Within the Stormwater Capture Parks Program, the Valley Plaza Park South concept consists of capturing runoff from an approximately 229-acre tributary area and diverting it from the Central Branch of Tujunga Wash (which is owned and maintained by Los Angeles County Public Works (LACPW)) into a 0.7-acre underground infiltration basin (UIB) constructed below the park. The basin is envisioned to store approximately 307,000 cubic feet of stormwater.

Valley Plaza Park South is one of nine City-owned parks within the North Hollywood area that are under consideration for inclusion in the Stormwater Capture Parks Program. Site investigations and pre-design studies are underway for each of the parks to assess each site’s potential for inclusion in the program.

The conceptual design for Valley Plaza Park South indicates that stormwater will be diverted from an existing open concrete channel that runs along the western boundary of the park between the park and the SR-170 freeway. Per the current design concept, a channel drop inlet near the southern end of the park will intercept the channel and direct water through a series of chambers where it will be lifted by pumping and sent through a sedimentation basin before ending up at the UIB. The Project components include a drop inlet from the open channel, actuated valve vault, pump station, hydrodynamic separator, flow measuring station, and a series of interconnected underground infiltration galleries that will include an initial containment/settling area.

The preliminary concept also includes a rubber dam constructed within the channel to help control stormwater diversion into the facility. If a rubber dam is planned to be used as part of the infrastructure at the Site, we would envision that the anchorage of the dam would be to the existing channel lining and that the design of the anchorage would be carried out by the Project's structural engineer. The structural engineer would need to evaluate the capacity of the existing channel lining relative to loads from the rubber dam and evaluate if additional structural reinforcement is required

The UIB is envisioned to have an overall height (from base of footing to top of deck) on the order of 12 feet (ft), with an open or perforated base. Such a system may be constructed using the StormTrap® precast elements in the doubleTrap® configuration or could be comprised of individual precast concrete units founded on strip footings similar to the ConTech Con/Storm™ system. Individual units of either type of system will be interconnected to achieve the required design volume. The base of the UIB is planned to be on the order of 16 to 20 ft below existing ground surface (ft bgs). A concept-level illustration of the primary Project features is presented in Figure 2.

Surface features will include manholes and access hatches, and there will be some pads and minor shelters for electrical panels and other equipment and controls related to the project. There will be some concrete-paved access roads. Disturbed park facilities, including parking lots, will generally be replaced in kind.

1.2 Purpose and Scope of Investigation

This soils investigation report was prepared to support the pre-design planning of the proposed stormwater infiltration facilities at Valley Plaza Park South. An assessment of groundwater levels, subsurface conditions, infiltration capacity, and other general geotechnical and soils parameters necessary for pre-design planning were the focus of the investigation performed. In addition to a description of subsurface conditions encountered, this report presents geotechnical recommendations relevant to the Project improvements planned at the time of this report.

Geosyntec's scope included field explorations, field testing, laboratory testing, engineering analyses and evaluations, development of geotechnical recommendations, and preparation of this report. The field exploration and field testing were carried out by Geosyntec personnel with the assistance from several subcontractors working under contract with Tetra Tech, Inc. Hollow-stem auger drilling, sampling, and standard penetration test (SPT) was performed by Martini Drilling. Cone Penetration Testing (CPT) was performed by Kehoe Testing & Engineering. Geotechnical laboratory testing of select soil samples was performed by California Testing and Inspection, and soil chemical testing was performed by Project X Corrosion Engineers.

The results of our investigation were used to develop the geotechnical discussion, conclusions, and recommendations presented in this report regarding:

- Geologic and seismic setting;
- Surface and subsurface conditions;
- Potential geologic hazards;
- Infiltration;

- Design groundwater level;
- Seismic design parameters;
- Earthwork;
- Concrete slab-on-grade;
- Foundations;
- Bearing capacity and settlement below UIB and other buried structures;
- Lateral earth pressures
- Utility trenches;
- Earthwork construction observation and testing;
- Site monitoring and maintenance; and
- Construction considerations, including temporary shoring.

The discussions, conclusions, and recommendations presented herein are specifically focused on the infiltration facilities described in this report and are not intended for other future land uses or non-stormwater structures.

1.3 Relevant Code and Standards

This report was prepared in general accordance with the following codes, standards, and manuals:

- 2019 California Building Code, Title 24, Part 2 (CBC, 2019); and
- 2017 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, American Society of Civil Engineers (ASCE 7-16).

2. GEOTECHNICAL FIELD INVESTIGATION

2.1 Investigation Summary

The geotechnical site investigation at Valley Plaza Park South was conducted between 13 April and 29 April 2020. Onsite activities consisted of soil boring, sampling, and logging, seismic cone penetration testing (SCPT), and temporary infiltration well installation, testing, and abandonment. More specifically, the site exploration consisted of the following:

- One hollow-stem auger boring (VPS-HSA-5) to depth of approximately 31.5 ft bgs;
- Four hollow-stem auger borings (VPS-HSA-1 through -4) to depths between approximately 31 to 52 ft bgs, with the installation of temporary infiltration test wells;
- Six CPTs to depths between approximately 37 and 49 ft bgs, with shear wave velocity measurements at five of the soundings, and;
- Four constant-head infiltration tests performed in the four temporary wells.

A summary of the field explorations is represented in Table 1. Investigation locations are depicted on the Site map contained in Figure 3.

2.2 Exploratory Borings

Geotechnical borings were advanced using a truck-mounted drill rig outfitted with a hollow-stem auger. At each boring location, an SPT was performed at 5-ft intervals to measure blow counts (N-values) and collect drive samples. Additionally, a California-modified sampler (CalMod) was used to collect ring samples. Relatively undisturbed and bulk samples were obtained at selected intervals from the borings and logged by a Geosyntec engineer. During logging, samples were screened with a photoionization detector (PID) to provide information on potential contamination. A log of each borehole is presented in Appendix A. Select soil samples were transported to the laboratory for geotechnical and soil chemical testing, as described later in this section.

Four of the hollow-stem auger borings were converted to temporary infiltration test wells, and the remaining one hollow-stem borehole was backfilled with a mixture of cement-bentonite grout and capped with native soils. Soil cuttings from each boring were placed into steel drums and temporarily left on site for environmental profiling prior to offsite disposal at a permitted disposal facility.

2.3 Temporary Well Construction and Field Infiltration Testing

Following completion of drilling and sampling, select boreholes were converted to infiltration wells using the following procedure:

- A 2-in diameter polyvinyl chloride (PVC) well screen with 0.02-inch slots was placed into the boring from 20 ft to 30 ft bgs (for boreholes VPS-1, -2, -4), from 15 ft to 25 ft bgs (for borehole VPS-3);
- A solid PVC pipe with no perforations was installed in the upper region of each borehole above the screened length.
- A 3-in thick filter sand pack (Cemex Lapis Lustre #3 Sand) was placed around the slotted pipe section at each borehole.
- A 2-ft thick layer of Bentonite chips was used to fill annular space above the screened section of pipe to isolate it from the borehole annulus above (and a 2-ft thick layer of Bentonite chips was also used to fill the space under the screened section of pipe to isolate it from the borehole below at locations where the boring was originally extended beyond the infiltration well depth and then partially backfilled prior to well construction).
- Native backfill was used to fill the annular space above the Bentonite chips to the top of each well.

The four infiltration test wells were constructed with screened intervals at relatively shallow depths (between 15 to 30 ft bgs) to assess in-situ hydraulic conductivity in the soil zone directly below the proposed UIB. Screen depths were adjusted in the field based on a visual-manual classification of the soil samples obtained from each boring, with preference given to soil layers with relatively lower fines contents.

A constant-head infiltration test was conducted at each of the four test well locations in general accordance with United States Bureau of Reclamation test method U.S. Bureau of Reclamation (USBR) 7300-89, as presented in the County of Los Angeles Administrative Manual GS200.2 [GMED, 2017]. At each location, after first saturating the zone immediately around the borehole (for a minimum of one hour), water was added to the borehole at a measured rate using a mechanical water meter and a stopwatch. The flow of water delivered to the test well was adjusted to maintain a relatively constant water level within the standpipe. Cumulative volume measurements were recorded at regular intervals until the rate of flow necessary to maintain constant head remained stable for a period of at least 30 minutes. A digital data logger was used to continuously record the water level in the well. At the end of each constant head test, falling water head within the well was recorded by the data logger after the supply of water was shut off.

Upon completion of infiltration tests, all temporary wells were abandoned by pulling out the PVC casing and screen, over-drilling the borehole down to the bottom of the temporary well, and backfilling with bentonite and Portland cement to near ground surface. Native soil was placed in the upper 1 to 2 ft of each abandoned well.

2.4 Cone Penetration Testing

A total of six CPT soundings were advanced to depths as great as 49 ft bgs at four different locations (CPT-1, -2, -3, and -4). Immediately adjacent to CPT locations 3 and 4, second soundings were attempted (CPT-3A and CPT-4A) after hitting refusal at the initial locations. CPT-3A was advanced to an approximate depth of 48 ft, 11 ft deeper than CPT-3. CPT-4A was advanced to an approximate depth of 49 ft, 7 ft deeper than CPT-4.

The cone penetrometers were pushed using a 30-ton CPT rig with a cone tip area of 2.3 square inches. Instrumentation on the cone and within the rig measured cone bearing, sleeve friction, and dynamic pore water pressure at 2.5 cm (~1-inch) intervals during penetration to provide a nearly continuous geologic log. Each CPT sounding was performed in accordance with American Society of Testing Materials (ASTM) International Test Method D5778 with the truck-mounted rig providing thrust. Measurements of CPT resistance were used to evaluate the variation of material types and engineering properties. Soil Behavior Type (SBT) and the stratigraphic interpretation are based on relationships between cone bearing, sleeve friction, and pore water pressure. The friction ratio is a calculated parameter (defined as the ratio of the sleeve friction to cone bearing) and is used to infer SBT.

Shear wave velocity seismic tests were performed in CPT soundings CPT-1, -3, and -4 at approximately 10-ft depth intervals, by measuring the travel time and distance between a triaxial geophone in the CPT cone and the seismic source. The seismic source used was an air-actuated hammer located inside the front jack of the CPT rig. Individual CPT locations are shown in Figure 3. The results of the CPT soundings and limited interpretative data are presented in Appendix B.

2.5 Geotechnical Laboratory Testing

Geotechnical laboratory soil testing of selected representative soil samples was performed to evaluate in-situ moisture and density, gradation, plasticity, consolidation, sand equivalent, and shear strength characteristics of in-situ soils. The results of this testing were used to aid in soil classification and evaluation of the engineering properties of the soils. Results of the laboratory testing program, along with the applicable ASTM test standard, are summarized in Table 2, with full results included in Appendix C. The results of this geotechnical laboratory testing program were used to corroborate field classifications and assist in selecting inputs for geotechnical evaluations.

2.6 Soil Chemical Laboratory Testing

Analytical testing was performed to profile the chemical composition of the soil for assessment of its potential to create a corrosive environment for onsite features constructed at or below grade. The suite of tests performed includes sulfates, chlorides, resistivity, pH, redox, sulfide, nitrate, and ammonium, in addition to several other anion and cation tests. A summary of the results of this testing can be found in Table 3. Full laboratory test results are presented in Appendix D.

2.7 Photoionization Detector (PID) Screening

No PID readings greater than 0.2 parts per million (ppm) were recorded during logging of the hollow stem auger soil samples. Additionally, no unusual odors or colors indicating the potential presence of contamination were noted for any of the samples collected.

3. SITE CONDITIONS

3.1 Geological Setting

The San Fernando Valley is located within the Transverse Ranges Geomorphic Province of Southern California. The Valley is bounded to the north by the San Gabriel and Santa Susana Mountains, to the east by the Verdugo Mountains, to the south by the Santa Monica Mountains, and to the west by the Simi Hills [Yerkes et al., 2005]. Formation of the Valley began in the Early-Middle Miocene (~15-18 Ma.) as movement along the San Andreas Fault system caused rotation of the Transverse Ranges Province and uplift of the Santa Monica Mountains [Langenheim et al., 2011]. Basin-filling sediments are sourced from the surrounding ranges and consist primarily of silt, sand, and gravel derived from crystalline basement rocks of Proterozoic and Mesozoic age [Hitchcock and Willis, 2000].

The stratigraphy of the San Fernando Valley consists, from oldest to youngest, of the Tertiary Topanga, Modelo, Towsley, and Fernando Formations, the Quaternary Saugus and Pacoima Formations, and ten recognized units of unnamed Quaternary alluvial sediments [Yerkes, et al., 2005; Hitchcock and Wills, 2000].

Figure 4 shows the location of the Site on a regional geologic map. The park is situated within the historic flood plain of the Central Branch Tujunga Wash [Hitchcock and Wills, 2000]. Hitchcock and Willis describe the surficial geology in the vicinity of the Site as recent wash deposits consisting of sand and silty sand, underlain by Holocene alluvial fan deposits consisting of sand and silty sand with minor clay. Borehole logs from nearby groundwater monitoring wells at the Hewitt Landfill RWQCB cleanup site, approximately 0.9 mile to the north, confirm subsurface conditions generally matching the above descriptions to depths up to 404 ft bgs [Golder, 2017]. Beneath the park, the base of the Saugus Formation is approximately 2,000 ft bgs [Langenheim et al., 2011].

3.2 Seismic Setting

The Transverse Ranges Geomorphic Province is seismically active. Ongoing deformation associated with movement along the San Andreas Fault, at the boundary of the North American and Pacific tectonic plates, is distributed through the region on a network of primarily strike-slip, thrust, and reverse faults.

A list of significant regional Quaternary faults is provided in Table 4, organized by proximity to the Site [U.S. Geological Survey (USGS) and California Geological Survey (CGS), 2020]. The first column in the table lists the names of significant nearby faults or fault zones. The second column lists the age of activity of each fault. Late Quaternary activity indicates that a fault has slipped in the last 130,000 years. Latest Quaternary activity indicates that a fault has slipped in the last 15,000 years. Historic activity as per the USGS/CGS indicates that a fault has slipped in the last 150 years. Columns 3 and 4 provide a generalized description of the orientation (strike and dip) of each fault. Quantitative estimates of average strike and average dip from the USGS/CGS database are provided where available. Column 5 lists the sense of motion of each fault. Columns 6 and 7 list the distance and direction from the Site to the surface expression or surface projection of each fault. Four listed faults have experienced relatively recent seismic activity.

- January 17, 1994, slip on the Northridge Hills Blind Thrust generated the 6.7 moment magnitude Northridge Earthquake, with an epicenter approximately 8.0 miles west of the Site [SCEDC, 2013a].
- October 1, 1987, slip on the Puente Hills Blind Thrust generated the 5.9 local magnitude Whittier Narrows Earthquake, with an epicenter approximately 20 miles southeast of the Site [SCEDC, 2013b].
- February 9, 1971, slip on the Sierra Madre Fault Zone (San Fernando Section) generated the 6.5 moment magnitude San Fernando Earthquake, with an epicenter approximately 16 miles north of the Site [SCEDC, 2013c].
- January 9, 1857, slip on the southern section of the San Andreas Fault generated the 7.9 moment magnitude Fort Tejon Earthquake, with an epicenter approximately 155 miles northwest of the Site [SCEDC, 2013d].

In addition to these significant faults, there is an unnamed possible fault in North Hollywood at a distance of approximately 1.6 miles south of the Site.

3.3 Site History

Aerial photos of the North Hollywood area taken as early as the mid-1940s indicate that, prior to development as a park, approximately half of the Site (the southwesterly half) lay within the bottom of the Tujunga Wash while the northeasterly portion of the site was situated along the eastern bank of the wash. As early as the 1950s, portions of what is now Valley Plaza Park South appear to have been constructed. During the 1960s, the wash was diverted into a series of lined canals and buried box culverts, and the SR-170 freeway was constructed generally along the original wash alignment. In conjunction with the freeway development, a concrete-lined open canal was constructed along the western perimeter of the Site for stormwater conveyance [UCSB, 2020].

A review of environmental documents available on the State Water Resources Control Board's (SWRCB) GeoTracker website [2020] does not indicate the presence of any groundwater monitoring wells on or adjacent to the Site.

The as-built design drawings for the open channel that the proposed drop inlet will tie into indicate that the channel structure was completed in 1965. Per 36 Code of Federal Regulations (CFR) 800, the U. S. Army Corps of Engineers (USACE) is required to fulfill regulatory obligations of the National Historic Preservation Act (NHPA) for any future projects on channel structures greater than 50 years old, upon concurrence with the State Office of Historic Preservation (SHPO). Since the structure is over 50 years old, a study should be performed to determine whether the structure is eligible for listing in the National Register of Historic Places (NRHP) and whether it is considered historic property under Section 106 of the NHPA.

3.4 Surface Conditions

Valley Plaza Park South is bordered by the SR-170 freeway to the west, Vanowen Street to the north, St. Claire Avenue to the east, and Victory Boulevard to the south in the North Hollywood neighborhood of the City of Los Angeles. The planned 0.7-acre underground infiltration gallery is located at the south end of the park, immediately west of the existing tennis courts. Victory Valley Childcare Center is located south of tennis courts and southwest of the Site.

In general, the Site is relatively flat in the east-west direction and has a gentle slope in the north-south direction with an overall relief of approximately 18 ft. Site elevation ranges from approximately +720 ft mean sea level (MSL) (near Vanowen Street to the north end) to + 702 ft MSL (by the childcare center at the south end). A concrete-lined open drainage channel runs between the western boundary of the site and the SR-170 freeway embankment. The embankment rises approximately 20 and 25 ft above the Site with a side slope of approximately 2.5:1 horizontal to vertical (H:V).

The portion of the park proposed for use in the stormwater capture program is actively used as a recreational park with mostly grass cover and limited trees.

The geophysical utility locating performed in support of the drilling activities detected the presence of relatively shallow irrigation lines throughout the park.

3.5 Subsurface Conditions

3.5.1 Soils

A review of the boring logs and geotechnical laboratory test data from samples collected at the five hollow-stem auger borings indicates that the subsurface at the Site predominantly consists of fine to medium Sand with Silt (SW-SM and SP-SM) and Silty Sand (SM). The upper approximately 5 ft is believed to consist generally of artificial fills, while the material below consists of young alluvium. Between the depths of approximately 5 ft and 45 ft bgs, silty sands were encountered with silt contents generally between 20 and 45 percent. At a depth of approximately 25 ft bgs, a 5- to 8-ft thick layer of firm sandy silt with was encountered in the southwestern portion of the Site. Soil below depths of approximately 35 to 45 ft bgs generally consist of Well-Graded Sand with Silt and Gravel (SW-SM).

Based on the recorded SPT values, SM layers in the upper 20 ft have generally loose to medium dense relative density; whereas, SM layers at depths greater than 20 ft generally become gradually denser. Soil samples collected were typically brown in color and moist to very moist at the time of our investigation.

Cross sections of the Site developed to illustrate inferred subsurface stratigraphy are provided in Figures 5 and 6. A characteristic subsurface profile, developed based on observations made during the geotechnical site investigation and the interpretation of laboratory test results, is presented in Table 5.

3.5.2 Groundwater

Groundwater monitoring reports compiled in the California State Water Resources Control Board (SWRCB) GeoTracker database [2020], Sustainable Groundwater Management Act Data Viewer [2020], and LA County Public Works (PW) Groundwater Well Database [2020] document depth to groundwater as observed in monitoring wells near the Site. According to the reports available from these sources, measured groundwater depths ranged from approximately 194 ft to 238 ft bgs between the years 2008 and 2018 at monitoring wells located between 0.5 and 2.4 miles from the Site.

Figure 7 contains an excerpt from a California Geological Survey map of “historic high” groundwater elevations in the Van Nuys 7.5-Minute Quadrangle [CGS, 1997]. Information provided on this figure indicates that the “historic high” groundwater level at the Site was approximately 45 ft bgs. This groundwater level is on the order of 150 ft to 190 ft higher than what was recorded during the recent groundwater monitoring. These findings are not atypical, as the current groundwater elevation throughout many parts of the Los Angeles County is often tens of feet, and in some areas, hundreds of feet below historic high levels. This phenomenon is largely attributed to wide-scale drawdown of various aquifers that occurred as a result of regional development throughout the last century.

Groundwater was not encountered to the depths explored during the Geosyntec site investigation described in this report, and no surface springs or seeps were observed at the Site. However, groundwater levels, including regional and perched groundwater, can be influenced by seasonal variations in rainfall and irrigation, ocean tides, groundwater pumping, subsurface stratigraphy, topography, and other environmental conditions and are subject to variation.

4. GEOLOGIC HAZARDS

The geologic hazards considered as part of this investigation include surface fault rupture, strong ground shaking, liquefaction, lateral spreading, collapsible soils, expansive soils, tsunami, oil extraction, methane gas, subsidence, and other geologic hazards.

4.1 Surface Fault Rupture

Surface fault rupture is the offset or rupturing of the ground surface by relative displacement across a fault during an earthquake. Typically, Alquist-Priolo Zones are used to identify project sites susceptible to surface fault rupture. However, the California Geological Survey has not identified Alquist-Priolo Earthquake Fault Zones for the Van Nuys Quadrangle [CGS, 1998] where the Site is located. Based on the Quaternary fault and fold database for the United States [USGS and CGS, 2020], no active or potentially active faults (defined as exhibiting displacement within the last 11,000 years and 1.6 million years, respectively) are known to underlie or project toward the Site. The nearest potential faults are an unnamed possible fault in North Hollywood, the nearest projection of which is located approximately 1.6 miles south of the Site, and the Verdugo fault, the nearest projection of which is located approximately 2.9 miles northeast of the Site. In light of this, surface fault rupture is not believed to pose a hazard to the proposed Project.

4.2 Strong Ground Shaking

The Site is situated within a seismically active region and will likely experience moderate to severe ground shaking in response to a large magnitude earthquake occurring on a local or more distant active fault during the expected lifespan of the Project. As a result, seismically induced ground shaking in response to an earthquake occurring on a nearby active fault, such as the Sierra Madre fault zone, the Hollywood fault, the Mission Hills fault zone, the Verdugo fault, and the Northridge Hills fault, or a more distant regional fault, such as the San Andreas fault, is considered to be one of the primary geologic hazards affecting the Project.

4.3 Liquefaction

Soil liquefaction is a phenomenon that may occur during seismic loading when loose, saturated materials experience a significant loss of shear strength. The cyclic undrained loading induced by an earthquake increases the pore water pressure due to the contractive tendency of the loose material. This decreases the effective stress, resulting in a decrease in shear strength and stiffness. If the pore water pressure becomes equal to the total stress, the effective stress becomes zero, and liquefaction may be triggered. Manifestations of soil liquefaction may include sand boils, surface settlements and tilting in level ground, as well as lateral spreading and global instability (flow slides) in areas of sloping ground. The impact of liquefaction on structures can include loss of bearing capacity, liquefaction-induced total and differential settlement, and increased lateral and uplift pressures on buried structures.

The CGS Seismic Hazard Zone Map [CGS, 1998] for the vicinity of the Site is shown in Figure 8. The CGS map indicates that the Site is immediately adjacent to an area where the historical occurrence of liquefaction, or local geological, geotechnical, and groundwater conditions indicate a potential for permanent ground displacement such that mitigation would be required. Due to the Site's proximity to this zone of recognized liquefaction hazard, a site-specific liquefaction evaluation was conducted. A discussion of the liquefaction susceptibility evaluation and the results relative to the proposed improvements is presented in Section 5.

Infiltration of treated stormwater at the Site has the potential to produce a localized increase in groundwater elevations. The scope of this investigation did not include an assessment of impacts to liquefaction susceptibility for substantially increased groundwater elevations.

4.4 Lateral Spreading

When liquefaction occurs, sloping ground or soils near a vertical face can potentially move as a mass downslope or towards the vertical face, applying lateral forces to structures and their foundations, and potentially imposing large deformations.

When lateral spreading occurs, spreading of greatest magnitude generally occurs nearest the free face and gradually diminishes with distance from the free face. Typically, portions of a site that may be impacted within a zone that extends away from the free face, a distance approximately 50 times the height of the free face, are considered to have a potential for lateral spread. Liquefied soils within a depth of approximately two times the height of the free face are typically considered to potentially contribute to lateral spreading. The open canal on the west side of the Site presents a free face in close proximity to the site. Given the estimated 7-ft free face height adjacent to the Site, liquefaction of soils within the upper approximately 15 ft would be most productive of lateral spreading. As the historic high groundwater level is 45 ft bgs, no further evaluation of lateral spreading was conducted.

4.5 Dry Sand Settlement

Soil materials above the analysis groundwater level may be subject to dry settlement during earthquake shaking due to densification. The seismically induced dry sand settlement for free-field conditions was estimated using the CPT-based procedure of Robertson and Shao [2010] as implemented in Cliq [GeoLogismiki, 2007] and is contained in Appendix E. A further discussion of this evaluation and the results relative to the proposed improvements is presented in Section 5.

4.6 Collapsible Soils

Collapsible soil is most commonly observed in sediments that are loosely deposited, separated by coatings or particles of clay or carbonate, then subject to saturation. Infiltration of treated stormwater at the Site will result in a temporary and periodic rise in the groundwater elevation, and this rise in groundwater could change the soil structure by dissolving or deteriorating the inter-granular contacts between the sand particles. However, soils encountered at and below the proposed depth of infiltration are generally medium dense to very dense and do not exhibit signs of significant clay or carbonate bonding between particles. Hydrocollapse beneath the proposed infiltration features is, therefore, not anticipated.

4.7 Expansive Soils

As discussed in Section 3.5 (Subsurface Conditions), the Site is generally underlain by sand intermixed with varying amounts of non-plastic silt and some gravel. The potential for expansive behavior for these types of soil is considered very low. No significant, potentially expansive high-plasticity clay or silt layers were identified in the explorations.

4.8 Tsunami

Based on the physiographic setting of the Site, the distance to the ocean, Site elevation, and review of California Tsunami Inundation Maps [State of California, 2009], the potential for flooding from seismically induced tsunamis is low.

4.9 Oil Extraction

Based on available data from the California Geologic Energy Management Division (CalGEM) Well Finder tool [2020], the Site is located outside an area with significant well development. No existing or abandoned wells were identified within one mile of the Site boundaries. Based on the location of the Site outside of an identified oil field and lack of wells reported in the immediate vicinity of the Site, the possibility of encountering an oil well during construction is considered low.

4.10 Methane Gas

The Site is not located within a mapped City of Los Angeles Methane Zone or Methane Buffer Zone and, therefore, the presence of methane at the Site was not investigated as part of this investigation.

4.11 Subsidence

Subsidence is the gradual settling of the ground surface with little to no horizontal movement which can be caused by many factors such as fluid (i.e., oil or groundwater) extraction, mining operations, or karst terrain. Within Southern California, extraction of large fluid volumes (such as water, oil, or gas) from thick layers of poorly consolidated sediments is the principal cause of subsidence. The potential for subsidence due to karst, pseudo karst, or mining features is considered very low in relation to the geologic setting and absence of large or commercial subsurface mining within the Site area. Groundwater extraction in the Los Angeles Basin prior to the 1970s contributed to the subsidence, but the majority of the subsidence resulted from oil and gas production [Chilinger, 2004]. The subsidence hazard in the Los Angeles Basin has largely been mitigated by fluid injection into various oil fields, and subsidence in this area is no longer an issue. The Site is located outside an oil field, and subsidence is not considered a hazard to the proposed construction.

4.12 Other Geologic Hazards

Other potential geologic hazards that could affect the Site include landslides, volcanic activity, and seiches. Given the relatively level topography of the Site, landslides are not considered a potential hazard. Seiches typically occur when enclosed bodies of water are seismically shaken to generate oscillations and waves, resulting in overtopping. No enclosed water bodies are located adjacent to or upgradient of the immediate Site area, and seiches are not considered a potential hazard. Given the geologic setting of the Site, volcanic activity is not likely to pose an impact on the Project.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Subsurface Infiltration

5.1.1 Field Estimates of Hydraulic Conductivity

Geosyntec used two separate methodologies to estimate the hydraulic conductivity at each infiltration test well. The first method, developed by Hvorslev and outlined by Fang [1991] and Massmann [2004], employs a formula for a well point in uniform soil.

The second estimation method, presented by the USBR (USBR, 2001], is often used for gravity permeability tests and assumes that the constant head maintained within the well during testing is at a level below the top of screened section of pipe (Method 1).

Based on these two methods, the estimated hydraulic conductivity ranges from approximately $1x10^{-4}$ centimeters per second (cm/s) [0.2 inches per hour (in./hr)] to $1x10^{-2}$ cm/s [20 in./hr]. The field measurements obtained at each test location are summarized in Table 6.

5.1.2 Design Infiltration Rate

The materials in which the stormwater will infiltrate classify predominantly as Silty Sands (SM) and Sands with Silt (SP-SM). As described above, based on the results of field infiltration testing, the range of hydraulic conductivity for the in-situ soil varies between $1x10^{-4}$ cm/s [0.2 in./hr] and $1x10^{-2}$ cm/s [20 in./hr].

Test values are understood to vary widely, not only based on soil type (i.e., particle size, distribution, and density), but are also significantly affected by equipment and environmental variations, even if following standardized testing procedures. A reduced infiltration rate is typically selected for design based on anticipated infiltration performance, considering the variability in results from the field evaluations, potential for subsurface variability, and potential for long-term siltation.

A layer of Sandy Silt (ML) is present in the southwestern portion of the Site at a depth of approximately 25 ft bgs, less than 10 ft below the proposed invert of the UIB, as described in Section 3.5, and as illustrated in Figures 5 and 6 as “Layer 3A.” The measured hydraulic conductivity of the infiltration test performed within this area, test well HSA-1, was found to be an order of magnitude lower than the other three infiltration tests performed at this site. The measured conductivity rate at HSA-1, $1.4x10^{-4}$ cm/s [0.19 in./hr], suggests that soil conditions at the tested depth within this portion of the site may not be favorable to infiltration. For this reason, we have identified a “Zone of Reduced Hydraulic Conductivity” within this portion of the Site in which infiltration through a UIB is not recommended. This zone, identified on Figure 3, occupies approximately 20 percent of the proposed footprint of the UIB. However, drywells installed with screened intervals positioned below a depth of approximately 40 ft bgs may be considered for infiltration within this area using the recommended design infiltration rate suggested below.

A hydraulic conductivity of 5.2 x 10^{-3} cm/s [7.4 in./hr], the geometric mean of the measured conductivity values for the tests performed at well locations HSA-2, -3, and -4, was selected to represent the subsurface conditions at the depths envisioned for infiltration at the Site for areas outside of the prescribed "Zone of Reduced Hydraulic Conductivity." Following Los Angeles County guidance [County of Los Angeles, 2017], a reduction factor of 2 was applied to this measured value because the infiltration testing was performed in cased wells. The recommended design infiltration rate is 2.6 x 10^{-3} cm/s [3.7 in/hr]. This infiltration rate is consistent with the typical range for the soil types encountered at the Site.

A reduction factor to account for long-term system performance has not been applied to the recommended design infiltration rate. The stormwater infiltration facility designer should consider an appropriate reduction factor (typically between 1.0 and 3.0), based on the level of de-siltation and/or pre-filtration provided and the planned operation and maintenance program.

5.2 Design Groundwater Level

As described in Section 3.5.2, the groundwater level below the site is typically more than about 150 ft bgs. However, the infiltration galleries may create a locally elevated groundwater level when the galleries are in use. Therefore, the groundwater level for design of UIB and the facilities adjacent to the UIB (pump station, etc.) should be considered to lie at the base of the nearest infiltration gallery.

During operation of the facility, water may accumulate in backfill soils surrounding the UIB in response to filling. Care should be taken in the design and operation of facilities to provide for appropriate drainage of surrounding backfill so that a differential head is not produced in the event of a drawdown of the water in the UIB.

5.3 Groundwater Mounding

When evaluating the operating practices for long-term infiltration facility operation, the potential for changes in groundwater conditions, including groundwater mounding, to occur in the surrounding area should be considered. For typical sites these changes have the potential to include the following impacts:

- Reduction in the infiltration rate and storage capacity for further stormwater infiltration;
- Seepage and ponding in low lying areas;
- Saturation of slopes, increasing the potential for slope instability; and
- Effects on the geotechnical properties of granular soils (i.e., the potential for liquefaction, collapse, increased lateral loads against buried structures, and buoyancy effects).

The mounding should be actively monitored and controlled to limit these potential adverse effects.

Although a specific assessment of mounding and mounding effects was not within the scope of this investigation, as a general consideration, if groundwater mounding is controlled below the historic high groundwater level of approximately 45 ft bgs, geotechnical impacts to the subsurface soils are not expected to be significant.

5.4 Seismic Design Parameters

Seismic design parameters were developed in accordance with the 2019 CBC and the American Society of Civil Engineers (ASCE) Standard 7-16. The center of the park at a latitude and longitude of 34.189 degrees North and 118.401 degrees West was used to evaluate the minimum seismic design parameters presented in Table 7. The structural designer may utilize more conservative values at their discretion.

Site classification for seismic design was carried out following the guidelines of ASCE 7-16 Chapter 20. Classification was based on the characteristics of the upper 100 ft of the site profile e per ASCE 7-16 Section 20.3.1, which states that for structures that have fundamental periods of vibration equal to or less than 0.5 s, site response analysis is not required and the site class is permitted to be determined by appropriate soil properties in the upper 100 ft of the site profile.

The Site was characterized using shear wave velocity measurements (V_s) from three SCPT soundings. The interpreted shear wave velocity of the upper 30 m (V_{S30}), evaluated according to Equation 20.4-1 [ASCE 7-16], is 1025 ft/s. Based on the V_{S30} of 1025 ft/s, the Site is classified as Site Class D “stiff soil.”

Seismic design parameters for buildings and other structures at the Site were developed following the guidelines of ASCE 7-16 Chapter 11. In accordance with ASCE 7-16, the risk-targeted maximum considered earthquake (MCE_R) ground motion parameters, S_S and S_1, which incorporate a target risk of structural collapse equal to 1 percent in 50 years, were determined for the Site. These mapped ground motion parameters were used to determine the MCE_R ground motion parameters adjusted for Site class effects, S_{MS} and S_{M1}, with appropriate site coefficients for Site Class D. The design ground motion parameters, S_{DS} and S_{D1}, were then determined as 2/3 of the site adjusted MCE_R ground motion parameters.

Table 7 summarizes the seismic design parameters for buildings and other structures at the Site. The site adjusted Maximum Credible Earthquake Geometric Mean (MCE_G) peak ground acceleration (PGA_M) used for dry sand settlement analysis is also included in Table 7. Note that ASCE 7-16 Section 11.4.8 requires that sites classified as Site Class D with an S_1 greater than or equal to 0.2 perform a site-specific ground motion hazard analysis.

Although the Site meets the criteria for this requirement, a site-specific ground motion hazard analysis was not performed, which is permitted per Exception #2 in ASCE 7-16 Section 11.4.8.

This exception states that a ground motion hazard analysis is not required provided that the value of the seismic response coefficient C_s is determined by Eq. (12.82) for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Eq. (12.8-3) for $T_L \geq T >$

1.5T_S or Eq. (12.8-4) for T > T_L. Geosyntec recommends that structural design of relevant project components include the calculation of C_S and be used in analysis and design as required by Exception #2 of Section 11.4.8.

5.5 Earthwork

Site earthwork will generally consist of excavations for underground facilities, foundation excavations, and backfill of utility trenches. Earthwork should be performed in accordance with City of Los Angeles Department of Public Works Bureau of Engineering (BOE) Master Specifications, BOE Standard Plans, BOE-Approved Products and Material Lists, City of Los Angeles approval conditions, the recommendations of this report, the Standard Specifications for Public Works Construction "Greenbook," the Standard Specifications for Public Works Construction, "Brown book," and California Occupational Safety and Health Administration (Cal-OSHA) safety requirements. A preconstruction conference should be held at the Site with the City, the contractor, civil engineer, and geotechnical engineer in attendance. Existing structures identified by the City to remain should be protected in place during earthwork construction.

5.5.1 Site Preparation

Debris and vegetative matter in the Project area should be cleared and properly disposed of off site. Existing infrastructure within areas to be improved should be properly demolished and disposed of or dismantled and relocated. Existing utilities should be terminated or relocated as necessary.

Soils containing organic matter should be stockpiled separately on site for potential use as topsoil during Site restoration. Separate stockpiles should also be maintained for excavated soils that meet or may not meet the requirements for select fill and free-draining fill for potential differing re-use purposes.

Excavation bottoms should be moisture conditioned to a moisture content within 3 percent of optimum moisture content as determined by ASTM D 1557, and then observed and approved by a representative of the geotechnical engineer in preparation to receive foundations or before placement of overlying engineered fill. Loose or soft soil within the proposed grading area, as identified by the geotechnical consultant during earthwork and foundation excavation, should be excavated or scarified as required, moisture conditioned, and then placed and compacted in accordance with the requirements of Section 5.5.5 before placing additional fill or preparing subgrade. Soil containing organic or other deleterious matter, if encountered, should be properly disposed of off site.

5.5.2 Remedial Grading

A majority of the Site is mantled by undocumented fill. The borings performed during the referenced investigations encountered undocumented fill to a depth of approximately 5 ft below ground surface. Deeper fill areas may be present. We are not aware of any elements of the proposed infiltration facilities that would be founded on this upper fill layer.

There may be miscellaneous at-grade features, such as signage and fitness equipment, that may be supported in this undocumented fill on a case by case basis.

5.5.3 Bulking and Shrinkage

The undocumented fill materials and the alluvial deposits are anticipated to shrink between 10 and 15 percent when excavated and recompacted [Horner, 1988]. These estimates for bulking and shrinkage are intended for planning preliminary earthwork quantities. Contingencies should be made for balancing earthwork quantities based on actual bulking and shrinkage values at the time of earthwork operations.

5.5.4 Fill and Backfill Materials

Except as specified by manufacturers of the precast infiltration gallery, other substructure component fill materials for this project should be select fill, defined as granular native or import soil that contains at least 40 percent of material, by dry weight, less than ¼ inch in size. Select fill should not contain rocks or hard lumps greater than 3 inches in maximum dimension. In addition, select fill should have an expansion index less than 30, a liquid limit less than 30, and a plasticity index less than or equal to 15, and without perishable, spongy, deleterious, or otherwise unsuitable material. The lab testing conducted on this project indicates that much of the onsite materials will meet the requirements for select fill.

5.5.5 Fill Placement and Compaction

Except as specified by manufacturers of the precast infiltration gallery, other substructure component fill should be moisture conditioned and compacted between 0 and 3 percent above the optimum moisture contents in layers that do not exceed 8-inch loose lifts for heavy equipment compaction or 4-inch loose lifts for hand-held equipment compaction. Each lift of fill should be compacted to a minimum 90 percent relative compaction unless otherwise specified. Relative compaction is defined as the ratio (in percent) of the in-place dry density to the maximum dry density determined using the latest version of ASTM D 1557 as the compaction standard. Fill placed should demonstrate a moisture content within 3 percent of optimum moisture content determined with ASTM D 1557.

5.5.6 Permanent Fill and Cut Slopes

We understand that current surface grades will generally remain the same at the completion of the planned construction. As such, no permanent cut and fill slopes are planned.

5.5.7 Surface Drainage and Features

The ground surface should be sloped to provide positive drainage. The final Site grades should be planned so that surface drainage can accommodate the anticipated potential settlements during facility operation. No permanent structures or vegetation with significant root depth should be constructed over the top of the infiltration facilities or within a 2:1 (H:V) slope up from the base of the infiltration facilities.

5.6 Hardscape Recommendations

The placement of hardscape elements (such as access roads and walkways) shall be designed to promote positive drainage away from structures and/or slopes.

5.6.1 Concrete Slab-on-Grade

Concrete slabs cast on-grade may be used within the Site. Concrete slabs should be designed in accordance with requirements and procedures described in 2019 CBC Section 1808.

5.6.2 Concrete Pavement

Concrete access roads and walking paths may be constructed within the Site. Concrete pavements should be designed for the anticipated loads and in accordance with “Greenbook” requirements. Because of the presence of some undocumented fills at the site, we recommend that pavements be underlain by a minimum of 18 inches of compacted engineered fill. Fill shall be placed and compacted per the requirements of Section 5.5.5. A modulus of subgrade reaction of 250 pounds per cubic inch (pci) can be used for design of concrete pavements.

5.6.3 Asphalt Pavement

Asphalt pavement may be used to restore parking areas within the Site after construction of the UIBs. Flexible pavements should be designed for the anticipated loads and in accordance with “Greenbook” requirements. Because of the presence of some undocumented fills at the site, we recommend that pavements be underlain by a minimum of 18 inches of compacted engineered fill. Fill shall be placed and compacted per the requirements of Section 5.5.5. A presumptive subgrade CBR value of 30 can be used for flexible pavements at this Site.

5.7 Underground Infiltration Basin (UIB)

The UIB is envisioned to be constructed using precast concrete elements. One alternative under consideration is the use of fully precast StormTrap® concrete elements system in the doubleTrap® configuration to achieve the required volumes. Another alternative that may be considered is the use of a system with top precast elements placed on cast-in-place strip footings. In either case, the structures are expected to have a minimum soil cover, on the order of 3 to 5 ft, and extend to a depth of about 16 to 20 ft bgs. Furthermore, the structures will have a partially open bottoms to facilitate infiltration.

Proprietary precast systems, such as StormTrap® system, are typically designed by the manufacturer. The manufacturer design will include minimum requirements that the site needs to meet for the system to be installed and will dictate specifics such as backfill materials type, placement sequence and compaction effort, and minimum cover and allowed surface traffic. These requirements should be verified against the recommendations provided in this report as well as other project-specific requirements. Plans and specifications provided by the proprietary system manufacturer should clearly indicate loading and other geotechnical assumptions used to develop their design and be signed by a California registered professional engineer.

The following section provide geotechnical recommendations we expect to be required to support the precast system design finalization.

5.7.1 Fully Precast System (e.g. StormTrap®) Considerations

Fully precast systems such as StormTrap® include the base slab on which the elements sit. This adjoining base slab can be considered an equivalent mat foundation from the perspective of bearing capacity assessment, assuming that the openings in the base consist of less than about 25 to 35 percent of the area. Allowable bearing pressures of 3,000 pounds per square foot (psf) can be used for the mat foundation placed directly on the prepared competent native material or compacted soil or gravel fill on top of prepared native ground. The UIB system should be designed to be able to accommodate a static settlement of about 1-1/2 inches and differential settlements of about 1/2 of this amount over a distance of 30 to 50 ft.

The UIB is comprised of individual precast components, and the manufacturer should provide for lateral resistance in their design consist with the structural behavior of the UIB and the prescribed backfill staging. If needed, the resistance to lateral loads can be provided by frictional resistance along the bottom of the UIB. We recommend an allowable friction coefficient of 0.4 be used with the dead load to compute the frictional resistance of the UIB. If passive pressure is needed for the UIB to resist lateral loads, it may need to be evaluated on a case-by-case basis. A nominal passive resistance calculated using 100 psf/ft of depth can be used without additional review.

5.7.2 Precast System on Strip Footings

Precast systems placed on cast-in-place strip footings, or fully precast systems with limited base area that will act similar to strip footings, can be designed using the following recommendations.

5.7.2.1 Dimensions and Embedment

We recommend that foundations be at least 2.5 ft wide and embedded at least 24 inches below the lowest adjacent grade in the compacted engineered fill or competent undisturbed native soil. The minimum foundation embedment and size can be selected based on anticipated loads using the information regarding bearing capacity and settlement provided in the following sections. Adjacent foundations founded at different elevations should be located such that the slope from bearing level to bearing level is flatter than 1:1 (H:V)

5.7.2.2 Allowable Bearing Pressure

We recommend that for a minimum 2.5-foot wide strip foundation, an allowable bearing pressure of 2,000 psf can be used when embedded a minimum of 24 inches into the adjacent subgrade. This allowable bearing pressure can be increased by 400 psf for each additional 6 inches of embedment. Additionally, an increase of 400 psf is allowed for each additional 6 inches of footing width over 2.5 ft. The increase in the allowable bearing capacity is capped at a maximum of 5,000 psf. These allowable bearing pressures incorporate a factor of safety of two and can be increased by one third for short-term seismic loading.

5.7.2.3 *Estimated Static Settlements*

The settlement of a UIB foundation for a given allowable bearing pressure depends on the size, shape, and embedment depth of the foundation, and the alluvial materials below the foundation. For strip footings with widths between 2 and 7.5 ft, the estimated static settlement under allowable pressure is less than 0.5 to 1 inch. The majority of the static settlement should occur during, or shortly after, construction. The UIB system should be designed to be able to accommodate differential settlements of about 1/2 of the total settlement over a distance of 30 to 50 ft.

5.7.3 Estimated Seismic Induced Settlements

Estimates of seismic-induced differential settlements for the UIB were computed in accordance with the two-level evaluation approach described in P/BC 2020-151 "Liquefaction Analysis Guidelines." This approach relies on the evaluations conducted using (2/3) PGA_M as the primary reference ground shaking level for assessment of design, which is consistent with the overall design approach used for structures. The evaluation PGA_M is performed for reference only. For the (2/3) PGA_M analysis, the predominant earthquake magnitude was developed consistent with a 10 percent probability of exceedance in 50 years (475-year return period).

5.7.3.1 *Liquefaction and Lateral Spreading Evaluations*

Liquefaction and lateral spreading evaluations were conducted in general accordance with the guidelines from ASCE 7-16, using the inputs described in the following sections.

Groundwater Level

As indicated in Section 3.5, existing groundwater levels in the vicinity of the Site range from 194 ft to 238 ft bgs. The depth to historic high groundwater level at the Site is estimated as 45 ft bgs [CGS, 1997]. Long-term pumping of groundwater in the general area resulted in current groundwater levels being significantly below the historic highs, with a low probability of the groundwater levels recovering to the historic high levels in the foreseeable future.

Saturated soil conditions above the regional groundwater level resulting from stormwater infiltration will be temporary and periodic in nature, with a lower probability that the design seismic event coincides with saturated soil conditions. Additionally, as described in the recommendations section, the groundwater level in the area of the proposed system will be monitored and operations modified, as needed, to control groundwater elevation below the historic high level.

Therefore, for the liquefaction analysis, the historic high groundwater level of 45 ft bgs was considered. This "historic high" groundwater elevation was selected as the assumed location of the phreatic surface for the liquefaction assessment, consistent with current practice and regulatory expectations in the Los Angeles area.

Methodology

Soil liquefaction potential at the site was evaluated following the stress-based simplified liquefaction evaluation procedure of Boulanger and Idriss [2014]. In this procedure, the capacity of the soil to resist liquefaction or the cyclic resistance ratio (CRR) is expressed as a function of in-situ test indices (e.g., normalized and fines corrected tip resistance) and the demand imposed by the earthquake or the cyclic stress ratio (CSR) is expressed as a function of the PGA and earthquake magnitude. Liquefaction is predicted to occur when the factor of safety against liquefaction (FS_{liq}), calculated as the CRR divided by the CSR, is less than or equal to one.

Liquefaction evaluation at the Site was performed based exploration data from Geosyntec's site investigations that extends beyond 45-ft depth, which includes SPT data from Borings VS-HSA-1, VS-HSA-4, CPT-3, and CPT-4. Analysis was performed for the (2/3) PGA_M input using (2/3) $PGA_M = 0.593g$ and $M_w = 6.72$. (An evaluation of the full PGA_M was conducted for reference only as well). Liquefaction triggering evaluations were performed at each CPT sounding location following the Boulanger and Idriss [2014] methodology, as implemented in the computer program *CLiq v2.2.0.37* [GeoLogismiki, 2007]. Each boring carried below 45 ft encountered refusal, and SPT penetration test data below 45-ft depth exceeded 50 blows per foot, indicating very dense soils and no liquefaction potential.

Liquefaction-induced 1-D reconsolidation settlements were estimated for free field conditions following the strain potential approach outlined in Zhang et al. [2002], as implemented in *CLiq*. The Zhang et al. methodology estimates the post-liquefaction volumetric strain as a function of the normalized and fines-corrected CPT tip resistance (q_{c1Ncs}), and FS_{liq}, wherein all layers with $FS_{liq} < 2.0$ contribute to the settlement calculations.

The details on the liquefaction evaluation and settlement calculations are presented in Appendix E.

Results

The results of the CPT-based liquefaction potential analyses considering the design ground motion levels (2/3 PGA_M) and the historic high groundwater level (i.e. 45 ft bgs) do not indicate the potential for liquefaction or liquefaction-induced settlement at the Site.

Because liquefaction potential has not been identified as a hazard for the site, liquefaction-induced settlements or lateral spreading hazards are not anticipated.

5.7.3.2 Dry Sand Settlement

In the (2/3) PGA_M case, the estimated seismically induced dry sand settlement at the ground surface were estimated at less than 0.5 inch. Differential settlements over 30 ft are anticipated to be less than 0.5 inch. The estimated total and differential dry sand settlement at the anticipated foundation level of approximately 16 ft to 20 ft bgs is expected to be of a similar magnitude. The detailed calculations for dry sand settlements are shown in Appendix E.

5.7.4 Lateral Earth Pressures

Proprietary UIB systems are expected to be designed under a general manufacturer design lateral earth pressures which will be ensured in field by a prescribed backfill criteria, such as requiring select gravel backfill. The lateral earth pressures below are provided for the case that UIB is proposed to be designed using general backfill, such to reduce soil export. These values are higher, as they account for the range of soil types, compaction effort, and saturation conditions.

Buried structures with general backfill should be designed for the following vertical and lateral pressure cases:

- Case 1: Maximum Vertical (140 H1) and Minimum Horizontal Earth Pressure (36 H2); and
- Case 2: Maximum Vertical (140 H1) and Maximum Horizontal Earth Pressure (120 H2),

where in the above, H1 (in feet) is the earth cover from the top of a buried structure to ground surface and H2 (in feet) varies, representing the height from any locations of the vertical side wall to the ground surface and the calculated pressures are in psf. These recommendations are consistent with the Caltrans recommendations used for buried culverts. The vertical earth pressure on top of slab is derived from the weight of the prism of soil above the top slab and the amplification by the soil-structure interaction factor. The lateral soil pressure on walls reflects a large range of variation due to uncertainties in soil profiles around the buried structure. The uncertainties can come from many reasons, such as soils that are compacted around walls during backfill or because of a lack of drainage measures outside the buried structure.

Surface loads associated with lighter weight maintenance vehicles, if allowed and/or expected, can be modeled using a live load equivalent to 2 ft of additional soil cover, equivalent to an infinite surcharge of about 250 psf. Surface loads associated with heavy equipment will need to be assessed on case-by-case basis. Distribution of loads from the high-contact surface load (e.g., heavy equipment tire load) to the top of the buried structure can be estimated using a 2:1 vertical:horizontal role, where the stress on the surface decreases with depth by distributing the total load over an increasing area with depth, with the area boundaries increasing at an 2:1 vertical:horizontal rate in all directions.

Seismic impacts are expected to be limited for buried structures with spans less than 20 ft.

Resistance to lateral loads on buried structures with unbalanced lateral loads may be provided by passive resistance along the vertical face and frictional resistance along the bottom of foundations. The allowable passive resistance may be taken as ($6.3*H^{2.8}$) psf/ft (where H is the depth of the footing below surrounding grade in feet) for foundations poured neat against the excavated foundation soils. This allowable passive resistance value incorporates a factor of safety of 2. An allowable friction coefficient of 0.4 may be used with the dead load to compute the frictional resistance of foundations. If frictional and passive resistances are combined, the allowable friction coefficient should be reduced to 0.3. The upper 12 inches of soil should be neglected in passive pressure calculations in areas where the surface adjacent to the structure is unpaved. The resistance from passive pressure should also be neglected where utilities or similar excavations may occur in the future.

5.8 Other Buried Structures

Other underground structures included in the concept-level facility configuration (Figure 2) include an RCB diversion structure, actuated vault valve, hydrodynamic separator, and sedimentation basin, in addition to vaults for pumps and flow measuring devices. Assuming mat-type foundations with base of footings greater than 5 ft bgs, a bearing capacity of 3,000 psf can be used in the design of these features. Total static settlement is estimated to be less than 0.5 inches for structures with foundations up to approximately 5 ft square. Structures with foundations on the order of 50 ft square can be expected to have immediate settlements of up to approximately 1.5-inch total. Up to ½ of these total settlements should be expected to occur as differential settlement across these footings. General earth pressure recommendations provided in Section 5.7.4 can be used for the design of these structures.

5.9 Lightly Loaded Structures with Slab-on-Grade Foundations

Lightly loaded equipment shelters and pads can be supported on concrete slabs on grade. Because of the presence of undocumented fills, concrete slabs supporting these types of minor facilities should be underlain by a minimum of 18 inches of compacted engineered fill. Fill shall be placed and compacted per the requirements of Section 5.5.5. A bearing capacity of 2,000 psf and a modulus of subgrade reaction of 250 pci can be used for design of concrete slabs supporting these types of miscellaneous facilities, provided they are not settlement sensitive.

Depending on the structure use and occupancy, structures founded on fill may require a variance from the City prior to permitting.

5.10 Utility Trenches

Trench backfill is defined as material placed in a trench starting 6 inches above the crown of pipe, and bedding is all material placed in a trench below the backfill. Pipe trench backfill should conform to the recommendations presented in this report and Section 306-1.3 of the “Greenbook” and “Brownbook.” Unless concrete bedding is required around utility pipes, free-draining clean sand should be used as bedding. Compaction of backfill by water jetting should not be permitted.

5.11 Corrosion Potential

Based on the criteria established by the County of Los Angeles [LACPW, 2013], soils are considered corrosive when soluble sulfate concentrations in the soil are equal or greater than 2,000 ppm (or mg/kg), or chloride concentrations in the soil are equal or greater than 500 ppm (or mg/kg), or the pH value of the soil is equal or less than 5.5, or soil’s minimum resistivity value is less than 1,000 ohm-centimeters. Soil chemical test results from the soil sample collected from the Site indicate that the measured values (provided in Table 3 for reference) are well outside the ranges typically considered harmful or deleterious to foundation elements. A review of ACI-318-11 [2011], Table 4.2.1 and 4.3.1, also indicates no restriction on the planned concrete type based on the chloride and sulfate concentrations in the tested soil sample.

5.12 Site Monitoring and Maintenance

5.12.1 Pre-Construction Survey

We recommend that a pre-construction survey of the Site and the vicinity be performed. The survey should consist of photos and notes to document existing conditions of Site features prior to initiation of construction activities.

5.12.2 Pre-Saturation

Geosyntec recommends that a pre-saturation program be developed and implemented for the planned infiltration facilities for the purpose of confirming expectations related to subsurface infiltration, hydrocollapse, and groundwater mounding. Pre-saturation should generally be performed within the UIB excavation at an elevation near the planned base of excavation, and ground surface elevation monitoring should take place before and after the application of saturation water. The pre-saturation program should include detailed requirements for water application, saturation elevation, water volumes, timing of water delivery, and site monitoring.

5.12.3 Settlement Monitoring

Settlement may be experienced at the Site associated with the planned project. A network of surface settlement monuments should be installed around the Site, along adjacent roadways, and in the neighboring developments. These settlement monuments should be monitored and the results evaluated before construction, during construction, after construction prior to infiltrating stormwater, and quarterly during the first year of facility operation. Additional monitoring frequency should be developed based on the initial observations.

5.12.4 Groundwater Monitoring

A groundwater monitoring program should be considered to evaluate potential groundwater mounding associated with the planned project. The groundwater monitoring program would typically consist of at least four groundwater monitoring wells installed around the perimeter of the Site, to include one monitoring well along each boundary.

Data on groundwater levels would typically be collected and evaluated monthly during each rainy season for the first five years of facility operation to confirm that groundwater mounding, if present, remains below a depth of 45 ft bgs.

5.12.5 Site Monitoring and Maintenance

The proposed facilities will require maintenance for continued functionality. The design of these features will provide for access, cleanout, security, monitoring, and instrumentation, as necessary. We recommend that an operations and maintenance (O&P) plan be developed as part of the design and implemented by the City. This O&P plan should detail the requirements and frequency of monitoring, action levels, and potential responses. For example, monitoring for surficial settlement or ponded water, and regrading if depressions or surface water ponding is noted. Additionally, documentation and communication regarding location of the infiltration facility features will be important for future development so that the functionality of the Project is not disrupted by future Site activities.

6. CONSTRUCTION CONSIDERATIONS

6.1 Earthwork Construction, Observation, and Testing

Variations in subsurface conditions will likely be encountered during Project construction. Continuing engagement of the geotechnical engineer should be considered to help ensure that the project is constructed in accordance with the intent of the engineering design and with respect to actual geotechnical conditions encountered during construction.

6.2 Temporary Slopes

The design, excavation, and safety of temporary slopes and their maintenance during construction are the responsibility of the contractor. The contractor should have their geotechnical or geological professional evaluate the soil conditions encountered during excavation to determine permissible temporary slope inclinations and other measures required by Cal-OSHA. For planning purposes, based on the materials observed in the borings, the design of temporary slopes for planning purposes may assume Type C conditions. Existing infrastructure within a 2:1 (H:V) line projected up from the toe of temporary slopes should be monitored for potential movement during construction. The top of excavations should be graded to prevent runoff from entering the excavation.

6.3 Temporary Shoring

Shoring design is the responsibility of the contractor, and specific details of onsite temporary excavation and support are not known at this time. The contractor should retain a qualified engineer to design temporary shoring systems. The shoring parameters presented in the following subsection are for planning purposes only. The contractor should develop independent soil parameters for final shoring design and prior to construction, Geosyntec should review the shoring design plans. Existing infrastructure within a 2:1 (H:V) line projected up from the excavation toe should be monitored for potential movement during construction. The top of all excavations should be graded to prevent runoff from entering the excavation. During construction, shoring system deflection should be monitored weekly or more frequently. In addition, the structures should be periodically inspected for signs of distress. In the event that distress or settlement is noted, an investigation should be performed, and corrective measures should be taken to prevent continued or worsened distress or settlement.

Shoring should be designed to resist the pressure exerted by the retained soils, plus additional lateral forces from surface loads near the top of the excavation. For planning purposes, active and ultimate passive earth pressures can be estimated using an equivalent fluid weight of 40 and 360 pcf, respectively. For spaced soldier piles extending below the bottom of the excavation, total resistance can be calculated by using twice the width of the piles, to account for the three-dimensional effect of pile-soil interaction. Uniform surface loads can be applied as additional uniform horizontal earth pressures equal to one-half of the vertical surface load. Hydrostatic loads are not expected, as groundwater level is below the expected maximum depth of excavation.

The shape of apparent pressures behind the shoring will vary depending on the shoring system, with triangular for cantilever system to close to uniform for braced or tie-backed systems. Detailed calculations should be performed by the contractor following guidance such as Trenching and Shoring Manual by Caltrans [1988] or recommendations provided in AASHTO LRFD Bridge Design Specifications [2017].

7. UNCERTAINTY AND LIMITATIONS

The report and other materials resulting from Geosyntec's effort are not intended to be suitable for reuse on any project site other than the currently proposed development area as they may not contain sufficient or appropriate information for such uses. If this report or portions of this report are provided to contractors or included in specifications, it should be understood that they are provided for information only.

Soil deposits may vary in type, strength, and many other important properties between points of exploration due to non-uniformity of the geologic formations or to man-made cut and fill operations. While we cannot evaluate the consistency of the properties of materials in areas not explored, the information presented in this report are based on the assumption that the data obtained during our investigation are reasonably representative of field conditions and are conducive to interpolation and extrapolation.

The investigation and evaluations were performed using generally accepted engineering approaches and principles available at this time and the degree of care and skill ordinarily exercised under similar circumstances by reputable Geotechnical Engineers practicing in this area. No other representation, either expressed or implied, is included or intended in our report.

8. REFERENCES

AASHTO (2017) "LRFD Bridge Design Specifications." American Association of State Highway and Transportation Officials.

ASCE (2017) "*Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE7-16)*", American Society of Civil Engineers.

Boulanger, R.W. and Idriss, I.M. (2014). *CPT and SPT Based Liquefaction Triggering Procedures*. Report No. UCD/CGM-14/01, Center for Geotechnical Monitoring, University of California, Davis, CA.

California Geologic Energy Management Division (CalGEM) (2020). Well Finder tool. https://maps.conservation.ca.gov/doggr/wellfinder/#openModal/-118.94276/37.12009/6, accessed May 2020.

California Geological Survey (CGS) (1997) "*Seismic Hazard Zones Report for the Van Nuys 7.5 Minute Quadrangle*."

California Geological Survey (CGS) (1998) "*Seismic Hazard Zones Map for the Van Nuys 7.5 Minute Quadrangle*."

Caltrans (1988), "*Trenching and Shoring Manual*" Office of Structure Construction, Califorina Department of Transportation.

CBC (2019) *"2019 California Building Code,"* California Building Standards Commission.

Chilinger, G.V, and Endres, B. (2004) *"Environmental Hazards Posed by the Los Angeles Basin Urban Oilfields: An Historical Perspective of Lessons Learned,"* Environmental Geology 47: 302-317.

County of Los Angeles (2017) *"Guidelines for Design, Investigation, and Reporting, Low Impact Development Stormwater Infiltration,"* Administrative Manual, County of Los Angeles Department of Public Works, Geotechnical and materials Engineering Division, dated December 31.

Fang, H.Y. (1991) *"Foundation Engineering Handbook,"* Second Edition, Van Host and Reinhold.

GeoLogismiki (Cliq) (2007), Software Version 2.2.0.37, Serres, Greece.

GMED (2017) Administrative Manual GS200.2, *"Guidelines for Geotechnical Investigation and Reporting Low Impact Development Stormwater Infiltration,"* Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division (GMED), dated June 30.

Golder Associates (2017) "*Well Installation Report, Hewitt Site, 7245-7361 Laurel Canyon Boulevard, North Hollywood District, City of Los Angeles, California*." March.

Hitchcock, C.S., and Wills, C.J. (2000) "*Quaternary Geology of the San Fernando Valley, Los Angeles County, California.*" California Division of Mines and Geology. Map Sheet MS 50. 1:48,000.

Horner, P.C. (1988) "Earthworks," Telford, London, United Kingdom.

LA County Public Works (LACPW) (2020) Groundwater Wells database, https://dpw.lacounty.gov/general/wells/. Accessed May 2020.

LA County Public Works (LACPW) (2013) *"Manual for the Preparation of Geotechnical Reports,"* Geotechnical and Materials Engineering Division, Los Angeles County Department of Public Works, 99 p. plus appendices.

Langenheim, V.E., Wright, T.L., Okaya, D.A., Yeats, R.S., Fuis, G.S., Thygesen, K., and Thybo, H. (2011) *"Structure of the San Fernando Valley region, California: Implications for Seismic Hazard and Tectonic History."* Geosphere 7(2): 528-572.

Massmann, J. (2004) Technical Report, "*An Approach For Estimating Infiltration Rates For Stormwater Infiltration Dry Wells*", prepared for Washington State Transportation Commission, Department of Transportation and in cooperation with U.S. Department of Transportation Federal Highway Administration, WA-RD 589.1.

Robertson, P. K. and Shao, L. (2010). "Estimation of Seismic Compression in dry soils using the CPT." *International Conferences on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics*. 18.

State of California (2009) *"Tsunami Inundation Map for Emergency Planning,"* Venice Quadrangle, County of Los Angeles; produced by California Emergency Management Agency.

State Water Resources Control Board (SWRCB) (2020) GeoTracker online database, https://geotracker.waterboards.ca.gov/. Accessed May 2020.

Southern California Earthquake Data Center (SCEDC), 2013a. "Significant Earthquakes and Faults, Northridge Earthquake." California Institute of Technology, https://scedc.caltech.edu/significant/northridge1994.html. Last update 31 January 2013.

Southern California Earthquake Data Center (SCEDC), 2013b. "Significant Earthquakes and Faults, Whittier Narrows Earthquake." California Institute of Technology, https://scedc.caltech.edu/significant/whittier1987.html. Last update 31 January 2013.

Southern California Earthquake Data Center (SCEDC), 2013c. "Significant Earthquakes and Faults, San Fernando Earthquake." California Institute of Technology, https://scedc.caltech.edu/significant/sanfernando1971.html. Last update 31 January 2013.

Southern California Earthquake Data Center (SCEDC), 2013d. “Significant Earthquakes and Faults, Fort Tejon Earthquake.” California Institute of Technology, https://scedc.caltech.edu/significant/forttejon1857.html. Last update 31 January 2013.

Sustainable Groundwater Management Act (SGMA) (2020), SGMA Data Viewer, https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#gwlevels, Accessed May 2020.

UC Santa Barbara (UCSB) (2020) Frame Finder Online Tool, UCSB Library. http://mil.library.ucsb.edu/ap_indexes/FrameFinder/. Accessed May 2020.

U.S. Bureau of Reclamation (2001) *“Engineering Geology Field Manual,”* Second Edition U.S. Department of the Interior.

U.S. Geological Survey (USGS) and California Geological Survey (CGS) (2020) “Quaternary fault and fold database for the United States,” accessed April 22, 2020, at: https://www.usgs.gov/natural-hazards/earthquake-hazards/faults.

Yerkes, R.F., R.H. Campbell, R. Alvarez, and K. Bovard, 2005. “Preliminary Geologic Map of the Los Angeles 30' X 60' Quadrangle, Southern California.” United States Geological Survey. Open-File Report OF-2005-1019. 1:100,000.

Zhang, G., Robertson, P.K., and Brachman, R.W.I. (2002). “Estimating liquefaction-induced ground settlements from CPT for level ground.” *Canadian Geotechnical Journal*, 39(5): 1168-1180.

TABLES

Table 1
Summary of Field Explorations
Valley Plaza Park South - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Exploration Name	Exploration Type	Approximate Surface Elevation (feet, MSL)[1]	Depth Advanced (feet)	Date Advanced	Performed By
VS-HSA-1	Hollow-Stem Auger	702	50	4/13/2020	Geosyntec
VS-HSA-2	Hollow-Stem Auger	703	32	4/13/2020	Geosyntec
VS-HSA-3	Hollow-Stem Auger	705	31.5	4/14/2020	Geosyntec
VS-HSA-4	Hollow-Stem Auger	707	51.5	4/13/2020	Geosyntec
VS-HSA-5	Hollow-Stem Auger	706	31.5	4/13/2020	Geosyntec
VS-CPT-1	Cone Penetration Test	702	42.68	4/13/2020	Geosyntec
VS-CPT-2	Cone Penetration Test	703	38.2	4/13/2020	Geosyntec
VS-CPT-3	Cone Penetration Test	705	36.89	4/13/2020	Geosyntec
VS-CPT-3A	Cone Penetration Test	705	47.58	4/13/2020	Geosyntec
VS-CPT-4	Cone Penetration Test	707	41.67	4/13/2020	Geosyntec
VS-CPT-4A	Cone Penetration Test	707	48.98	4/13/2020	Geosyntec

Notes:

1. MSL = Mean Sea Level.

Table 2

Summary of Geotechnical Laboratory Test Results
Valley Plaza Park South - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Sample Information				USCS Classification (3,4)	USCS Name (3,4)	Sieve Analysis			Atterberg Limits (5)			Moisture-Density Porosity Tests (6)			Consolidated Undrained Triaxial Strength (7)		Other Tests (8)
						ASTM D6913 / D1140			ASTM D4318			ASTM D2937			ASTM D4767		
Boring ID	Sample ID	Sample Type (1)	Depth (ft bgs) (2)			Gravel (%)	Sand (%)	Silt & Clay (#200) (%)	Liquid Limit LL	Platic Limit PL	Plasticity Index PI	Dry Density (pcf)	Moisture Content (%)	Moist Unit Weight (pcf)	Pre-Consolidation Stress (psf)	S_u (psf)	
VS-HSA-1	S-2	SPT	10-11.5	SM	Silty Sand								7.2				
VS-HSA-1	S-3	SPT	15-16.5	SP-SM	Poorly-graded Sand with Silt			11.9					6.3				
VS-HSA-1	SH-1	Shelby	20-22.5	SM	Silty Sand			41.5				95.9	14.0	109.3			
VS-HSA-1	S-4	SPT	25-26.5	ML	Sandy Silt			56.0	NP	NP	NP		14.1				
VS-HSA-1	S-5	SPT	30-31.5	SM	Silty Sand			20.0					11.9				
VS-HSA-1	S-6	SPT	35-36.5	SW-SM	Well-graded Sand with Silt and Gravel	26.0	66.2	7.8					3.9				
VS-HSA-1	S-7	SPT	40-41.5	SW-SM	Well-graded Sand with Silt and Gravel	21.0	72.3	6.7					3.6				
VS-HSA-2	B-1	Bulk	1-5	SM									5.6				SE = 50
VS-HSA-2	S-3A	Cal Mod	15.5-16	SM								121.0	4.7	126.7			
VS-HSA-2	S-5	SPT	25-26.5	SM									3.7				
VS-HSA-2	S-6	SPT	30-31.5	SM	Silty Sand	9.0	63.0	28.0	NP	NP	NP		14.3				
VS-HSA-3	B-1	Bulk	1-5	SM	Silty Sand				NP	NP	NP		8.2				
VS-HSA-3	S-1	SPT	5-6.5	SM									6.6				
VS-HSA-3	S-2	SPT	10-11.5	SM													SE = 76
VS-HSA-3	S-3	SPT	15-16.5	SM	Silty Sand	0.0	67.0	33.0					8.7				
VS-HSA-3	S-4A	Cal Mod	20.5-21	SM								100.9	3.5	104.4			
VS-HSA-3	S-5A	Cal Mod	25.5-26	SM								109.9	16.2	127.7			
VS-HSA-3	S-5B	Cal Mod	26-26.5	SM	Silty Sand			44.0				115.8	14.5	132.6			1D
VS-HSA-4	S-1	SPT	5-6.5	SM	Silty Sand	13.0	61.0	26.0					8.5				
VS-HSA-4	S-4	SPT	20-21.5	SM													SE = 74
VS-HSA-4	S-5	SPT	25-26.5	SW	Well-graded Sand			3.9					3.7				
VS-HSA-4	S-7	SPT	35-36.5	SM	Silty Sand			23.0					12.6				
VS-HSA-4	S-9	SPT	45-46.5	SW-SM	Well-graded Sand with Silt and Gravel			5.8					2.6				
VS-HSA-4	S-10	SPT	50-51.5	SW-SM	Well-graded Sand with Silt and Gravel	20.0	70.5	9.5					3.5				
VS-HSA-5	S-1A	SPT	5-5.6	SM	Silty Sand				NP	NP	NP		18.3				
VS-HSA-5	S-1B	SPT	5.6-6.5	SW	Well-graded Sand			2.1					4.6				
VS-HSA-5	S-2	SPT	10-11.5	SW	Well-graded Sand	2.0	96.0	2.0					8.0				
VS-HSA-5	S-4	SPT	25-26.5	SM									3.0				
VS-HSA-5	S-5	SPT	30-31.5	SM	Silty Sand	0.0	56.0	44.0					10.7				

Notes

1. Cal Mod = California Modified ring sampler; SPT = Standard Penetration Test Drive sample; Shelby = Shelby tube sample; Bulk = Bulk bag sample
2. bgs = Below Ground Surface
3. USCS = Unified Soil Classification System
4. UCSC Classification and Name based on laboratory test results (where available).
5. NP = Non-plastic
6. pcf = pounds per cubic foot
7. psf = pounds per square foot
8. 1-D = One-dimensional consolidation test (ASTM D2435); SE = Sand Equivalent test (ASTM D2419)

Table 3
Summary of Soil Chemical Test Results
Valley Plaza Park South - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Boring ID	**Sample ID**	**Depth** (ft BGS)	**USCS Classification**	**ASTM D4327**		**ASTM D4327**		**ASTM G187**		**ASTM G51**	**ASTM G200**	**SM 4500-S2-D**	**ASTM D4327**	**ASTM D6919**	**ASTM D6919**	**ASTM D6919**	**ASTM D6919**	**ASTM D6919**	**ASTM D6919**	**ASTM D4327**	**ASTM D4327**	**SM-2320B**
				Sulfates		**Chlorides**		**Min. Resistivity**		**pH**	**Redox**	**Sulfide**	**Nitrate**	**Ammonium**	**Lithium**	**Sodium**	**Potassium**	**Magnesium**	**Calcium**	**Flouride**	**Phosphate**	**Bicarbonate**
				(mg/kg)	(wt %)	(mg/kg)	(wt %)	**As Received** (Ohm-cm)	**Minimum** (Ohm-cm)		(mV)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
VS-HSA-2	S-2	10-11.5	SM	13.2	0.0013	4.3	0.0004	80,400	21,440	8.17	214	0.12	1.3	ND	ND	30.5	0.3	1.1	8.3	1.8	1.5	37.4

Notes:
ND = 0 = Not Detected
mg/kg = milligrams per kilogram (parts per million) of dry soil weight

Table 4

Regional Quaternary Faults

Valley Plaza Park South - TOS-25 Stormwater Capture Parks Program

Los Angeles, CA

Fault	Activity	Average Strike	Average Dip	Sense of Slip	Distance	Direction
Unnamed Possible North Hollywood Fault	Latest Quaternary	WSW	Unspecified	Unspecified	1.6 mi	SSE
Verdugo Fault	Late Quaternary	NW	NE	Reverse	2.9 mi	NE
Northridge Hills Fault	Late Quaternary	NW	Unspecified	Unspecified	4.9 mi	NW
Hollywood Fault	Latest Quaternary	076°	Vertical	Left-Lateral	6.4 mi	SSE
Sierra Madre Fault Zone (San Fernando Section)	Historic	085°	50° N	Thrust	6.6 mi	NNE
Mission Hills Fault Zone	Late Quaternary	W	Unspecified	Reverse	7.0 mi	NNW
Northridge Blind Thrust	Historic	ESE	35° S	Thrust	8.4 mi	N
Santa Monica Fault	Latest Quaternary	086°	30°-70° N	Reverse	8.5 mi	S
San Gabriel Fault Zone	Late Quaternary	NW	70° NE - Vertical	Right-Lateral	11 mi	NNE
Puente Hills Blind Thrust	Historic	WNW	29° N	Thrust	24 mi	SE
San Andreas Fault Zone	Historic	293°	Vertical	Right-Lateral	30 mi	NNE

Table 5
Idealized Subsurface Profile
Valley Plaza Park South - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Layer (I.D.)	Approximate Depth to Top of Layer (ft bgs)	Approximate Thickness of Layer (ft)	Description	Fines Content (%)	$(N_1)_{60}$-Value (Range)	Estimated Range of Unit Weight (pcf)	ϕ' (deg)	c' (psf)
Artificial Fill	5	5	Silty Sand (SM)	-(1)		110-125		
1	5	0-15	Sand, Sand with Silt and Silty Sand (SW, SP-SM & SM)	2-15	15-47	110-125		
2	5-20	5-20	Silty Sand (SM)	25-45	6-71	100-115	38.0	300
3A	22-25	0-8	Sandy Silt (ML)	50-60	6	110-120		
3B	25-27	0-8	Sand and Sand with Silt (SW & SW-SM)	4-10	39-41	110-125		
4	25-30	8-18	Silty Sand (SM)	20-45	13-50+	115-125	38.0	300
5	35-45	12+	Sand with Silt and Gravel (SW-SM)	5-10	>50	120-130		

Notes:

1. No laboratory test data for this layer.

Table 6
Summary of Field-Measured Hydraulic Conductivity
Valley Plaza Park South - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Borehole Nr.	Date Tested	Depth of Screened Interval	Soil Type in the Screened Interval	Estimated Hydraulic Conductivity using USBR method, cm/s (in/hr)	Estimated Hydraulic Conductivity using Hvorslev Method, cm/s (in/hr)
VPS-HSA-1	4/15/2020	20ft to 30ft	SM, ML	1.4E-04 (0.19)	2.0E-04 (0.29)
VPS-HSA-2	4/15/2020	20ft to 30ft	SM	7.9E-03 (11)	5.1E-03 (7.2)
VPS-HSA-3	4/14/2020	15ft to 25ft	SM	2.4E-03 (3.3)	2.9E-03 (4.1)
VPS-HSA-4	4/14/2020	20.6ft to 30ft	SM, SW	9.2E-03 (13)	1.4E-02 (20)

Table 7
Seismic Design Parameters
Valley Plaza Park South - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Seismic Hazard Parameter	Value
Approximate Site Latitude	34.189° N
Approximate Site Longitude	118.401° W
Average Shear Wave Velocity of the top 100 ft (30 m), V_{S30}	1025 ft/s
Site Class	D
Mapped Short Period Spectral Response Acceleration, S_s (1)	1.987 g
Mapped 1-second Spectral Response Acceleration, S_1 (1)	0.673 g
Short Period Site coefficient (at 0.2-s period), F_a	1
Long Period Site coefficient (at 1.0-s period), F_v	1.7
Site-modified Short Period Spectral Response Acceleration, S_{MS}	1.987 g
Site-modified 1-second Spectral Response Acceleration, S_{M1}	1.144 g
Design Short Period Spectral Response Acceleration, S_{DS}	1.325 g
Design 1-second Spectral Response Acceleration, S_{D1}	0.763 g
Mapped MCE_G Peak Ground Acceleration, PGA(1)	0.809 g
Site Coefficient, F_{PGA}	1.1
Site Class Adjusted MCE_G Peak Ground Acceleration, PGA_M	0.890 g

(1) Value obtained from SEAOC/OSHPD Seismic Design Map Tool
(https://seismicmaps.org/)

FIGURES

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Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community

Site Location Map
Valley Plaza Park South

TOS- 25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

Figure

1

Project No: LA0590D

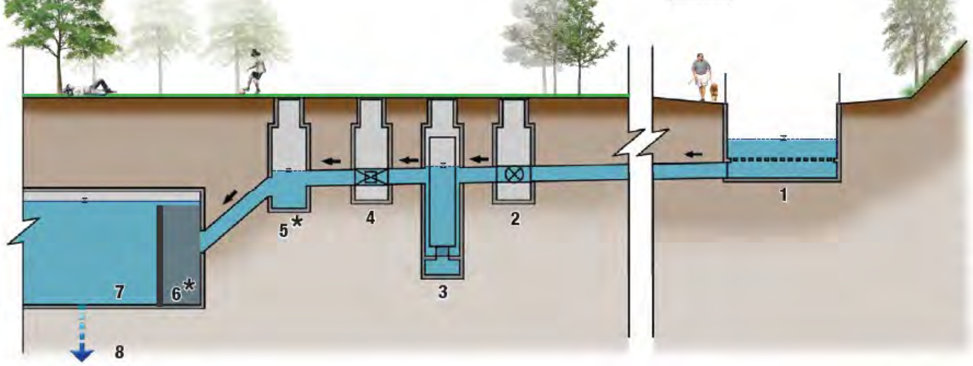
JUNE 2020

S:\GIS\LA0590\Project\SiteLocationValleyPlazaSouth.mxd\v5/18/2020

PLAN

LEGEND

- ▬ RCB Diversion Structure
- ▬ Rubber Dam *
- ● Actuated Valve Vault
- ● Hydrodynamic Separator
- ● Flow Measuring Device
- ▪ Sedimentation Basin *
- ▬ Underground Infiltration Basin
- ▬ Initial Containment/Settling Area
- ▬ Diversion Pipe
- ▬ Construction Fence
- 🟩 New Sod/Irrigation System
- ▬ Replace Trail Paths
- * Innovative Addition to Original Concept



SECTION COMPONENT KEY

1 Channel Drop Inlet
2 Actuated Valve Vault
3 Hydrodynamic Separator
4 Flow Measuring Device
5 Sedimentation Basin *
6 Initial Containment/Settling Area *
7 Underground Infiltration Basin
8 Groundwater Infiltration/Recharge

Conceptual Site Plan
Valley Plaza Park South
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec
consultants

Figure
2

Project No: LA0590C
JUNE 2020

Figure 2 - Conceptual Site Plan

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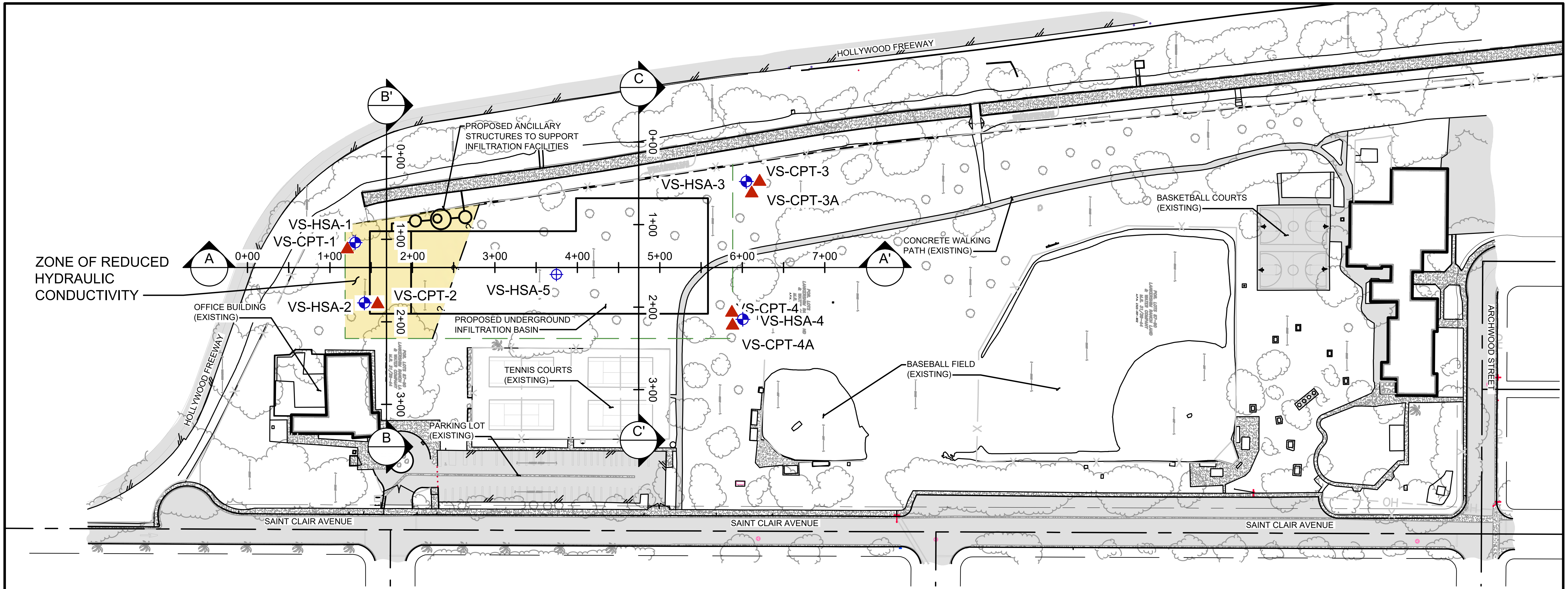

LEGEND

—— 731 ——	EXISTING GROUND MAJOR CONTOUR (5')
————	EXISTING GROUND MINOR CONTOUR (1')
—— — — ——	PROPERTY LINE
——— — ———	EXISTING ROADWAY CENTERLINE
——— ———	RIGHT-OF-WAY
——— x ———	EXISTING FENCE LINE
— — — —	APPROXIMATE LIMITS OF EXCAVATION FOR CONCEPTUAL FACILITY CONFIGURATION
⊕	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
⊕	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
▲	CONE PENETRATION TEST (GEOSYNTEC, 2020)

NOTES:

1. COORDINATE SYSTEM CCS83, ZONE 5 (2017.5). VERTICAL DATUM NAVD88.
2. CONTOURS AND EXISTING FEATURES ARE BASED ON TOPOGRAPHIC SURVEY MAP PROVIDED BY CALVADA SURVEYING INC., DATED MARCH 30, 2020.
3. FACILITY LAYOUT DEPICTED IS A PRELIMINARY CONCEPT DEVELOPED BY TETRA TECH.
4. INVESTIGATION LOCATIONS ARE APPROXIMATE AND WERE NOT SURVEYED.

0 120'
SCALE IN FEET

SITE MAP
VALLEY PLAZA PARK SOUTH
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec
consultants

FIGURE
3

PROJECT NO: LA0590C
JUNE 2020

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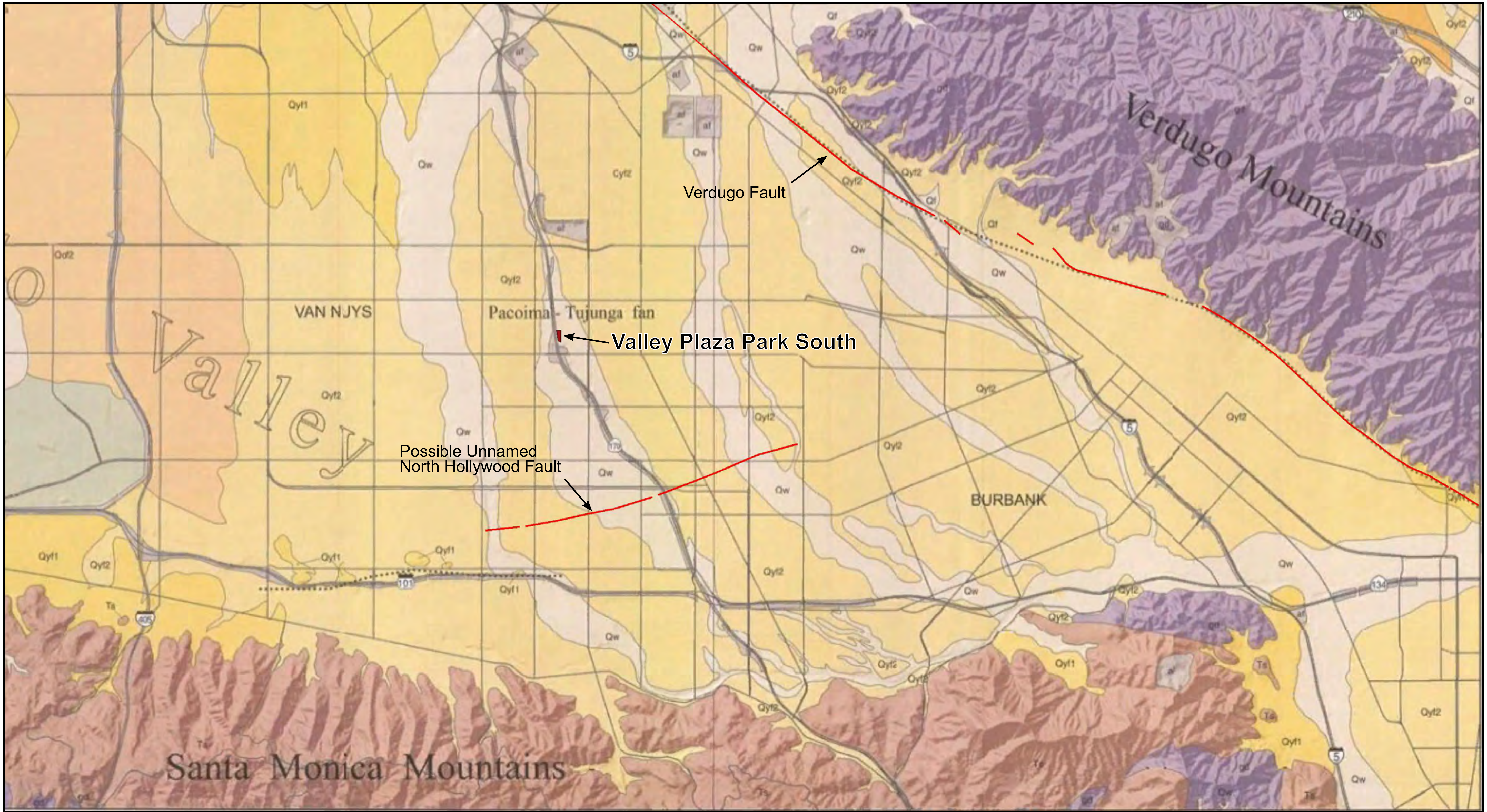

LEGEND

af	Artificial fill
Qa	Anthropogenic basin deposits
Qw	Active wash deposits
Qf	Active alluvial fan deposits
Qyf2	Holocene alluvial fan deposits
Qyf1	
Qof2	Late Pleistocene - Holocene alluvial fan deposits
Qof1	
Qvof2	Late Pleistocene - Holocene alluvium/ alluvial fan deposits
Qvoa1	
Qvof1	
Qpa	Quaternary Pacoima Formation
Qs	Quaternary Saugus Formation
Ts	Tertiary sedimentary rocks
gd	Crystalline rocks
🟥	Quaternary fault

1 MILE

SCALE

N

Geologic map source: Hitchcock, C.S., and C.J. Wills (2000) "Quaternary Geology of the San Fernando Valley, Los Angeles County, California"

Fault map source: USGS, CGS (2020) "Quaternary fold and fault database for the United States"

Geologic Map
Valley Plaza Park South
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

Figure
4

Project No: LA0590C

JUNE 2020

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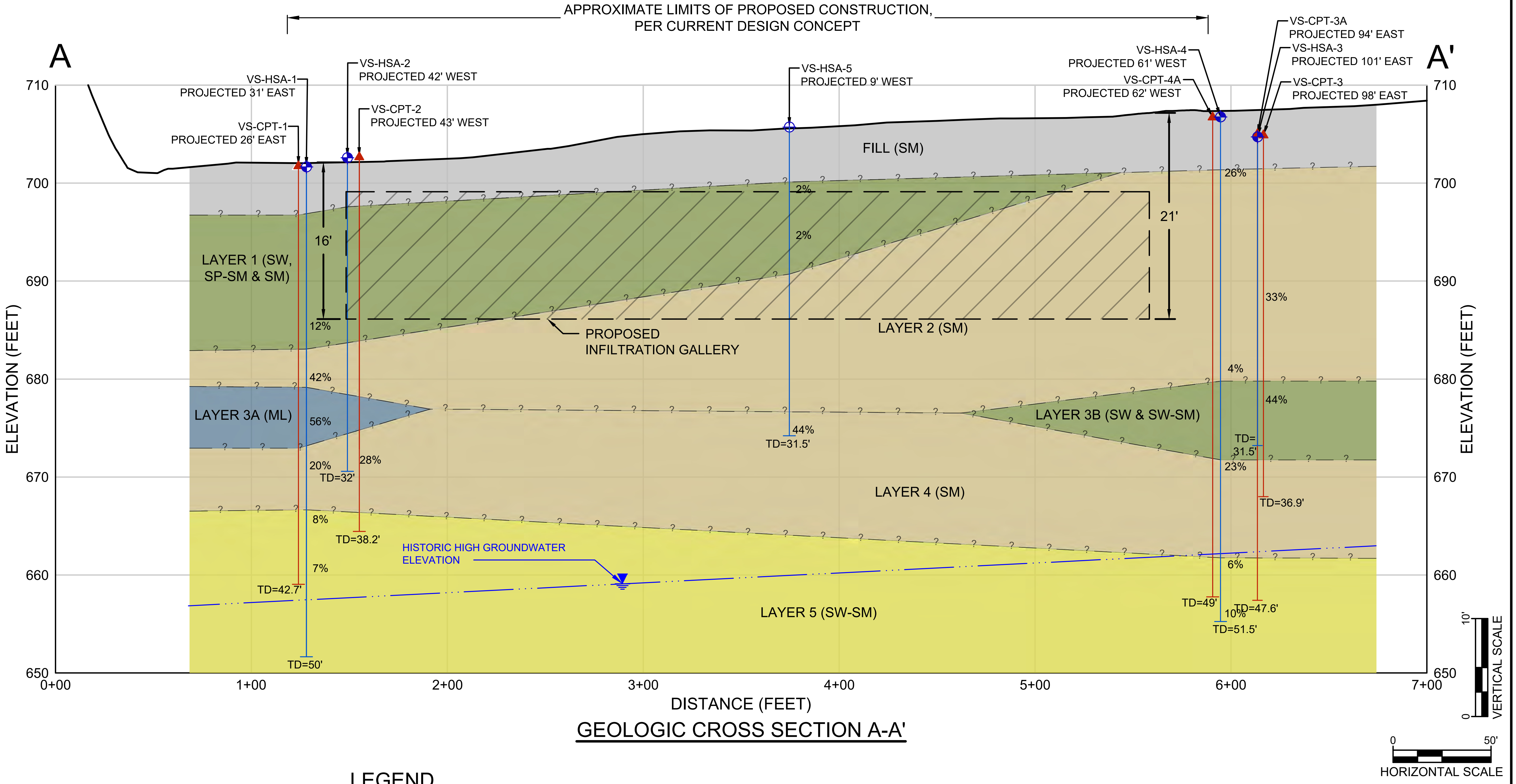

GEOLOGIC CROSS SECTION A-A'

LEGEND

⬜	ARTIFICIAL FILL (SM)	⊕	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
🟫	SILTY SAND (SM)	⊕	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
🟩	SAND, SILT (SW, SP-SM, SW-SM & SM)	▲	CONE PENETRATION TEST (GEOSYNTEC, 2020)
🟨	SAND, SILT AND GRAVEL (SW-SM)	|12%	FINES CONTENT (%)
🟦	SANDY SILT (ML)		

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 5 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.

CROSS SECTION A-A'
VALLEY PLAZA PARK SOUTH
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec
consultants

FIGURE
5

PROJECT NO: LA0590C
JUNE 2020

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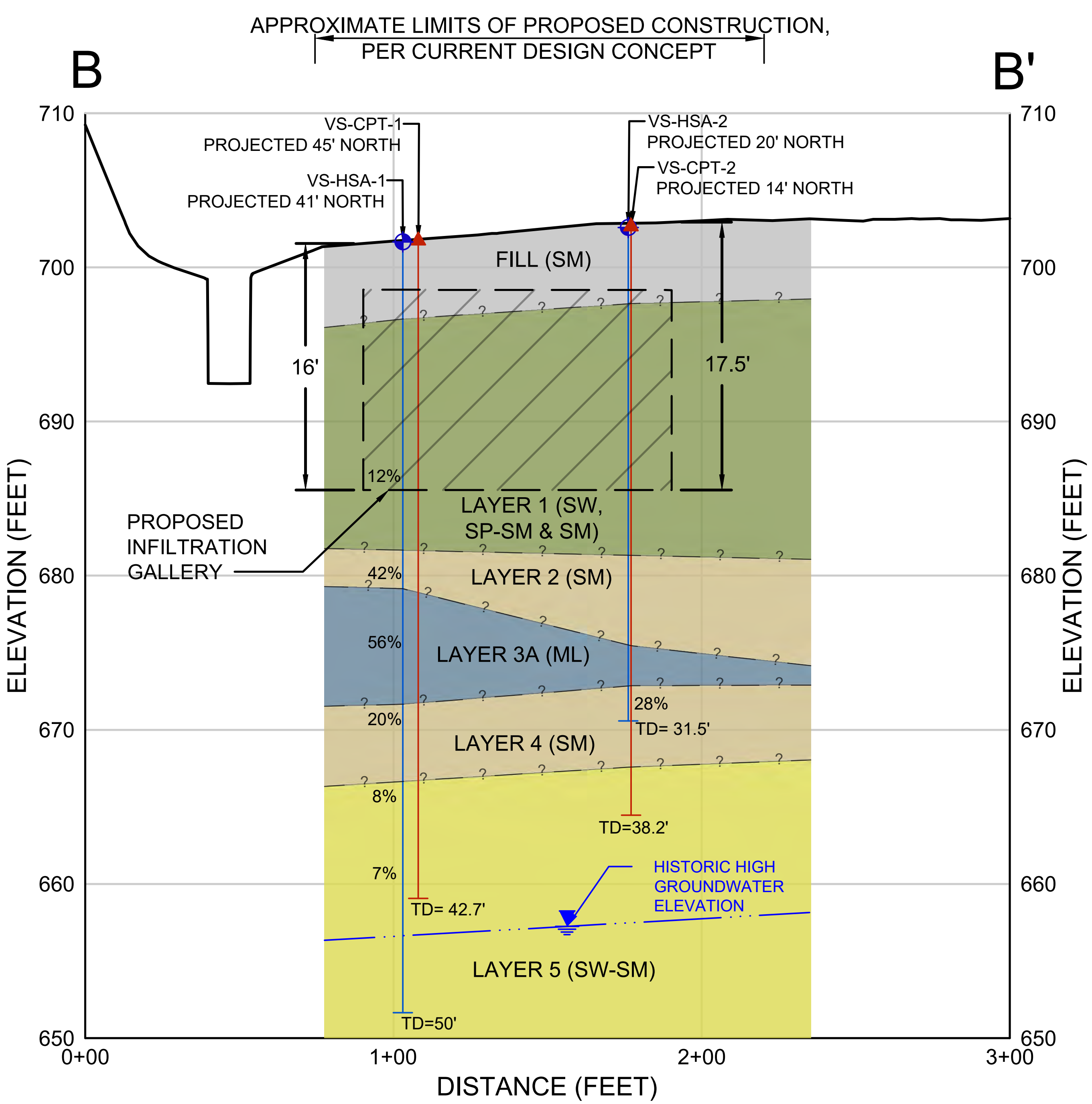
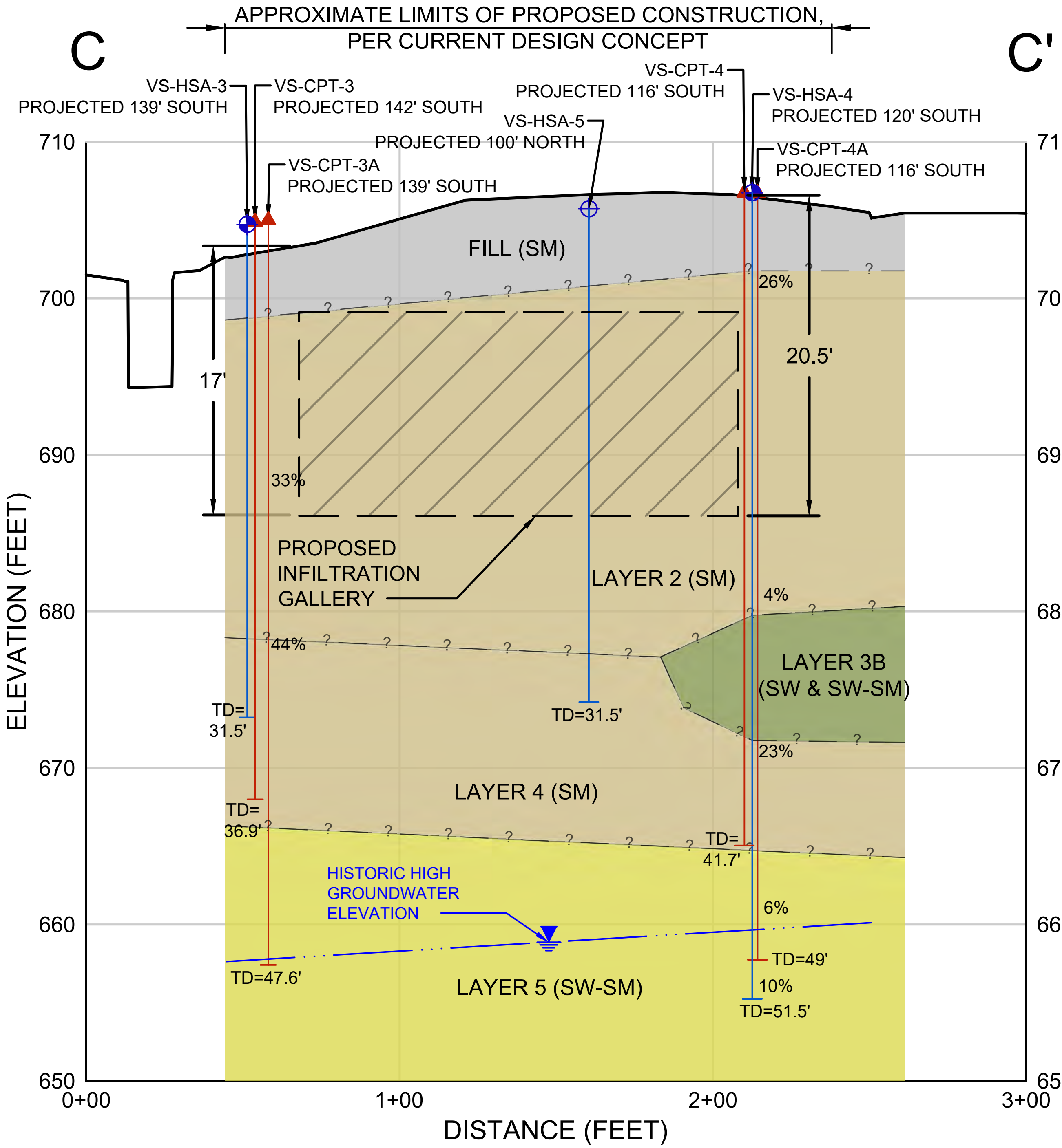


GEOLOGIC CROSS SECTION B-B'



GEOLOGIC CROSS SECTION C-C'

0 10' VERTICAL SCALE

0 50' HORIZONTAL SCALE

LEGEND

⬜	ARTIFICIAL FILL (SM)	⊕	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
🟫	SILTY SAND (SM)	⊕	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
🟩	SAND, SILT (SW, SP-SM, SW-SM & SM)	▲	CONE PENETRATION TEST (GEOSYNTEC, 2020)
🟨	SAND, SILT AND GRAVEL (SW-SM)	|12%	FINES CONTENT (%)
🟦	SANDY SILT (ML)		

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 5 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.

CROSS SECTIONS B-B' & C-C'
VALLEY PLAZA PARK SOUTH
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec
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FIGURE
6

PROJECT NO: LA0590C
JUNE 2020

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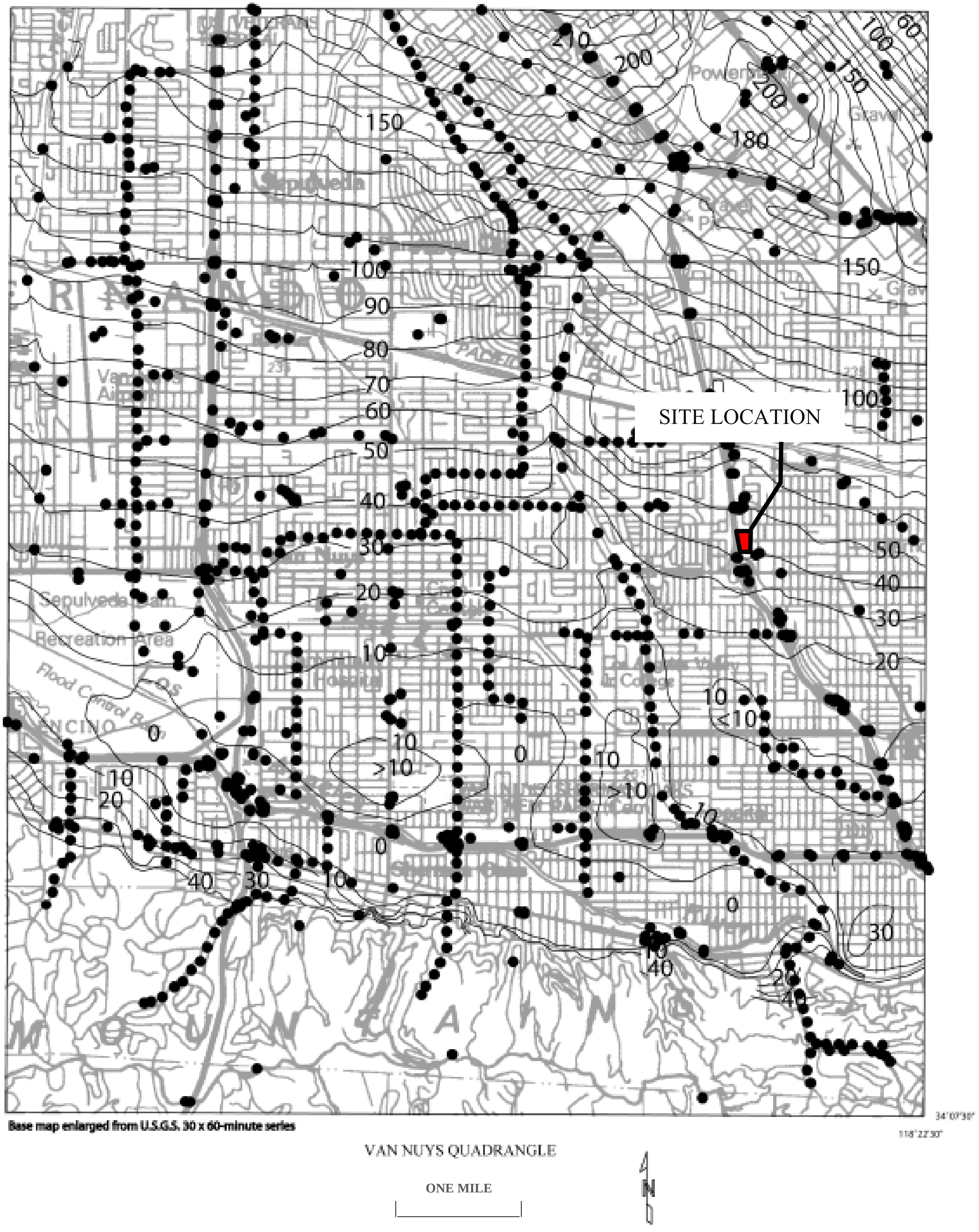


Base map enlarged from U.S.G.S. 30 x 60-minute series

~ 50 ~ Depth to ground water, in feet

● Geotechnical borings used in liquefaction evaluation

NOTE: IMAGE EXTRACTED FROM SEISMIC HAZARD ZONE REPORT FOR THE VAN NUYS 7.5-MINUTE QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA (CGS 1997)

Historic High Groundwater
Valley Plaza Park South
TOS-25 Stormwater Capture Program
Los Angeles, California

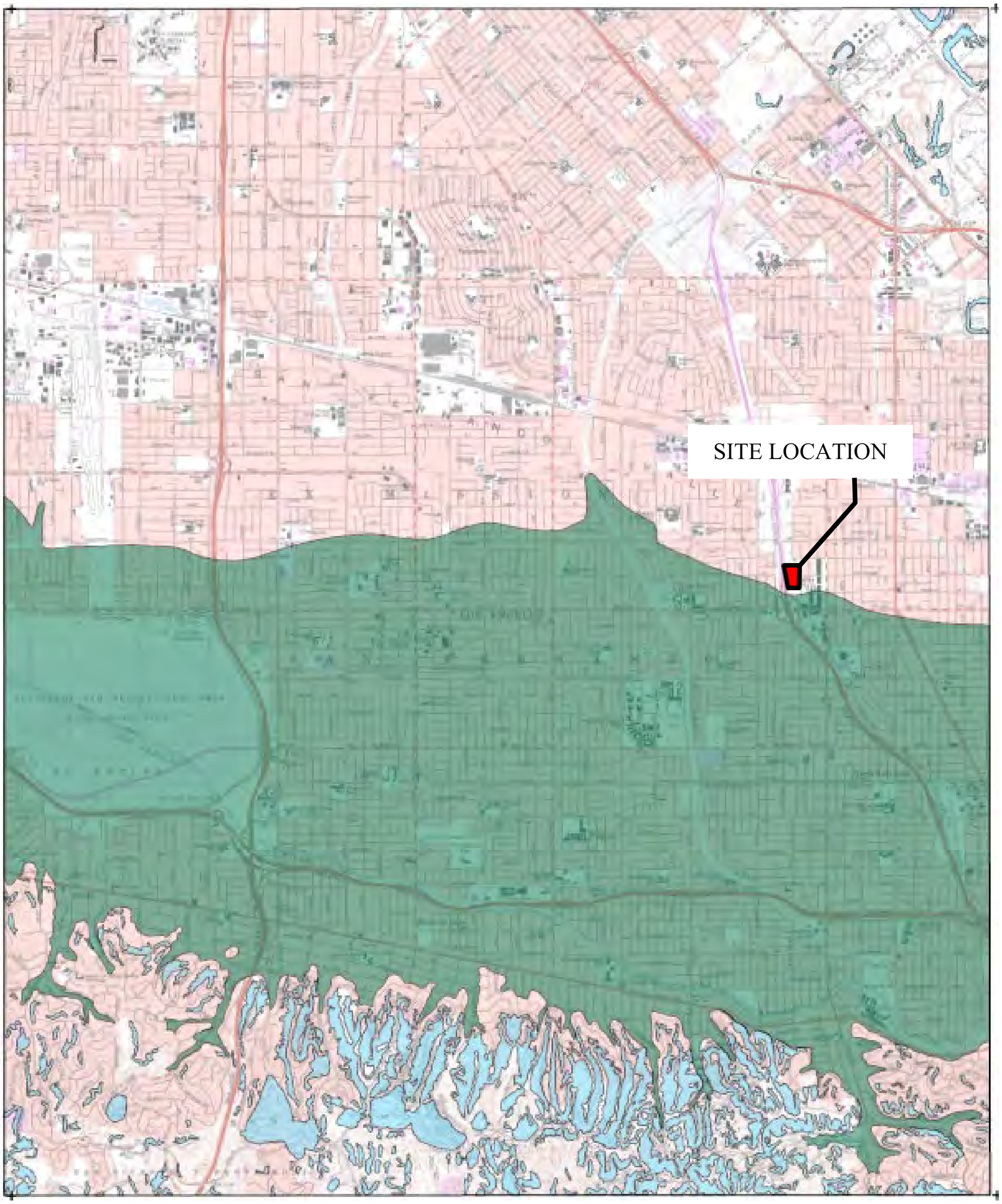
Geosyntec consultants

Figure
7

Project No: LA0590C

JUNE 2020

Figure 7 - Historic High Groundwater



SEISMIC HAZARD ZONES

🟩 **Liquefaction Zones**
Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water 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 Landslide Zones**
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: IMAGE EXTRACTED FROM MAP OF EARTHQUAKE ZONES OF REQUIRED INVESTIGATION, VAN NUYS QUADRANGLE (CGS 1998)

Seismic Hazard Zone Map
Valley Plaza Park South
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

Figure
8

Project No: LA0590C
JUNE 2020

Figure 8 - Siesmic Hazard Zone Map

APPENDIX A

Boring Logs

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Geosyntec consultants

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PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
PROJECT LOCATION North Hollywood, CA
PROJECT NUMBER LA0590C

KEY SHEET - CLASSIFICATIONS AND SYMBOLS

GS FORM:
KEY/SYMBOLS 01/04

EMPIRICAL CORRELATIONS WITH STANDARD PENETRATION RESISTANCE N VALUES *

	N VALUE * (BLOWS/FT)	CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (TONS/SQ FT)
FINE GRAINED SOILS	0 - 2	VERY SOFT	<0.25
	3 - 4	SOFT	0.25 - 0.50
	5 - 8	FIRM	0.50 - 1.00
	9 - 15	STIFF	1.00 - 2.00
	16 - 30	VERY STIFF	2.00 - 4.00
	31 - 50	HARD	>4.00
	>50	VERY HARD	

	N VALUE * (BLOWS/FT)	RELATIVE DENSITY
COARSE GRAINED SOILS	0 - 4	VERY LOOSE
	5 - 10	LOOSE
	11 - 30	MEDIUM DENSE
	31 - 50	DENSE
	>50	VERY DENSE

* ASTM D 1586; NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30 INCHES TO DRIVE A 2 IN. O.D., 1.4 IN. I.D. SAMPLER ONE FOOT.

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

MAJOR DIVISIONS			SYMBOLS		DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL COARSER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO.4 SIEVE	CLEAN GRAVELS LITTLE OR NO FINES	▨	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			▨	GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES APPRECIABLE AMOUNT OF FINES	▨	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			▨	GC	CLAYEY GRAVELS, GRAVEL -SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO.4 SIEVE	CLEAN SANDS LITTLE OR NO FINES	▨	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			▨	SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES APPRECIABLE AMOUNT OF FINES	▨	SM	SILTY SANDS, SAND-SILT MIXTURES
			▨	SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL FINER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	▨	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			▨	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			▨	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	▨	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILT
			▨	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			▨	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			▨	PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENT

NOTE: DUAL SYMBOLS USED FOR BORDERLINE CLASSIFICATIONS

PARTICLE SIZE IDENTIFICATION

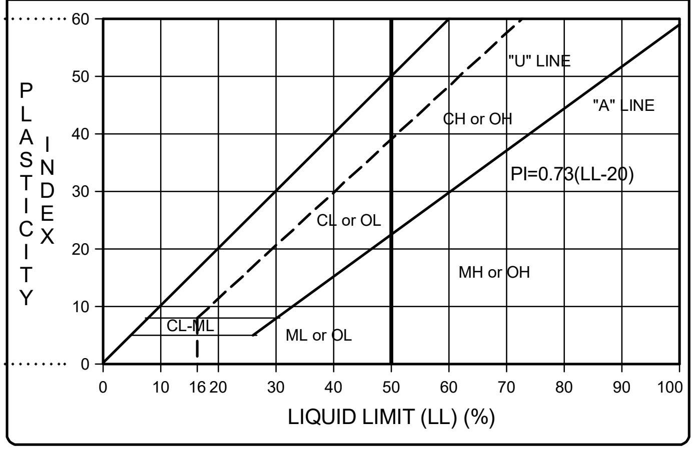
USCS (SOILS ONLY) *		SEDIMENTARY (ROCK ONLY)	
BOULDER	>300 mm	BOULDER	>256 mm
COBBLE	75 - 300 mm	COBBLE	64 - 256 mm
GRAVEL: COARSE	20 - 75 mm	PEBBLE	4 - 64 mm
GRAVEL: FINE	4.75 - 20 mm	GRANULE	2 - 4 mm
		SAND: V. COARSE	1 - 2 mm
SAND: COARSE	2 - 4.75 mm	SAND: COARSE	0.5 - 1 mm
SAND: MEDIUM	0.42 - 2 mm	SAND: MEDIUM	0.25 - 0.5 mm
SAND: FINE	0.074 - 0.42 mm	SAND: FINE	0.125 - 0.25 mm
		SAND: V. FINE	0.063 - 0.125 mm
SILT/CLAY	<0.074 mm	SILT	0.004 - 0.063 mm
		CLAY	<0.004 mm

* WELL GRADED - HAVING WIDE RANGE OF GRAIN SIZES AND APPRECIABLE AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES

* POORLY GRADED - PREDOMINANTLY ONE GRAIN SIZE, OR HAVING A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING

PERCENTAGE OF PARTICLE TYPE IN DECREASING ORDER OF PARTICLE SIZE (GRAVEL,SAND,FINES)

PLASTICITY CHART



OTHER MATERIAL SYMBOLS

▨	Conglomerate	▨	Sandy Claystone	▨	Marker Bed
▨	Sandstone	▨	Granitic/Intrusive		
▨	Silty Sandstone	▨	Volcanic/Extrusive	▨	Artificial Fill
▨	Clayey Sandstone	▨	Metamorphic	▨	Refuse
▨	Sandy Siltstone	▨	Limestone	▨	Concrete/Asphalt
▨	Siltstone	▨	Dolomite		
▨	Claystone	▨	Glacial Till		
▨	Clayey Siltstone/ Silty Claystone	▨	Landslide Debris		

WELL SYMBOLS

▨	CONCRETE
▨	GROUT
▨	BENTONITE SEAL
▨	TRANSITION SAND
▨	SAND PACK
▨	GRAVEL PACK
▨	NATIVE/SLUFF
<	CENTRALIZER

SAMPLE TYPE AND OTHER SYMBOLS

▨	BULK SAMPLE
▨	STANDARD PENETRATION TEST
▨	MODIFIED CALIFORNIA SAMPLE
▨	CORE SAMPLE
▨	SHELBY TUBE
▨	DRIVE SAMPLE

▽	Water Level at Time Drilling, or as Shown
▼	Static Water Level
◇	Pump Inlet
◄	Loss of Drilling Fluid

MSL: Mean Sea Level

AGS: Above Ground Surface

BGS: Below Ground Surface

BTOC: Below Top of Casing

HSA: Hollow Stem Auger

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Tel: (714) 969-0800
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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-1 **SHEET** 1 **OF** 2
START DRILL DATE Apr 13, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 13, 20 **GROUND SURF.** 701.65
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DESCRIPTION: 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)

COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	SAMPLE NO.	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	701	Silty SAND (SM): brown; moist to wet; fine to coarse sand; (10,75,15); non-plastic; 1/4 in. to 2 in. gravel.						1105										
	700		B-1				0.0		Hand auger to 5-ft. b.g.s.									
	699																	
	698																	
	697																	
5	696	Silty SAND (SM): brown; moist to wet; fine to coarse sand; (10,75,15): medium dense; non-plastic; 1/4 in. to 1 in. gravel. at 6 ft. - 1 in gravel bed.	S-1	6 20 6	26	78	0.0	1110	Hard drilling.									
	695																	
	694																	
	693																	
	692																	
10	691	1/4 in. to 3/4 in. gravel.	S-2	8 10 10	20	83	0.1	1115						7.2				
	690																	
	689																	
	688																	
	687																	
15	686	Poorly-graded SAND with Silt (SP-SM): brown; moist to wet; predominantly fine-grained with medium to coarse sand; (0,88,12); loose; non-plastic.	S-3	3 4 4	8	100	0.2	1118				11.9		6.3				
	685																	
	684																	
	683																	
	682																	
20	681	Silty SAND (SM): brown; moist; fine to medium sand; (0,58,42); non-plastic.	SH-1			50	0.0	1126		95.9		41.5		4.9				
	680																	
	679																	
	678																	
	677																	
25	676	Sandy SILT (ML): brown; moist; fine to medium sand; (0,44,46); firm; non-plastic; rapid dilatancy.	S-4	2 2 3	5	100	0.0	1130				56		14.1		NP	NP	NP
	675																	
	674																	
	673																	
	672																	
30																		

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
REVIEWER S. Siciliano, P.G., C.E.G.

NORTHING 34.18837
EASTING -118.40095
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

DRAFT - FOR DISCUSSION PURPOSES ONLY

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-1 **SHEET** 2 **OF** 2
START DRILL DATE Apr 13, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 13, 20 **GROUND SURF.** 701.65
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
	671	Silty SAND (SM): brown; moist; fine to coarse sand; (0,80,20); medium dense; non-plastic.		S-5		4 7 10	17	100	0.0	1135				20		11.9				
	670																			
	669																			
	668																			
	667																			
35	666	Well-graded SAND with Silt and Gravel (SW-SM): brown; moist to wet; fine to coarse sand; (26;66;8); very dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-6		12 21 30	51	83	0.0	1145				7.8	26	3.9				
	665																			
	664																			
	663										Hard drilling.									
	662																			
40	661	Increase in sand content; (21,72,7); 1/4 in. to 3/4 in. gravel.		S-7		18 32 48	80	89	0.0	1148				6.7	21	3.6				
	660																			
	659																			
	658										Hard drilling - 43 ft. to 50 ft. b.g.s.									
	657																			
45	656					50/0	REF	0	0.0	1152	SPT sampler does not advance. No Recovery.									
	655																			
	654																			
	653																			
	652																			
50	651	Terminated Boring at 50 ft. below ground surface due to refusal. After completion of drilling, borehole was converted to infiltration test well.								1204	Refusal									
	650																			
	649																			
	648																			
	647																			
55	646																			
	645																			
	644																			
	643																			
	642																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
REVIEWER S. Siciliano, P.G., C.E.G.

NORTHING 34.18837
EASTING -118.40095
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

DRAFT - FOR DISCUSSION PURPOSES ONLY

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-2 **SHEET** 1 **OF** 2
START DRILL DATE Apr 13, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 13, 20 **GROUND SURF.** 702.58
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DESCRIPTION: 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)

COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	SAMPLE NO.	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	702	Silty SAND (SM): brown; moist; fine to coarse sand; (5,70,25); non-plastic; 1/4 in. to 2 in. pebbles.						1305										
	701		B-1				0.0		Hand auger to 5-ft. b.g.s.					5.6				
	700																	
	699																	
	698																	
5	697	Silty SAND (SM): brown; moist; fine to coarse sand; (5,80,15); medium dense; non-plastic; 1/4 in. to 3/4 in. pebbles. at 5.8 ft. - 2 in. gravel bed.	S-1	9 7 4	11	94	0.0	1313										
	696																	
	695																	
	694																	
	693																	
10	692		S-2	7 9 8	17	100	0.0	1316										
	691																	
	690																	
	689																	
	688																	
15	687	Increase in fines content; (0,70,30).	 S-3A S-3B	6 13 12	17	 100 100	0.0	1320		 121				 4.7				
	686																	
	685																	
	684																	
	683																	
20	682	Decrease in fines content; (0,85,15); medium dense; trace gravel.	S-4	7 9 11	20	94	0.0	1324										
	681																	
	680																	
	679																	
	678																	
25	677	Increase in gravel content; (5,80,15); dense; 1/4 in. to 1/2 in. gravel.	S-5	12 21 26	47	83	0.0	1330						3.7				
	676																	
	675																	
	674																	
	673																	
30																		

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan **REVIEWER** S. Siciliano, P.G., C.E.G.

NORTHING 34.18843
EASTING -118.40071
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-2 **SHEET** 2 **OF** 2
START DRILL DATE Apr 13, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 13, 20 **GROUND SURF.** 702.58
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	672	Increase in fines content; moist to wet; fine to medium sand; (9,63,28); medium dense; non-plastic.	▨	S-6	◺	2 7 7	14	94	0.0	1336				28	9	14.3		NP	NP	NP
	671																			
	670	Terminated Boring at 32 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1340										
	669																			
	668																			
35	667																			
	666																			
	665																			
	664																			
	663																			
40	662																			
	661																			
	660																			
	659																			
	658																			
45	657																			
	656																			
	655																			
	654																			
	653																			
50	652																			
	651																			
	650																			
	649																			
	648																			
55	647																			
	646																			
	645																			
	644																			
	643																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.18843
EASTING -118.40071
COORDINATE SYSTEM:
REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-3 **SHEET** 1 **OF** 2
START DRILL DATE Apr 14, 20
FINISH DRILL DATE Apr 14, 20
ELEVATION DATA:
GROUND SURF. 704.88
TOP OF CASING
LOCATION North Hollywood, CA
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DESCRIPTION: 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)

COMMENTS: 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	SAMPLE NO.	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	704	Silty SAND (SM): dark brown; moist; fine to coarse sand; (5,75,20); non-plastic; 1/4 in. pebbles; trace roots.						0720										
	703		B-1				0.0		Hand auger to 5-ft. b.g.s.					8.2		NP	NP	NP
5	700	Silty SAND (SM): brown; moist; fine to coarse sand; (5,75,20); medium dense; non-plastic; 1/4 in. to 1 in. gravel.	S-1	5 6 5	11	100	0.0	0725						6.6				
	698	Increase in fines content; (0,75,25); no gravel.																
10	695	Increase in fines content; (5,65,30); 1/4 in. to 1/2 in. gravel.	S-2	4 7 8	15	89	0.0	0729										
15	690	Increase in fines content; (0,67,33); loose; trace gravel.	S-3	4 3 4	7	100	0.0	0733				33	0	8.7				
20	685	Decrease in fines content; (0,75,25); very dense.		15			0.0	0737										
	684		S-4A	24		100				100.9				3.5				
			S-4B	50/5		100												
25	680	Increase in fines content; (0,65,35); medium dense.		4	12		0.0	0742										
	679		S-5A	9		100				109.9				16.2				
		Increase in fines content; (0,56,44).	S-5B	9		100				115.8		44		14.5				
30	675																	

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
REVIEWER S. Siciliano, P.G., C.E.G.

NORTHING 34.18970
EASTING -118.40118
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-3 **SHEET** 2 **OF** 2
START DRILL DATE Apr 14, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 14, 20 **GROUND SURF.** 704.88
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE							COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS								
				SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)		DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	674	Decrease in fines content; (0,65,35).		S-6		12 11 13	24	83	0.0	0748										
	673	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								0751										
	672																			
	671																			
35	670																			
	669																			
	668																			
	667																			
	666																			
40	665																			
	664																			
	663																			
	662																			
	661																			
45	660																			
	659																			
	658																			
	657																			
	656																			
50	655																			
	654																			
	653																			
	652																			
	651																			
55	650																			
	649																			
	648																			
	647																			
	646																			
60	645																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.18970
EASTING -118.40118
COORDINATE SYSTEM:
REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

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Fax: (714) 969-0820

GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-4 **SHEET** 1 **OF** 2
START DRILL DATE Apr 13, 20
FINISH DRILL DATE Apr 13, 20
LOCATION North Hollywood, CA
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

ELEVATION DATA:
GROUND SURF. 706.75
TOP OF CASING

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	706	Silty SAND (SM): brown; moist; fine to coarse sand; (10,75,15); non-plastic; 1/4 in. to 2 in. gravel.								0916										
	705			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	704																			
	703																			
	702																			
5	701	Silty SAND (SM): brown; moist; fine to coarse sand; (13,61,26); very loose; non-plastic; 1/4 in. to 1 in. gravel.		S-1		8 2 2	4	67	0.0	0921				26	13	8.5				
	700																			
	699																			
	698																			
	697																			
10	696	Decrease in fines content; (5;80;15); medium dense; 1/4 in. to 1/2 in. gravel.		S-2		6 6 7	13	100	0.1	0924										
	695																			
	694																			
	693																			
	692																			
15	691	1/4 in. gravel.		S-3		7 7 8	15	100	0.2	0927										
	690																			
	689																			
	688																			
	687																			
20	686			S-4		5 11 18	29	89	0.0	0930										
	685	at 21 ft. - 3 in. gravel bed.																		
	684																			
	683																			
	682																			
25	681	Well-graded SAND (SW): brown; moist; fine to coarse sand; (10;86;4); dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-5		9 17 19	36	94	0.0	0935				3.9		3.7				
	680																			
	679																			
	678																			
	677																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan

NORTHING 34.18965
EASTING -118.40065
COORDINATE SYSTEM:

REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

DRAFT - FOR DISCUSSION PURPOSES ONLY

Geosyntec consultants

2100 Main St
Suite 150
Huntington Beach, CA 92648
Tel: (714) 969-0800
Fax: (714) 969-0820

GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-4 **SHEET** 2 **OF** 2
START DRILL DATE Apr 13, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 13, 20 **GROUND SURF.** 706.75
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
	676 675 674 673 672	Well-graded SAND with Silt (SW-SM): brown; moist; fine to coarse sand; (0;90;10); dense; non-plastic; trace gravel.		S-6		8 15 19	34	100	0.0	0938										
35	671 670 669 668 667	Silty SAND (SM): brown; moist; fine to coarse sand; (0,77,23); medium dense; non-plastic.		S-7		5 5 7	12	100	0.0	0941	Hard drilling.			23		12.6				
40	666 665 664 663 662	Decrease in fines content; (10,75,15); dense; 1/4 in. to 3/4 in. gravel.		S-8		10 19 24	43	100	0.0	0946	Hard drilling - 40 ft. to 43 ft. b.g.s.									
45	661 660 659 658 657	Well-graded SAND with Silt and Gravel (SW-SM): brown; moist; fine to coarse sand; (15;79;6); very dense; non-plastic; 1/4 in. to 3/4 in. gravel. at 45.5 ft. - 2 in. cemented sand seam.		S-9		50/5	REF	100	0.1	0952	Hard drilling - 45 ft. to 48 ft. b.g.s.			5.8		2.6				
50	656	Increase in fines content; (20;70;10); 1/4 in. to 1/2 in. gravel. at 50.5 ft. - 3 in. cemented sand seam.		S-10		42 33 50/5	83/11	72	0.0	0958				9.5	20	3.5				
	655 654 653 652	Terminated Boring at 51.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1002										
55	651 650 649 648 647																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan **REVIEWER** S. Siciliano, P.G., C.E.G.

NORTHING 34.18965
EASTING -118.40065
COORDINATE SYSTEM:

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

DRAFT - FOR DISCUSSION PURPOSES ONLY

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-5 **SHEET** 1 **OF** 2
START DRILL DATE Apr 13, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 13, 20 **GROUND SURF.** 705.71
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE: SAMPLE NO.	SAMPLE: TYPE	SAMPLE: BLOWS PER 6"	SAMPLE: N VALUE	SAMPLE: RECOVERY (%)	SAMPLE: PID READING (ppm)	SAMPLE: TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	LABORATORY RESULTS: DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	705	Silty SAND (SM): brown; moist to wet; fine to coarse sand; (5,80,15); non-plastic; 1/4 in. to 1/2 in. gravel.								0817										
	704			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	703																			
	702																			
	701																			
5				S-1A		3	17	94	0.0	0819						18.3		NP	NP	NP
	700	Well-graded SAND (SW): brown; moist; fine to coarse sand; (5;93;2); medium dense; non-plastic; 1/4 in. gravel.		S-1B		7 10								2.1		4.6				
	699																			
	698																			
	697																			
	696																			
10	695	Decrease in gravel content; (2;96;2); 1/4 in. to 3/8 in. gravel.		S-2		4 9 14	23	44	0.0	0823				2.0	2	8.0				
	694																			
	693																			
	692																			
	691																			
15	690					4 8 9	17	0		0827	No recovery.									
	689																			
	688																			
	687																			
	686																			
20	685	Silty SAND (SM): brown; moist; fine to coarse sand; (10,65,25); dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-3		15 19 29	48	22	0.0	0830										
	684																			
	683																			
	682																			
	681																			
25	680			S-4		4 17 17	34	89	0.0	0835						3.0				
	679																			
	678																			
	677																			
	676																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan

NORTHING 34.18905
EASTING -118.40082
COORDINATE SYSTEM:

REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

DRAFT - FOR DISCUSSION PURPOSES ONLY

Geosyntec consultants

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Suite 150
Huntington Beach, CA 92648
Tel: (714) 969-0800
Fax: (714) 969-0820

GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING VS-HSA-5 **SHEET** 2 **OF** 2
START DRILL DATE Apr 13, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 13, 20 **GROUND SURF.** 705.71
LOCATION North Hollywood, CA **TOP OF CASING**
PROJECT TOS #25 - Valley Plaza Park South Stormwater Capture
NUMBER LA0590C

				SAMPLE								LABORATORY RESULTS						ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION 1) Soil Name (USCS) 2) Color 3) Moisture 4) Grain Size 5) Percentage 6) Plasticity 7) Density/Consistency 8) Other (Mineral Content, Discoloration, Odor, etc.)	GRAPHIC LOG	SAMPLE NO.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	TIME (00:00)	COMMENTS 1) Rig Behavior 2) Air Monitoring 3) Pocket Pen 4) Tor Vane	DRY DENSITY (pcf)	MAX. DRY DENSITY (pcf)	PERCENT FINES (%)	PERCENT GRAVEL (%)	MOIST. CONTENT (%)	OPT. MOIST. CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	675	Increase in fines content; moist to wet; fine to medium sand; (0,56,44); medium dense.	▨	S-5	/	3 5 8	13	100	0.0	0839				44	0	10.7				
	674	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite slurry.								0844										
	673																			
	672																			
	671																			
35																				
	670																			
	669																			
	668																			
	667																			
	666																			
40																				
	665																			
	664																			
	663																			
	662																			
	661																			
45																				
	660																			
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	648																			
	647																			
	646																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan

NORTHING 34.18905
EASTING -118.40082
COORDINATE SYSTEM:

REVIEWER S. Siciliano, P.G., C.E.G.

NOTES: No groundwater encountered. Logging of soils completed in general accordance with ASTM D2488.

SEE KEY SHEET FOR SYMBOLS AND ABBREVIATIONS

APPENDIX B

Cone Penetration Testing Data

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

City of LA TOS-25 – Valley Plaza Park South
12240 Archwood Street
N. Hollywood, CA
April 13, 2020

Prepared for:

Mr. Jason Fussel
Tetra Tech, Inc.
711 Tank Farm Road, Ste 110
San Luis Obispo, CA 93401
Office (805) 542-9052 / Fax (805) 542-9254

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289
www.kehoetesting.com

TABLE OF CONTENTS

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the City of LA TOS-25 – Valley Plaza Park South project located at 12240 Archwood Street in N. Hollywood, California. The work was performed by Kehoe Testing & Engineering (KTE) on April 13, 2020. The scope of work was performed as directed by Tetra Tech, Inc. personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at six locations to determine the soil lithology. A summary is provided in **TABLE 2.1**.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	42	Refusal
CPT-2	38	Refusal
CPT-3	36	Refusal
CPT-3A	47	Refusal
CPT-4	41	Refusal
CPT-4A	48	Refusal

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed

At location CPT-1, CPT-3, CPT-3A, CPT-4 & CPT-4A, shear wave measurements were obtained at various depths. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for up to 2 years for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil behavior type on the CPT plots is derived from the attached CPT SBT plot (Robertson, “Interpretation of Cone Penetration Test…”, 2009) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

The CPT data files have also been provided. These files can be imported in CPeT-IT (software by GeoLogismiki) and other programs to calculate various geotechnical parameters.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe

Steven P. Kehoe
President

04/17/20-wt-1434

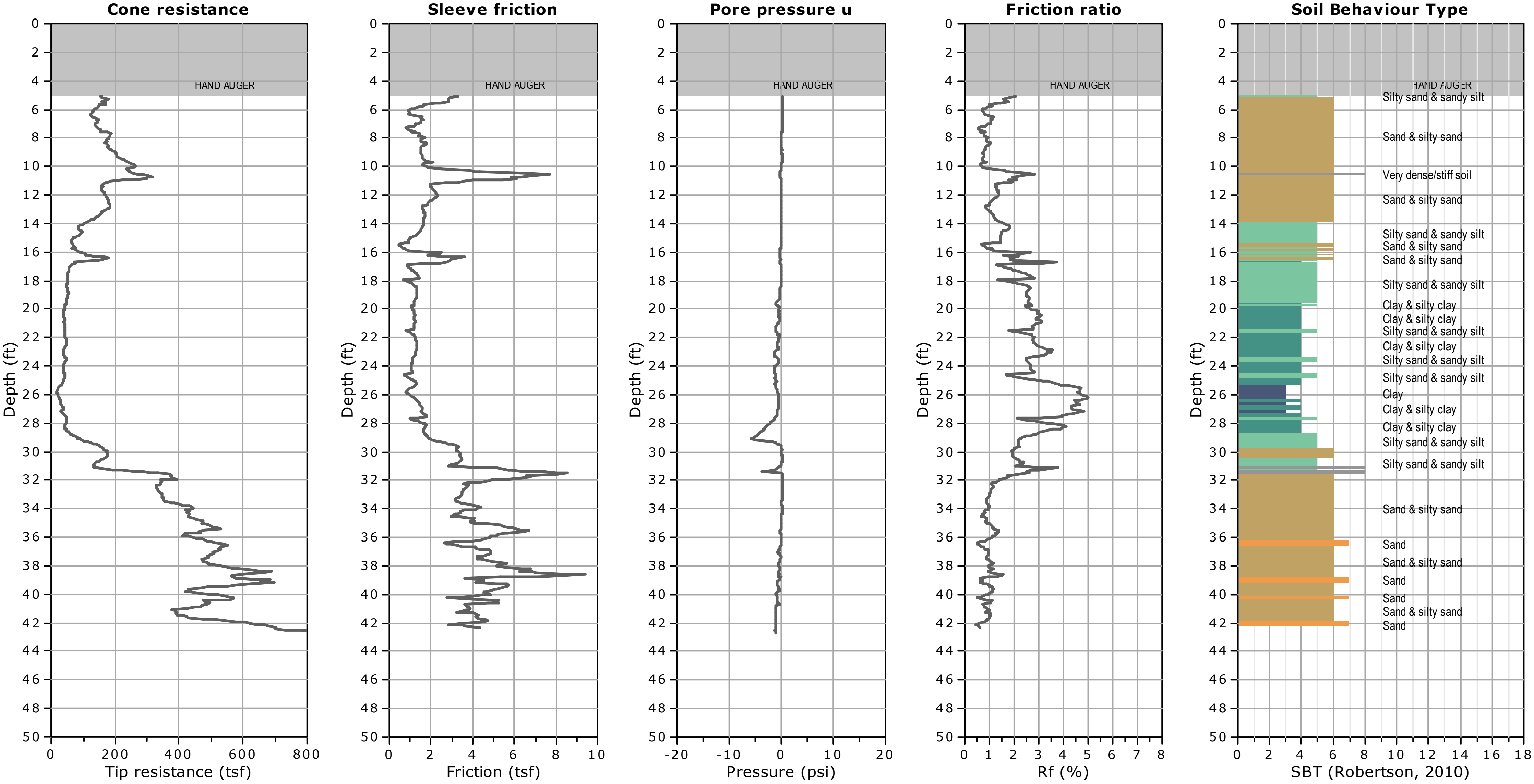
APPENDIX

DRAFT - FOR DISCUSSION PURPOSES ONLY

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Tetra Tech / City of LA TOS-25 - Valley Plaza Park South**
Location: **N. Hollywood, CA**

CPT-1
Total depth: 42.68 ft, Date: 4/13/2020



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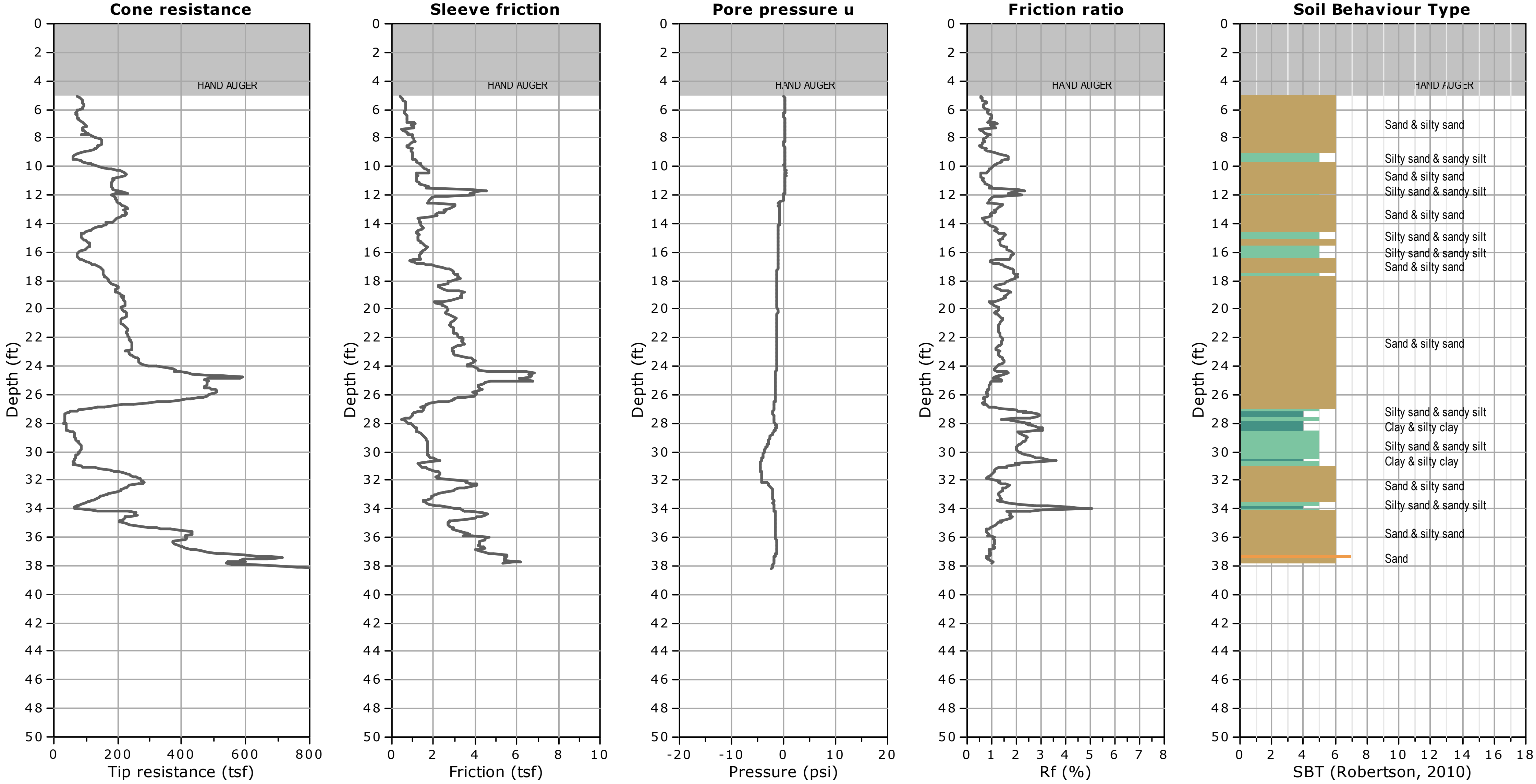
www.kehoetesting.com

Project: **Tetra Tech / City of LA TOS-25 - Valley Plaza Park South**

Location: **N. Hollywood, CA**

CPT-2

Total depth: 38.20 ft, Date: 4/13/2020



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Kehoe Testing and Engineering
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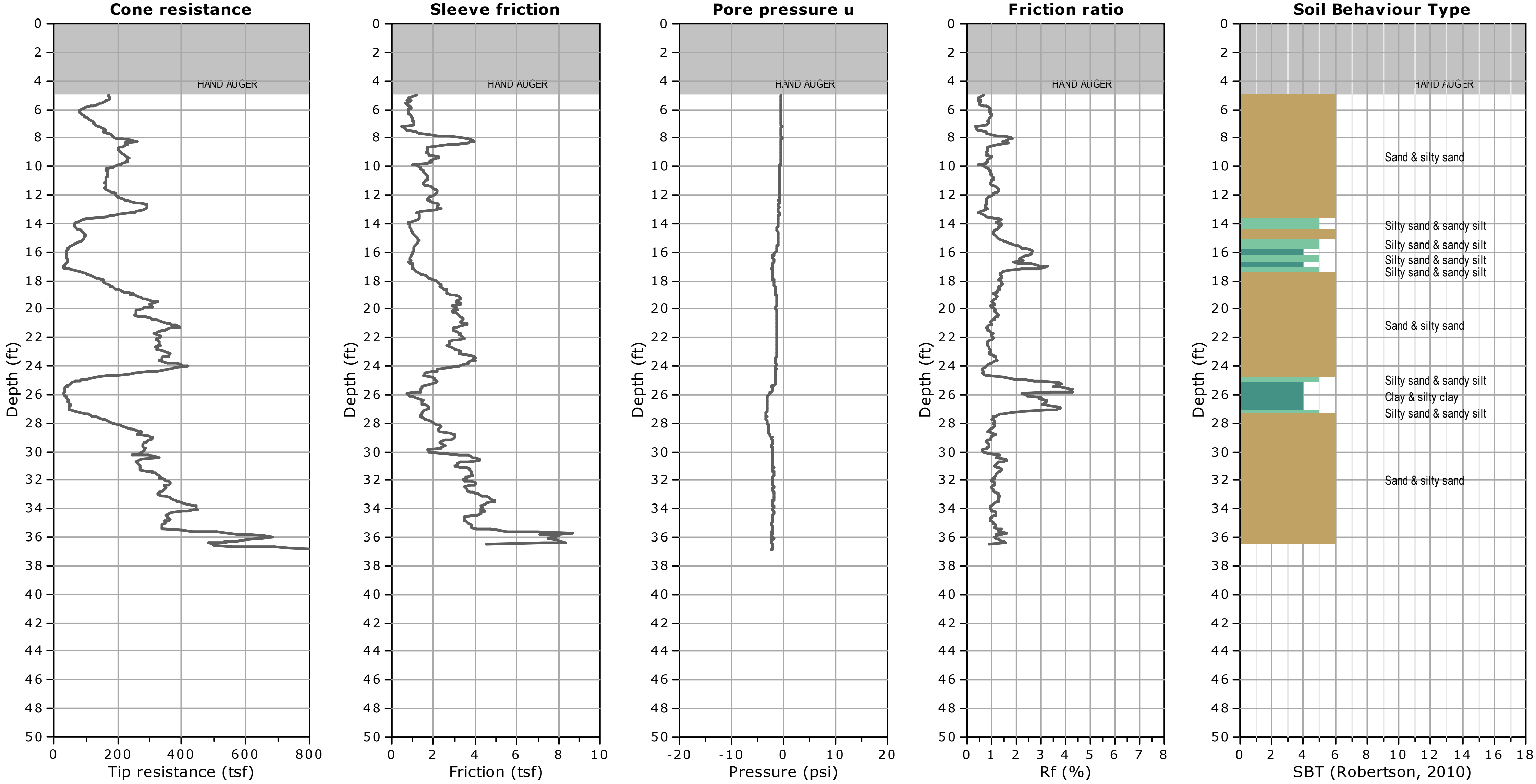
www.kehoetesting.com

Project: **Tetra Tech / City of LA TOS-25 - Valley Plaza Park South**
Location: **N. Hollywood, CA**

CPT-3
Total depth: 36.89 ft, Date: 4/13/2020



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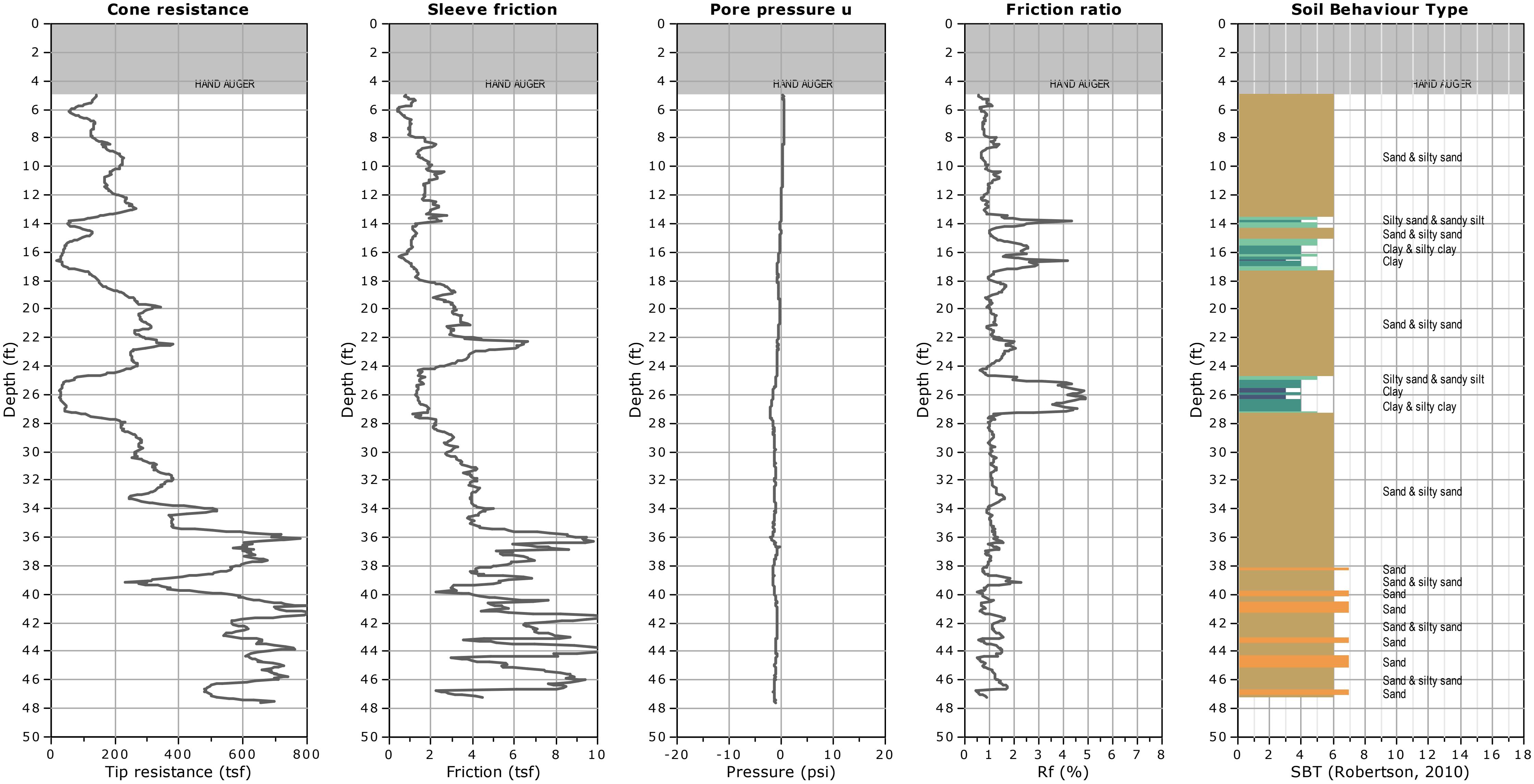
steve@kehoetesting.com
www.kehoetesting.com

Project: **Tetra Tech / City of LA TOS-25 - Valley Plaza Park South**
Location: **N. Hollywood, CA**

CPT-3A

Total depth: 47.58 ft, Date: 4/13/2020



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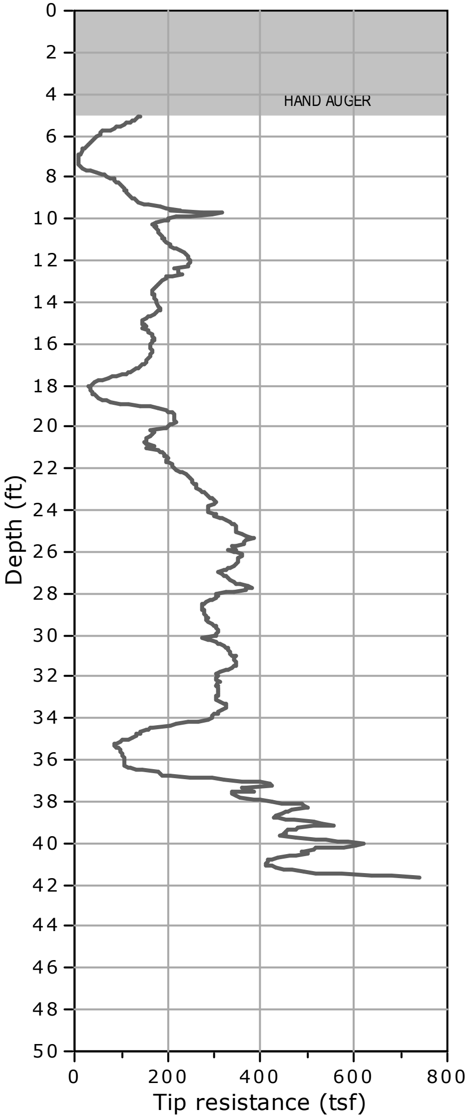
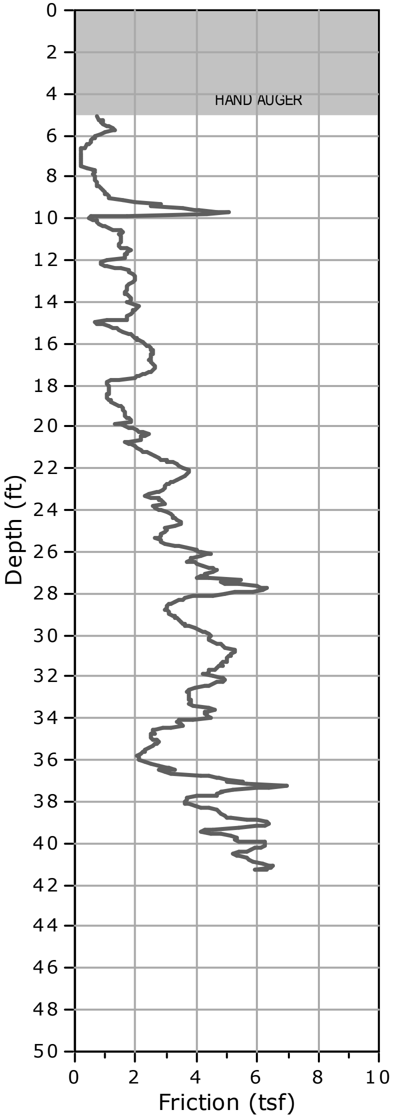
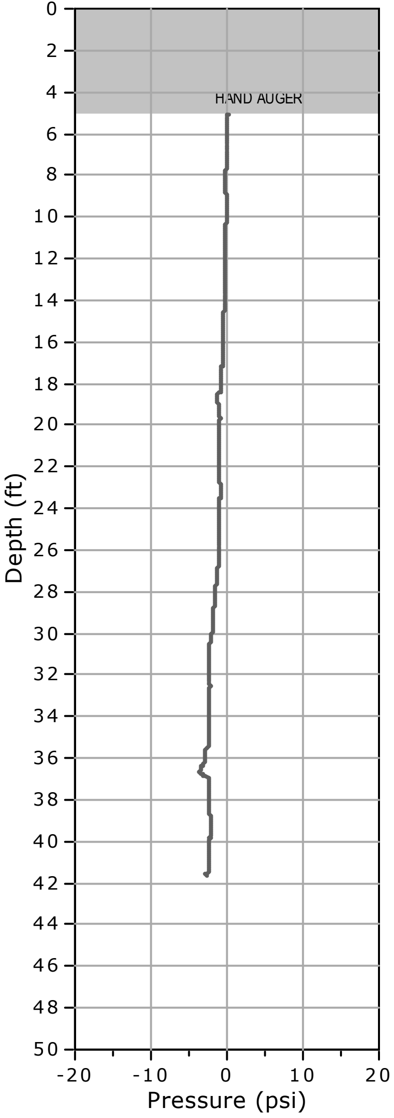
www.kehoetesting.com

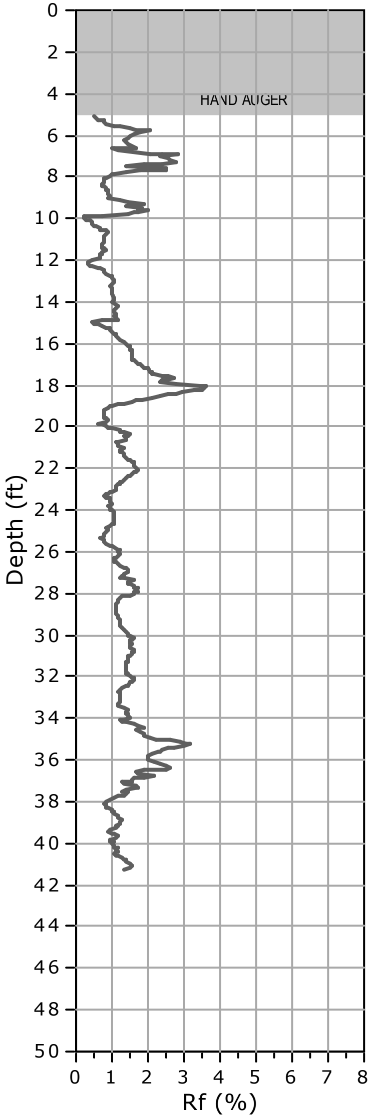
Project: **Tetra Tech / City of LA TOS-25 - Valley Plaza Park South**
Location: **N. Hollywood, CA**

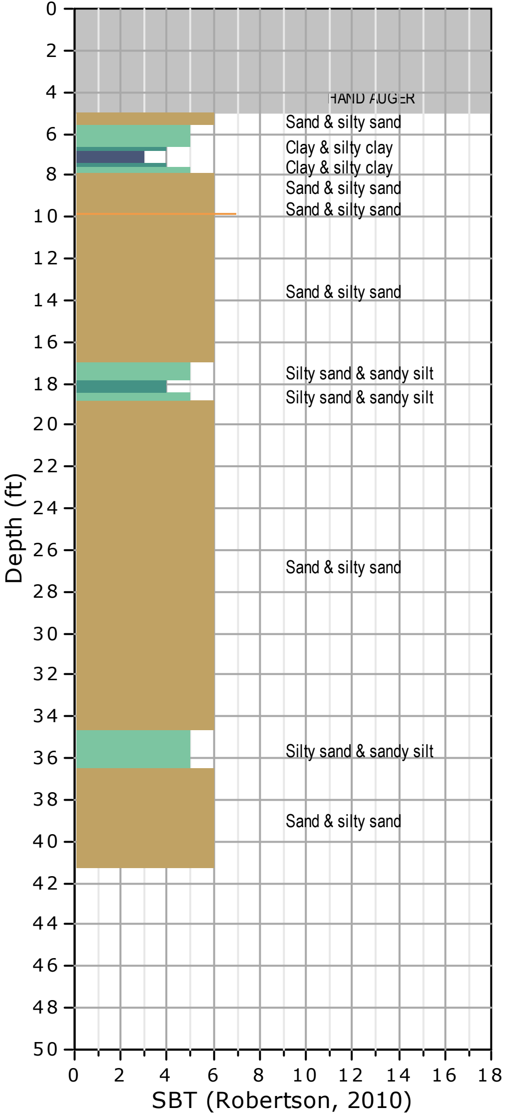
CPT-4
Total depth: 41.67 ft, Date: 4/13/2020


Cone resistance


Sleeve friction


Pore pressure u


Friction ratio


Soil Behaviour Type

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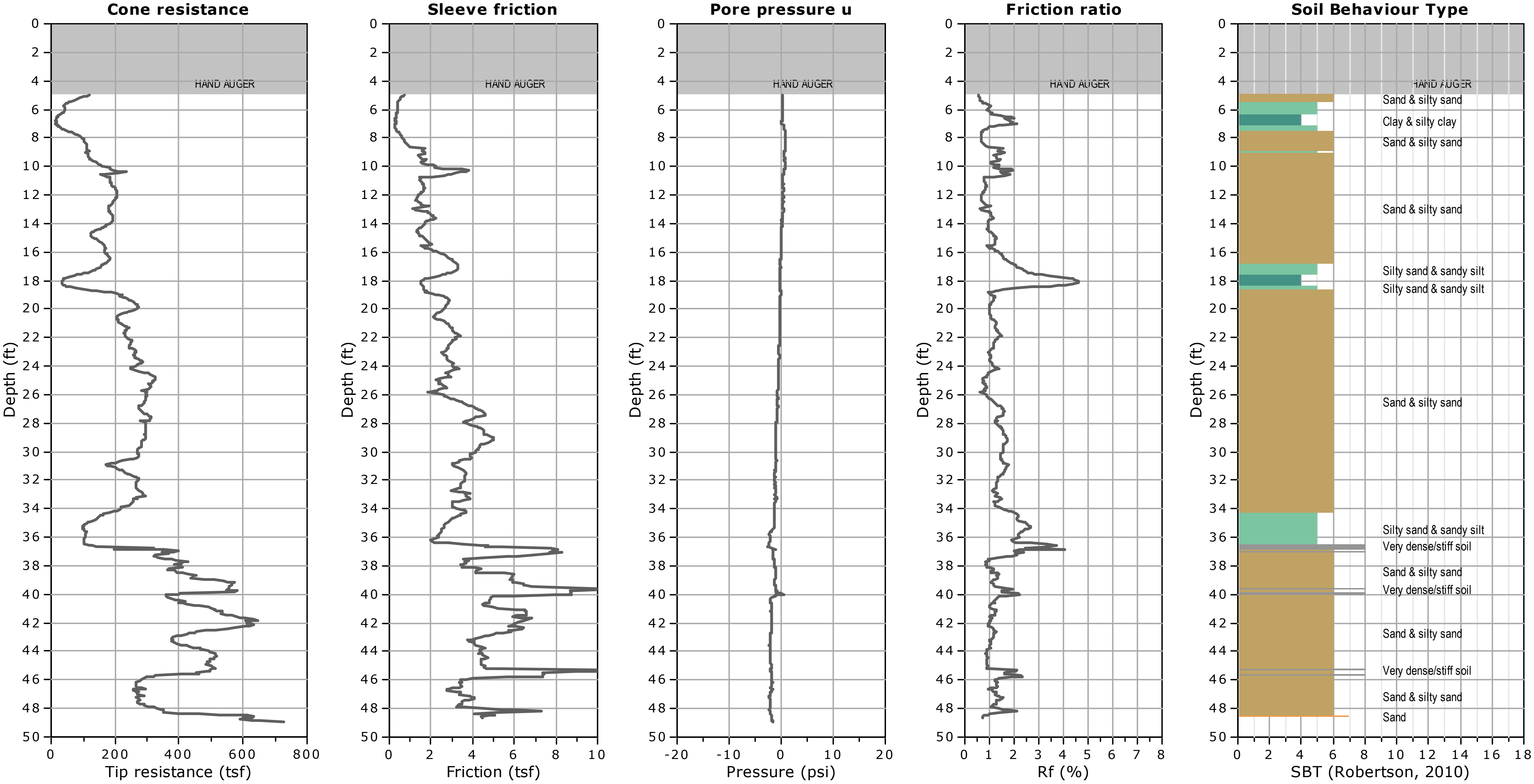
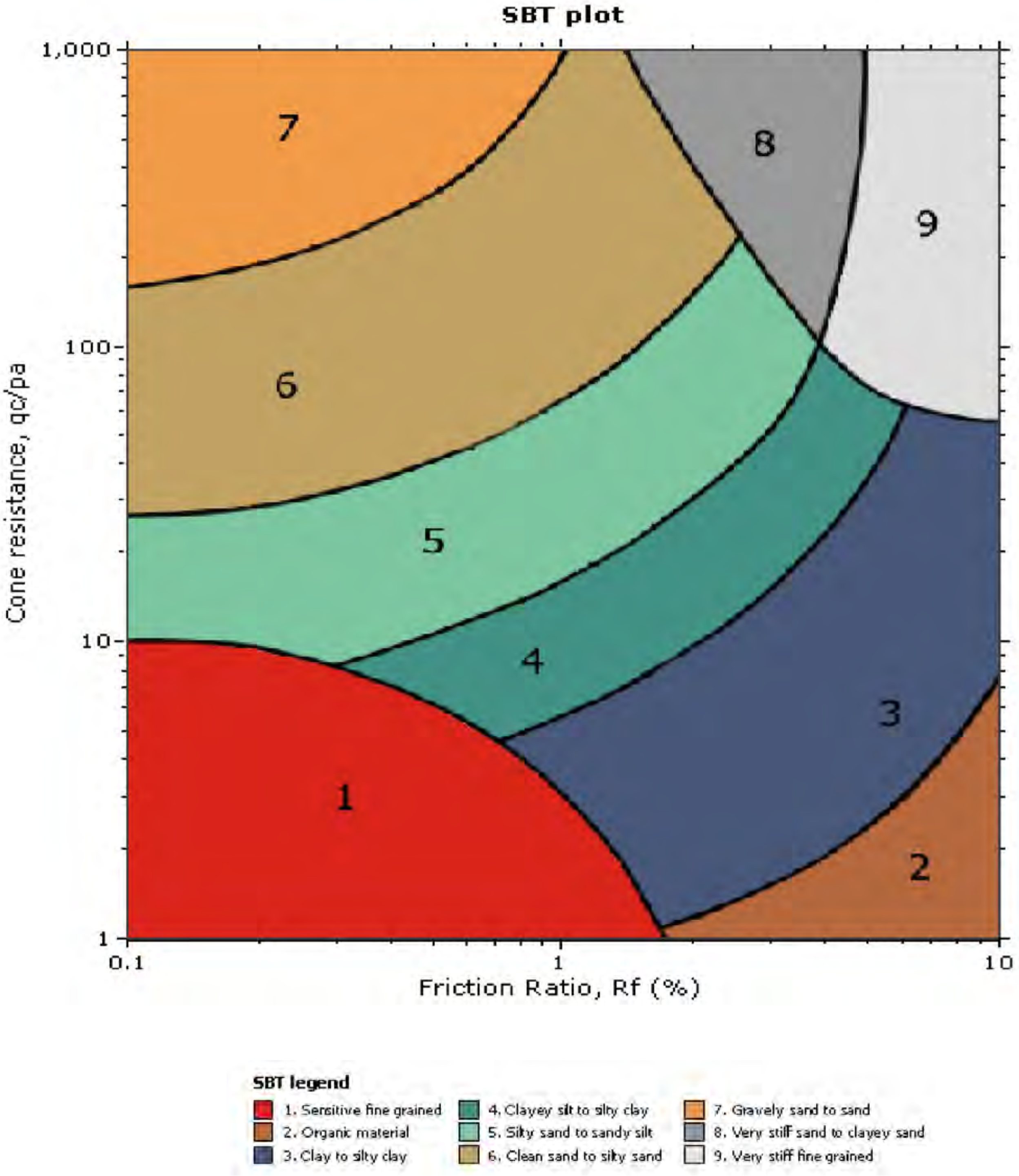
www.kehoetesting.com

Project: **Tetra Tech / City of LA TOS-25 - Valley Plaza Park South**
Location: **N. Hollywood, CA**

CPT-4A
Total depth: 48.98 ft, Date: 4/13/2020




SBT plot
1,000
100
10
1
Cone resistance, qc/pa
0.1
1
10
Friction Ratio, Rf (%)
7
8
9
6
5
4
3
1
2
SBT legend
1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Tetra Tech
TOS-25 - Valley Plaza Park South
N. Hollywood, CA

CPT Shear Wave Measurements

Location	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
CPT-1	10.14	9.14	9.36	15.28	612	
	20.08	19.08	19.18	27.20	705	825
	30.02	29.02	29.09	39.94	728	777
	40.03	39.03	39.08	48.48	806	1170
	42.59	41.59	41.64	50.52	824	1253
CPT-3	10.10	9.10	9.32	15.52	600	
	20.01	19.01	19.11	29.96	638	679
	30.15	29.15	29.22	43.46	672	748
	36.84	35.84	35.90	49.44	726	1117
CPT-3A	47.44	46.44	46.48	59.66	779	1036
CPT-4	10.20	9.20	9.41	15.28	616	
	20.11	19.11	19.21	29.76	646	677
	30.09	29.09	29.16	41.20	708	869
	40.03	39.03	39.08	51.28	762	984
CPT-4A	48.62	47.62	47.66	58.64	813	1166

Shear Wave Source Offset - 2 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

APPENDIX C

Geotechnical Laboratory Testing Data

CALIFORNIA TESTING & INSPECTIONS

Geotechnical and Construction Materials Testing Laboratory

Project: TOS-25 Valley Plaza Park South Stormwater Capture
Project Number: 200-20043-20001-03(LA0590C)
Date: 4/20/2020
Sample ID:
Sampled:

Date Tested: 4/20/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 4/23/2020
Remarks:

DESCRIPTION	(SM-SP) Med-Coarse, Poorly Graded Sand, Coarse up to 1/2", Light Brown, Moist	(SM-SP) Silty Sand, Moist, Brown	(ML) Sandy Silt, Moist, Dark Brown	(SM) Silty Sand, Moist, Brown	(SM) Medium Coarse to Fine Silty Sand, Medium dense, Brown, Moist	(SM-SP) Medium to Coarse Silty Sand, some 1/2" gravel, Moist, Light Brown	(SM) SIlty Sand, some roots, Dark Brown	(SM-SP) Poorly Graded Silty Sand , Brown	(SM-SP) Silty Sand, Medium Dense, Light Brown, Moist,
BORING #	VS-HSA-1	VS-HSA-1	VS-HSA-1	VS-HSA-1	VS-HSA-2	VS-HSA-2	VS-HSA-3	VS-HSA-3	VS-HSA-3
DEPTH (ft)	10-11.5	15-16.5	25-26.5	30-31.5	15.5-16.0	25-26.5	1-5	5-6.5	20.5-21
SAMPLE #	S-2	S-3	S-4	S-5	S-3A	S-5	B1	S1	S-4A
HEIGHT OF SAMPLE	SPT	SPT	SPT	SPT	5	SPT	BULK	SPT	5
WEIGHT OF SAMPLE (g)	SPT	SPT	SPT	SPT	984.43	SPT	BULK	SPT	850.66
TARE (g)	85.7	86.1	91.6	82.4	45.44	45.5	106.9	45.9	45.42
TARE + SAMPLE WET (g)	283.7	277.4	366.1	246.6	286.11	265.3	519.7	311.3	183.85
TARE + SAMPLE DRY (g)	270.4	266.1	332.1	229.1	275.4	257.5	488.5	294.8	179.2
MOISTURE CONTENT (%)	7.2	6.3	14.1	11.9	4.7	3.7	8.2	6.6	3.5
DRY DENSITY (pcf)	NT	NT	NT	NT	121.0	NT	NT	NT	100.9
PASSING #200 (%)	NT	11.9	56	20	NT	NT	NT	NT	NT
PLASTIC INDEX (%)	NT	NT	**NP**	NT	NT	NT	**NP**	NT	NT

NT: Not Tested | NP: Non Plastic

CALIFORNIA TESTING & INSPECTIONS

Geotechnical and Construction Materials Testing Laboratory

Project: TOS-25 Valley Plaza Park South Stormwater Capture
Project Number: 200-20043-20001-03(LA0590C)
Date: 4/20/2020
Sample ID:
Sampled:

Date Tested: 4/20/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 4/23/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Moist, Firm, Dark Brown	(SM-ML) Medium grained Sandy Silt, Firm, Moist, Yellowish Brown	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Brown	(SM) Silty Sand, Moist, Dark brown	(SM-SP) Silty Sand, Moist, Brown	(SM-SP) Silty Sand w/ gravel 3/4", Moist, Light Brown	
BORING #	VS-HSA-3	VS-HSA-3	VS-HSA-4	VS-HSA-4	VS-HSA-4	VS-HSA-5	VS-HSA-5	VS-HSA-5	
DEPTH (ft)	25.5-26	26-26.5	25-26.5	35-36.5	45-46.5	5-5.6	5.6-6.5	25-26.5	
SAMPLE #	S-5A	S-5B	S-5	S-7	S-9	S-1A	S-1B	S-4	
HEIGHT OF SAMPLE	5	4	SPT	SPT	SPT	SPT	SPT	SPT	
WEIGHT OF SAMPLE (g)	991.3	816.69	SPT	SPT	SPT	SPT	SPT	SPT	
TARE (g)	46.04	239.92	66.2	61.7	61.3	60.2	61.5	68.2	
TARE + SAMPLE WET (g)	169.62	396.83	210.3	270.1	228.8	296.5	213.7	400.2	
TARE + SAMPLE DRY (g)	152.4	376.9	205.2	246.7	224.6	260	207	390.6	
MOISTURE CONTENT (%)	16.2	14.5	3.7	12.6	2.6	18.3	4.6	3.0	
DRY DENSITY (pcf)	109.9	115.8	NT	NT	NT	NT	NT	NT	
PASSING #200 (%)	NT	44	3.9	23.0	5.8	NT	2.1	NT	
PLASTIC INDEX (%)	NT	NT	NT	NT	NT	NT	NT	NT	

NT: Not Tested | NP: Non Plastic

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park South Stormwater Capture**

Client: **Geosyntec Consultants**

Attention To: K. Viswanathan

Location: See Below

Date Sampled: 4/14/2020-4/16/2020

Date of Report : 5/11/20

Project No. : 200-20043-20001-03 (LA0590C)

Reported By: L. Valle

Reviewed By: L. Valle

CT&I Sample Number :	#846	#846						
Sample Location :	VS-HSA-1 S-6	VS-HSA-1 S-7						
Depth:	35-36.5	40-41.5						
Gradation (ASTM D6913) **Percent Passing Sieve Size**								
2"	-	-						
1 ½"	-	-						
1"	-	100%						
3/4"	100%	98%						
1/2"	91%	90%						
3/8"	87%	88%						
#4	74%	79%						
#10	54%	67%						
#30	30%	40%						
#40	25%	31%						
#50	20%	23%						
#100	13%	12%						
#200	7.8%	6.7%						
Moisture content (ASTM D 2216)	3.9%	3.6%						
Wash #200 (ASTM D 1140)								
Liquid Limit (ASTM D 4318)	NT	NT						
Plastic limit (ASTM D 4318)	NT	NT						
Plastic Index (ASTM D 4318)	NT	NT						
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT						
Sand Equivalent (ASTM D2419)	NT	NT						
Visual Soil Classification	(SW-SM) Well Graded Sand w/Silt and Gravel	(SW-SM) Well Graded Sand w/Silt and Gravel						

Comments: NP: Non-Plastic

NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

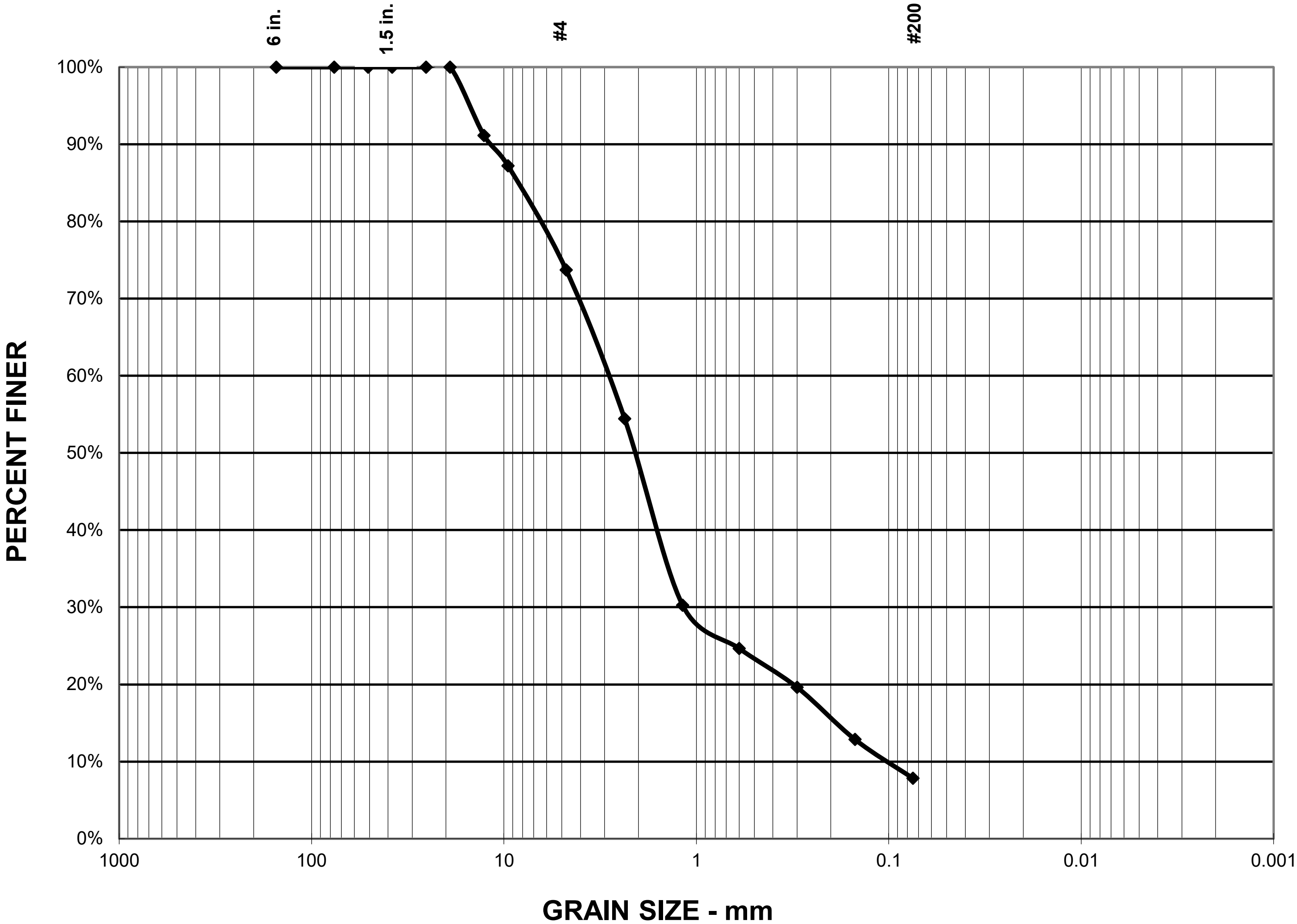
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL =	26%
% SAND =	66%
% SILT & CLAY =	8%

Project No.: 200-20043-20001-03 (LA0590C)

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Date sampled: 04/30/20

Location: VS-HSA-1 @ 35-36.5, S-6

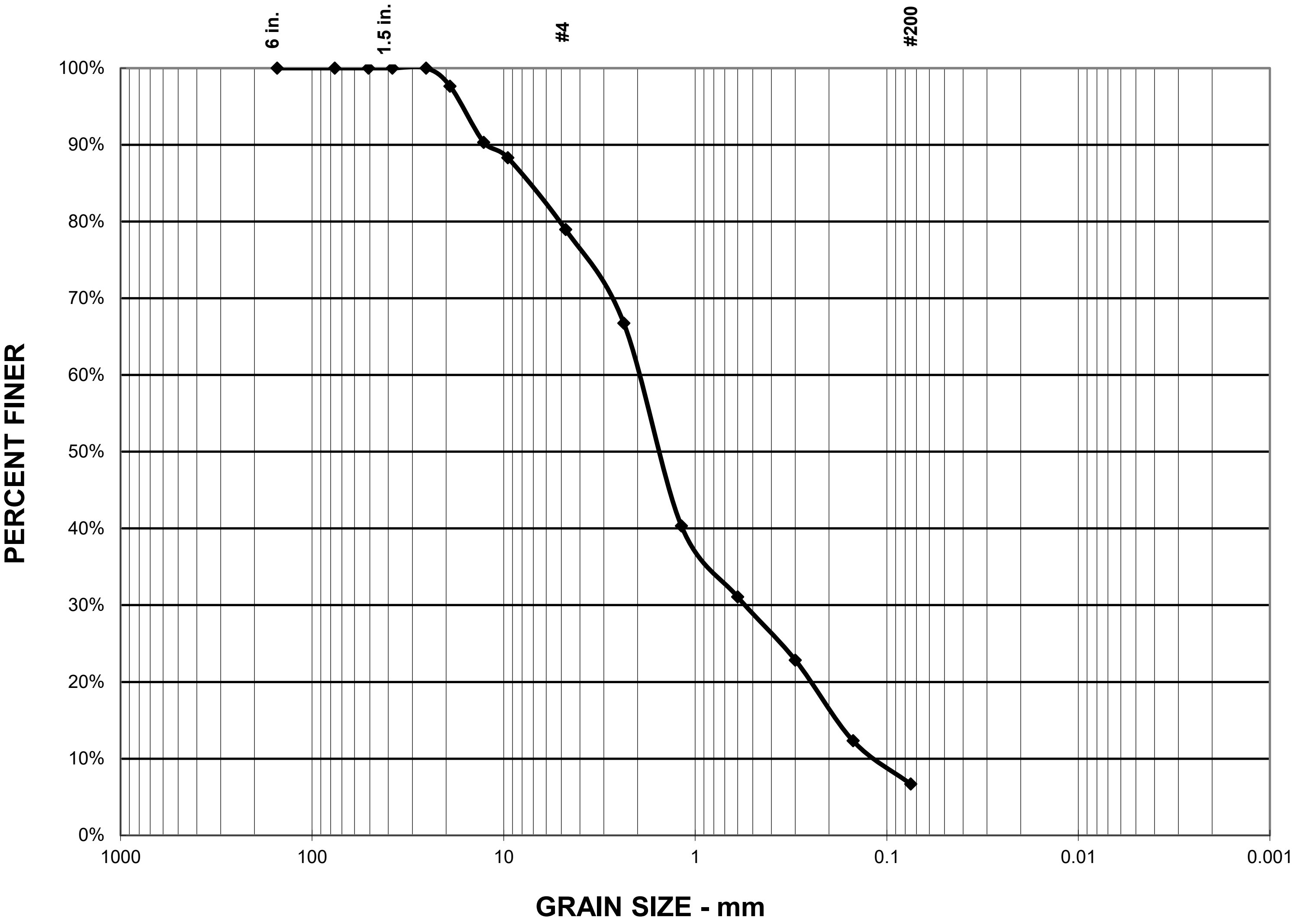
Soil Description: Well Graded Sand w/Silt and Gravel (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VS-HSA-1 S-6***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 21%

% SAND = 72%

% SILT & CLAY = 7%

Project No.: 200-20043-20001-03 (LA0590C)

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Date sampled: 04/30/20

Location: VN-HSA-1 @40-41.5', S-7

Soil Description: Well Graded Sand w/Silt and Gravel (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VS-HSA-1 S-7***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park South Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-03 (LA0590C)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

CT&I Sample Number :	#846	#846					
Sample Location :	VS-HSA-2 B-1	VS-HSA-2 S-6					
Depth:	1-5	30-31.5					
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-					
1 ½"	-	-					
1"	-	100%					
3/4"	-	97%					
1/2"	-	95%					
3/8"	-	95%					
#4	-	91%					
#10	-	83%					
#30	-	74%					
#40	-	69%					
#50	-	60%					
#100	-	43%					
#200	-	28%					
Moisture content (ASTM D 2216)	5.6%	14.3%					
Wash #200 (ASTM D 1140)	NT						
Liquid Limit (ASTM D 4318)	NT	NP					
Plastic limit (ASTM D 4318)	NT	NP					
Plastic Index (ASTM D 4318)	NT	NP					
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT					
Sand Equivalent (ASTM D2419)	50%	NT					
Visual Soil Classification	Silty Sand (SM)	Sandy Elastic Silt (SM-ML)					

Comments: NP: Non-Plastic
NT: Not Tested

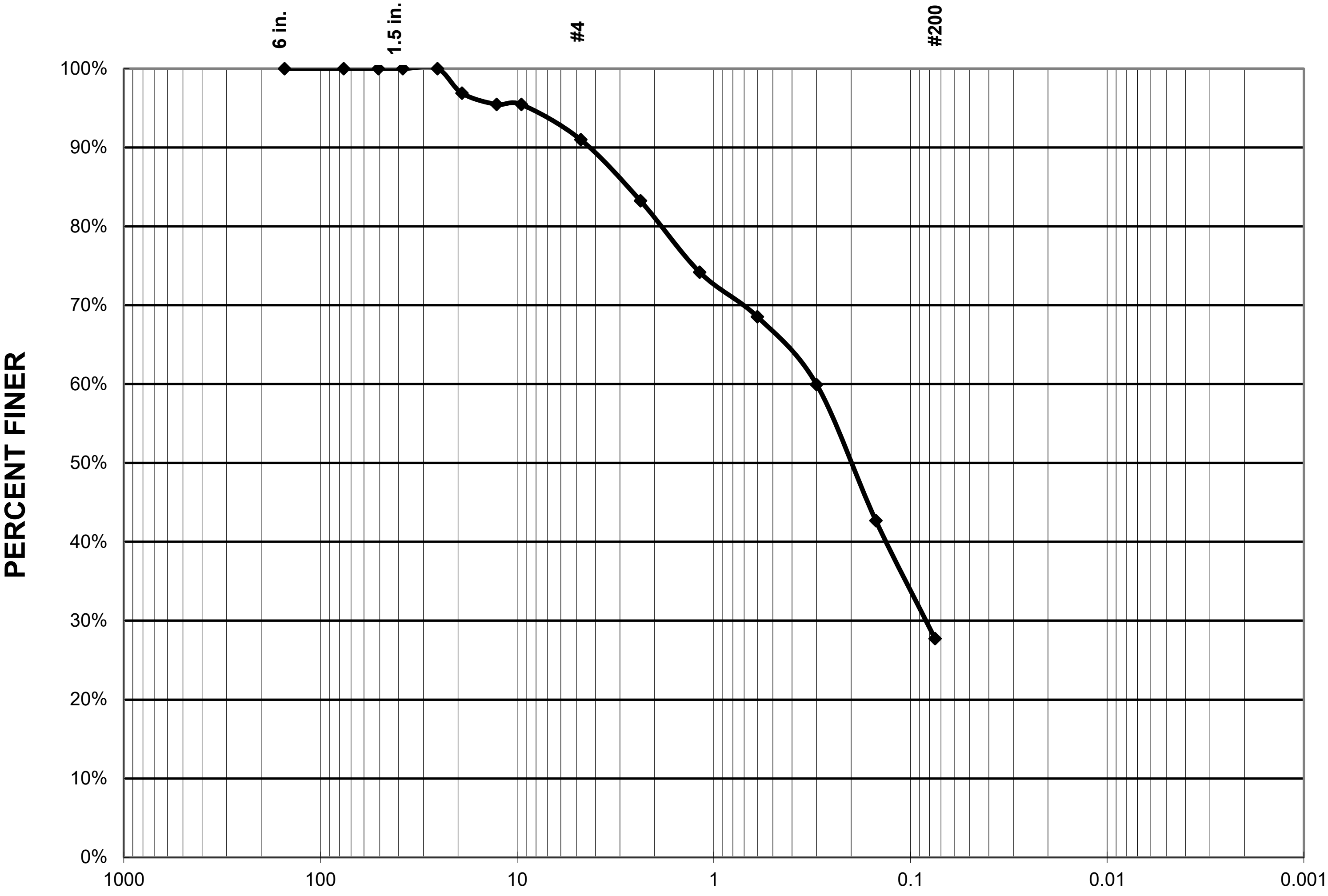
Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

Fabiola Jaque-Diaz, P.E., Project Manager
Print Name/Title

5/11/2020
Date

GRAIN SIZE DISTRIBUTION GRAPH



GRAIN SIZE - mm

ASTM D-6913

TEST SUMMARY

% GRAVEL = 9%

% SAND = 63%

% SILT & CLAY = 28%

Project No.: 200-20043-20001-03 (LA0590C)

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Date sampled: 04/30/20

Location: VS-HSA 2 @30-31.5', S-6

Soil Description: Sandy Elastic Silt (SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. *VS-HSA-2 S-6*

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

Project Name: **TOS-25 Valley Plaza Park South Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-03 (LA0590C)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

CT&I Sample Number :	#846	#846					
Sample Location :	VS-HSA-3 S-2	VS-HSA-3 S-3					
Depth:	10-11.5	15-16.5					
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-						
1 ½"	-						
1"	-						
3/4"	-						
1/2"	-						
3/8"	-						
#4	-						
#10	-	100%					
#30	-	96%					
#40	-	92%					
#50	-	85%					
#100	-	55%					
#200	-	33%					
Moisture content (ASTM D 2216)	NT	8.7%					
Wash #200 (ASTM D 1140)	NT	NT					
Liquid Limit (ASTM D 4318)	NT	NT					
Plastic limit (ASTM D 4318)	NT	NT					
Plastic Index (ASTM D 4318)	NT	NT					
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT					
Sand Equivalent (ASTM D2419)	76%	NT					
Visual Soil Classification	Fine Silty Sand (SM-SP)	Sandy Elastic Silt (SM-ML)					

Comments: NP: Non-Plastic
NT: Not Tested

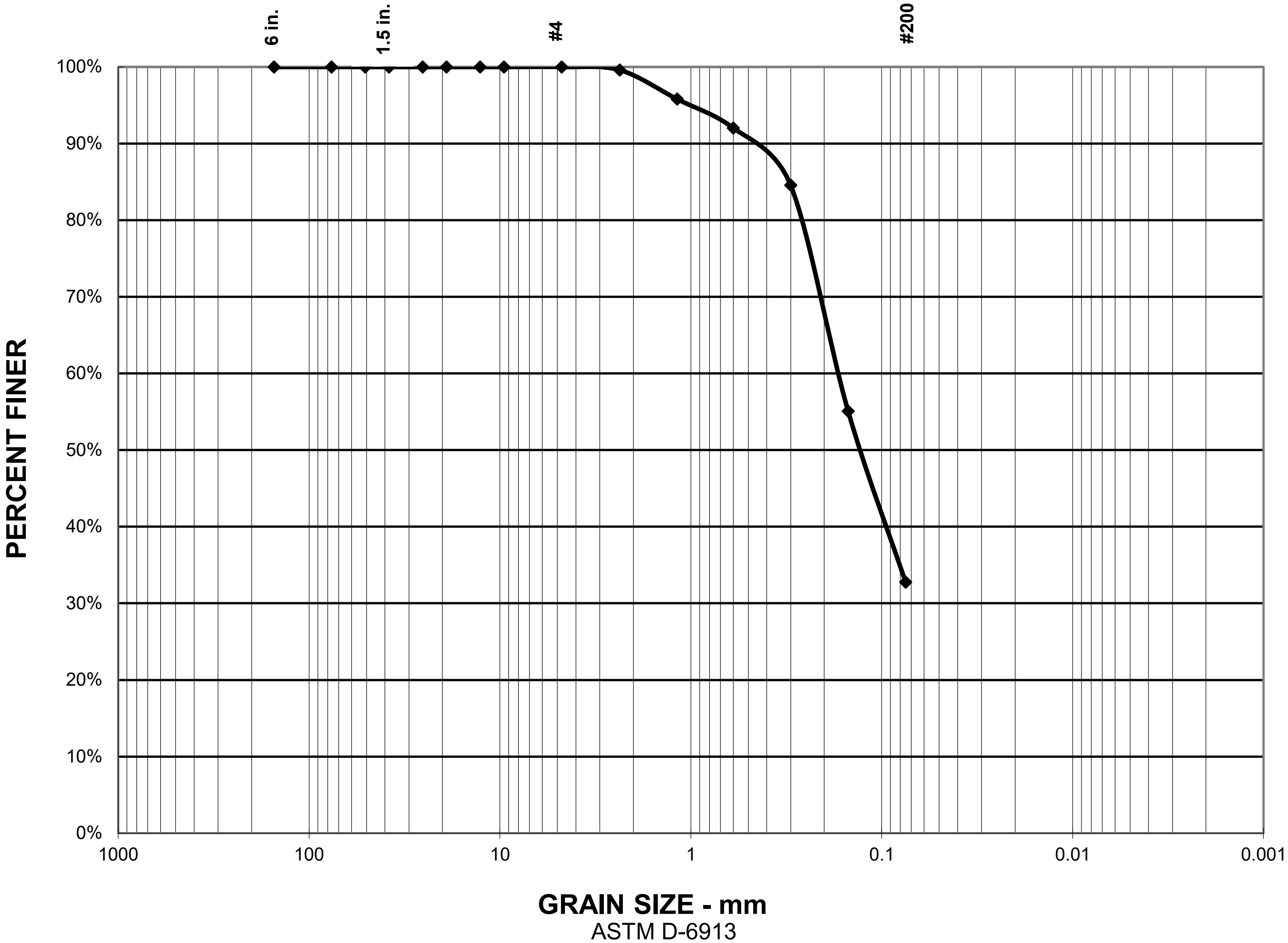
Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

Fabiola Jaque-Diaz, P.E., Project Manager
Print Name/Title

5/11/2020
Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 67%

% SILT & CLAY = 33%

Project No.: 200-20043-20001-03 (LA0590C)

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Date sampled: 04/30/20

Location: VS-HSA-3 @15-16.5', S-3

Soil Description: Sandy Elastic Silt (SM-ML)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VS-HSA-3 S-3***

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California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park South Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-03 (LA0590C)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

CT&I Sample Number :	#846	#846	#846				
Sample Location :	VS-HSA-4 S-1	VS-HSA-4 S-4	VS-HSA-4 S-10				
Depth:	5-6.5	20-21.5	50-51.5				
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-				
1 ½"	100%	-	-				
1"	92%	-	-				
3/4"	89%	-	100%				
1/2"	89%	-	92%				
3/8"	89%	-	86%				
#4	87%	-	80%				
#10	82%	-	70%				
#30	60%	-	46%				
#40	51%	-	33%				
#50	44%	-	23%				
#100	35%	-	14%				
#200	26%	-	9.5%				
Moisture content (ASTM D 2216)	8.5%	NT	3.5%				
Wash #200 (ASTM D 1140)	NT	NT	NT				
Liquid Limit (ASTM D 4318)	NT	NT	NT				
Plastic limit (ASTM D 4318)	NT	NT	NT				
Plastic Index (ASTM D 4318)	NT	NT	NT				
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT				
Sand Equivalent (ASTM D2419)	NT	74%	NT				
Visual Soil Classification	Sandy Elastic Silt (SM-ML)	Silty Sand (SM-SP)	Well Graded Sand w/Silt and Gravel (SW-SM)				

Comments: NP: Non-Plastic
NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

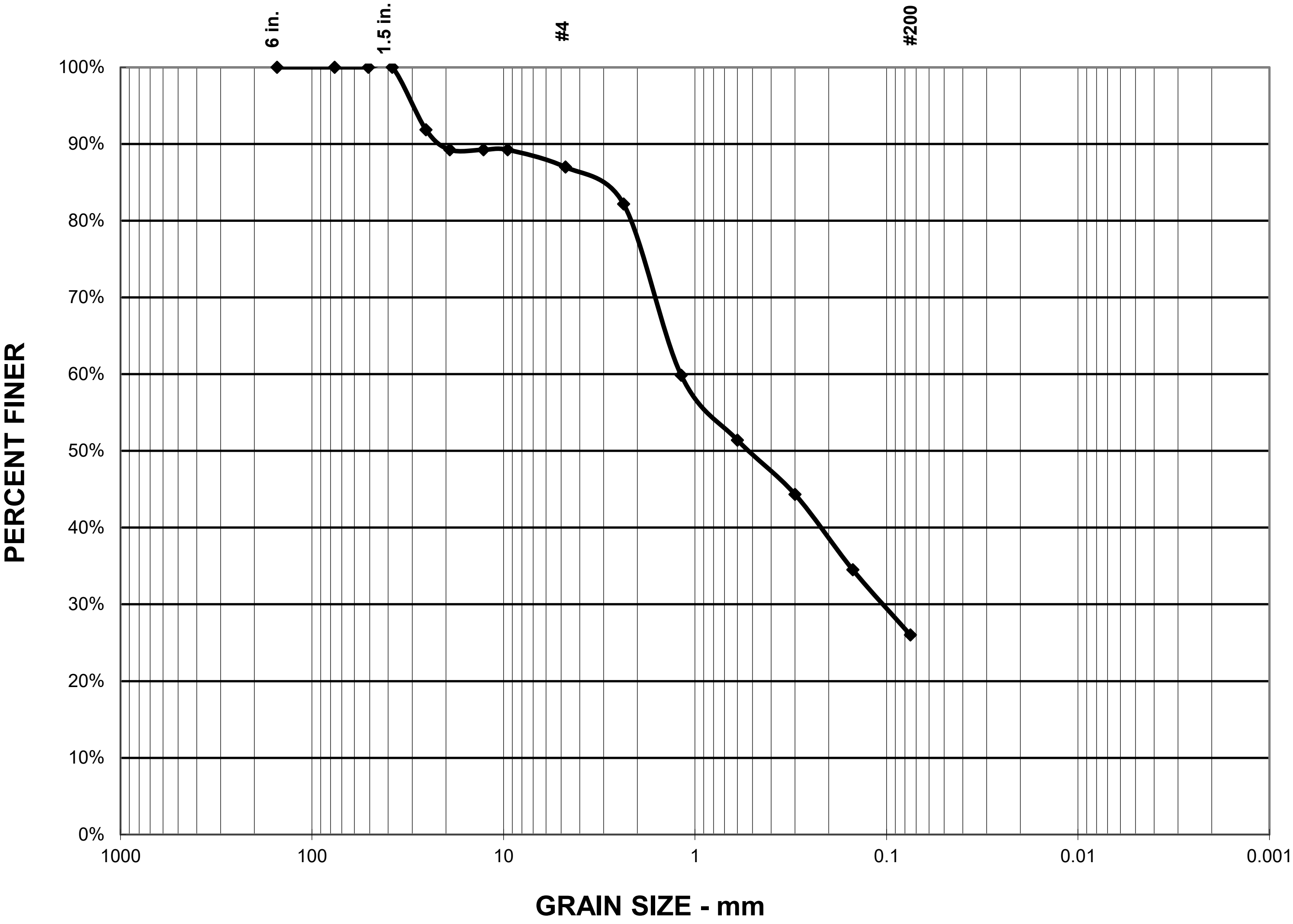
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL =	13%
% SAND =	61%
% SILT & CLAY =	26%

Project No.: 200-20043-20001-03 (LA0590C)

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Date sampled: 04/30/20

Location: VS-HSA-4 @5-6.5@, S-1

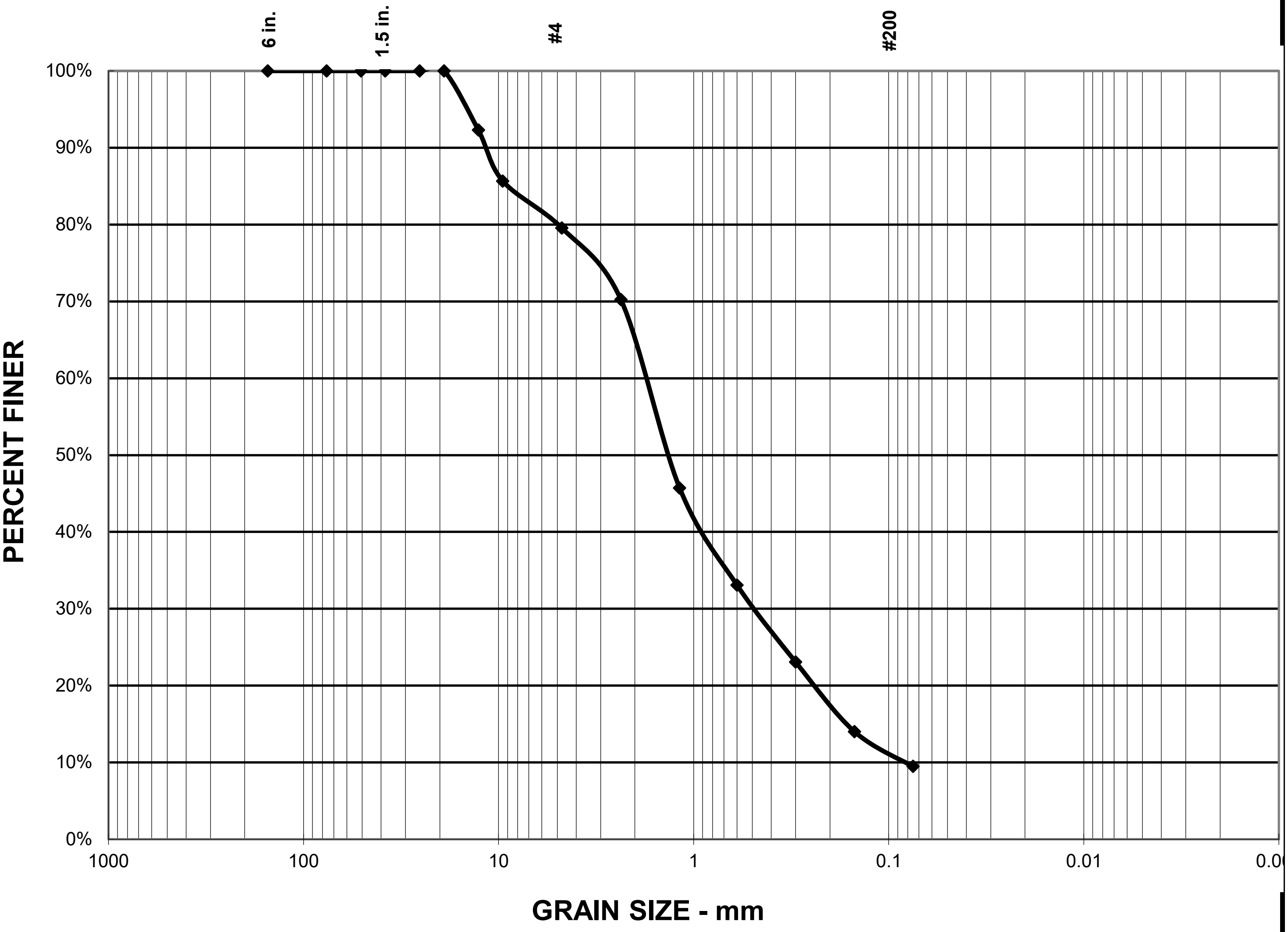
Soil Description: Sandy Elastic Silt (SM-ML)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VS-HSA-4 S-1***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 20%

% SAND = 70%

% SILT & CLAY = 9%

Project No.: 200-20043-20001-03 (LA0590C)

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Date sampled: 04/30/20

Location: VS-HSA-4 @50-51.5', S-10

Soil Description: Well Graded Sand w/Silt and Gravel (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VS-HSA-4 S-10***

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California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 Valley Plaza Park South Stormwater Capture**
Date of Report : 5/11/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-03 (LA0590C)
Attention To: K. Viswanathan
Reported By: L. Valle
Location: See Below
Date Sampled: 4/14/2020-4/16/2020
Reviewed By: L. Valle

CT&I Sample Number :	#846	#846	#846				
Sample Location :	VS-HSA-5 S-1A	VS-HSA-5 S-2	VS-HSA-5 S-6				
Depth:	5-5.6	10-11.5	30-31.5				
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-				
1 ½"	-	-	-				
1"	-	-	-				
3/4"	-	-	-				
1/2"	-	100%	-				
3/8"	-	99%	-				
#4	-	98%	-				
#10	-	91%	100%				
#30	-	50%	97%				
#40	-	30%	94%				
#50	-	16%	89%				
#100	-	6.0%	69%				
#200	-	2.0%	44%				
Moisture content (ASTM D 2216)	NT	8.0%	10.7%				
Wash #200 (ASTM D 1140)	NT	NT	NT				
Liquid Limit (ASTM D 4318)	NP	NT	NT				
Plastic limit (ASTM D 4318)	NP	NT	NT				
Plastic Index (ASTM D 4318)	NP	NT	NT				
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT				
Sand Equivalent (ASTM D2419)	NT	NT	NT				
Visual Soil Classification	Fine Silty Sand (SM)	Well Graded Sand (SW)	Sandy Elastic Silt (ML)				

Comments: NP: Non-Plastic
NT: Not Tested

Test(s) performed in accordance with: ☑ ASTM ☐ AASHTO ☐ CAL-TEST METHOD

Signature

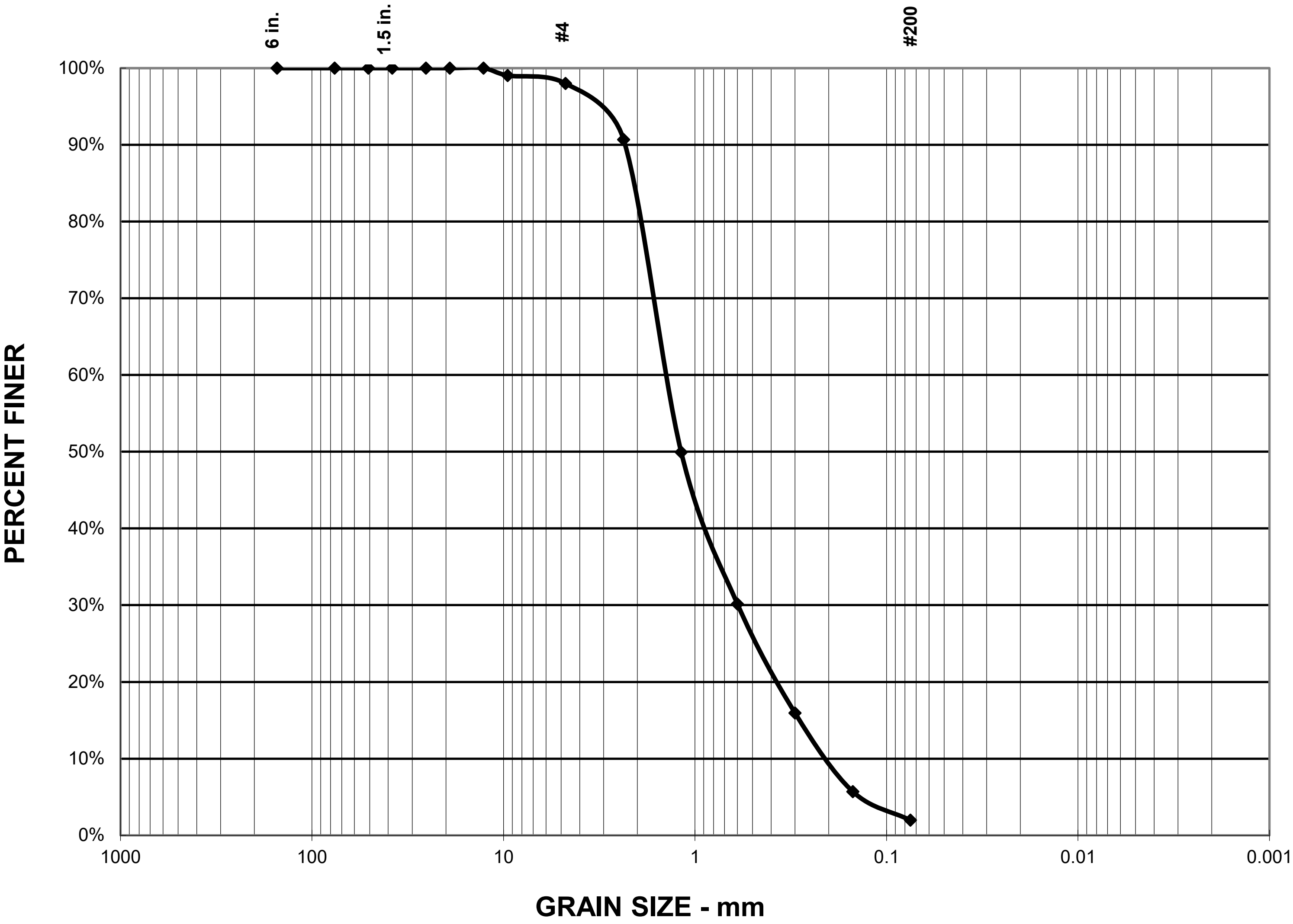
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/11/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 2%

% SAND = 96%

% SILT & CLAY = 2%

Project No.: 200-20043-20001-03 (LA0590C)

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Date sampled: 04/30/20

Location: VS-HSA-5 @10-11.5', S-2

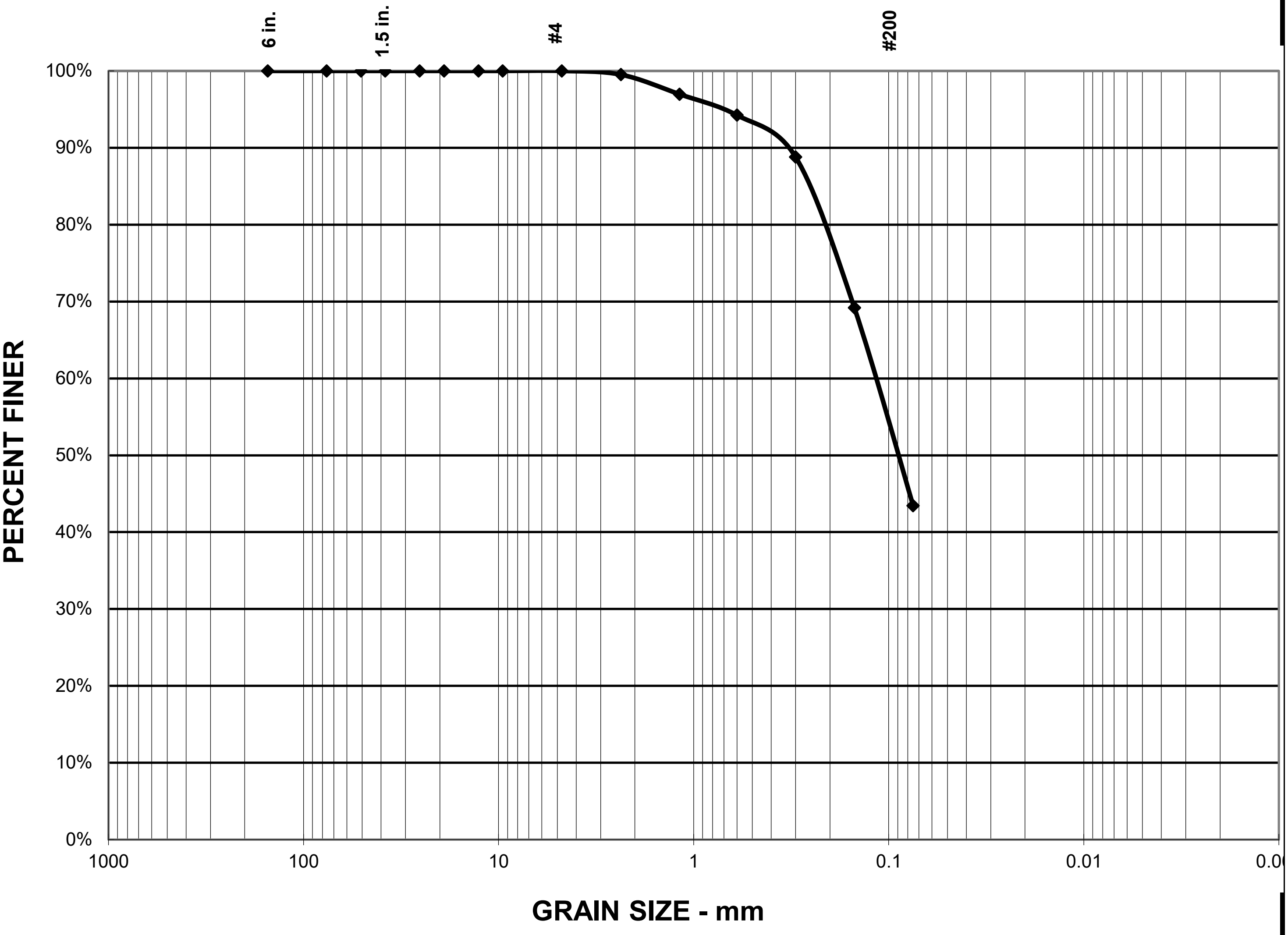
Soil Description: Well Graded Sand (SW)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VS-HSA-5 S-2***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM C117 & C136

TEST SUMMARY

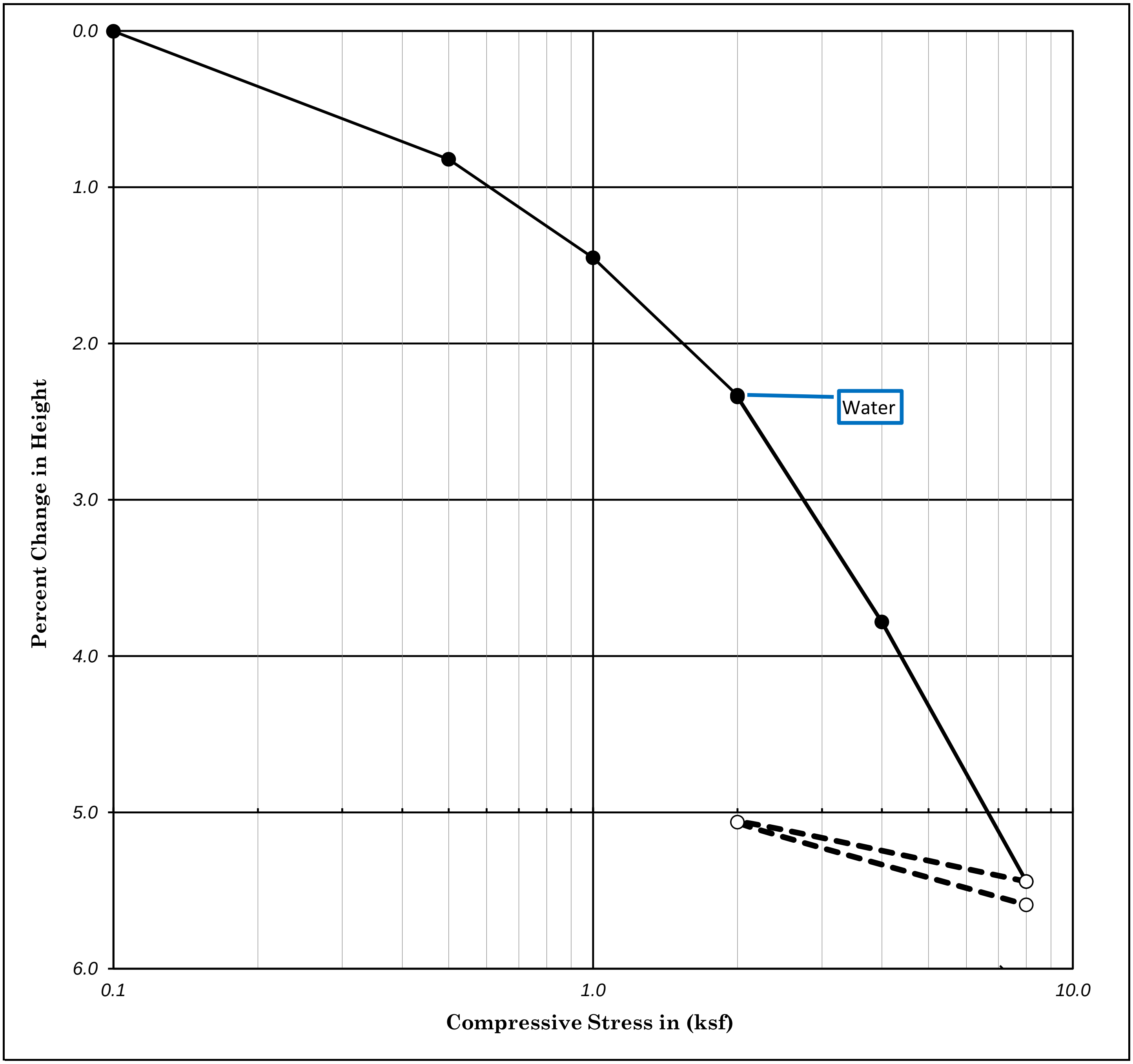
% GRAVEL =	0%
% SAND =	57%
% SILT & CLAY =	43%

Project No.:	200-20043-20001-03 (LA0590C)
Project Name:	TOS-25 Valley Plaza Park South Stormwater Capture
Date sampled:	04/30/20
Location:	VD-HSA-5 @30-31.5', S-6
Soil Description:	Sandy Elastic Silt (ML)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***VS-HSA-5 S-6***



							Moisture Content (%)	Dry Density (pcf)		Percent Saturation	Void Ratio
Boring No.	:	VS-HSA-3		**Liquid Limit :**	N.T.						
Sample No.	:	S-5A		**Plastic Limit :**	N.T.						
Depth	**(ft)** :	26'-26.5'		**Plastic Index :**	N.T.	**Initial**	16.1	111.6		85.2	0.51
				Specific Gravity :	2.70	**Final**	17.1	118.2		100.00	0.43

Description : Sandy Silt (SM-ML)

TOS -25 Valley Plaza Park South Stormwater Capture

CONSOLIDATION TEST

(ASTM D-2435)

Project No. : 200-20043-200001-03 **Date :** 05/12/20

Drawing No. : HSA-3

PERCENT PASSING NO. 200 SIEVE

ASTM D1140

Client: California Testing & Inspections, Inc.

AP Lab No.: 20-0431

Project Name: TOS-25 Valley Plaza Park South Stormwater Capture

Test Date: 05/06/20

Project Number: 200-20043-20001-03 (LA0590C)

Boring No.	Sample No.	Depth (ft)	Percent Fines (%)
VS-HSA-1	SH-1	20-22.5	41.5

AP Engineering and Testing, Inc.
DBE|MBE|SBE
2607 Pomona Boulevard | Pomona, CA 91768
t. 909.869.6316 | f. 909.869.6318 | www.aplaboratory.com

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	TOS-25 ValleyPlazaPark South Stormwater Capture	Tested by:	ST	Date:	05-11-20
Project No.:	200-20043-20001-03 (LA0590C)	Input Data by:	JP	Date:	05-12-20
Boring No.:	VS-HSA-1	Reviewed by:	AP	Date:	05-15-20
Sample No.:	SH-1				
Depth (feet):	20-22.5	Sample Type:	Shelby Tube	Confining Pressure = 11.0 psi	
Soil Description:	Silty Fine Sand				

Diameter (in)	2.840	2.851	2.865	Avg. =	2.852
Height (in)	5.996	6.003	6.007	Avg. =	6.002

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	6.388	6.401
Moisture Content (%)	13.95	27.32
Wet Weight (gms)	266.32	1436.64
Dry Weight (gms)	251.28	1175.50
Container Weight (gms)	143.45	219.79
Density and Saturation		
Wet Weight (gms)	1100.43	
Container Weight (gms)	0.00	
Wet Density (pcf)	109.3	
Dry Density (pcf)	95.9	
Initial Void Ratio	0.756	
% Saturation	49.8	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 96

Consolidation

Cell Pressure (psi) =	71.0	Initial Burette Ht.(cm)=	66.9
Back Pressure(psi) =	60.0	Final Burette Ht.(cm)=	59.3
Eff. Consol. Stress (psi) =	11.0	Final Height (in)=	5.918
Induced OCR =	1.0	Initial Volume (cu.in)=	38.343
Change in Ht. of Specimen (in) =	0.0845	Final Volume (cu.in) =	37.879

Shear

		At Failure	
Rate of Deformation (in/min)=	0.004	Max. Deviator Stress (ksf) =	1.02
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.60
Failure Mode:	Bulging Failure	Eff. Major Principal stress (ksf) =	1.62
		Axial Strain (%) =	1.36

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	TOS-25 ValleyPlazaPark South Stormwater Captur	Cell Pressure:	71.0	psi
Project No.:	200-20043-20001-03 (LA0590C)	Back Pressure :	60.0	psi
Boring No.:	VS-HSA-1	Consolidation Pressure :	11.0	psi
Sample No.:	SH-1	Initial Sample Height:	6.002	in
Depth (feet):	20-22.5	Initial Area of Sample:	6.388	sq. in.
Sample Type:	Shelby Tube	Final Sample Ht.* (L):	5.918	in
Soil Description:	Silty Fine Sand	Final Sample Area (A)*:	6.401	sq. in.
		Induced OCR=	1.0	

Cell Pressure (psi)	Load (lbs)	Axial Deformation (in)	Back Pressure (psi)	Stress Ratio (S1'/S3')	Deviator Stress (S1-S3) (ksf)	Axial Strain (%)	Pore Pressure Change (ksf)	Shear Stress q' (S1-S3)/2 (ksf)	Normal Stress p' (S1'+S3')/2 (ksf)
71.0	0	0.000	60.0	1.00	0.00	0.00	0.00	0.00	1.58
71.0	24	0.005	61.9	1.41	0.54	0.08	0.28	0.27	1.57
71.0	32	0.010	62.9	1.62	0.72	0.17	0.42	0.36	1.53
71.0	36	0.015	63.6	1.75	0.80	0.25	0.52	0.40	1.47
71.0	38	0.020	64.1	1.85	0.85	0.34	0.59	0.42	1.42
71.0	40	0.025	64.6	1.96	0.89	0.42	0.66	0.44	1.37
71.0	41	0.030	65.0	2.05	0.91	0.51	0.72	0.46	1.32
71.0	42	0.035	65.3	2.14	0.94	0.59	0.76	0.47	1.29
71.0	43	0.040	65.6	2.21	0.95	0.68	0.80	0.48	1.26
71.0	43	0.045	65.8	2.29	0.97	0.76	0.83	0.48	1.24
71.0	44	0.050	66.0	2.36	0.98	0.84	0.86	0.49	1.21
71.0	46	0.080	66.8	2.70	1.02	1.36	0.98	0.51	1.11
71.0	46	0.120	67.5	2.98	1.01	2.03	1.07	0.51	1.02
71.0	46	0.162	67.8	3.15	1.00	2.73	1.12	0.50	0.96
71.0	45	0.204	68.0	3.29	0.98	3.44	1.15	0.49	0.92
71.0	45	0.244	68.2	3.37	0.97	4.13	1.18	0.48	0.89
71.0	45	0.286	68.3	3.45	0.96	4.82	1.19	0.48	0.87
71.0	45	0.327	68.4	3.51	0.95	5.53	1.21	0.47	0.85
71.0	45	0.367	68.5	3.58	0.94	6.21	1.22	0.47	0.84
71.0	45	0.409	68.5	3.59	0.93	6.91	1.22	0.47	0.83
71.0	45	0.450	68.6	3.66	0.94	7.60	1.23	0.47	0.82
71.0	45	0.491	68.6	3.66	0.93	8.29	1.24	0.46	0.81
71.0	45	0.532	68.6	3.70	0.93	8.99	1.24	0.46	0.81
71.0	46	0.574	68.6	3.73	0.93	9.71	1.24	0.46	0.80
71.0	46	0.615	68.7	3.74	0.92	10.39	1.25	0.46	0.80
71.0	46	0.656	68.7	3.75	0.92	11.09	1.25	0.46	0.79
71.0	47	0.697	68.7	3.77	0.92	11.79	1.25	0.46	0.79
71.0	47	0.739	68.7	3.77	0.92	12.48	1.25	0.46	0.79
71.0	47	0.780	68.7	3.77	0.91	13.18	1.25	0.46	0.79
71.0	48	0.822	68.7	3.81	0.92	13.89	1.26	0.46	0.79
71.0	48	0.862	68.7	3.79	0.91	14.57	1.26	0.46	0.79
71.0	48	0.905	68.7	3.81	0.91	15.29	1.26	0.46	0.78

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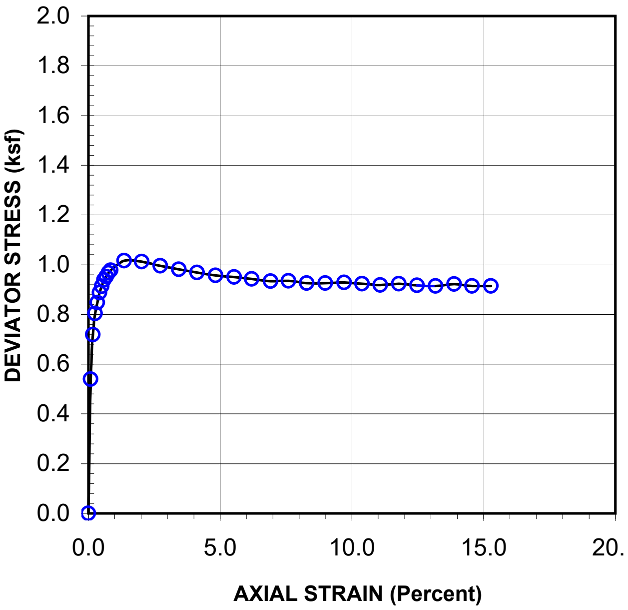

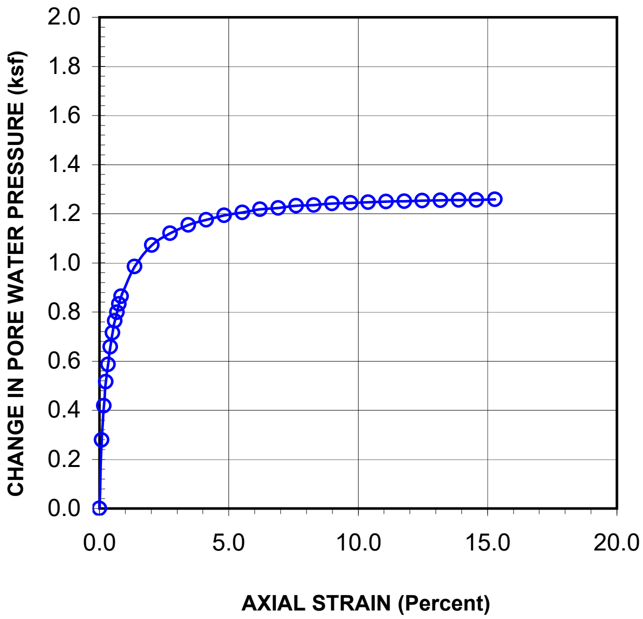

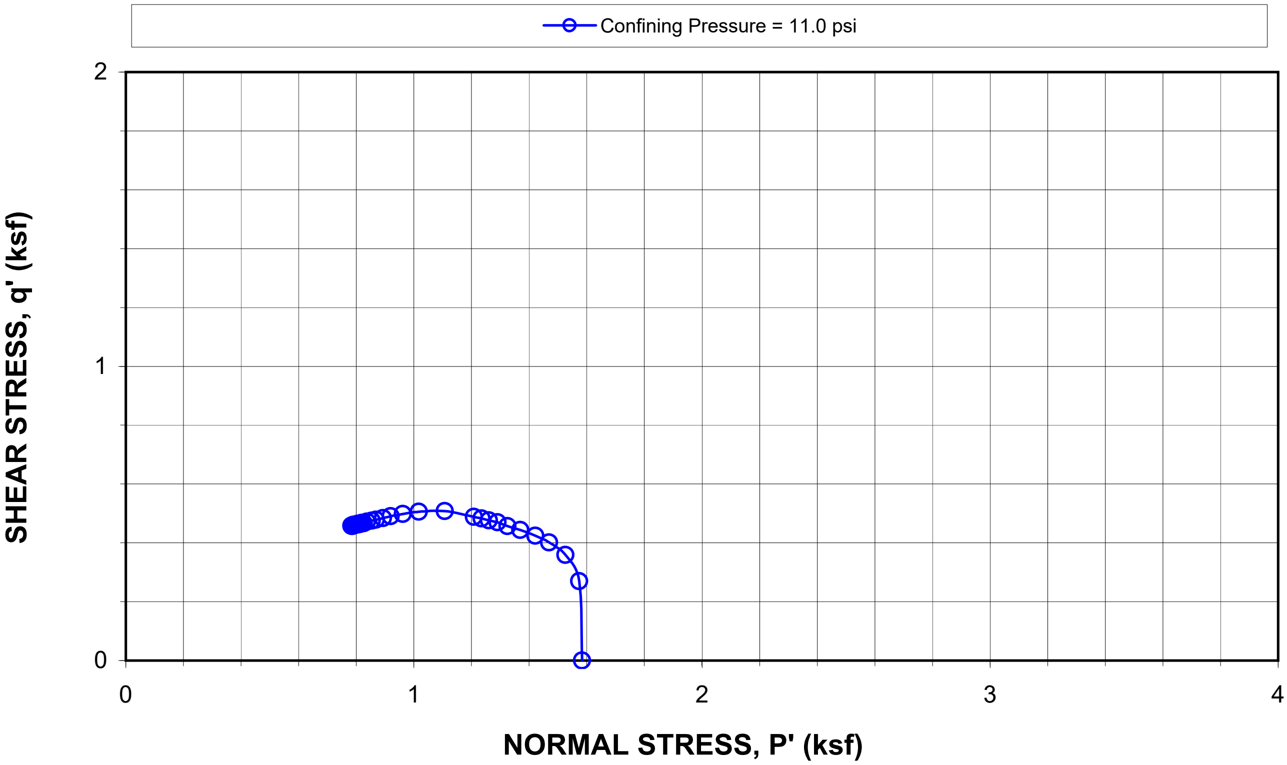

Project Name:	TOS-25 ValleyPlazaPark South Stor	Sample Type:	Shelby Tube
Project No.:	200-20043-20001-03 (LA0590C)	Soil Description:	Silty Fine Sand
Boring No.:	VS-HSA-1	Dry Unit Weight (pcf):	100.4
Sample No.:	SH-1	Initial Moisture Content (%):	16.0
Depth (feet):	20-22.5	Confining Pressures:	11.0 psi

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

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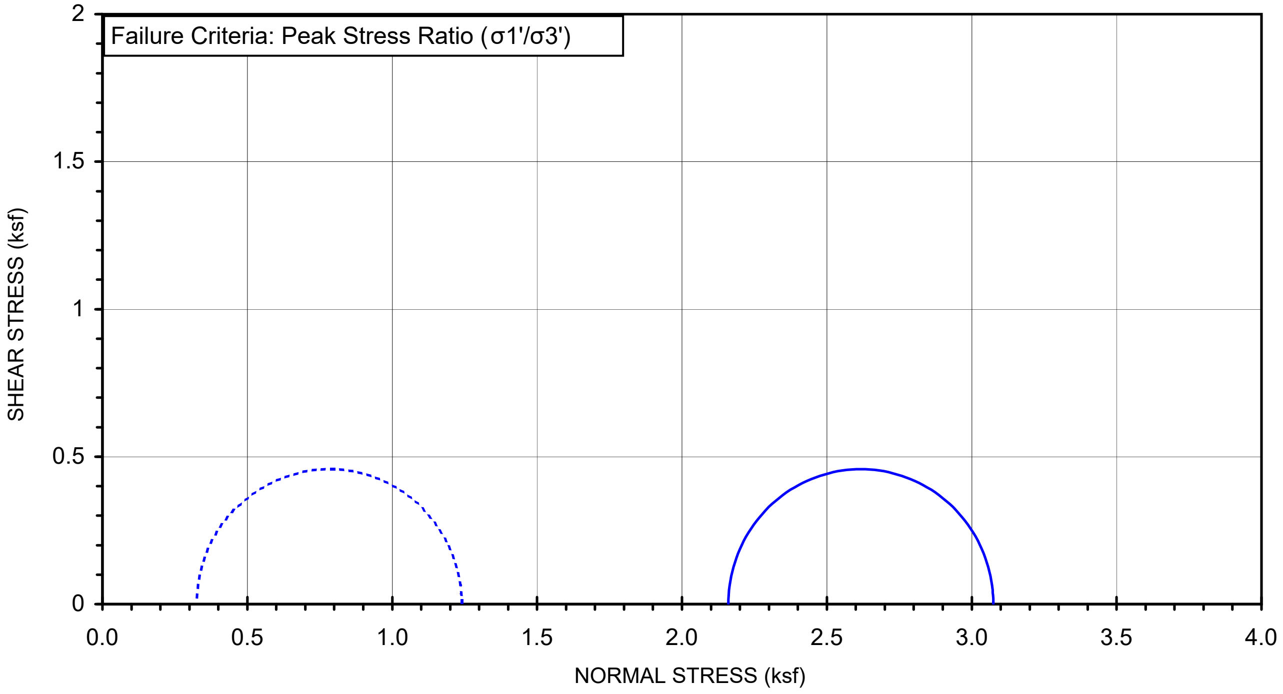

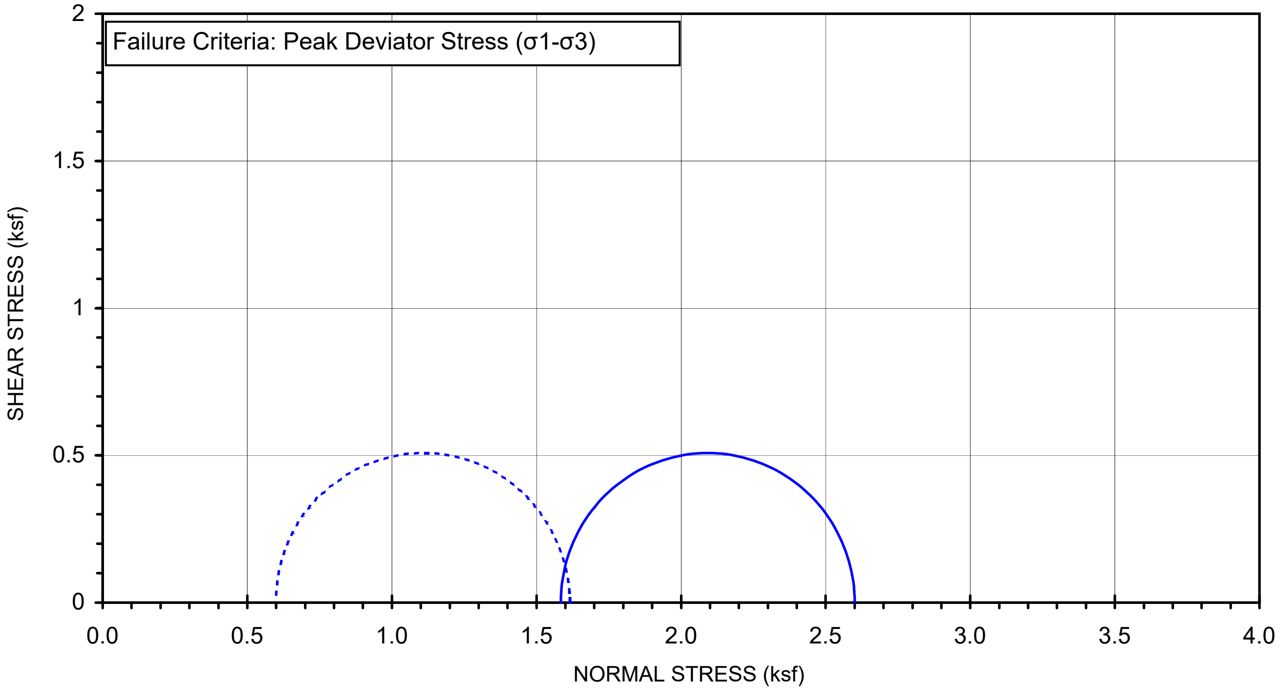

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CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

2.4.2 Hydrology and Hydraulics

A draft Hydrology and Hydraulics Memorandum, compiled during the preliminary design phase, can be found in the following pages.

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DRAFT Memorandum

Date: 29 June 2020

To: Tim Joyce, Jason Fussel and Sam Sarkar, Tetra Tech Inc

From: Curtis Fang, Geosyntec Consultants

Subject: TOS 25: Stormwater Capture Parks - Valley Plaza Park North Preliminary Hydrology Analysis

STATEMENT OF PURPOSE

The purpose of this memorandum is to summarize the methodology of a hydrology analysis performed to estimate the 24-hour stormwater runoff volume and the average annual infiltration volumes captured by a wide range of stormwater Best Management Practices (BMPs) configurations at Valley Plaza North Park (Project). The methodology includes event-based and long-term historical continuous simulation using the Los Angeles County Flood Control District (LACFCD)'s Watershed Management Modeling System (WMMS) to estimate the 24-hour stormwater management volume and the average annual infiltration volumes for various BMP configurations and dimensions.

PROJECT BACKGROUND

The Project site is located at 12240 Archwood Street, North Hollywood. Based on the current design concept, the primary BMPs selected for installation includes underground infiltration galleries and drywells. Dry and wet weather runoff are diverted to the Project site from the nearby 144-inch by 126-inch flood conveyance channel. The original project drainage area shown in the Project Concept Report *Valley Plaza Park North Stormwater Capture Project, Conceptual Study Report*, by the City of Los Angeles, Department of Water and Power, dated October 2018 (LADWP, 2018) is 830 acres. Geosyntec conducted a desktop screening analysis and refined the drainage area by reviewing both topographic data and existing storm drain infrastructure as-builts[1] As shown in Figure 1, the revised Project drainage area is 921 acres and is roughly bounded by

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[1] As-builts were downloaded from the Los Angeles County Storm Drain System webpage (LACPW, 2020)

Roscoe Blvd to the north, Highway 170 to the west., Hart St. to the south, and Lankershim Blvd to the east.

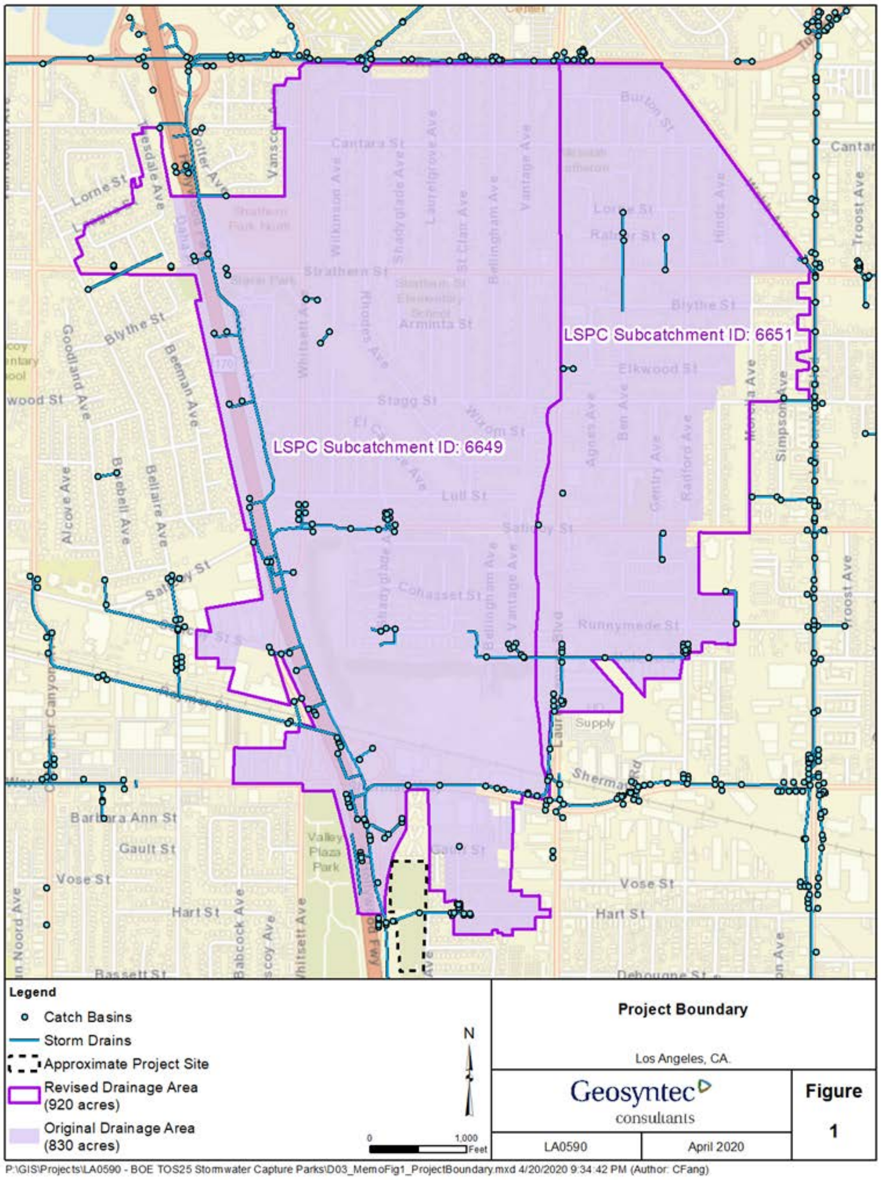

Figure 1: Project Boundary

WMMS MODEL

The hydrology analysis included the development of a WMMS model to perform event-based and long-term continuous simulation. The baseline WMMS model was developed by LACFCD in August 2013 for all major watershed within Los Angeles County. WMMS contains two major components: a Loading Simulation Program in C++ (LSPC), which is a watershed modelling system to simulate runoff and pollutant loading; and a System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN), which utilizes LSPC model output and evaluates BMP performance in terms of pollutant load reduction and runoff volume reduction.

For the hydrology analysis, the baseline LSPC model was modified by editing the subwatershed boundary and hydrologic response unit (HRU) parameters to simulate dry and wet weather runoff from the project Drainage area. A SUSTAIN model was then developed to determine the 24-hour stormwater runoff management volume over a 85th percentile 24-hour storm, and determine and the average annual stormwater capture volumes over a long-term continuous simulation using 20 years of historical precipitation data. This section describes the inputs used, the proposed sizing scenario and the results. It is assumed that the baseline LSPC model has been calibrated by LACFCD to reflect the hydrologic condition within each watershed in Los Angeles County. Default parameters were used unless site-specific modification was required (e.g. subwatershed boundary)

Assumptions and Approach

The WMMS input parameters assumed for each scenario included:

- **Subwatershed and Imperviousness**: As shown in Figure 1, the revised Project drainage area overlaps with the original LSPC subwatershed 6649 and 6651. Boundaries of subwatershed 6649 and 6651 were then modified based on the revised Project drainage area. The Project drainage area imperviousness was updated using the Hydrologic Response Unit (HRU) breakdown spreadsheet obtained from the Los Angeles County Public Works website[2]. The resultant drainage landuse and impervious breakdown is summarized in Table 1.

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[2] https://dpw.lacounty.gov/wmd/wmms/docs/xls/HRUBreakdown.xlsx

Table 1 Drainage Area Land Use and Impervious Characteristics

Land Use Classification	Approximate Area (acres)	% Impervious
Agriculture (Moderate Slope)	12.5	15.7
Commercial	30.6	88.5
High Density Single Family Residential	401.3	39.4
Industrial	134.6	72.3
Institutional	10.8	82.0
Low Density Single Family Residential	12.6	10.3
Multifamily Residential	58.0	58.2
Secondary Roads	202.7	49.2
Transportation	54.5	90.7
Vacant (Moderate Slope)	3.2	1.2
Total	**920.8**	**51.9**

- **Precipitation and Model Run Time:** Taken directly from the baseline WMMS model, the default rain gauges assigned to 6649 and 6651 and model run time (10/11991–09/302011) were used for the long-term continuous simulation.

  The 85th-percentiel 24-hour design storm developed in according with Los Angeles County Hydrology Manual was used for the event-based model simulation. Based on the drainage area wide average value, according to Los Angeles County 85th percentile 24-hour rainfall isohyetal map, the 24-hr storm equates to 1.1 inches (LACPW, 2004).

- **Stormwater and Dry-weather Runoff and Pollutant Load Estimate:** The WMMS model simulation estimated the wet weather runoff based on the drainage area characteristics and precipitation pattern; and dry weather runoff as a function of irrigated pervious landuse area. The WMMS model relies on the Los Angeles County Event Mean Concentrations (EMCs) to estimate pollutant loading based on land use group for stormwater and dry-weather runoff.

- **Soils:** Taken directly from the baseline WMMS model, the default WMMS soil parameters adopted from subwatersheds 6649 and 6651 were used in the simulation.

- **Routing:** Upon review of City of Los Angeles Drainage Map[3], the default WMMS subwatershed routing was used for the runoff volume simulation in LSPC model simulation. Since subwatershed 6649 is the most downstream subwatershed, the hourly outflow rate from subwatershed 6649 is representative of the outflow from the entire Project drainage area. This output was then used as input for the SUSTAIN model simulation.

  A simplified routing network as illustrated in Figure 2 was set up to evaluate BMP configuration and dimension in the SUSTAIN model run.

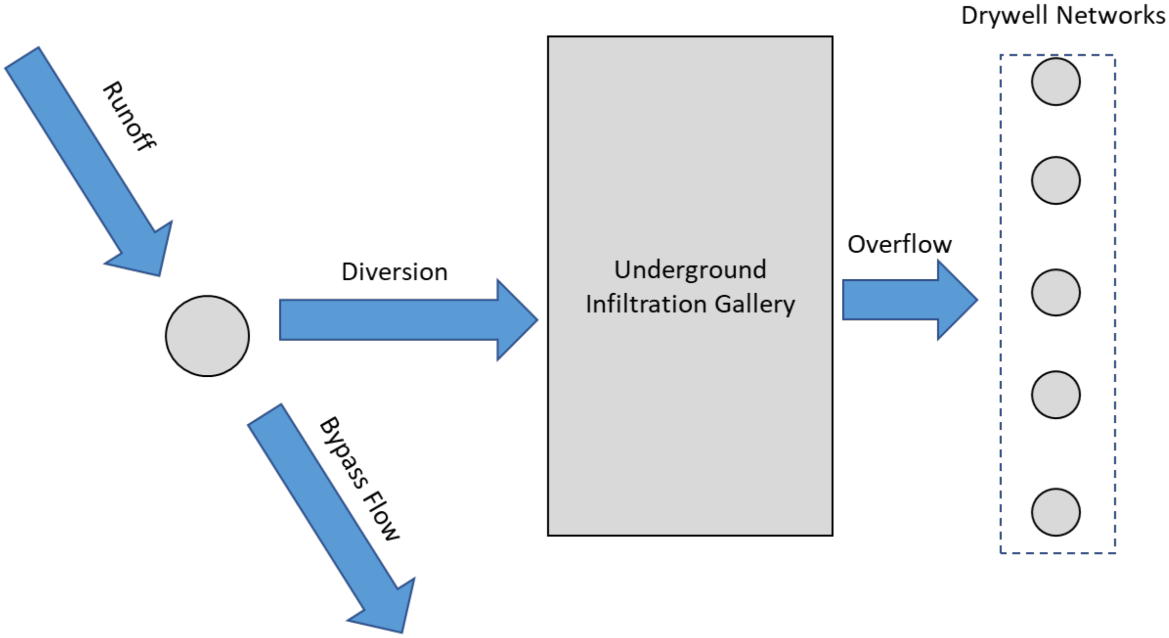

Figure 2. SUSTAIN Routing network

- **Underground Infiltration Gallery:** The Underground Infiltration Gallery was modelled as an unlined dry pond in the SUSTAIN model. The infiltration process was modelled using Holtan's equation, which is the default method used to evaluate the infiltration capacity of a dry pond in SUSTAIN. It was assumed that there was no vegetation growth at the bottom of the gallery, and the infiltration rate did not vary temporally. The

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[3] City of Los Angeles Drainage Map was downloaded from Navigate LA (LABOE, 2020)

evaporation process was disabled. Based on recommendation from the site geotechnical investigation, a saturated hydraulic conductivity of 2.3 inches/hour was used to model the infiltration capacity of the gallery. The storage capacity of the gallery was simplified into a cubic shape. The storage capacity approximated volume was based on the gallery dimension (length, width and depth).

- **Drywell:** Based on recommendation from the site and preliminary concept drawing, each drywell was modelled to provide 322 cubic-feet storage and 0.5 cubic feet per second **(**cfs) infiltration rate. This value is consistent with preliminary design capacities for drywells in the San Fernando Valley. To simplify model setup, all proposed drywells are modelled as one storage unit, with storage and infiltration capacity equivalent to the sum of all proposed drywells.

Modelling Output: Existing Hydrology and Water Quality

An overview of the WMMS modelling output showing existing hydrology and is presented in Table 2. Timeseries of runoff simulated by the WMMS model for water years 1991 to 2011 for the Project's drainage area is shown in Figure 3. Timeseries of stormwater runoff simulated by the WMMS model for the 85th-percentile 24-hour design storm is shown in Figure 4.

Table 2 Existing Hydrology Summary

Event-based Simulation			
85th-Percentile, 24-hour Storm Peak Discharge (cubic feet per second, cfs)	135		
85th-Percentile, 24-hour Storm Total Runoff (acre-feet, AF)	64		
Long-Term Simulation			
	Average	**Min [Water Year]**	**Max [Water Year]**
Wet Weather Runoff (AFY)	734	127 [2007]	1817 [2005]
Dry Weather Runoff (AFY)	192	97 [2007]	257 [2005]
Total Runoff (AFY)	926	225 [2007]	2073 [2005]

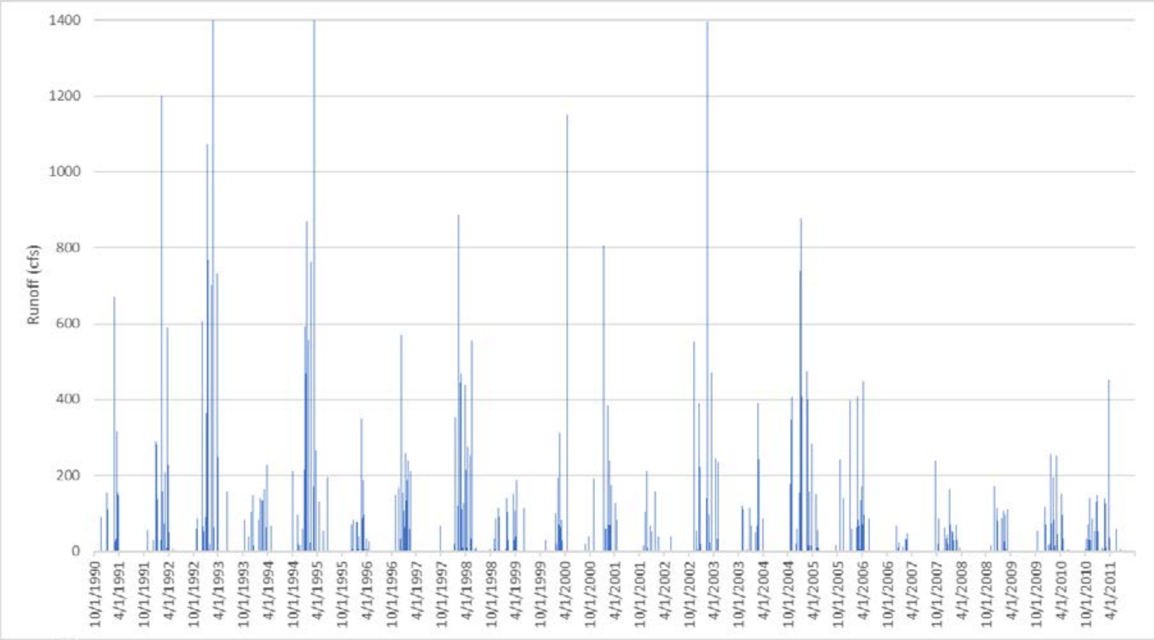

Figure 3. WMMS Simulated Historic Runoff Timeseries

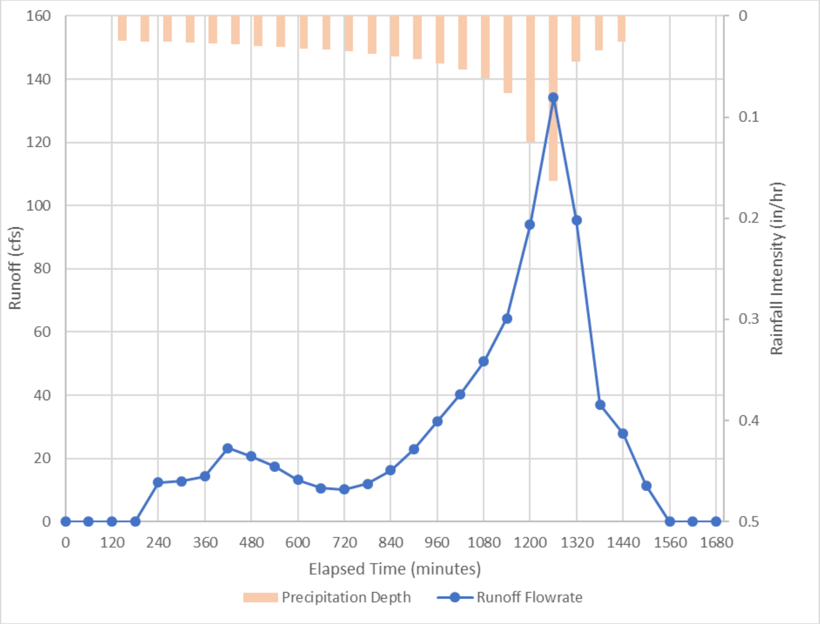

Figure 4. WMMS 85th Percentile 24-Hour Runoff Timeseries

An overview of the WMMS modelling output showing existing water quality condition of the Project's drainage area is shown in Table 3.

Table 3 Existing Hydrology Summary

Pollutant	Dry Weather Mass Loading			Wet Weather Mass Loading			Total Mass Loading		
	Average	Min [Year]	Max [Year]	Average	Min [Year]	Max [Year]	Average	Min [Year]	Max [Year]
TN (lbs/year)	18.3	0.1 [2002]	45 [1998]	3588	612 [2002]	8885 [2005]	3606	612 [2002]	8923 [2005]
TP (lbs/year)	10.2	0.1 [2002]	25 [1998]	2662	470 [2002]	6430 [2005]	2672	470 [2002]	6451 [2005]
Cu (lbs/year)	0.0	0	0	34	10 [2002]	89 [1993]	34	10 [2002]	89 [1993]
Pb (lbs/year)	0.0	0	0	29	9 [2002]	54 [1993]	29	9 [2002]	54 [1993]
Zn (lbs/year)	0.0	0	0	308	95 [2002]	530 [1993]	308	95 [2002]	530 [1993]
Fecal (MPN/year)	3E+11	1.7E+09 [2002]	7.1E+11 [1998]	4.8E+13	8.1E+12 [2002]	1.2E+14 [2005]	4.8E+13	8.1E+12 [2002]	1.2E+14 [2005]

Modelling Output: BMP Sizing Analysis

Based on the current design concept, the performance of three key design parameters were evaluated using the WMMS model: the diversion rate, number of drywells, and infiltration gallery footprint.

Table 4 summarizes the input range of the three design variables. The range of the diversion rate was selected to include the diversion rate proposed in the concept report and the minimum diversion rate needed to achieve Project performance criteria as discussed in Section 3.3.1 of the main report. The maximum infiltration gallery area of 3.67 acres was selected, consistent with the recommended configuration from the Concept Report. The maximum number of drywells of 100 was determined to match the maximum diversion rate of 50 cfs

Table 4 Evaluated Range of Design Parameters

Design Parameter	**Input Range**
Diversion Rate	30 & 50 cfs
Number of Drywells	0 – 100
Infiltration Gallery Footprint	0– 3.67 acres

BMP Sizing charts were developed as scatter plots showing the correlation between design parameters and the annual average capture yield, and between design parameters 24-hour stormwater runoff management volume, which is computed as the ratio between infiltrated runoff and the total inflow over the entire simulation, are shown in Figure 5 and Figure 6 respectively.

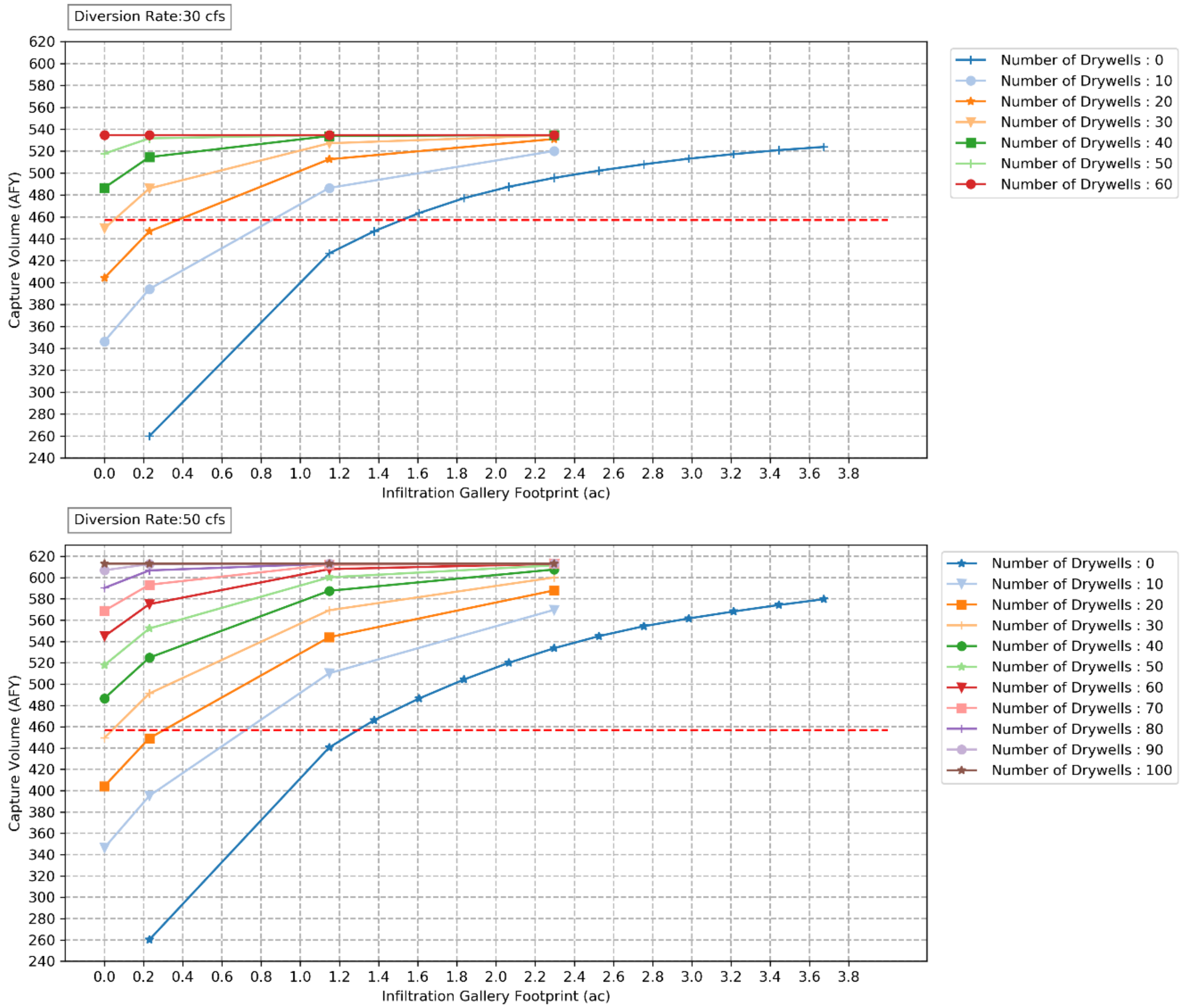

Figure 5. Correlation between Design Parameters and Annual Average Capture Yield

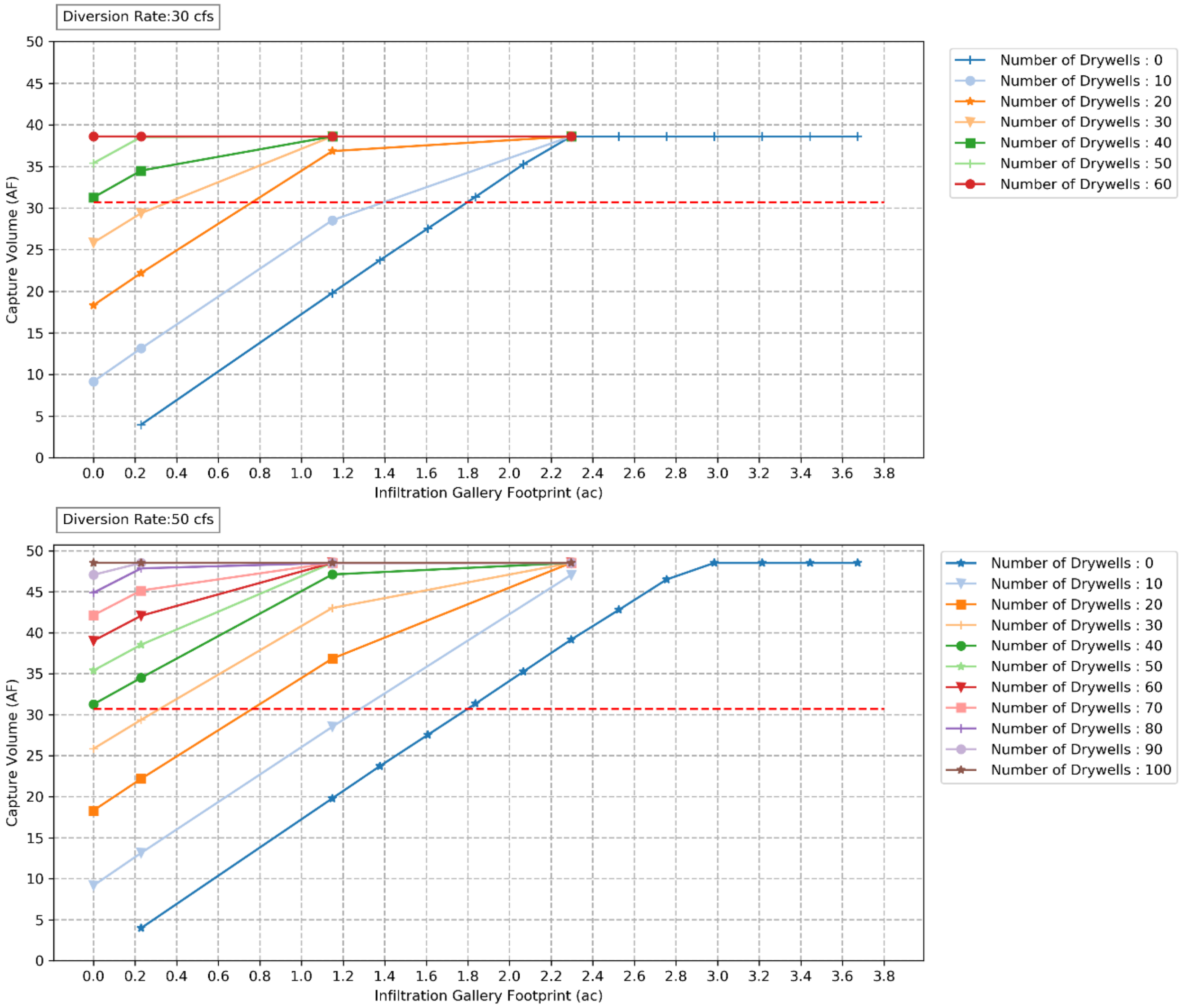

Figure 6. Correlation between Design Parameters and Long-term Capture Efficiency

CONCLUSION AND RECOMMENDATION

Depending on the BMP configuration, the average annual stormwater capture could ranges from 260 acre-feet (ac-ft) up to 615 ac-ft. The 24-hour stormwater runoff management volume ranges from 5 ac-ft to 47 ac-ft.

The presented BMP sizing charts will assist the design team selecting the optimal BMP configuration. The results can be utilized to:

- Identify the optimal BMP configuration using one or multiple constraints, such as construction costs, utility conflicts, and tree interferences.
- Inform the development of hydraulic models that evaluate the impact of the proposed diversion structure to the existing storm channel.
- Inform the development of a hydraulic model and calculation for Project design.

REFERENCES

Los Angeles Bureau of Engineering (LABOE). 2020. *Navigate LA.* https://navigatela.lacity.org/navigatela/

Los Angeles Department of Water and Power (LADWP). 2018. *Valley Plaza Park North Stormwater Capture Project, Conceptual Study*. October

Los Angeles County Flood Control District (LACFCD). 2013. *Watershed Management Modelling System (WMMS)*. https://pw.lacounty.gov/wmd/wmms/default.aspx. August.

Los Angeles County Public Works (LACPW). 2020. *Los Angeles County Storm Drain System.* https://pw.lacounty.gov/fcd/stormdrain/disclaimer.cfm

Los Angeles County Public Works (LACPW), 2004. Analysis of the 85th Percentile 24-hour Rainfall Depth Analysis Within the County of Los Angeles. https://ladpw.org/wrd/publication/engineering/Final_Report-Probability_Analysis_of_85th_Percentile_24-hr_Rainfall1.pdf

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TETRA TECH

MEMO

To: Bryan Powell, Wirikit Wichianchan, Amy Lam (City of Los Angeles)

From: Sam Sarkar, PE, Maureen Harris, PE, Jason Wright, PE, Tim Joyce, PE, and Jason Fussel, PE (Tetra Tech)

Date: June 15, 2020

Subject: Task Order Solicitation (TOS) No. 25: Valley Plaza South Stormwater Capture Project – Hydrologic and Hydraulic (H&H) Modeling Technical Memorandum (DRAFT)

This memorandum transmits the results of the hydrologic and hydraulic (H&H) analysis for the proposed stormwater capture project at Valley Plaza Park South.

1.0 Introduction

1.1 Los Angeles Stormwater Capture Parks Program

The Los Angeles Department of Water and Power (LADWP) and the Los Angeles Department of Public Works Bureau of Engineering (BOE) are committed to pursuing the Stormwater Capture Parks Program (Program). The goal of the Program is to alleviate local flooding, increase water supplies through stormwater capture, improve water quality, and provide recreational, social, and economic benefits. The Program will incorporate innovative techniques and emerging technologies to capture and infiltrate stormwater.

The Program will capture up to 2,912 acre-feet of stormwater and urban runoff per year from a 5,686-acre drainage area and divert the runoff into subterranean infiltration galleries or other stormwater capture and infiltration infrastructures located under the City of Los Angeles (City) parks for infiltration into the underlying groundwater basin. The Program consists of nine (9) Projects (Project(s)) located in the San Fernando Valley in Council Districts 2, 6, and 7.

1.2 Valley Plaza South Overview and Objectives

As part of the Los Angeles Stormwater Capture Parks Program, a stormwater capture project is proposed for Valley Plaza Park South. This park is located in the North Hollywood neighborhood south of Vanowen Street between State Route 170 (SR-170) and St. Clair Avenue (Figure 1) and is owned by the City of Los Angeles Department of Recreation and Parks. Valley Plaza Park South is one of nine City-owned parks within the North Hollywood area that are under consideration for inclusion in the Program.

A stormwater capture project is proposed to divert, store, and infiltrate an estimated 136 acre-feet per year (AFY) of stormwater runoff from the Tujunga Wash Central Branch. Tetra Tech has conducted a hydrologic and hydraulic (H&H) modeling analysis to evaluate the feasibility of a project to capture the 136 AFY volume goal. This memorandum presents the results of the H&H modeling analysis.

Figure 1. Valley Plaza Park South potential stormwater capture project location

2.0 Current Conditions

2.1 Drainage Area Delineation and Land Use

The initial drainage area for the Valley Plaza Park South project provided by LADWP was refined based on the City of Los Angeles “Drainage Subareas”[1] shapefile and subsequently verified using the Los Angeles County 1-meter resolution LiDAR-based digital elevation model (DEM). The most recent version (at the time of this report) of the Los Angeles County’s Watershed Management Modeling System (WMMS) formed the basis for the land use, and runoff and pollutant load timeseries for the hydrologic modeling analysis. WMMS incorporates the Loading Simulation Program C++ (LSPC) simulation model to establish runoff volumes and pollutant loads for Los Angeles County watersheds. The current version of WMMS is calibrated for the period of 2002 to 2011.

As discussed above, the proposed stormwater capture project will divert runoff from nearby Tujunga Wash Central Branch. The drainage area for the Valley Plaza South project encompasses several drainage areas upstream that also discharge to Tujunga Wash, including the drainage areas associated with the following projects: Fernangeles Park, Strathern Park North, Valley Plaza North Park, and Whitsett Fields Park. However,

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[1] http://geohub.lacity.org/datasets/drainage-subareas

the hydrologic analysis presented herein only accounts for the runoff and pollutant loads generated from the watershed associated only with the Valley Plaza South Park project. A separate analysis that simultaneously optimizes all nine projects (programmatic analysis) to maximize the total stormwater capture includes the entire upstream drainage area. The land use characteristics of the local watershed based on the WMMS model show that high-density single-family residential and secondary roads are predominant (Table 1). Timeseries of runoff simulated by the WMMS model for water years 2002 to 2011 (10/1/2001 to 9/30/2011) for the Valley Plaza Park South drainage area are shown in Figure 2. The average annual runoff and pollutant loads simulated by WMMS for the same time-period are summarized in Table 2.

Table 1. Land use characteristics of the Valley Plaza South Park contributing drainage area

Land Use Classification	Area (acres)	Impervious Area (acres)
Single-Family Residential (High-Density)	52.9	22.0
Single-Family Residential (Low-Density)	45.4	4.5
Multi-Family Residential	39.0	32.0
Commercial	9.9	9.2
Institutional	2.1	1.9
Industrial	2.7	2.4
Transportation	13.4	12.2
Secondary Roads	44.8	24.1
Vacant (Moderate Slope, HSG D)	2.3	0.0
Total	**212.4**	**108.3**

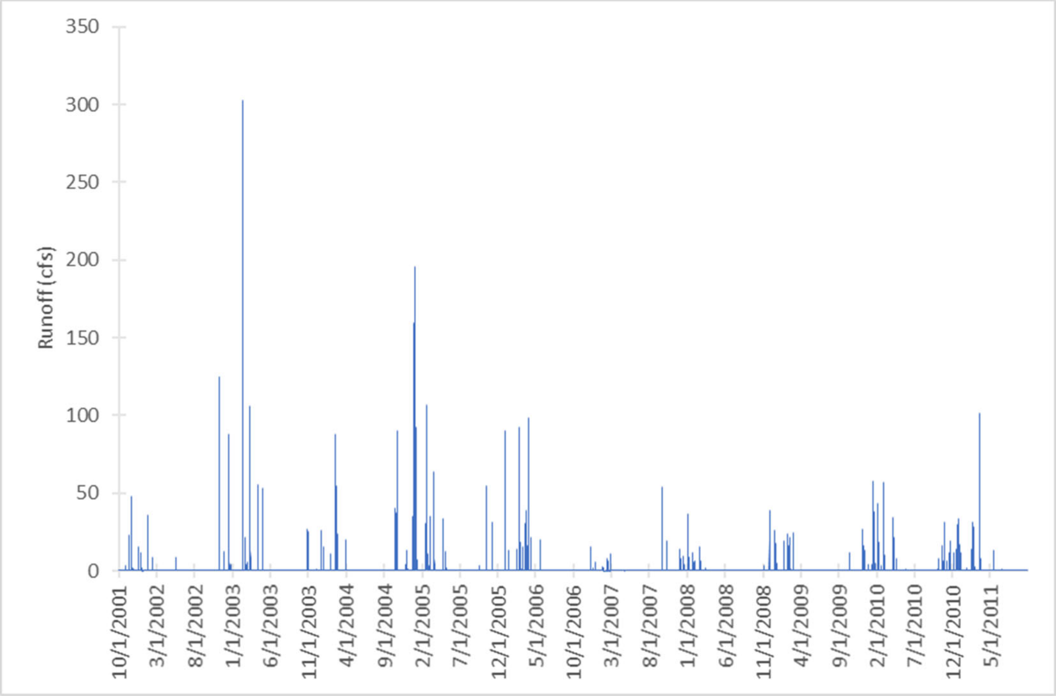

Figure 2. WMMS simulated runoff timeseries for the Valley Plaza Park South

Table 2. WMMS simulated runoff, sediment, nutrients and zinc load for Valley Plaza Park South

Constituent	Runoff (AFY)	Sediment (lbs/year)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	Total Zinc (lbs/year)
Simulated Load	164.4	17,798.6	660.2	521.1	68.4

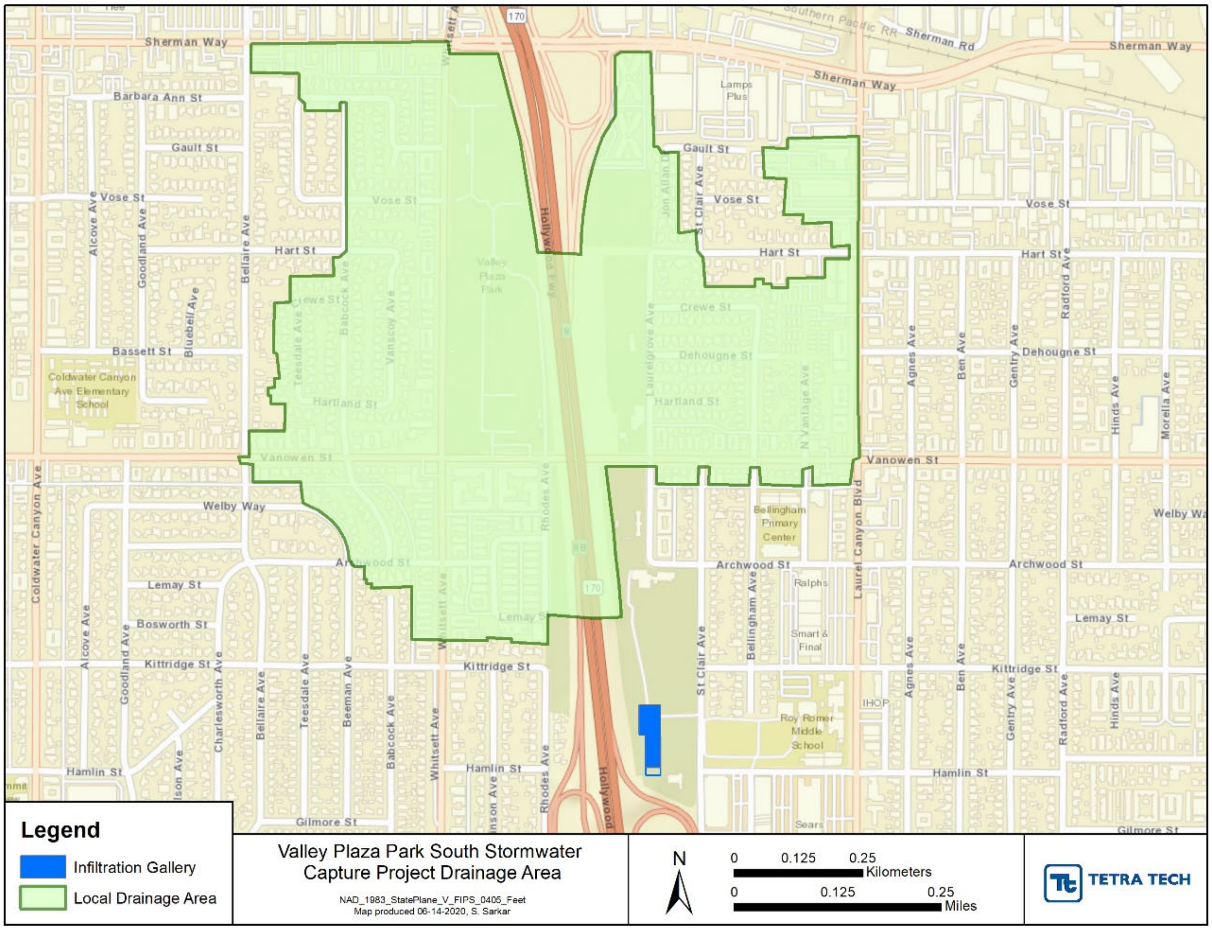

Figure 3. Contributing drainage area for Valley Plaza Park South stormwater capture project

2.2 Geotechnical Investigation

Geotechnical investigations and infiltration testing studies were performed by Geosyntec Consultants, Inc. (Geosyntec) at Valley Plaza Park South between April 13 and April 29, 2020 to support the pre-design planning of the proposed stormwater capture and infiltration facility. An assessment of groundwater levels, subsurface conditions, infiltration capacity, and other general geotechnical and soils parameters necessary for pre-design planning were the focus of the investigation performed (Geosyntec, 2020).

2.2.1 Soil Characterization

A review of the boring logs and geotechnical laboratory test data from samples collected at the five hollow-stem auger borings indicates that the subsurface at the Site predominantly consists of fine to medium Sand with Silt (SW-SM and SP-SM) and Silty Sand (SM). The upper approximately 5 ft is believed to consist generally of artificial fills, while the material below consists of young alluvium. Between the depths of approximately 5 ft and 45 ft below ground surface (bgs), silty sands were encountered with silt contents generally between 20 and 45 percent. At a depth of approximately 25 ft bgs, a 5- to 8-ft thick layer of firm sandy silt with was encountered in the southwestern portion of the Site. Soil below depths of approximately 35 to 45 ft bgs generally consist of Well-Graded Sand with Silt and Gravel (SW-SM).

2.2.2 Groundwater Elevation

Regarding elevation of the seasonal high-water table (SHWT), Geosyntec (2020) reports that groundwater depths in the range of 194 ft bgs to 238 bgs have been measured between 2008 and 2018 at monitoring wells located between 0.5 mile and 2.4 miles from the site. In contrast, a 1997 California Geologic Survey map indicates a “historic high” groundwater level at the site of 45 ft. bgs. Geosyntec (2020) further notes that “wide-scale drawdown of aquifers” has occurred due to development in the region over the last century. Groundwater was not encountered at the depths explored during the geotechnical site investigation.

2.2.3 Design Infiltration Rate

In-situ hydraulic conductivity testing was performed at four shallow (between 15 ft. and 30 ft. bgs) test well locations using two different methodologies. Figure 4 illustrates the locations of the four infiltration test wells. Initial field measurements indicated hydraulic conductivity in the range of $1x10^{-4}$ cm/s to $1x10^{-2}$ cm/s (0.2 in/hr to 20 in/hr).

Based on preliminary conceptual designs for Valley Plaza Park South, the materials in which the stormwater will infiltrate classify predominantly as Silty Sands (SM) and Sands with Silt (SP-SM). However, during the geotechnical investigation a layer of Sandy Silt (ML) was identified in the southwestern portion of the site at a depth of approximately 25 ft bgs, less than 10 ft below the proposed invert of the conceptual stormwater capture system. The measured hydraulic conductivity of the infiltration test performed within this area, test well HSA-1, was found to be an order of magnitude lower than the other three infiltration tests performed at the site. The measured conductivity rate at HSA-1, $1.4x10^{-4}$ cm/s (0.19 in/hr), suggests that soil conditions at the tested depth within this portion of the site may not be favorable for infiltration. For this reason, a “Zone of Reduced Hydraulic Conductivity” was identified within this portion of the site in which infiltration is not recommended. This zone occupies approximately 20 percent of the proposed footprint of the stormwater capture system. However, dry wells can be installed “with screened intervals positioned below a depth of approximately 40 ft bgs” and should be considered for infiltration within this area (Geosyntec, 2020).

The recommended design infiltration rate for Valley Plaza Park South was computed by applying a factor of safety to the geometric mean of the measured hydraulic conductivity values for the tests performed at well locations HAS-2, -3, and -4. The geometric mean was calculated as $5.2x10^{-3}$ cm/s (7.4 in/hr), and, following Los Angeles County guidance (County of Los Angeles, 2017), a safety factor of 2 was applied to the measured value. The recommended design infiltration rate is therefore $2.6x10^{-3}$ cm/s (3.7 in/hr) (Geosyntec, 2020). Table 3 summarizes field measurements for hydraulic conductivity obtained at each test location.

Table 3. Summary of field measured hydraulic conductivity at Valley Plaza Park South (Geosyntec, 2020)

Infiltration Test Well ID[1]	Date Tested	Testing Depth	Soil Type at Depth	Estimated Hydraulic Conductivity (USBR[1]), cm/s (in/hr)	Estimated Hydraulic Conductivity (Hvorslev[2]), cm/s (in/hr)
HSA-1	4/15/2020	20 ft. to 30 ft.	SM, ML	$1.4\text{x}10^{-4}$ (0.19)	$2.0\text{x}10^{-4}$ (0.29)
HSA-2	4/15/2020	20 ft. to 30 ft.	SM	$7.9\text{x}10^{-3}$ (11)	$5.1\text{x}10^{-3}$ (7.2)
HSA-3	4/14/2020	15 ft. to 25 ft.	SM	$2.4\text{x}10^{-3}$ (3.3)	$2.9\text{x}10^{-3}$ (4.1)
HSA-4	4/14/2020	20.6 ft. to 30 ft.	SM, SW	$9.2\text{x}10^{-3}$ (13)	$1.4\text{x}10^{-2}$ (20)

[1] HSA-1 was excluded from calculation of recommended design infiltration rate due to presence of soils unfavorable for infiltration (Geosyntec, 2020)

[2] See (USBR, 2001)

[3] See Fang (1991) and Massmann (2004)

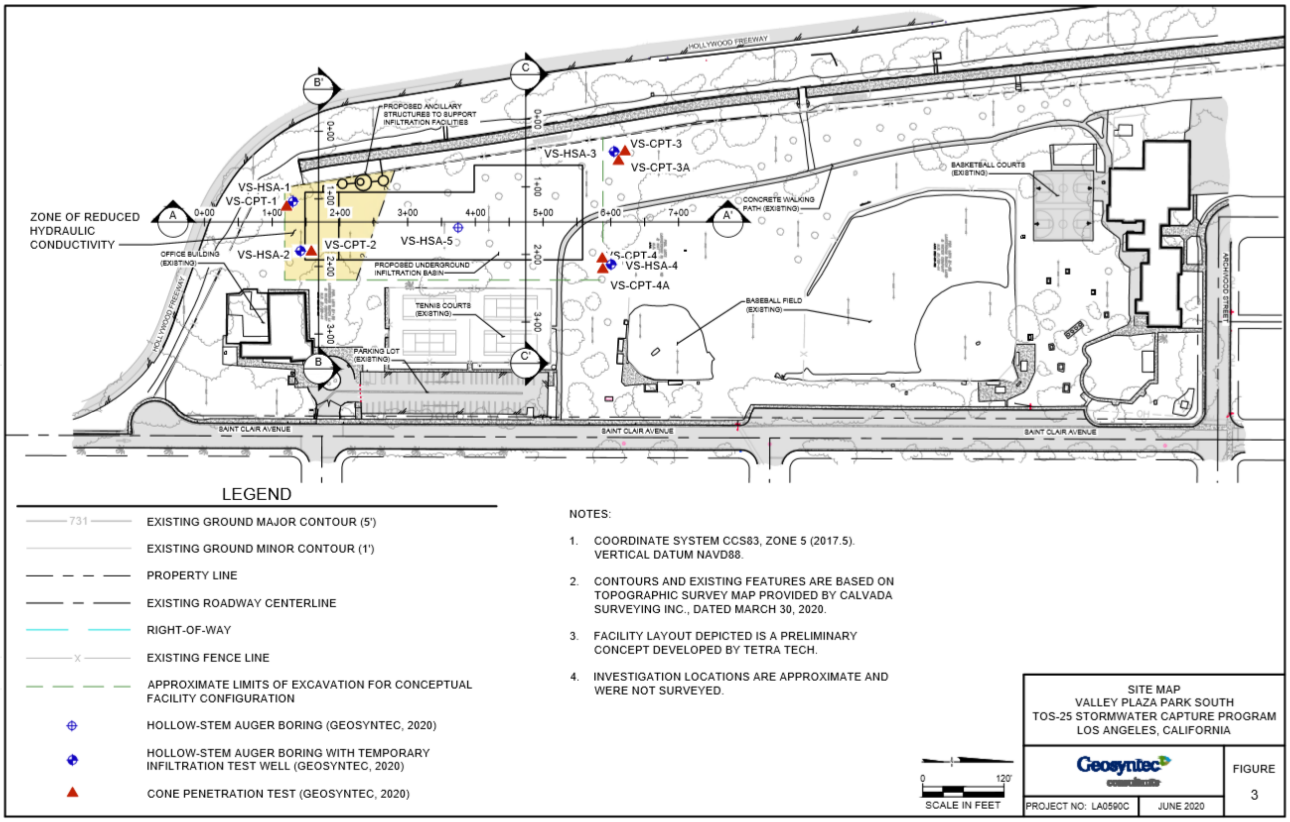

Figure 4. Valley Plaza Park South site map indicating locations of infiltration test wells (Geosyntec, 2020)

3.0 Hydrologic and Hydraulic Modeling

3.1 Optimization Model

The proposed stormwater best management practice (BMP) for Valley Plaza Park South is a subterranean infiltration gallery. Tetra Tech has developed a robust optimization routine to determine the most cost-effective BMP configuration and diversion rate from Tujunga Wash to achieve the annual stormwater volume capture target of 136 AFY. The USEPA System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN) model was applied to perform a wet and dry weather flow analysis for a 10-year continuous simulation (October 1, 2001 through September 30, 2011) utilizing runoff timeseries from the calibrated Los Angeles County WMMS. The optimal regional structural BMP footprint and diversion rate were determined for the Valley Plaza Park South site based on the long-term average annual infiltration (recharge) simulated using SUSTAIN.

A schematic representation of the Valley Plaza Park South SUSTAIN optimization framework is shown in Figure 5. The optimization modeling consisted of varying the diversion rates, infiltration gallery area, and infiltration gallery depth to determine the most cost-effective configurations to meet or exceed the average annual recharge target of 136 AFY.

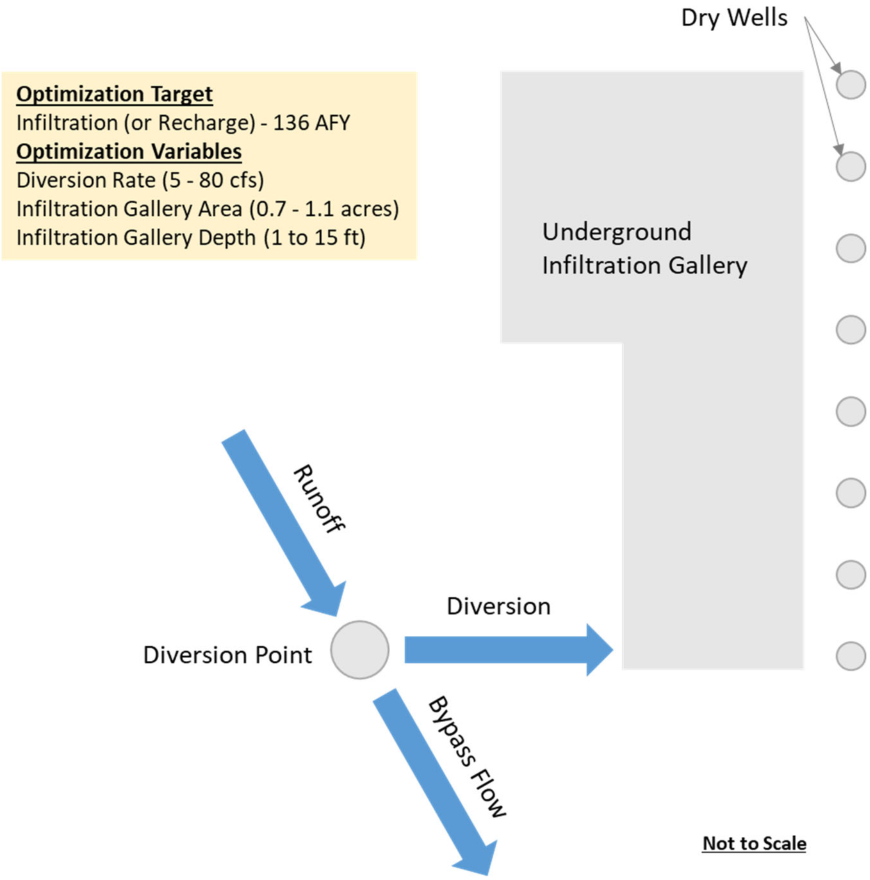

Figure 5. Schematic representation of SUSTAIN optimization framework for Valley Plaza Park South

The average annual recharge simulated by the SUSTAIN model was evaluated for diversion rates ranging from 5 to 80 cfs, infiltration gallery area between 0.7 and 1.1 acres, and infiltration gallery depth ranging from 1 to 15 ft. Due to site restrictions the maximum feasible depth and infiltration area of the gallery were determined to be approximately 10 ft and 1.1 acres, respectively. Based on the subset of simulated results shown in Figure 6, it is evident that the target infiltration volume of 136 AFY is achieved with a 9 to 10-ft deep infiltration gallery with surface area 1.1 acres, and diversion rate at or above 50-cfs.

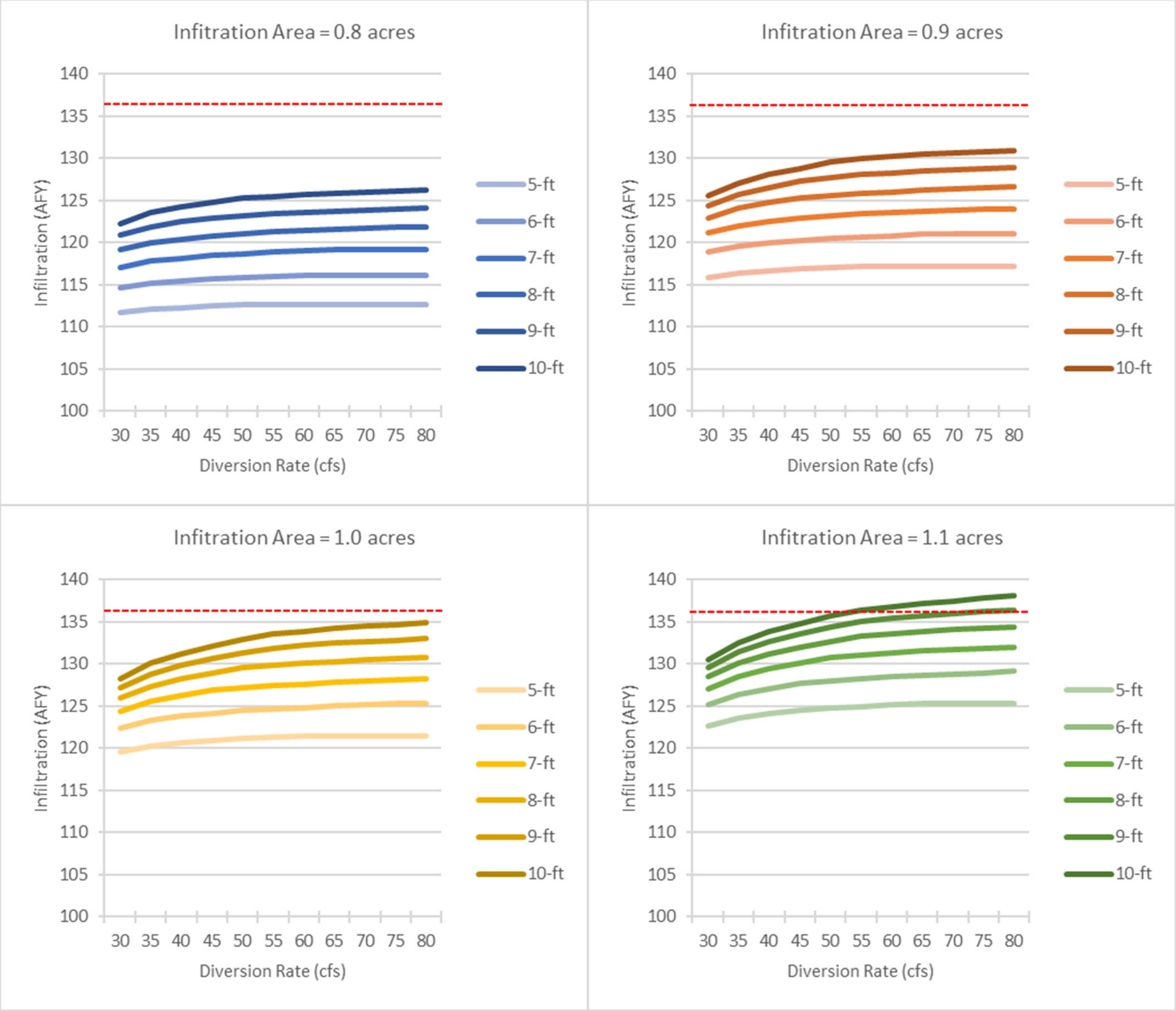

Figure 6. Simulated average annual infiltration for a range of diversion rates, infiltration areas, and gallery depths (the red dotted line indicates the target recharge of 136 AFY)

Dry wells in combination with an infiltration gallery were tested to determine the potential for additional stormwater capture. Assuming a dry well diameter of 10-ft and center-to-center spacing of 50-ft, approximately 8 dry wells may be placed along the eastern edge of the proposed infiltration gallery area.

Note that at a diversion rate of 50 cfs, most of the runoff generated from the local watershed is captured by the infiltration gallery. However, when the incoming runoff rate exceeds 50 cfs or the infiltration gallery at capacity, the excess flow is bypassed. Therefore, the most effective use of dry wells is to capture and infiltrate part of this excess bypass flow for additional stormwater capture. The design infiltration rate for the dry wells is assumed to be the same as that adopted for the infiltration gallery (3.7 in/hr). The average annual infiltration simulated by SUSTAIN is 132.8 AFY for a 10-ft deep 1-acre infiltration gallery. The average annual simulated infiltration increases slightly to 134 AFY for a configuration consisting of 8 dry wells in addition to the 10-ft deep 1-acre infiltration gallery.

The total cost associated with each tested combination of diversion rate and infiltration gallery volume were generated by the SUSTAIN model. The cost functions in the model are based on a review of unit price and project costing compiled by Tetra Tech for Task Order No. 027 with the City of San Diego (Tetra Tech, 2020). Total simulated average annual infiltration versus total estimated cost for each tested combination are shown in Figure 7. Note that the costs shown are planning level estimates suitable for relative comparison of the different alternatives tested and should not be interpreted as an opinion of probable construction costs.

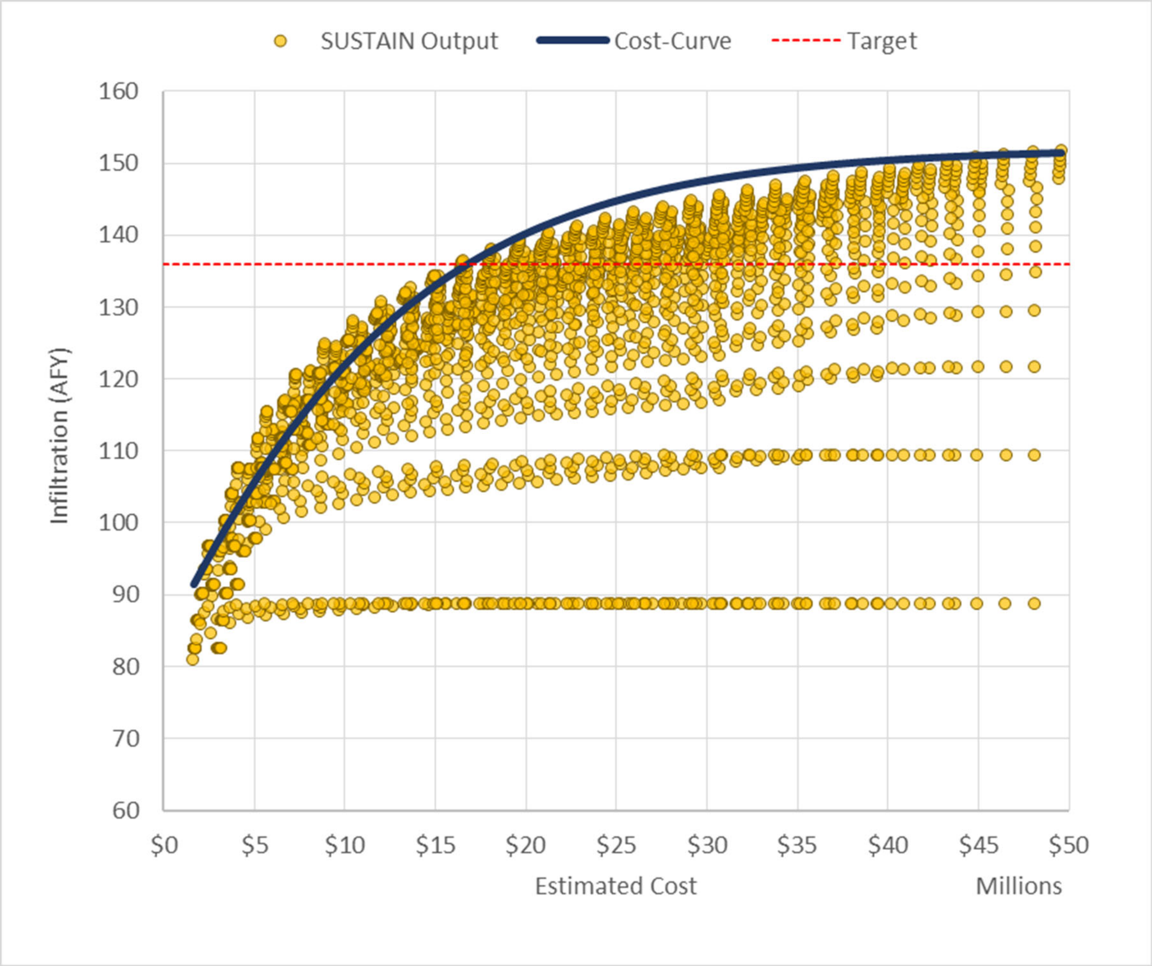

Figure 7. Relative performances of tested range of diversion rates and basin sizes versus estimated cost

3.1.1 Proposed BMP Alternatives

Based on the analysis of the SUSTAIN optimization model, the following two design alternatives are proposed. A third alternative will be based on the results of the programmatic analysis.

1. Infiltration Gallery
2. Infiltration Gallery and Dry Wells
3. TBD (pending completion of programmatic analysis)

Based on field reconnaissance, reviewing of results of the geotechnical investigation, and conducting a desktop analysis to determine soil feasibility and approximate available space, the above two alternatives were determined to have the greatest implementation feasibility for the Valley Plaza Park South site. Table 4 summarizes key design assumptions for each alternative. Additional design considerations are discussed in detail in Section 4.0. The annual runoff volume and simulated infiltration for the two proposed alternatives are shown in Figure 8. The expected reduction in pollutant loads as simulated by the SUSTAIN model for the two proposed alternatives are summarized in Table 5.

Table 4. Key design assumptions for SUSTAIN optimization of BMP alternatives

Design Consideration	Unit	Alternative 1	Alternative 2	
		Infiltration Gallery	Infiltration Gallery	Dry Wells
Number of BMP units	--	1	1	8 (each 10-ft dia.)
BMP depth	ft.	10	10	50
BMP surface area	sq. ft.	47,916	43,560	628.32
BMP storage volume	ac. ft.	11.0	10.0	0.7
Design infiltration rate	in/hr	3.70	3.70	3.70
Total Infiltration	AFY	135.7	134.0	

Table 5. Simulated sediment, nutrients and zinc load reduction for the proposed alternatives

BMP Scenario	Sediment (lbs/yr)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	Total Zinc (lbs/year)
Alternative 1	15,867.8	527.4	420.4	61.8
Alternative 2	15,730.0	518.8	413.7	61.3

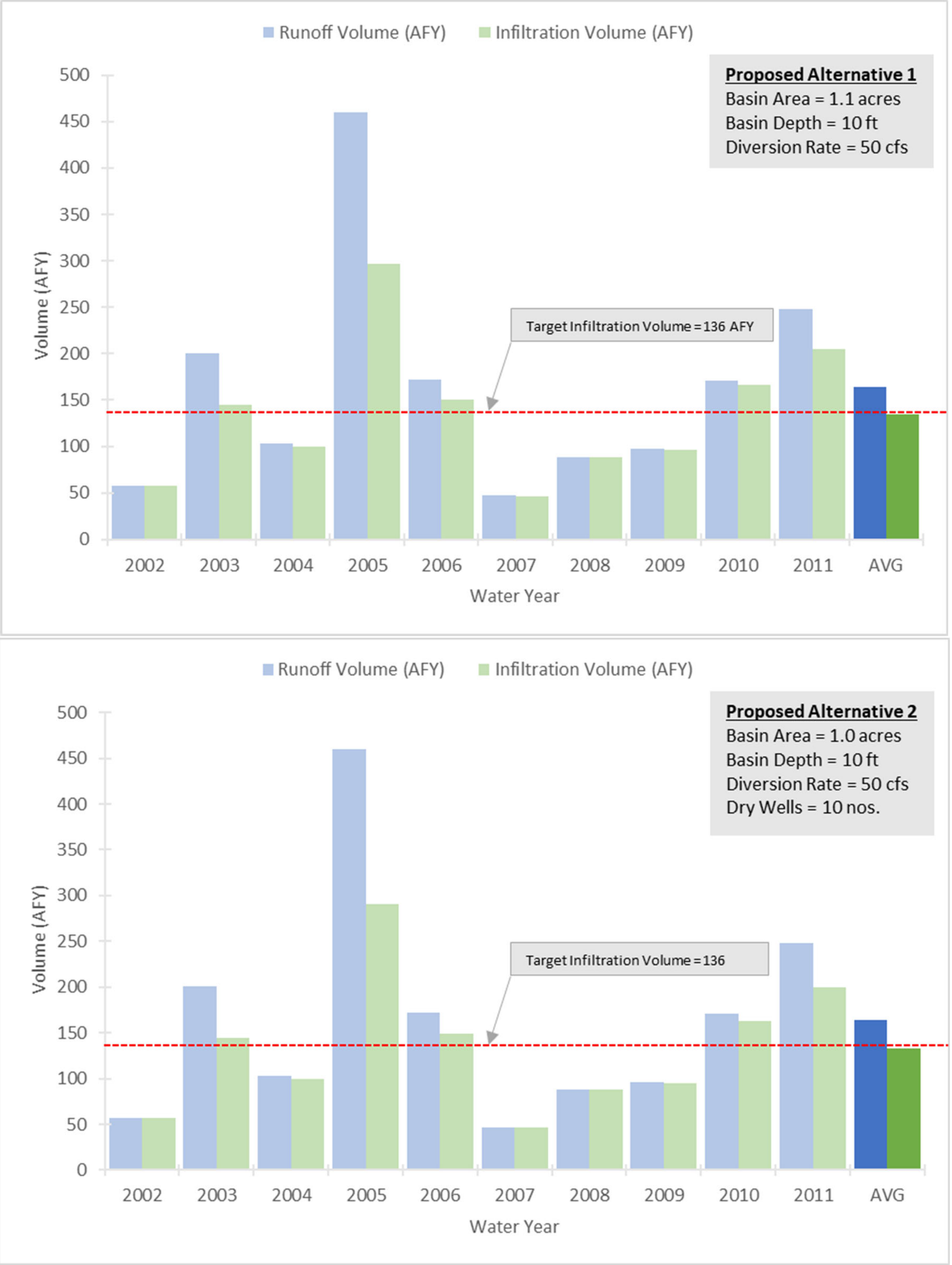

Figure 8. Simulated annual runoff and infiltration volumes for the proposed alternatives 1 and 2.

3.1.2 85th-percentile Storm Analysis

The runoff timeseries for the 85th-percentile 24-hour storm was generated using the Los Angeles County Public Works HydroCalc Calculator[2] and subsequently used in the SUSTAIN model. The 5-minute timestep runoff timeseries for the Valley Plaza Park South watershed for the 85th-percentile 24-hour storm is shown in Figure 9.

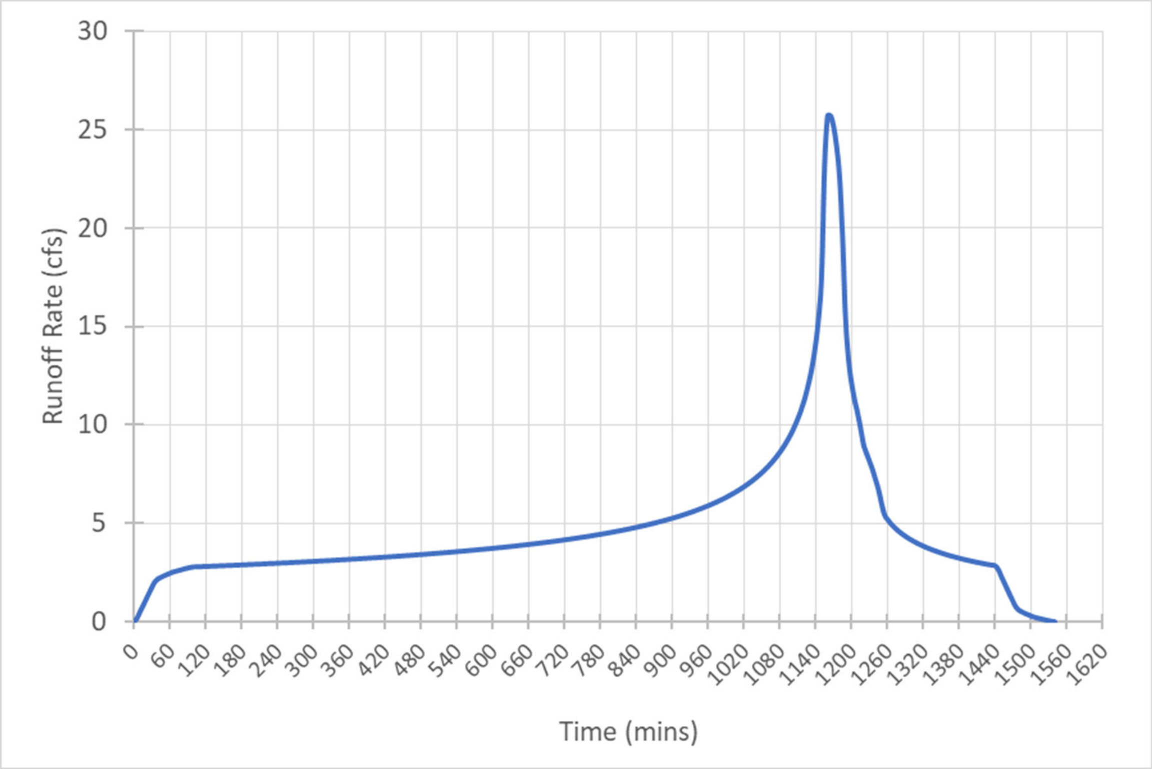

Figure 9. Simulated runoff for the 85th-percentile 24-hour storm

The SUSTAIN model simulates complete capture and recharge of the runoff associated with the 85th-percentile storm for both proposed alternatives. The depth of water in the infiltration gallery never exceeds 3-ft in the SUSTAIN simulation for the 85th-percentile storm for the proposed alternatives. Therefore, an infiltration basin depth of 3-ft (or approximate storage capacity of 3 ac-ft) is sufficient for complete capture and recharge of the 85th-percentile storm. The 85th-percentile storm generates a runoff volume of 10.1 ac-ft and is comparable to the storage capacity of the infiltration gallery for the proposed alternatives. A plot of average annual infiltration versus the infiltration gallery storage capacity (Figure 10) shows that the target annual recharge of 136 AFY is met with an infiltration gallery of storage capacity equivalent to the 85th-percentile storm volume.

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[2] https://dpw.lacounty.gov/wrd/publication/Engineering/hydrology/HydroCalc.zip

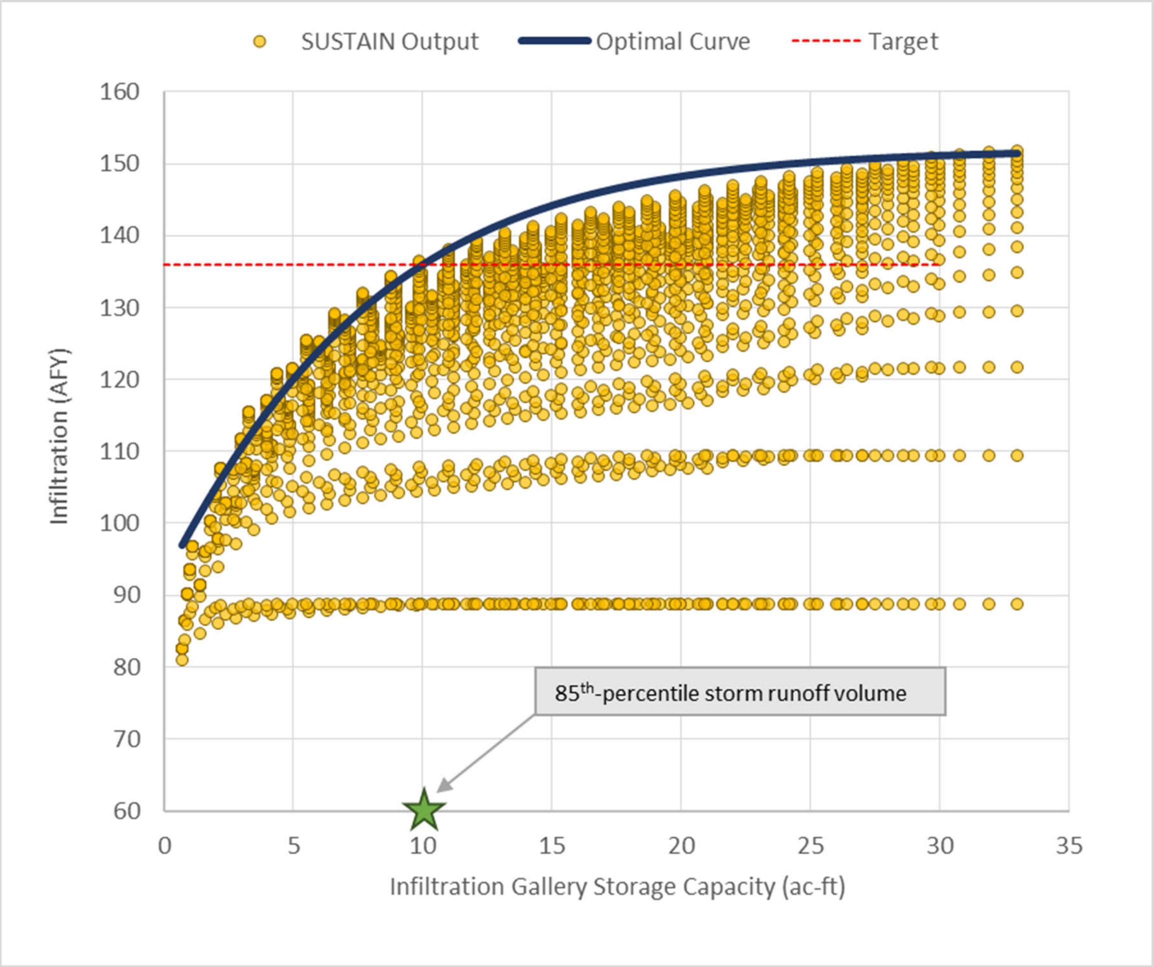


Figure 10. Simulated average annual infiltration versus infiltration gallery storage capacity

3.2 Diversion Structure Analysis

The storm drain system at Valley Plaza Park South was represented within EPA SWMM (version 5.1.013) to determine the hydraulic details of the diversion structure to ensure an optimal diversion rate of 50-cfs to the offline BMP units. Grated drop inlets with and without a rubber dam were tested to determine if the required diversion rate was achieved. The drop inlet was simulated as a bottom-draw orifice representing grates as recommended by Senior et al. (2018). The length and width of the grated inlet were assumed as 13-ft (width of the Tujunga Wash) and 2.3-ft, respectively. However, the SWMM simulations suggest that a drop inlet alone is able to divert only approximately 35 cfs for an influent flow of 50 cfs.

Therefore, rubber dams (simulated as transverse weir in SWMM) were tested in conjunction with the drop inlet. The SWMM simulations suggest that with a 2-ft height all the influent flow at or below 50 cfs is successfully diverted to the infiltration gallery. Note that at this time a Water Surface Pressure Gradient (WSPG) analysis has not been completed for the proposed diversion structure but will be conducted prior to the final submission of the proposed alternatives. A 30” diameter reinforced concrete pipe (RCP) is proposed to convey the diverted flow to the infiltration gallery.

The diversion structure should include a valve (manual or actuated), or an actuated sluice gate, to respond to the conditions within the BMP storage unit, shutting flows off if/when the storage capacity is exceeded, during emergency situations, if storm drain flows enter a pressure condition, or during peak storm events. Furthermore, the bottom of the diversion structure will be sloped towards the diversion pipe, in order to prevent ponding in the system.

4.0 Regional Structural BMP Characteristics

Subterranean infiltration galleries are storage areas that harvest, temporarily store, and infiltrate stormwater runoff. The harvested runoff percolates through the bottom of the reservoir and an approximately 2-foot layer of rock and compacted native soil, which has an infiltration rate capable of draining the reservoir within a specified design drawdown time (typically 48 hours, maximum 72 hours). After the stormwater infiltrates through the bottom soil layer, it percolates into the subsoil.

Dry wells (or “drywells”) are a type of injection well that have been widely used in practice in the west and southwest U.S. for several decades. They are typically most suitable for areas where the depth to the water table is greater than 130 ft. below the ground surface (Torrent Resources, 2020). A key benefit of dry wells is that they are installed below the confining layer (i.e., clay and other less permeable soil layers) typically encountered near the soil surface into deeper soils which are typically more permeable, such as alluvium and sand; this allows for infiltration of stormwater runoff into underlying soils and recharge of underlying groundwater aquifers. Dry wells also have a small footprint, are relatively low cost and can be installed quickly, and have a long service life with simple maintenance requirements.

4.1 Site Layout

The stormwater capture system at Valley Plaza Park South will consist of a diversion system of one or two pipes of varying sizes with flows diverted through a channel in the bottom of the culvert or via a rubber dam from the storm drain to a pretreatment device, with flows entering an underground infiltration gallery via gravity as illustrated conceptually in Figure 11. Depending on the size of the footprint, the infiltration gallery may be divided into multiple phases or diversions, which can also be connected with equalization pipes.

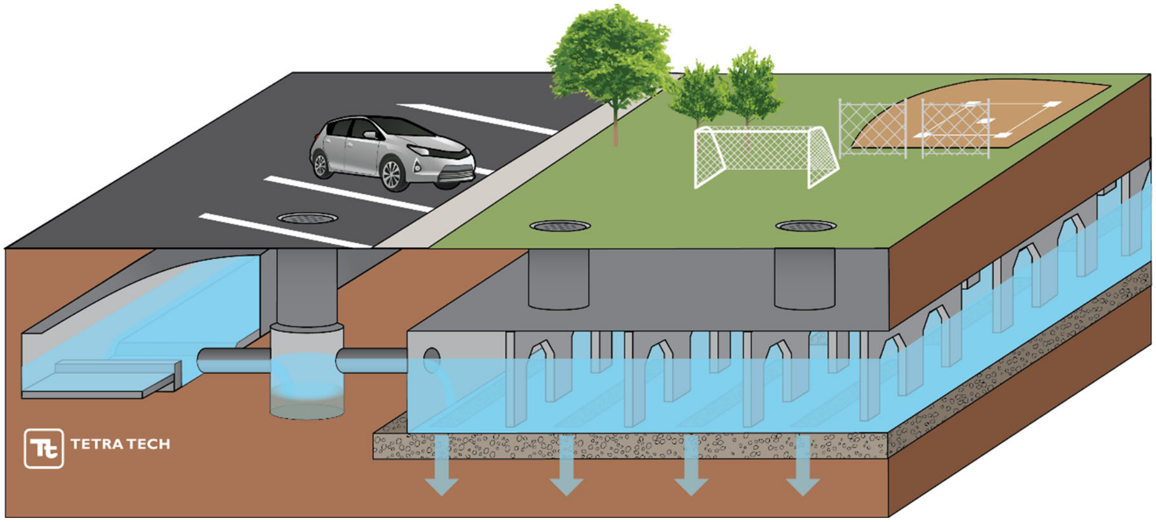


Figure 11. Conceptual layout of regional underground infiltration gallery configuration

For the stormwater capture alternative incorporating dry wells, a total of eight (8) dry wells of 10 ft. diameter are proposed in combination with the subterranean infiltration gallery. Based on available space at Valley Plaza Park South, the dry wells may be located along the eastern edge of the proposed infiltration gallery at a spacing of 50 ft. center-to-center (see Figure 5 for schematic representation).

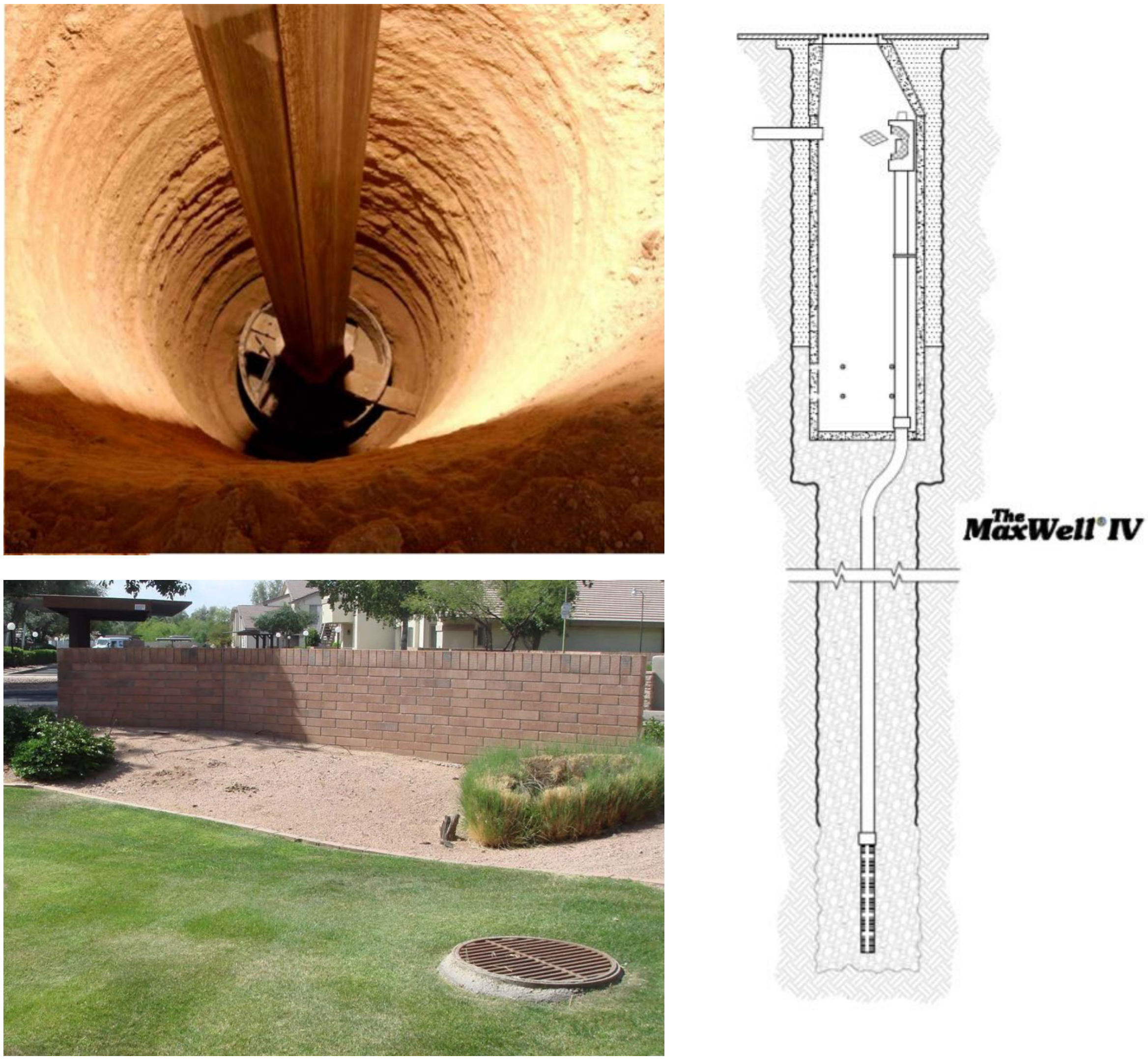


Figure 12. Typical deep drywell infiltration application (source: Torrent Resources)

(Top left: drywell installation, bottom left: after installation, right: typical deep drywell schematic)

4.2 Pretreatment

Stormwater runoff transports sediment, trash, and debris that can compromise the performance of stormwater facilities and pollute receiving waters. Pretreatment will be an integral component of the treatment strategies to extend the life of the proposed systems. It will be prescribed in order to reduce the maintenance frequency of the stormwater facilities, focus maintenance efforts to a concentrated area, and bolster compliance.

Two types of pretreatment devices are being considered for the project: a hydrodynamic separator and a baffle box type. The final selection will be made during the detailed design phase of the project. A typical hydrodynamic separator collects stormwater runoff on one or more sides of the structure then directs the water into a separation chamber where water begins swirling, forcing the particles out of the runoff. This process collects up to 100 percent of floatables and neutrally buoyant debris larger than the screen aperture is collected. Hydrodynamic separators typically have an 80 percent removal rate of total suspended solids (TSS). With the chambered system, hydrocarbons float to the top of the water surface and are prevented from being transported downstream. The size of the unit will be selected based on the estimated sediment removal and the routine maintenance required. Figure 13 represents a typical Contech CDS type hydrodynamic separator.

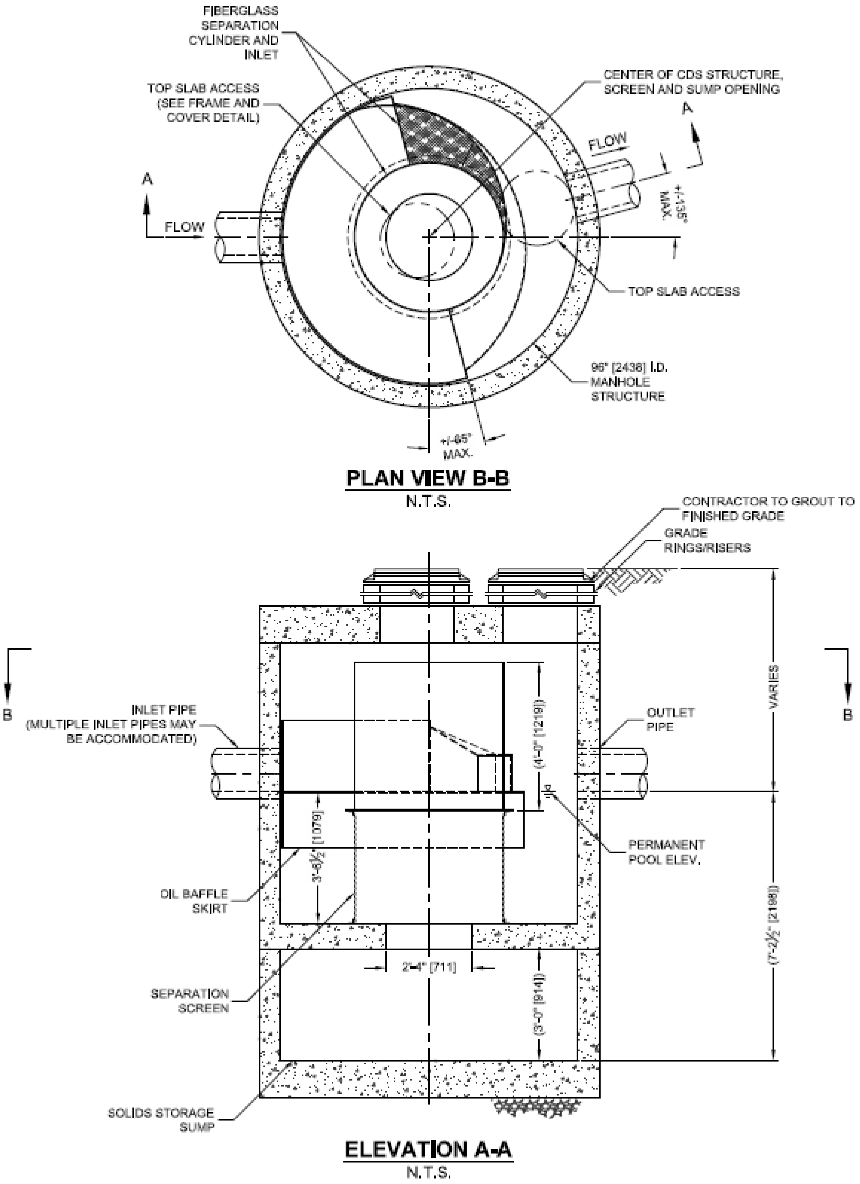


Figure 13. Standard detail for a typical CDS system (source: Contech Engineered Solutions)

Hydrodynamic separators, such as the Contech CDS system, are popular pretreatment devices; however, trash and debris are stored for long periods submerged in water, thus potentially leaching nutrients into the treated water. Therefore, as an alternative, the Debris Separating Baffle Box (DSBB) by BioClean Environmental Services is also being considered as a pretreatment solution. The DSBB is available in ten different models depending on the required storage capacity. The DSBB system uses screens that are suspended above the sedimentation chambers that capture and store trash and debris in a dry state, thus reducing potential nutrient leaching and bacteria growth. TSS is removed by routing the flows through a triple chambered system. An oil skimmer with hydrocarbon booms traps and absorbs oil. The DSBB system can remove more than 80 percent of TSS. The DSBB is also approved by the California Water Resources Control Board as a Full Capture treatment device. Figure 14 illustrates the typical operation of a DSBB system.

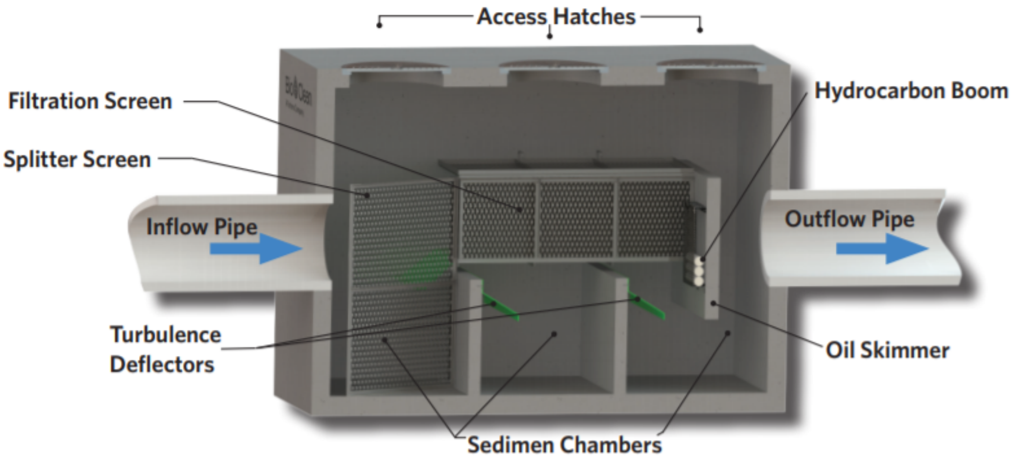


Figure 14. Typical DSBB system (source: BioClean Environmental)

4.3 Precast Concrete Structure

Precast concrete storage systems, such as the StormTrap, Oldcastle and Jensen StormVault systems, made from durable, reinforced, and high-strength concrete would be the most appropriate modular unit for this project (as opposed to plastic modular units). They can be designed to exceed HS-20 loading, have varying depths of cover, and overcome buoyancy forces. Internal heights can vary to meet the desired storage volume.

A precast concrete modular system, such as the StormTrap System, is proposed. The StormTrap Double Trap system allows for a maximum headroom of up to 11’-4”, allowing for the designed storage depth plus 1 foot of freeboard. The modular pieces are constructed offsite and delivered to the project site via truck and lifted into place with a crane. A typical day of installation may allow for 30 to 40 units to be placed in a day. Cast-in-place structures were not considered a viable solution due to the time required to form, pour, and cure the structure. The additional time would create an additional burden on park operations and could extend the construction schedule. A recent installation of a StormTrap system at the Bolivar Park stormwater capture project in Lakewood, California can be seen in Figure 15.

Figure 15**.** Example StormTrap installation at Bolivar Park in Lakewood, CA

5.0 References

County of Los Angeles. 2017. “Guidelines for Design, Investigation, and Reporting, Low Impact Development Stormwater Infiltration,” Administrative Manual, County of Los Angeles Department of Public Works, Geotechnical and materials Engineering Division, dated December 31.

Fang, H.Y. 1991. “Foundation Engineering Handbook,” Second Edition, Van Host and Reinhold.

Geosyntec Consultants, Inc. (Geosyntec). 2020. Draft Soils Investigation Report – Task Order Solicitation (TOS) No. 25 Stormwater Capture Parks Program Valley Plaza Park South, Los Angeles, CA. Prepared for Tetra Tech. Draft report date: 6/3/2020.

Los Angeles Department of Water and Power (LA DWP) and City of Los Angeles Sanitation (LA Sanitation). 2018. Valley Plaza Park South Stormwater Capture Project: Conceptual Study Report.

Massmann, J. 2004. Technical Report, “An Approach for Estimating Infiltration Rates for Stormwater Infiltration Dry Wells”, prepared for Washington State Transportation Commission, Department of Transportation and in cooperation with U.S. Department of Transportation Federal Highway Administration, WA-RD 589.1.

Senior, M., Scheckenberger, R. and Bishop, B., 2018. Modeling Catchbasins and Inlets in SWMM. Journal of Water Management Modeling 26:C435. Available at, https://www.chijournal.org/C435.

Tetra Tech. 2020. “TOS25 - Proposed Cost Functions for Programmatic Analysis (DRAFT).” Dated May 14, 2020.

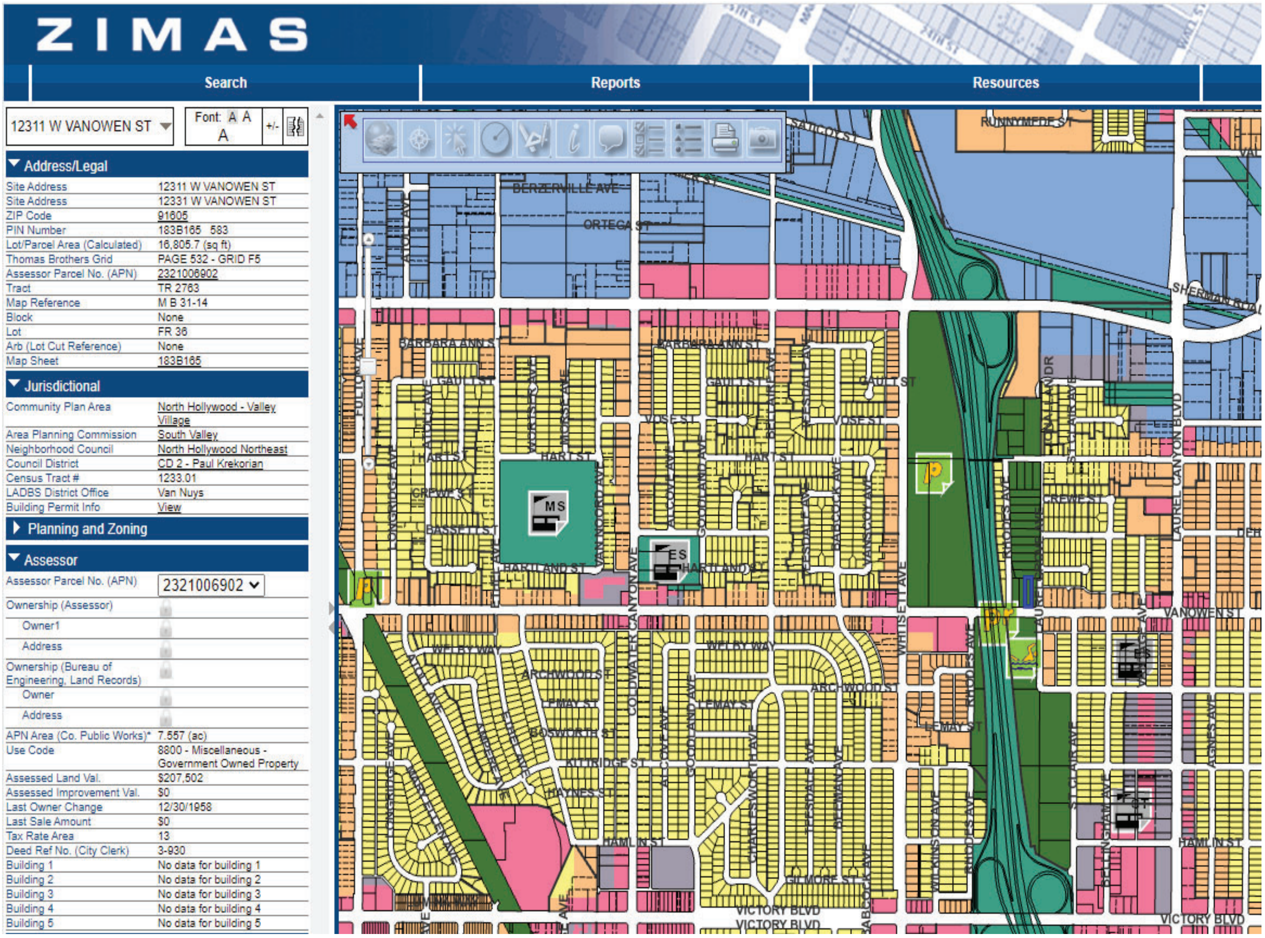
Torrent Resources. 2020. “New Drywell Installation.” http://www.torrentresources.com/services/drywell-installation/. Accessed June 2020.

U.S. Bureau of Reclamation (USBR). 2001. “Engineering Geology Field Manual,” Second Edition U.S. Department of the Interior.

2.4.3 Right of Way and LACFCD Conceptual Approval

The Project will divert from a Los Angeles County Flood Control District (LACFCD) storm drain. Confirmation of conceptual approval by LACFCD is included in the following pages.

The figure below is a screen shot from the Zone Information and Map Access System (ZIMAS) of the City of Los Angeles, demonstrating that the parcel on which the Project will be built is government-owned land and currently zoned as open space.



▼ Address/Legal

Site Address	12311 W VANOWEN ST
Site Address	12331 W VANOWEN ST
ZIP Code	91605
PIN Number	183B165 583
Lot/Parcel Area (Calculated)	16,805.7 (sq ft)
Thomas Brothers Grid	PAGE 532 - GRID F5
Assessor Parcel No. (APN)	2321006902
Tract	TR 2763
Map Reference	M B 31-14
Block	None
Lot	FR 36
Arb (Lot Cut Reference)	None
Map Sheet	183B165

▼ Jurisdictional

Community Plan Area	North Hollywood - Valley Village
Area Planning Commission	South Valley
Neighborhood Council	North Hollywood Northeast
Council District	CD 2 - Paul Krekorian
Census Tract #	1233.01
LADBS District Office	Van Nuys
Building Permit Info	View

▶ Planning and Zoning

▼ Assessor

Assessor Parcel No. (APN)	2321006902
Ownership (Assessor)	
Owner1	
Address	
Ownership (Bureau of Engineering, Land Records)	
Owner	
Address	
APN Area (Co. Public Works)*	7.557 (ac)
Use Code	8800 - Miscellaneous - Government Owned Property
Assessed Land Val.	$207,502
Assessed Improvement Val.	$0
Last Owner Change	12/30/1958
Last Sale Amount	$0
Tax Rate Area	13
Deed Ref No. (City Clerk)	3-930
Building 1	No data for building 1
Building 2	No data for building 2
Building 3	No data for building 3
Building 4	No data for building 4
Building 5	No data for building 5

Figure ZIMAS View for the Area Surrounding Valley Plaza Park

The following pages contain inter-agency e-mail correspondence between LADWP and LACFCD regarding conceptual approval of the Project by LACFCD. The correspondence demonstrates that LADWP initiated the approval process in July 2020, and conceptual approval is pending review by LACFCD and anticipated to be complete in October 2020.

From: Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Sent: Tuesday, October 13, 2020 8:59 AM
To: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

Hi Ryan,

We will send you the electronic approval letter shortly.

Meanwhile could you please confirm the address for Art?

Mr. Art Castro
Watershed Management Group
Los Angeles Department of Water and Power
111 North Hope Street, Room 318
Los Angeles, CA 90012

From: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Sent: Monday, October 12, 2020 6:42 PM
To: Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

CAUTION: External Email. Proceed Responsibly.

Hi Nayiri,

Can you send me an email by tomorrow, October 12th, to officially explain and confirm what to do for the conceptual approval portion of the application as we discussed over the phone last week?

Thank you

Ryan

From: Aghakhani, Ryan
Sent: Wednesday, October 7, 2020 3:47 PM
To: 'Nayiri Vartanian' <NVARTANIAN@dpw.lacounty.gov>
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

Nayiri,

Any updates on if this would need to be submitted at the application deadline?

Thanks again.

Ryan

From: Aghakhani, Ryan
Sent: Tuesday, October 6, 2020 10:37 AM
To: 'Nayiri Vartanian' <NVARTANIAN@dpw.lacounty.gov>
Cc: Ernesto Rivera <ERIVERA@dpw.lacounty.gov>
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval
Importance: High

Nayiri,

Are there any updates to this? We are fast approaching the October 15th deadline.

Ryan

From: Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Sent: Wednesday, September 9, 2020 3:15 PM
To: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Cc: Ernesto Rivera <ERIVERA@dpw.lacounty.gov>
Subject: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

Hi Ryan,

The conceptual approval letter is being reviewed by our admin and you should be getting it shortly.

Thank you,

Nayiri Vartanian, P.E.
Associate Civil Engineer
Los Angeles County Public Works
Office: (626) 458-7159

From: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Sent: Wednesday, September 09, 2020 1:33 PM
To: Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

Hi Nayiri,

I wanted to follow up with you on the status of the draft letter.

Thank you

Ryan

From: Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Sent: Monday, August 17, 2020 4:54 PM
To: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Cc: Luis Garcia <LuGarcia@dpw.lacounty.gov>; Ernesto Rivera <ERIVERA@dpw.lacounty.gov>; Tonthat, Peter <Peter.Tonthat@ladwp.com>
Subject: Re: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

Hi Ryan,
I would need to discuss this with our admin and get back to you. Thanks,

-Nayiri

From: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Sent: Monday, August 17, 2020 3:58:49 PM
To: Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Cc: Luis Garcia <LuGarcia@dpw.lacounty.gov>; Ernesto Rivera <ERIVERA@dpw.lacounty.gov>; Tonthat, Peter <Peter.Tonthat@ladwp.com>
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual

Approval

CAUTION: External Email. Proceed Responsibly.

Hi Nayiri,

I'm following up to see if an email approval would suffice. Please advise on how to proceed.

Thank you.

Ryan Aghakhani

Watershed Management Group | Water Resources Division
Los Angeles Department of Water and Power
111 N. Hope Street, Room 318
Los Angeles, CA 90012
(213) 367-2022

From: Nayiri Vartanian [mailto:NVARTANIAN@dpw.lacounty.gov]
Sent: Thursday, August 13, 2020 9:13 AM
To: Aghakhani, Ryan
Cc: Luis Garcia; Ernesto Rivera
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

Hey Ryan,

Unfortunately we do not have a sample letter. We were hopping to take you up on your offer and ask you for one.
However, if you don't have one readily available, we can figure out a way to proceed with the approval process.

From: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Sent: Thursday, August 13, 2020 8:47 AM
To: Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Cc: Luis Garcia <LuGarcia@dpw.lacounty.gov>; Ernesto Rivera <ERIVERA@dpw.lacounty.gov>; Tonthat, Peter <Peter.Tonthat@ladwp.com>
Subject: RE: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

CAUTION: External Email. Proceed Responsibly.

Thank you Nayiri for that information,

Do you by any chance have a sample draft letter we can work off?

Thank you

Ryan Aghakhani
Watershed Management Group | Water Resources Division
Los Angeles Department of Water and Power
111 N. Hope Street, Room 318
Los Angeles, CA 90012
(213) 367-2022

From: Nayiri Vartanian [mailto:NVARTANIAN@dpw.lacounty.gov]
Sent: Thursday, August 13, 2020 8:32 AM
To: Aghakhani, Ryan
Cc: Luis Garcia; Ernesto Rivera
Subject: [EXTERNAL] Stormwater Capture Parks Program - SCWP R2 LACFCD Conceptual Approval

Good morning Ryan,

Attached is a list of storm drain details for each connection, that we were able to pull from our records.

Please not that (as highlighted in the attached chart):
- Valley Plaza Park North, the northerly connection is in close proximity of a Caltrans drainage, and would need to be confirmed during the detailed site study that it connects to our drainage.
- North Hollywood Park, the Gallery No 3 connection is not LACFCD maintained and it's a LA City drain.

We would also request you to please send a draft letter for us to confirm the conceptual approval.

Should you need to discuss further we could set up a meeting.

Thank you!

Nayiri Vartanian, P.E.
Associate Civil Engineer
Los Angeles County Public Works
Office: (626) 458-7159

From: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Sent: Friday, July 31, 2020 4:04 PM
To: Ernesto Rivera <ERIVERA@dpw.lacounty.gov>; Genevieve Osmena <gosmena@dpw.lacounty.gov>; Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>

Cc: Tonthat, Peter <Peter.Tonthat@ladwp.com>; Castro, Art <Art.Castro@ladwp.com>
Subject: RE: [EXTERNAL] RE: SCWP R2 LACFCD Conceptual Approval

CAUTION: External Email. Proceed Responsibly.

Hi Ernesto,

I have attached the requested Concept Reports for the Parks we will be applying for in RD2:
David M Gonzales, Valley Plaza Park North, Valley Plaza Park South, North Hollywood Park

I've also included Concept Reports for Parks Projects we intend to be applying for in RD3 for future reference:
Alexandria Park, Whitsett Fields Park North

Please let me know if you have any questions

Thank you

Ryan Aghakhani
Watershed Management Group | Water Resources Division
Los Angeles Department of Water and Power
111 N. Hope Street, Room 318
Los Angeles, CA 90012
(213) 367-2022

From: Ernesto Rivera [mailto:ERIVERA@dpw.lacounty.gov]
Sent: Thursday, July 30, 2020 11:55 AM
To: Aghakhani, Ryan; Genevieve Osmena; Nayiri Vartanian
Cc: Tonthat, Peter; Castro, Art
Subject: RE: [EXTERNAL] RE: SCWP R2 LACFCD Conceptual Approval

Ryan,
Do you guys have concept reports you can share for these? Art had previously provided us the concept report for Strathern. Thanks much.

Ernesto J Rivera, P.E.
Civil Engineer
Los Angeles County Public Works
Office: (626) 458-6110

From: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Sent: Wednesday, July 29, 2020 8:20 AM
To: Genevieve Osmena <gosmena@dpw.lacounty.gov>; Ernesto Rivera <ERIVERA@dpw.lacounty.gov>; Nayiri Vartanian <NVARTANIAN@dpw.lacounty.gov>
Cc: Tonthat, Peter <Peter.Tonthat@ladwp.com>
Subject: RE: [EXTERNAL] RE: SCWP R2 LACFCD Conceptual Approval

Thank you Genevieve,
Middle of August would be a good time period to receive a draft to review. We do not have a template so we can use your template.

Ernesto and Nayiri,
I look forward to working with you to complete this. Please let me know what you need from us.

Thank you

Ryan Aghakhani
Watershed Management Group | Water Resources Division
Los Angeles Department of Water and Power
111 N. Hope Street, Room 318
Los Angeles, CA 90012
(213) 367-2022

From: Genevieve Osmena [mailto:gosmena@dpw.lacounty.gov]
Sent: Tuesday, July 28, 2020 10:15 AM
To: Aghakhani, Ryan
Cc: Ernesto Rivera; Nayiri Vartanian
Subject: [EXTERNAL] RE: SCWP R2 LACFCD Conceptual Approval

Hi Ryan,

Please work directly with Ernesto Rivera and Nayiri Vartanian of my team to coordinate their review and recommendations for the four stormwater capture park projects you mention below. I have cc'd them above. Thank you also for the fact sheets – they may need to ask you for additional information if we have any questions.

For the conceptual approval, we have a template letter of our own that we typically use, but feel free to share your template as well if you already have one drafted that has project-specific language that you may want us to consider or reference. What is your time frame to receive the conceptual approval?

Thanks,

Genevieve Osmeña
Senior Civil Engineer
Los Angeles County Public Works

Office: 626-458-4322

From: Aghakhani, Ryan <Ryan.Aghakhani@ladwp.com>
Sent: Wednesday, July 22, 2020 3:37 PM
To: Genevieve Osmena <gosmena@dpw.lacounty.gov>
Subject: SCWP R2 LACFCD Conceptual Approval

CAUTION: External Email. Proceed Responsibly.

Hi Genevieve,

We are currently preparing to apply for round 2 of the SCWP. We will be applying for Measure W funding for 4 parks that are part of our Stormwater Capture Parks Program. The park projects we will be applying for are Valley Plaza Park North and South, David M Gonzales, and North Hollywood Park. I have attached a factsheet of the program as a whole for your reference where you can see the location of the specified parks projects. We are currently wrapping up the pre-design phase for these projects.

As you know, part of the SCWP funding application process is to confirm conceptual approval from the LACFCD whenever your infrastructure will be involved. Please let me know if a simple email confirmation will suffice from you or your team. Alternatively, we can send you a draft letter where the LACFCD can confirm conceptual approval.

Please let me know if you require additional information to confirm conceptual approval.

Thank you in advance for your consideration.

Ryan Aghakhani
Watershed Management Group | Water Resources Division
Los Angeles Department of Water and Power
111 N. Hope Street, Room 318
Los Angeles, CA 90012
(213) 367-2022

2.4.4 Utility Investigation

Utilities were investigated as part of the pre-design phase. Available resources indicate that the following underground utilities are present within or adjacent to the Project area as summarized in the table below. A utility investigation will be completed during the design phase of the Project for all underground and conflicting utilities not readily identifiable during the pre-design phase.

Table Underground Utilities

Utility	Utility Provider	Potential for Interference
Storm Water Infrastructure	Los Angeles County Flood Control District Or City of Los Angeles	No
Waste Water Infrastructure	City of Los Angeles	No
Drinking Water Infrastructure	Los Angeles Department of Water & Power	No
Natural Gas Infrastructure	Southern California Gas	No
Telecommunication Infrastructure	AT&T Charter Communications UCTV	No

The existing irrigation system will be temporarily removed to facilitate construction of the Project and will then be replaced. No known utility lines will interfere with the proposed Project. Additional information and preliminary utility maps extracted from preliminary design reports are included in the following pages.

Agency	Potential Review and/or Approval
City of Los Angeles	Building, Grading, Electrical, and Plumbing Permits from the Department of Building & Safety – $19,510 Soils Report approval from the Department of Building & Safety – $1,000 Haul Route approval from the Department of Building & Safety Storm Drain, Construction, and Excavation Permits from the Bureau of Engineering SUSMP review by LA Sanitation – $1,100 LID Ordinance compliance by LA Sanitation Planning and zoning review by the Department of City Planning Traffic Control Plan prepared by the Tetra Tech team for Review by the Department of Transportation Access Review by Fire Department – $254 Tree removal/relocation review by Department of Recreation and Parks Clearance by the Cultural Affairs Department

7.8 Utility Interference Evaluation

7.8.1 Existing Utilities

Runoff from the 921-acre watershed is collected by the existing Central Branch Tujunga Wash, within the 12-ft W x 10.5-ft H RCB, which is owned and maintained by LACFCD. The RCB runs along the west side of the park, adjacent to SR-170.

In addition to the RCB, a 42-inch reinforced concrete pipe (RCP) City stormdrain enters the site from Hart Street to the east, continues parallel, north, to the alignment of the pedestrian path for approximately 110 ft. At that point, the RCP bends approximately 20 degrees and continues southwestward for roughly 320 ft. It bends approximately 30 degrees and continues for roughly another 30 ft, until it connects with the RCB.

Two other utilities extend westward from Hart Street into the site. One is an 8-inch LADWP water supply line that runs along the northern edge of the pedestrian path for a length of approximately 240 ft, as identified in the preliminary utility investigation. The other includes overhead AT&T and Charter communication lines that run along the southern end of the pedestrian path, across the width of the site. Existing utilities that are near Valley Plaza Park North, but outside of the project perimeter, include the following:

- Within Hart Street:
    - 8-inch LADWP water line (same as above)
    - Overhead communication lines (same as above)

- Along Laurelgrove Avenue:
  - 8-inch City sanitary sewer
  - 2-inch Southern California Gas Company line
  - 6-inch LADWP water line (joins 8-inch line at Hart Street)
  - Overhead communication and Charter Aerial lines
  - Abandoned 2-inch Southern California Gas Company line

- Within Vanowen Street (listed north to south):
  - 8-inch alternative concrete pipe stormdrain
  - Charter Aerial lines
  - One 2-inch and one 3-inch UCTV
  - 8-inch City sanitary sewer line
  - 6-inch Southern California Gas Company line
  - 4-inch Southern California Gas Company line
  - Abandoned 6-inch Southern California Gas Company line
  - Abandoned 33-inch LADWP water line
  - 33-inch LADWP water line
  - 54-inch LADWP water line
  - Abandoned 12-inch LADWP water line
  - Abandoned 48-inch LADWP water line
  - 48-inch LADWP water line
  - 12-inch LADWP water line
  - Overhead AT&T fiber facilities
  - Overhead PT&T communication lines

The utilities map is included in Appendix A.

7.8.2 Utility Interference

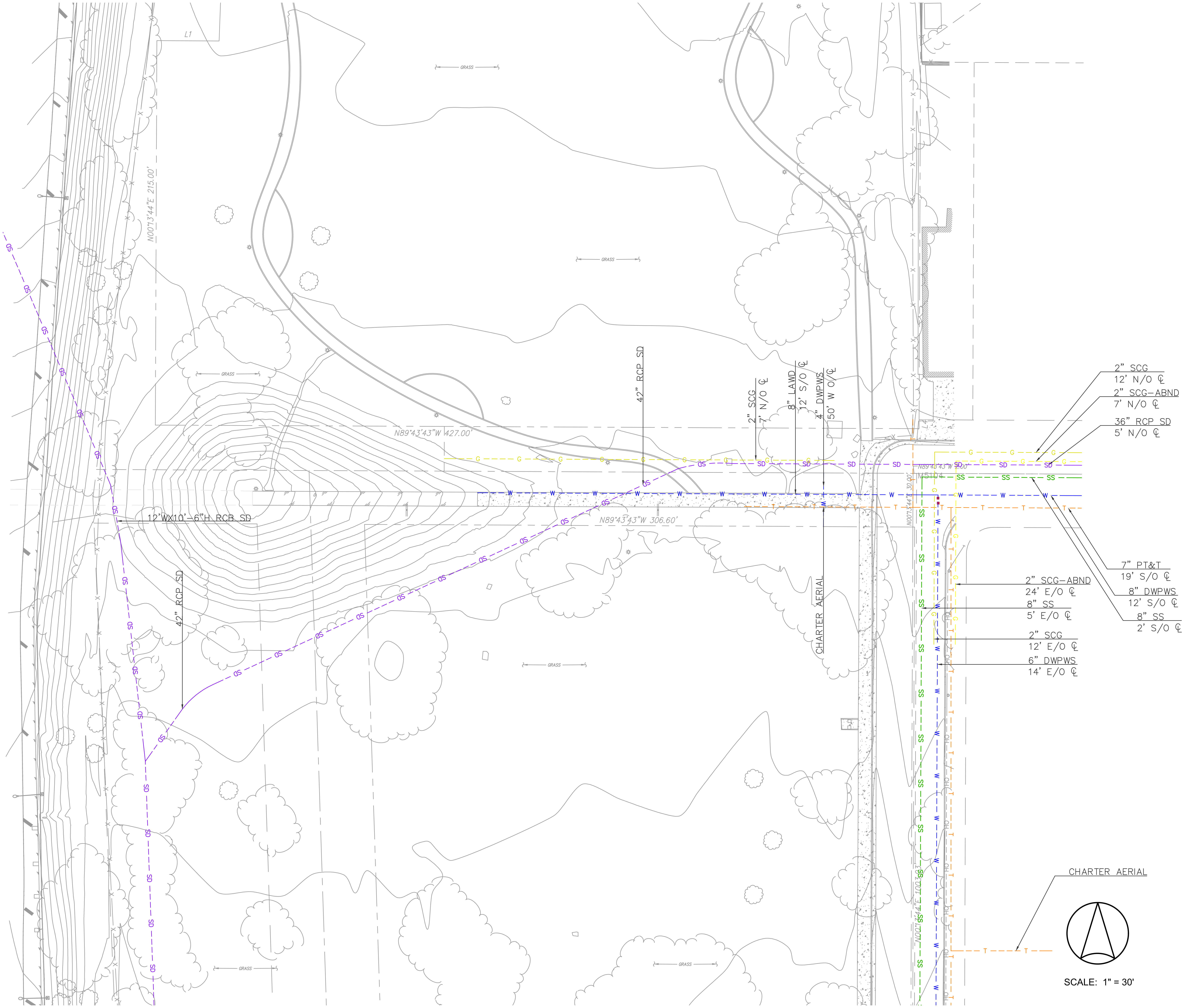
With the exception of the existing irrigation system, there are no known utility lines that will interfere with the recommended project. In order to facilitate construction of the project, the existing irrigation line will be temporarily removed and replaced. The project specifications will include requirements for the Contractor to maintain irrigation to plants and turf that are not impacted by this project during the construction of the project.

7.8.3 Conclusion

Utility structures and appurtenances, such as manholes, inlets, and valves, will need to be adjusted to grade, where necessary. At this time, no utilities are anticipated to be relocated.

7.9 Water Quality

Water sampling was not performed for this project as it was not part of the Task Order Solicitation.



PLAN VIEW

SCALE: 1" = 30'

LEGEND:

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EXISTING SANITARY SEWER LINE FROM CITY OF L.A. GIS MAP (NOT VERIFIED)	— — SS — — SS —
EXISTING DOMESTIC WATER LINE FROM AGENCY RECORD MAPS (NOT VERIFIED)	— — W — — W —
EXISTING ELECTRICAL TRAFFIC CONDUIT FROM AGENCY RECORD MAPS (NOT VERIFIED)	— — (E) — — (E) —
EXISTING CABLE/TELECOMM LINE FROM AGENCY RECORD MAPS (NOT VERIFIED)	— — OH — — OH —
EXISTING GAS/OIL LINE FROM AGENCY RECORD MAPS (NOT VERIFIED)	— — G — — G —
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REGISTERED PROFESSIONAL ENGINEER
Riaz Chaudhary
No. C48177
Exp. 6-30-20
STATE OF CALIFORNIA

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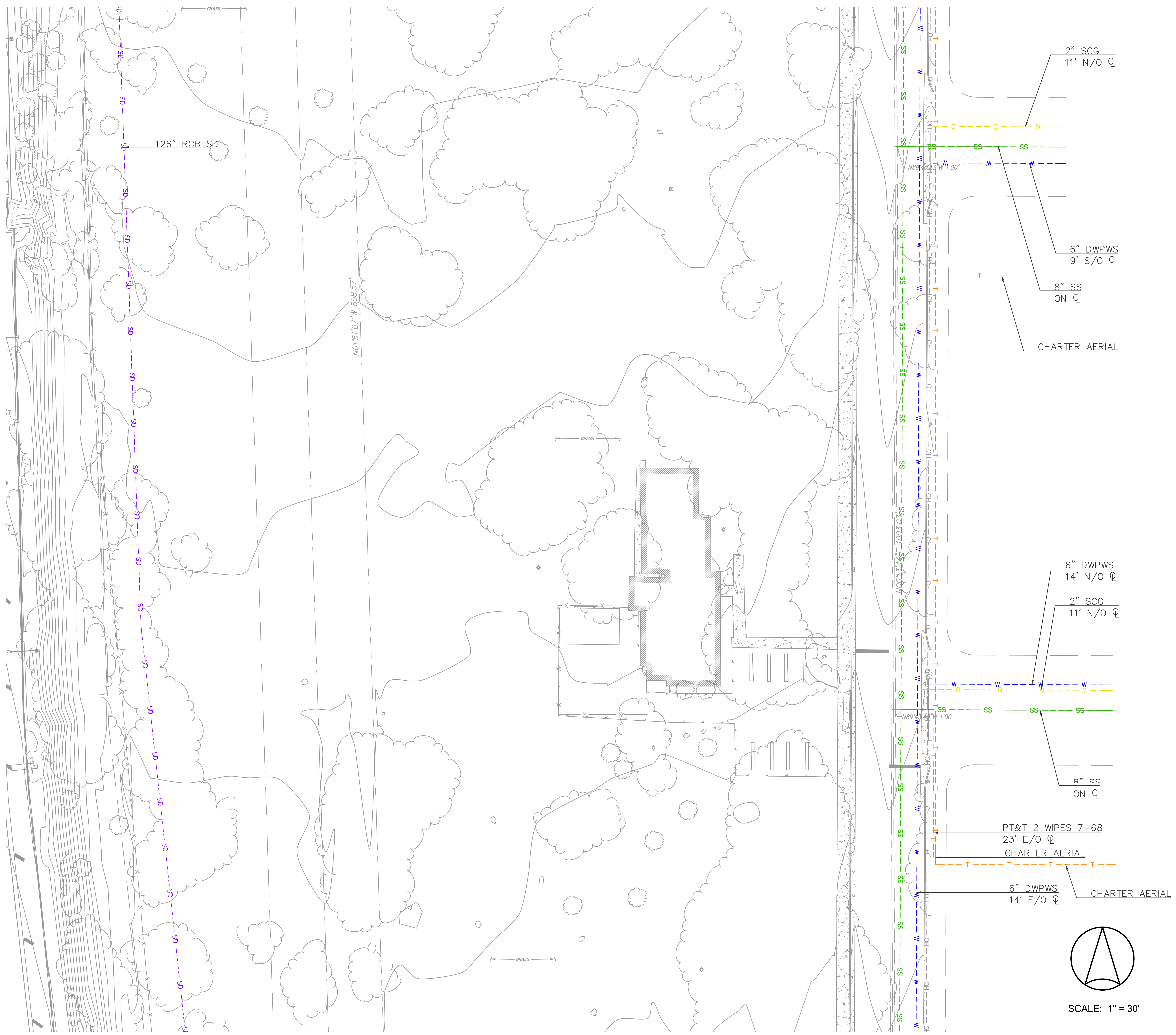

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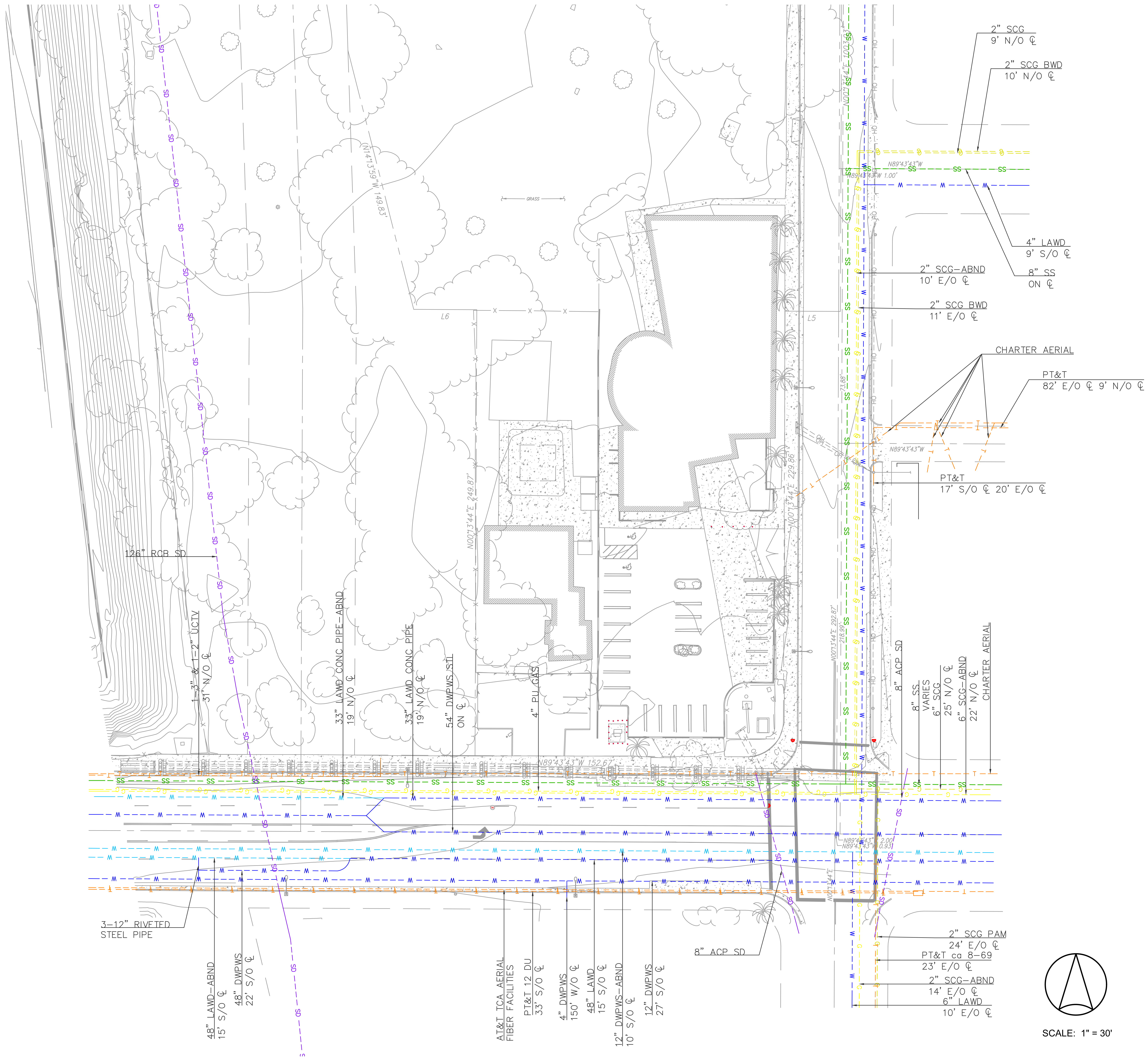

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Agency	Potential Review and/or Approval
City of Los Angeles	Building, Grading, Electrical, and Plumbing Permits from the Department of Building & Safety – $15,430
	Soils Report approval from the Department of Building & Safety – $1,000
	Haul Route approval from the Department of Building & Safety
	Storm Drain, Construction, and Excavation Permits from the Bureau of Engineering
	SUSMP review by LA Sanitation – $1,100
	LID Ordinance compliance by LA Sanitation
	Planning and zoning review by the Department of City Planning
	Traffic Control Plan prepared by the Tetra Tech team for Review by the Department of Transportation
	Access Review by Fire Department – $254
	Tree removal/relocation review by Department of Recreation and Parks
	Clearance by the Cultural Affairs Department

7.8 Utility Interference Evaluation

7.8.1 Existing Utilities

Runoff from the 212.5-acre watershed is collected by the existing Central Branch Tujunga Wash (Drawing No. 19-F1899), owned and maintained by LACFCD. The channel runs along the west side of the park, adjacent to SR-170.

An existing 6-inch water line, owned and operated by LADWP, runs beneath the east side of St. Clair Avenue, approximately 14 feet east of the centerline.

An existing 2-inch gas line, owned and operated by the Southern California Gas Company, runs beneath the east side of St. Clair Avenue, approximately 12 feet east of the centerline.

An existing 8-inch sanitary sewer line, owned and operated by the City of Los Angeles, runs beneath the east side of St. Clair Avenue, approximately 9 feet east of the centerline.

Other existing utilities that are near Valley Plaza Park South but farther from the project limits include the following:

- Within Archwood Street
  - 8-inch City sanitary sewer line
  - 6-inch LADWP water line
  - One overhead AT&T communications line
  - One overhead Charter Communications line

- Within Laurelgrove Avenue
  - Two 8-inch storm drain lines
  - 6-inch LADWP water line
  - 2-inch Southern California Gas Company line
  - Abandoned 2-inch Southern California Gas Company line
  - One overhead PT&T communications line

- Within Vanowen Street
    - 8-inch City sanitary sewer line
    - 54-inch LADWP water line
    - 48-inch LADWP water line
    - 33-inch LADWP water line
    - 12-inch LADWP water line
    - Abandoned 48-inch LADWP water line
    - Abandoned 33-inch LADWP water line
    - Abandoned 12-inch LADWP water line
    - 6-inch Southern California Gas Company line
    - 4-inch Southern California Gas Company line
    - Abandoned 6-inch Southern California Gas Company line
    - One overhead AT&T communications line
    - One overhead PT&T communications line
    - One overhead Charter Communications line
    - Two underground UCTV communications lines

The utilities map is included in Appendix A.

7.8.2 Utility Interference

With the exception of the existing irrigation system, there are no known utility lines that will interfere with the recommended project. In order to facilitate construction of the project, the existing irrigation line will be temporarily removed and replaced. The project specifications will include requirements for the Contractor to maintain irrigation to plants and turf that are not impacted by this project during the construction of the project.

7.8.3 Conclusion

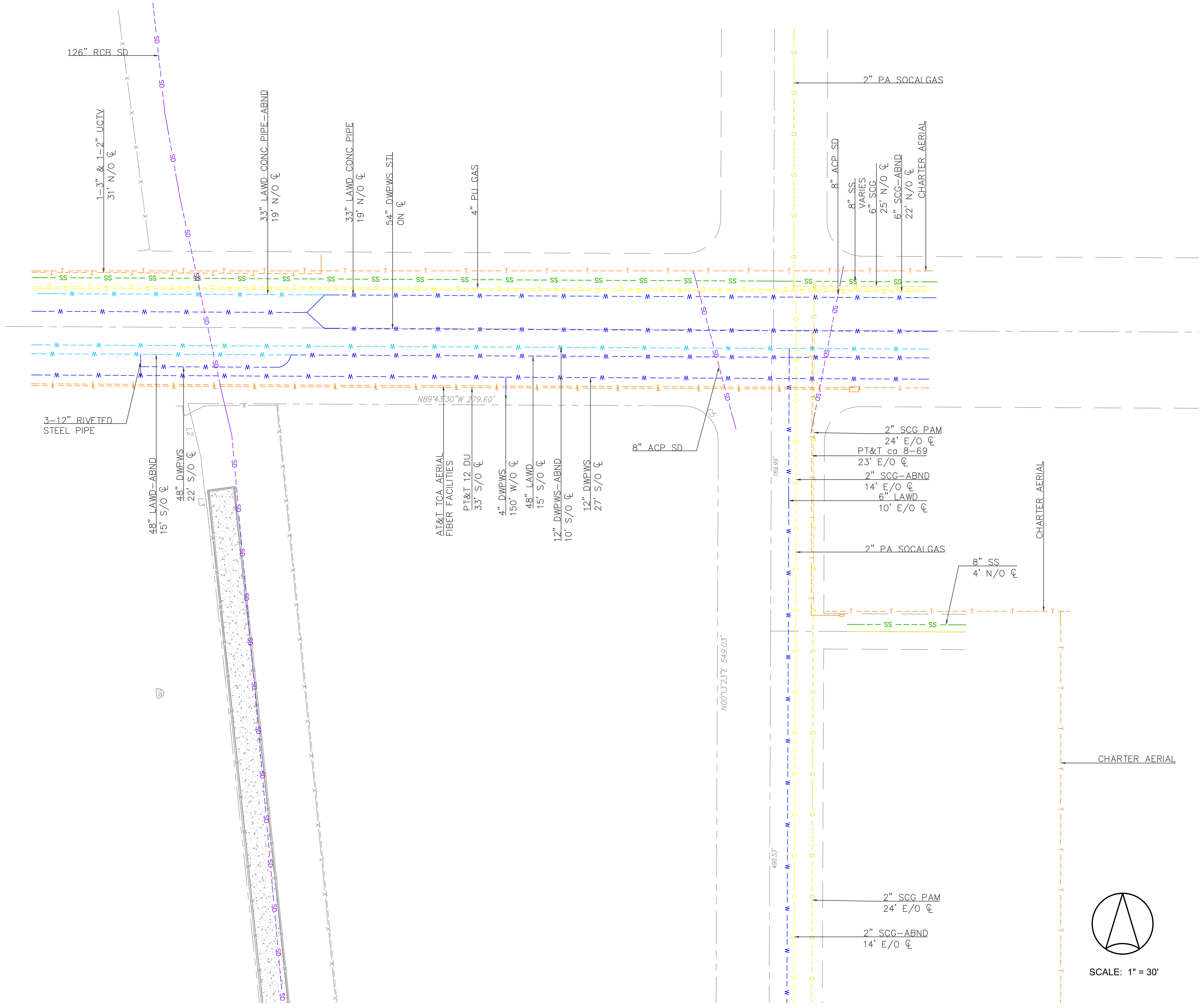
Utility structures and appurtenances, such as manholes, inlets, and valves, will need to be adjusted to grade, where necessary. At this time, no utilities are anticipated to be relocated.

7.9 Water Quality

Water sampling was not performed for this project as it was not part of the Task Order Solicitation.

7.10 Community Outreach, Impacts, and Opposition

The Tetra Tech team will engage the park-site surrounding community through a myriad of treatments and activities. The intent is to ensure that park-site stakeholders and end-users will have a good understanding of the project process, timeline, and improvement activities. Through the proposed engagement process the team will have the opportunity to learn from the community and educate them about the benefits of local water recharge while improving the quality of life by improving urban green space in their neighborhood. Outreach activities will also provide the opportunity to not only gain support for project site improvements but also for future city stormwater capture projects.



PLAN VIEW

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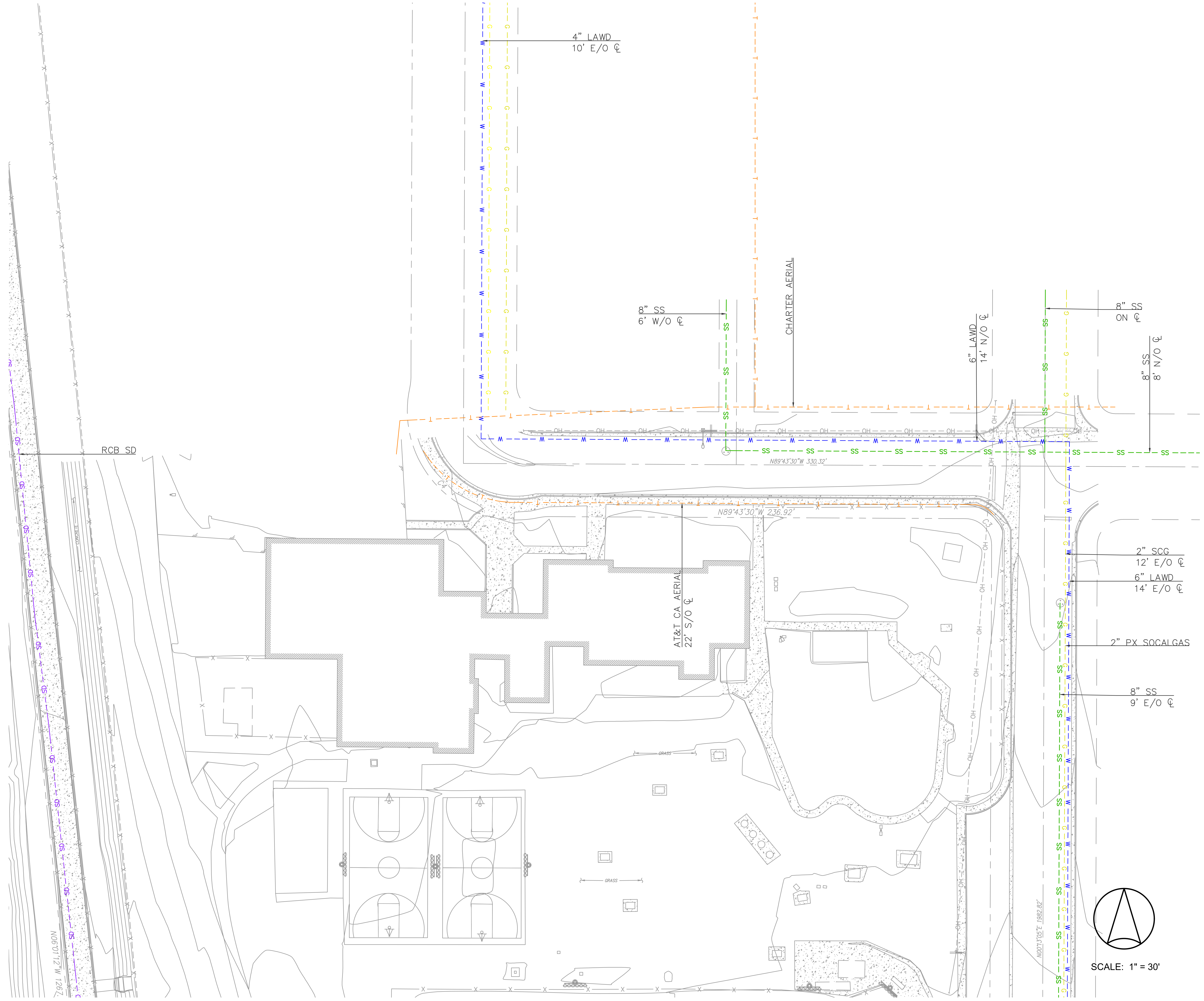

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ENGINEER:
DESIGNED BY:
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REVISION DATES (DESIGN STAGE ONLY)

Sheet Version 4.0

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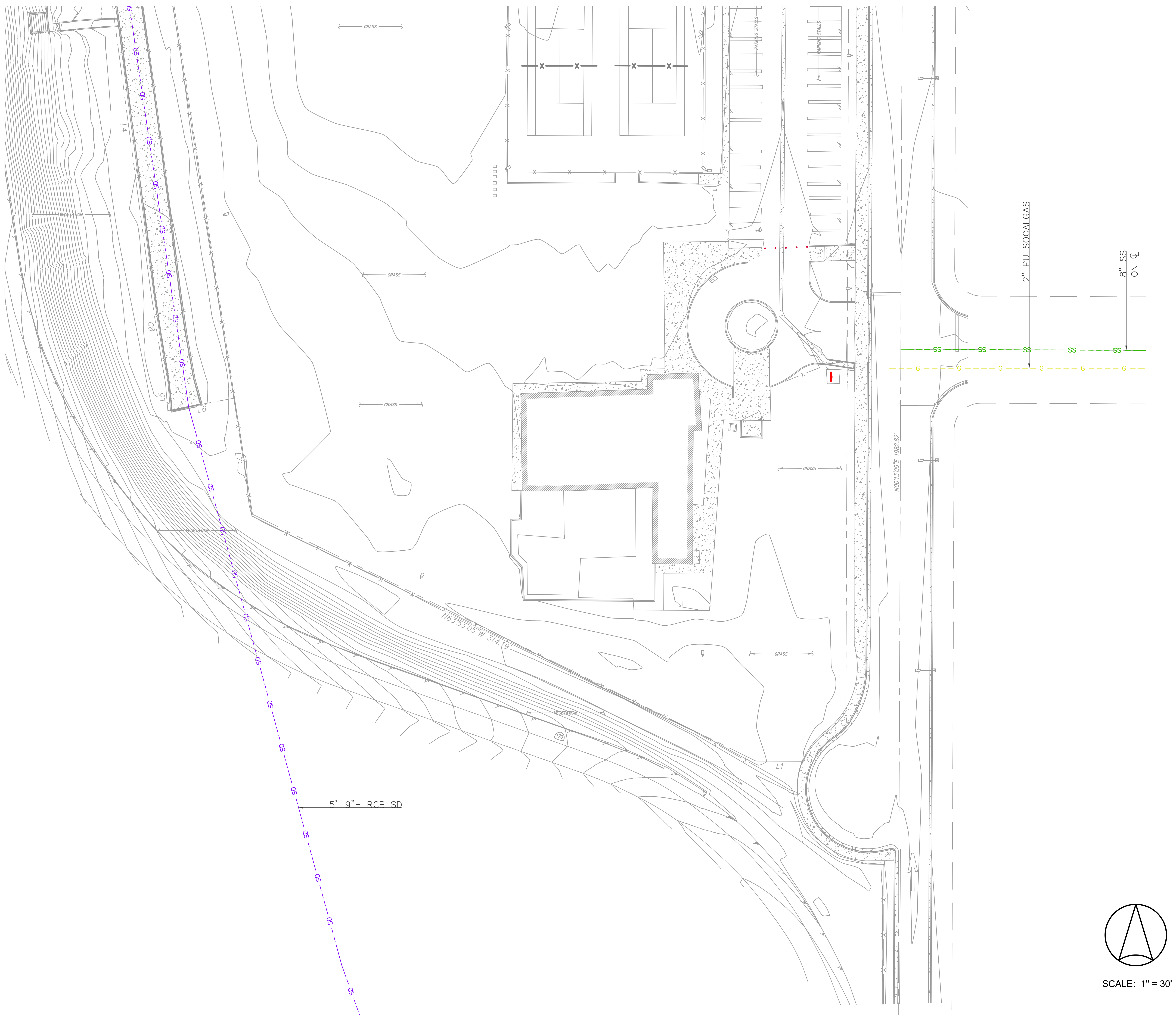

PLAN VIEW

SCALE: 1" = 30'

LEGEND:

NEW STORM DRAIN LINE	SD
EXISTING STORM DRAIN LINE FROM CITY OF L.A. GIS MAP (NOT VERIFIED)	SD SD
EXISTING SANITARY SEWER LINE FROM CITY OF L.A. GIS MAP (NOT VERIFIED)	SS SS
EXISTING DOMESTIC WATER LINE FROM AGENCY RECORD MAPS (NOT VERIFIED)	W W
EXISTING ELECTRICAL TRAFFIC CONDUIT FROM AGENCY RECORD MAPS (NOT VERIFIED)	(E) (E)
EXISTING CABLE/TELECOMM LINE FROM AGENCY RECORD MAPS (NOT VERIFIED)	UG/E UG/E OH UG/E OH
EXISTING GAS/OIL LINE FROM AGENCY RECORD MAPS (NOT VERIFIED)	G G
EXISTING GAS/OIL LINE FROM AGENCY RECORD MAPS (NOT VERIFIED)	OIL OIL

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Fullerton, CA 92832
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HORIZONTAL CONTROL:
SHEET TITLE:
PROJECT:
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INDEX NO.

GARY LEE MOORE, P.E., ENV SP
CITY ENGINEER
DATE:
DESIGN GROUP
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ATTACHMENTS FOR SECTION 2.5:

MONITORING

2.5 Monitoring

Baseline monitoring of the Project area was not performed for this feasibility study. Instead, previously collected data used for the WMMS model was applied to the modeling scenarios, and past field efforts identifying flooding concerns were noted.

The Project proposes installing a permanent BMP monitoring system that includes equipment to measure water flow during dry and wet weather. With this proposed monitoring system, the Project team will be able to measure the effectiveness of the BMPs and its ability to infiltrate diverted flows and remove pollutants. This monitoring system will also provide project performance data necessary for optimization planning and sustained achievement of project performance goals. Table 1 provides a summary of the expected monitoring frequency. These will be confirmed in the project-specific monitoring plan to be developed.

Table 1 Example Monitoring Frequency

Activity	Pre-Construction (2 yrs) Annually	Post-Construction (3 yrs) Annually	Long-Term O&M (~40 yrs)
Runoff Sampling	2 Wet, 2 Dry	2 Wet, 2 Dry	TBD
Infiltration Gallery Sampling	N/A	2 Wet	TBD
Groundwater Sampling	1 Dry	2 Dry	TBD

Notes:
(1) Long-Term monitoring frequency will be determined following Post-Construction Monitoring and will depend on the needs of the Project.

Flow and level monitoring will be provided for the diversion structures, sedimentation basins, and retention basins. The following equipment considered for monitoring are proposed for each facility:

- Gravity Pipes- Submerged velocity-area flow sensor, Hach AV9000 flow meter or approved equal. Magnetic flow meters for flow measurements on force mains.
- Pumps- Motor and VFD diagnostics and alarms for operations monitoring and maintenance reliability.
- Infiltration Basins- Pressure level sensor, Global Water model WL450, or approved equal.
- Sedimentation Basins- Ultrasonic level sensor, Siemens Hydroranger, or approved equal.

Flow diversion valves and actuated slide gate will normally be open (in diversion mode) and will automatically close (stop diverting flow) on power failure or high-level alarm at the infiltration basin. All monitoring equipment will be monitored by the proposed programmable logic controller (PLC). The data will be available to LASAN via SCADA. The flow diversion SCADA system will include remote monitoring of flow meters, level monitoring, and alarms. Remote control for flow diversion gates, valves, pumping, and related equipment will also be provided.

Reductions in pollutant loading will be quantified using sample pollutant concentrations in conjunction with flow measurements. If problems arise with the flow equipment or the Project faces other limitations, modeling will be used to calculate reduced flow in the sub-drainage area upon Project implementation.

The infiltration galleries will be monitored to determine whether captured runoff will contaminate the Project area's underlying soil and groundwater. Parameters that can affect drinking water and human health will also be monitored to determine their effects on groundwater. The same parameters will then be sampled in groundwater near the infiltration galleries and compared against the baseline groundwater monitoring results to detect any seeping runoff.

Additionally, level sensors will be installed in a representative subset of infiltration galleries to examine the relationship between rainfall, rain intensity, and capture capacity. This data will also be used to examine how the capacity and infiltration rates of the infiltration galleries change over the life of the Project.

A sample monitoring plan is included in the following pages, and a detailed plan specific to this Project will be developed during the design phase.

Monitoring Plan

Fernangeles Park
Stormwater Capture Project

Prepared by: Watershed Protection Program, LASAN, City of Los Angeles

May 2020
Version 2.0

1. Table of Contents

Section

List of Tables

List of Figures

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2. Introduction

Project Overview

The Fernangeles Park Stormwater Capture Project (hereafter referred to as the “Project”), located in the Tujunga Wash watershed of the Upper Los Angeles River Watershed within the San Fernando Valley Groundwater Basin, will entail construction of a 1.6-acre underground infiltration gallery to capture and infiltrate stormwater at Fernangeles Park. This would include installation of three catch basin inlets, pipes, a cross gutter, two hydrodynamic separator units, flow measuring devices, and educational signage. The Project will be designed to capture stormwater runoff from a 292-acre tributary area and infiltrate local stormwater runoff by implementing BMPs. The project will attempt to recharge the groundwater basin, alleviate localized flooding in the area, improve water quality of stormwater runoff, and attenuate peak flow at downstream water bodies. Implementation of the Project will capture approximately 192 AFY by diverting surface flow to the park and the green street along Morehart Avenue. The project will be designed to capture and infiltrate 100% of the runoff from the drainage area.

Monitoring Objectives

The primary goal of this monitoring plan is to measure the effectiveness of the Project once completed, including metrics specific to the identified benefits. The project will receive flows from the surrounding neighborhood with a total area of approximately 292-acres. Flows from this area will converge into reinforced concrete pipes (RCPs), where water will be diverted into the infiltration gallery. Pre-Construction (baseline) Monitoring will focus on characterizing the existing flow and pollutant loads of runoff from the tributary area as well as the water quality of the San Fernando Groundwater Basin. Post-Construction Monitoring will determine the amount of stormwater captured as well as efficacy of contaminant removal through the Project’s filtration gallery. This monitoring plan will be adapted, as necessary to fulfill the scope of work requirements of the funding source for this water quality improvement project, the Safe Clean Water (SCW) Program.

Study Questions

This monitoring program will examine the following study questions:

Pre-Construction (Baseline) Monitoring

1. What are the existing pollutant loads and water quality conditions coming from the 292-acre tributary area during dry and wet weather?

2. What are the baseline conditions of the groundwater in the Project drainage area?

Post-Construction (BMP Effectiveness) Monitoring

1. How much stormwater has been captured and recharged into the San Fernando Groundwater Basin by the project during wet-weather?

2. Do the infiltration galleries function as designed regarding capture capacity and infiltration rates relative to the quantity and intensity of the rainfall?

3. Do the infiltration galleries function as designed regarding contaminant removal? How much pollutant load has been captured and removed?

The data gathered from this monitoring program will help provide a basis for future implementation of similar types of BMPs that utilize infiltration systems. Furthermore, the information obtained from this study will demonstrate how this BMP project performs under varying conditions, which may assist in the design of similar projects in the future, as well as optimize the performance and operation and maintenance of this particular system at Fernangeles Park.

Monitoring Strategy and Design

The monitoring program is divided into three phases: Pre-construction Monitoring, Post-Construction Monitoring, and Long-Term Operation and Maintenance (O&M) Monitoring. Monitoring will focus on three impacted water sources: (1) Water that is sampled before going into the filtration gallery, (2) captured stormwater, and (3) groundwater. Water samples will be taken from the runoff of the 292-acre tributary area to assess the water quality before entering the Project area. Water samples taken from the infiltration gallery and groundwater monitoring wells will be used to assess captured stormwater and its potential impact on groundwater. Flow rates, pollutant concentrations, and general water quality parameters will be measured in the

Pre-Construction phase to determine existing pollutant loads and compared with similar measurements in the Post-Construction phase. Flow of water into the Project will be used to calculate how much water has been captured and recharged into the groundwater basin. Infiltration gallery water level, pollutant concentrations, and water quality measurements will be obtained to determine whether there is potential for captured runoff to contaminate underlying soil and groundwater. The measure of effective pollutant removal from urban and stormwater runoff will be considered the pollutant load reduction, quantified by multiplying volume captured with pollutant concentration. Long-Term O&M monitoring will be conducted for the life of the project (50 years) to determine the continued effectiveness of the Project.

Water samples will also be collected at each source for laboratory analysis of the parameters listed below in ***Table 2***. Additionally, parameters that have the potential to affect drinking water and human health will be monitored to determine the effect on groundwater. Analytes detected at insignificant levels in the optimization phase, with the exception of target analytes, may be excluded from future sampling.

3. Sampling Procedures and Analytical Methods

Monitoring Sites

The selection of the monitoring sites was based on consideration of the following factors: (1) goals of the study, (2) design of the system, (3) site accessibility and (4) safety of field personnel and the general public. Site locations are contingent on design plans and location of treatment facilities. During the Post-Construction phase of monitoring, the sites may be modified, depending on accessibility and actual location and construction of the Project. A map overview of the monitoring sites is shown below in **Figure 1**.

1. Urban and Storm Runoff Monitoring – Three sites will be established for water sampling and flow measurements of the 292-acre tributary area runoff during Pre- and Post-Construction Monitoring activities (FP-1, FP-2, FP-3).

2. Infiltration Gallery Monitoring – A monitoring site, FP-4 will be established for water sampling and water level measurements of the captured stormwater inside the infiltration gallery for Post-Construction Monitoring activities.

3. Groundwater Monitoring - One groundwater monitoring well (FP-GW) to be established for water sampling. Upon approval, FP-GW will be the Department of Water Resources' groundwater well ID:02N15W25L001S or an equivalent Public Water System well.

Figure 1. Fernangeles Park Stormwater Capture Project Monitoring Locations

Note: FP-GW monitoring site is located outside of this map.

Sampling Frequency

Sampling will be conducted on an annual basis according to the frequency listed in ***Table 1***, depending on the type of monitoring and the phase in which it is conducted. Pre-construction Monitoring will be conducted for a period of 2 years, Post-construction Monitoring will be conducted for a period of 3 years, and Long-Term O&M will be conducted for the life of the project (estimated at 50 years).

Table 1. Monitoring Frequency of Fernangeles Park

	Pre-Construction (2 Yrs) Annually	Post-Construction (3 yrs) Annually	Long-Term O&M (~50 yrs)
Runoff Sampling	2 Wet, 2 Dry	2 Wet, 2 Dry	TBD
Infiltration Gallery Sampling	N/A	2 Wet	TBD
Groundwater Sampling	1 Dry	2 Dry	TBD

Note: Long-Term O&M monitoring frequency will be determined following Post-Construction Monitoring and will depend on the needs of the Project.

Wet weather sampling will occur when rainfall events meet the following criteria: (1) rainfall is greater than or equal to 0.1 inch; and (2) the onset of rainfall is preceded by at least 72 hours of dry-weather.

Dry weather sampling will be scheduled so that the sampling is preceded by at least 3 days of dry weather. Furthermore, dry weather sampling events will be spaced at least one month apart, if feasible within the confines of the construction schedule.

Sample Collection and Delivery Procedures

During dry weather Pre-Construction sampling, FP-1, FP-2, FP-3, and FP-GW will be monitored by collecting grab samples. Following Project implementation, FP-1, FP-2, FP-3, FP-4, and FP-GW will be monitored by grab samples.

During wet weather, stormwater runoff samples will be collected from the monitoring sites with a refrigerated autosampler to take composite samples representing the entirety of a given rainfall event or with a manual 3-hour composite. For the infiltration gallery, water grab samples will be collected up to 24 hours after a rainfall event.

All field monitoring/sampling procedures will adhere to the guidelines found in the Surface Water Ambient Monitoring Program (SWAMP) sampling SOP, “Field Collection of Water Samples.”

Analytical Methods

Chemical Parameters

Water samples will be analyzed in LA Sanitation Environmental Monitoring Division's laboratory or contract laboratory by the methods listed in ***Table 2*** or equivalent.

Table 2. List of Parameters and Analytical Methods

Parameter/Type	Recommended Method	Target Reporting Limit	Units	Monitoring Type
Conventionals				
Total Hardness	SM2340C	2	mg/L	Runoff, Infiltration, Groundwater
Total Dissolved Solids	SM2540C	10	mg/L	Runoff, Infiltration, Groundwater
Fecal Indicator Bacteria (FIB)				
E. coli	SM9223B	1	MPN/100ml	Runoff, Infiltration, Groundwater
Metals				
Copper (Total and Dissolved)	EPA 200.8	0.5	µg/L	Runoff, Infiltration, Groundwater
Lead (Total and Dissolved)	EPA 200.8	0.5	µg/L	Runoff, Infiltration, Groundwater
Mercury	EPA 1631	0.5	µg/L	Runoff, Infiltration, Groundwater
Zinc (Total and Dissolved)	EPA 200.8	1	µg/L	Runoff, Infiltration, Groundwater
Nutrients				
Ammonia as Nitrogen	SM4500-NH3 C	0.1	mg/L	Runoff
Nitrite (NO_2), Nitrate (NO_3)	EPA 300.0	0.1	mg/L	Runoff
Organic Compounds				
4,4'-DDE	EPA 8279C/EPA625	50	ng/L	Runoff, Infiltration, Groundwater
4,4'-DDT	EPA 8279C/EPA625	10	ng/L	Runoff, Infiltration, Groundwater
G-Chlordane	EPA 607	100	ng/L	Runoff, Infiltration, Groundwater

Physical Parameters

General water quality characteristics are listed below in ***Table 3***.

Table 3. Field Observations and Water Quality Measurements

Parameter	Equipment	Equipment Accuracy and Range	Calibrate	Applicable Water Quality Standard
Temperature	YSI EXO2 or equivalent	±0.01°C (-5 to 35°C) ±0.05°C (35 to 50°C)	Calibrate <24 hours	None
Dissolved Oxygen (DO)	YSI EXO2 or equivalent	±0.1mg/L (0 to 20mg/L)	Calibrate <24 hours	None
pH	YSI EXO2 or equivalent	±0.1 pH units (0 to 14 pH)	Calibrate <24 hours	Title 22 Hazardous Waste (pH > 2 and < 12.5)
Turbidity	YSI EXO2 or	±0.3 NTU	Calibrate	None

	equivalent	(0-1000 NTU)	<24 hours	
Specific Conductivity	YSI EXO2 or equivalent	±.001 mS/cm (0 to 100 mS/cm)	Calibrate <24 hours	None
Color	Observation	--	--	None
Odor	Observation	--	--	None

Field Equipment

Prior to the start of construction, area-velocity flow meters will be utilized to continuously measure flow rate and volume discharged from the drainage areas. A telemetric system will be established for remote access to real time flow data. If permanent sensors cannot be installed, flow will be measured during site visits using a portable hand-held instrument when flow is adequate, or by using an alternative method, during low flow conditions. A level sensor will be installed inside the catch basin to determine the amount of water being captured. General water quality measurements (listed in Table 3 above) will be recorded concurrently with sampling events using a multi-parameter sonde.

Sample Types and Holding Requirements

Sample handling requirements are summarized in ***Table 4***. All sample bottles must be identified with the project title, appropriate identification number, analyses to be performed, date and time of sample collection, and sampler's initials. A field duplicate and a field blank will be included for each sampling event.

Samples must be stored on ice in a cooler during transport to the laboratory. Chain-of-custody (COC) forms are completed by the sampler for all samples, placed in a plastic envelope and kept inside the cooler with the samples. The laboratory staff is responsible for inspecting the condition of the samples, signing the COC, and reconciling the label information to the COC form. At this point, the laboratory becomes responsible for sample custody. Samples may be disposed of when the analysis is completed, and all analytical quality assurance/quality control procedures are reviewed and accepted.

Table 4. Sample Types, Required Volume, and Handling Requirements

Constituents	Sample Volume/ Mass	Containers (#, size and type)	Preservation	Holding Time
Bacteria	500mL	(1) 500mL Plastic (sterile)	Store Cool at 6ºC	6 hours

Metals	1L	(1) 1L Plastic Acid washed	Store Cool at 6ºC	6 months
Nitrate (NO_3-N) Nitrite (NO_2-N)	500 mL	(1) 500 mL Plastic Bottle	Store Cool at 4ºC	48 hours
Total Ammonia (NH_3-N) Total Nitrogen	500 mL	(1) 500 mL Plastic Bottle	Store Cool at 4ºC Add sulfuric acid, pH < 2	28 days
Total Suspended Solids	1000 mL	(1) 1000 mL Plastic Bottle	Store Cool at 4ºC	7 days

4. Data Quality Objectives

This monitoring plan will ensure high-quality data, evaluated by its comparability, representativeness, and completeness.

Comparability of the data is defined as the similarity of data generated by different monitoring programs. For this monitoring plan, this objective will be ensured by standardization of procedures for field measurements, sample collection, sample preparation, laboratory analysis, and site selection; adherence to quality assurance protocols and holding times; and reporting in standard units.

Representativeness is defined as the degree to which the environmental data generated by the monitoring program accurately and precisely represent actual environmental conditions. Data accuracy is the closeness of data to the true environmental value, whereas data precision is the closeness of two or more measurements to each other. Representativeness will be ensured by the methodical selection of characteristic sampling locations, methods, and parameters; calibration of measurement instruments; and validation of data using quality control samples. Quality control samples include field blanks to verify data accuracy and field duplicates to verify data precision.

Data completeness is a measure of the amount of successfully collected and validated data relative to the amount of data planned to be collected for the project. A project objective for percent completeness is based on the percentage of the data needed for the program or study to reach valid conclusions.

Quality assurance and quality control, including standard methods and procedures as well as data management and validation, will follow standards set by the Watershed Protection Program Quality Assurance Project Plan (WPPQAPP).

5. Data Management and Reporting

Data management will involve field staff (WPD), as well as laboratory staff (EMD/contract laboratory). WPD will record and maintain all field data collected during sampling events. This field log sheet will register all information during a particular sampling event, such as date, time, name of field personnel, sampling location, sample ID, name of sampling program, and visual inspection of the site as well as additional comments that may be relevant to the Project. All field data will be entered into a digital database. EMD/contract laboratory will record and log all samples analyzed, and all laboratory data will be entered into Laboratory Information Management System (LIMS). Upon validation from each respective laboratory supervisor, EMD/contract laboratory will submit the validated data electronically to WPD. Field log sheets and hard copies of lab results will be filed in a project specific folder at WPD. Data files will have an access log showing activities and changes made to the file. All data files, at WPD and EMD/contract laboratory, are saved on a network drive and are backed-up in an archive. Records will be maintained for a minimum of five years after project completion. All data will be compiled and reviewed by WPD's Field Team Coordinator. Final approval and validation of the data will be conducted by WPD's Project QA Officer.

Monitoring Reports that summarize the findings of this monitoring program will be prepared by Watershed Protection according to the requirements of the Safe Clean Water Program and/or by request of the Project Manager. These reports will include basic elements such as an overview of monitoring activities, a thorough assessment of all data collected, including tables summarizing sampling events, comparisons to applicable standards, and graphs depicting spatial and temporal patterns among constituents and a summary of the results, and conclusions based on the salient findings. The format of these reports may vary according to the requirements they are meeting, or the information they are conveying. An adaptive approach to monitoring reports or summaries will be taken as the requirements of the Safe Clean Water program are finalized.

6. Adaptive Management

An adaptive approach to monitoring will be crucial in order to provide the most useful information for the design and operation of the Project. The schedule, water quality parameters, and monitoring equipment may be modified depending on changes to Project design, regulatory revisions, and advances in new scientific technology. Monitoring may also be adapted to the needs of the project as they develop, e.g., additional needs to assess impacts on the environment or public health, optimization data, and/or data that may be needed to determine maintenance protocols and schedules.

Attachment 1. Monitoring Equipment Costs

Item Description	Qty	Unit Cost	Extended Cost	Replacement Cycle (yr)
Campbell Scientific Weather Station	1	$2,400	$2,400	10
Campbell Scientific Datalogger CR1000	1	$1,800	$1,800	10
Campbell Scientific Communication Hardware	1	$3,800	$3,800	10
Geotech Groundwater Sampling Pump Kit	1	$3,000	$3,000	5
YSI Multiparameter Sonde (Model EXO2)	1	$7,600	$7,600	5
YSI EXO Handheld Display Unit	1	$3,400	$3,400	5
YSI EXO Sonde Sensors	1	$12,000	$12,000	2
ISCO 6712FR Sampler with 4 Bottle Configuration	4	$8,000	$32,000	5
ISCO Flow Sensor	3	$1,300	$3,900	5
ISCO Flow Module	3	$2,400	$7,200	5
ISCO Communication Hardware	4	$4,000	$16,000	5
Solinst Levelogger Edge Water Level Datalogger	1	$300	$300	10
Monitoring Equipment Enclosure (stainless steel)	4	$9,200	$36,800	15
Ruggedized Laptop Computer	1	$5,300	$5,300	10
Utility Trailer (On-site secure housing for Monitoring Equipment)	1	$3,400	$3,400	10
		Total	**$138,900**	

Attachment 2. Monitoring Labor and Laboratory Analysis Costs

Pre-Construction (Baseline Monitoring)			
Item Description	**Annual Cost**	**Years**	**Extended Cost**
Laboratory Analysis	$33,800	2	$67,600
Labor: Sampling & Observations	$7,500	2	$15,000
Labor: Real-time Monitoring Systems (O&M)	$6,000	2	$12,000
Labor: Data Management & Reporting	$7,500	2	$15,000
Subtotal	**$54,800**	**2**	**$109,600**

Post-Construction (BMP Effectiveness Monitoring)			
Item Description	**Annual Cost**	**Years**	**Extended Cost**
Laboratory Analysis	$52,000	3	$156,000
Labor: Sampling & Observations	$9,200	3	$27,600
Labor: Real-time Monitoring Systems (O&M)	$6,000	3	$18,000
Labor: Data Management & Reporting	$9,200	3	$27,600
Subtotal	**$76,400**	**3**	**$229,200**

Total **$338,800**

Attachment 3. Monitoring Cost Summary (First 5 Year Period)

Monitoring Cost Summary (First 5 Year Period)			
Item Description	**Annual Cost**	**Years**	**Extended Cost**
Pre-Construction Monitoring	$54,800	2	$109,600
Post-Construction Monitoring	$76,400	3	$229,200
Monitoring Contingency (5% of Monitoring Total)	$6,560	3	$19,680
Equipment Initial Purchase Cost	$138,900	-	$138,900
Equipment Replacement Cost	$4,167	3	$12,501
Subtotal			**$509,881**

<u>Note:</u>
The costs associated with Long-Term O&M Monitoring are not shown here, because this phase of monitoring will be funded by the Project's O&M budget. Additionally, Long-Term O&M monitoring is contingent upon the findings from the 3-year post-construction period as well as the operational needs of the Project and will be adapted as such. If significant additional monitoring costs are incurred following Post-Construction, these costs will be absorbed by the Project's contingency funds.

ATTACHMENTS FOR SECTION 2.6:

O & M

2.6 Operations and Maintenance

The operations and maintenance (O&M) activities will be performed across both infiltration BMPs and filtration BMPs. This includes inspection and cleaning of surface drainage systems, diversion structures, hydrodynamic separators, pump stations, sedimentation basins, and infiltration galleries. O&M activities may also include care for plant materials, soil cultivation, irrigation, fertilizing, and mowing of park property. Responsibility for the maintenance of the recreational features will be with the RAP. An overview of the O&M requirements for the Project's stormwater components are outlined in Table 1.

Table 1 Typical O&M Guidelines

BMP Component	O&M Plan
Pump Station	• One annual dry season inspection and monthly wet season inspection. • Trash well cleaning once during the dry season and 3 times during the wet season. • Valve maintenance and control panel maintenance as needed.
Diversion Structures, Maintenance Holes, Sedimentation Basins	• Structures shall be cleaned and debris removed following major storm events and periodically. Maintenance will also prevent the potential for vector breeding. • If vector breeding is taking place at a site as a result of contained stormwater or inadequately maintained BMPs, the Greater Los Angeles County Vector Control District can fine site owners for violating the California Health and Safety Code (Section 2060-2067).
Infiltration Facilities	• Regular inspections shall take place to ensure that the pretreatment sediment removal BMP is working efficiently. Sediment buildup exceeding 50% of the sediment storage capacity shall be removed. • The infiltration facility shall be maintained to prevent clogging. Maintenance activities include checking for debris/sediment accumulation and removal of such debris with a Vactor truck.
Permeable Pavement	Check for sediment accumulation to ensure that flow onto the permeable pavement is not restricted. Remove any accumulated sediment. Stabilize any exposed soil.
	Portions of pavement should be swept with a vacuum street sweeper at least twice per year or as needed to maintain infiltration rates.
	Tasks include trash collection, sweeping, and spot weeding. Ensure landscaping materials (soil, mulch, grass clippings, etc.) are not stockpiled on permeable pavement surfaces.

O&M cost estimates for Valley Plaza Park North and Valley Plaza Park South are provided in Table 2 and Table 3, respectively. These estimates include the number of crew needed per event, hours per event, staff expertise, and projected O&M costs per year. A detailed O&M plan will be developed during the design phase.

Table 2 Estimate of O&M Activities Required Hours for Valley Plaza Park North

Description	No. of Times per year	No. of Personnel	Hours Per visit	Personnel Expertise Level	Unit Price	Annual Total
Common Maintenance						$ 3,300
Vacuum Truck Rental	6				$ 550	$ 3,300
Pump Stations						$ 16,250
Dry Season Inspection and Cleaning (Vacuum)	3	2	5	Vactor Truck Operator	$ 750	$ 2,250
Dry Season Inspection and Cleaning (Vacuum)	6	2	5	Vactor Truck Operator	$ 750	$ 4,500
Electrical Usage	12	2	4	Trash Removal Crew	$ 625	$ 7,500
Valve Maintenance	1	2	4	Electrician	$ 1,000	$ 1,000
Control Panel Maintenance	1	2	4	Electrician	$ 1,000	$ 1,000
Channel Diversion and Pre-Treatment						$ 39,000
Pump Station - Inspection, Cleaning and Maintenance	12				$ 750	$ 9,000
Diversion Structure - Inspection and Cleaning	12	2	4	Trash Removal Crew	$ 250	$ 3,000
Pre-treatment Device (Vacuum)	12	2	5	Vactor Truck Operator	$ 1,500	$ 18,000
Sedimentation Basin - Inspection and Cleaning	12	2	4	Trash Removal Crew	$ 750	$ 9,000
Storage						$ 16,000
Dry Season Inspection and Cleaning (Vacuum)	2	2	5	Vactor Truck Operator	$ 4,000	$ 8,000
Wet Season Inspection and Cleaning (Vacuum)	2	2	5	Vactor Truck Operator	$ 4,000	$ 8,000
					TOTAL	$ 74,550

Table 3 Estimate of O&M Activities Required Hours for Valley Plaza Park South

Description	No. of Times per year	No. of Personnel	Hours Per visit	Personnel Expertise Level	Unit Price	Annual Total
Common Maintenance						$ 3,300
Vacuum Truck Rental	6				$ 550	$ 3,300
Channel Diversion and Pre-Treatment						$ 39,000
Rubber Dam - Inspection, Cleaning and Maintenance	12				$ 750	$ 9,000
Diversion Structure - Inspection and Cleaning	12	2	4	Trash Removal Crew	$ 250	$ 3,000
Pre-treatment Device (Vacuum)	12	2	5	Vector Truck Operator	$ 1,500	$ 18,000
Sedimentation Basin - Inspection and Cleaning	12	2	4	Trash Removal Crew	$ 750	$ 9,000
Storage						$ 16,000
Dry Season Inspection and Cleaning (Vacuum)	2	2	5	Vector Truck Operator	$ 4,000	$ 8,000
Wet Season Inspection and Cleaning (Vacuum)	2	2	5	Vector Truck Operator	$ 4,000	$ 8,000
					TOTAL	$ 58,300

Safe, Clean Water Program
Operations and Maintenance Commitment

The Los Angeles Department of Water and Power (LADWP) proposes to implement three stormwater capture projects that will be constructed on facilities owned by the City of Los Angeles. These projects will treat stormwater runoff and recharge the San Fernando Groundwater Basin. These projects include the following:

- David M. Gonzales Recreation Center Stormwater Capture Project
- Valley Plaza Park Stormwater Capture Project
- North Hollywood Park Stormwater Capture Project

As required by the City of Los Angeles Charter Section 580 (see attached), the operations and maintenance commitments of the projects are the responsibility of the Los Angeles Department of Public Works, with the Bureau of Sanitation and Environment (LASAN) as the responsible Bureau. LASAN is responsible for collecting, cleaning, and recycling solid and liquid waste, including stormwater and urban runoff within the City of Los Angeles. LASAN will own, operate, and maintain the water quality components of these projects as part of LASAN’s fixed assets.

As Inter-City agencies, LADWP will coordinate with LASAN for operations and continued maintenance throughout the useful lives of the projects.

If you have any questions or require additional information, please contact Mr. Art Castro, Manager of LADWP’s Watershed Group, at (213) 367-2966.

Print

Los Angeles Charter and Administrative Code

Sec. 514. Transfer of Powers.

(a) **Charter Created Powers and Duties.** The Mayor may propose the transfer of any of the powers, duties and functions of the departments, offices and boards of the City set forth in the Charter to another department, office or board created by the Charter or by ordinance. The transfer shall be effective if approved by ordinance adopted by a two-thirds vote of the Council, or if the Council fails to disapprove the matter within 45 days after submittal by the Mayor of all documents necessary to accomplish the transfer, including the proposed ordinance transferring powers, duties or functions, and any related ordinances or resolutions concerning personnel or funds affected by the transfer. The Council on its own initiative may, by ordinance, adopted by a two-thirds vote of the Council, subject to the veto of the Mayor or by a three-fourths vote of the Council over the veto of the Mayor, make any such transfer.

(b) **Exceptions.** The power of the Mayor and Council to act as provided in this section shall not extend to:

(1) Elected Offices;

(2) Proprietary Departments;

(3) Los Angeles City Employees' Retirement System;

(4) Department of Fire and Police Pensions;

(5) City Ethics Commission;

(6) The disciplinary functions of the Fire Department and the Police Department as contained in Sections 1060 and 1070; and

(7) The Police Department and the Fire Department, if the transfer or consolidation would significantly alter or affect the primary purpose or character of the departments.

(c) **Ordinance Created Powers and Duties.** Powers, duties and functions established by ordinance may be transferred or eliminated by an ordinance proposed by the Mayor or Council. If the Mayor proposes a transfer or elimination, the action shall be effective if approved by ordinance adopted by a majority vote of the Council, or if the Council fails to disapprove the matter within 45 days after submittal by the Mayor of all documents necessary to accomplish the transfer or elimination, including the proposed ordinance transferring powers, duties or functions, and any related ordinances or resolutions concerning personnel or funds affected by the transfer or elimination.

Print

Los Angeles Charter and Administrative Code

Sec. 580. Public Works Department Powers and Duties.

The Department of Public Works shall have the following powers and duties:

(a) design, construct, excavate and maintain streets and public works improvements including but not limited to bridges, public parkways and rights-of-way, sanitary sewers and storm drains, water and sewer treatment facilities, landfills and public rights-of-way lighting facilities owned by the City;

(b) design and construct public buildings belonging to the City, except those under the jurisdiction of the Proprietary Departments and the Department of Recreation and Parks;

(c) dispose of solid waste; and

(d) perform other duties as may be assigned by ordinance, if not inconsistent with Section 514.

ATTACHMENTS FOR SECTION 3.2:

24-HOUR STORM CAPACITY

ATTACHMENTS FOR SECTION 3.3:

EVENT-BASED DESIGN DETAILS

ATTACHMENTS FOR SECTION 3.4:

LONG-TERM PERFORMANCE

ATTACHMENTS FOR SECTION 4.1:

NEXUS

4.1 Nexus

Figure 1 and Figure 2 depict the anticipated flow regimes and realization of supply benefits for Valley Plaza Park North and Valley Plaza Park South, respectively. Confirmation of the groundwater augmentation benefit is included in the following pages.

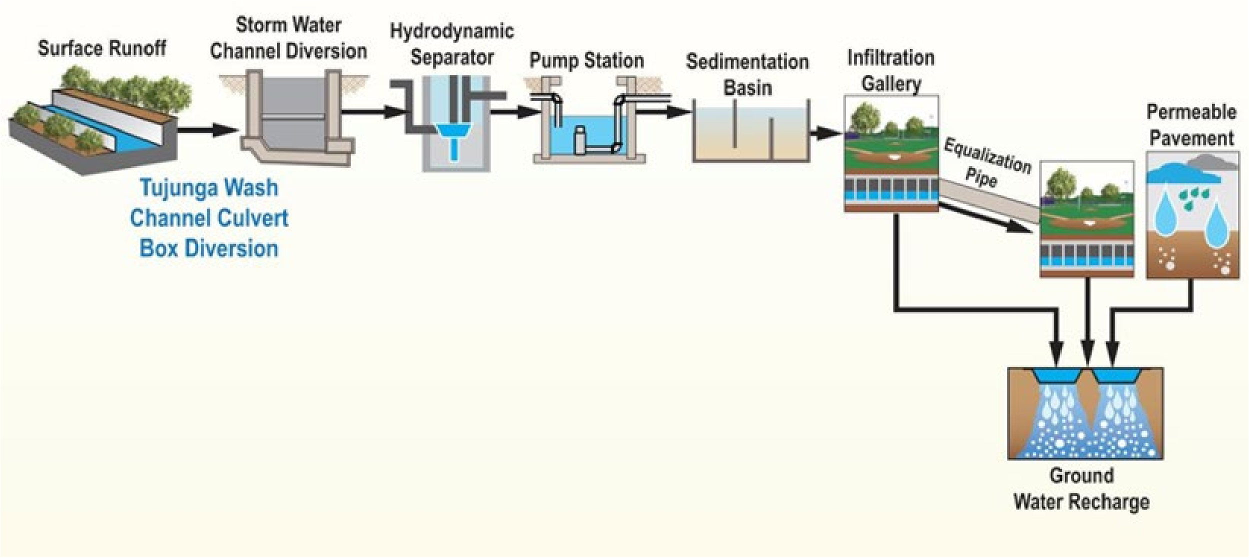


Figure 1 Process Flow Diagram for Valley Plaza Park North (Phase 1)

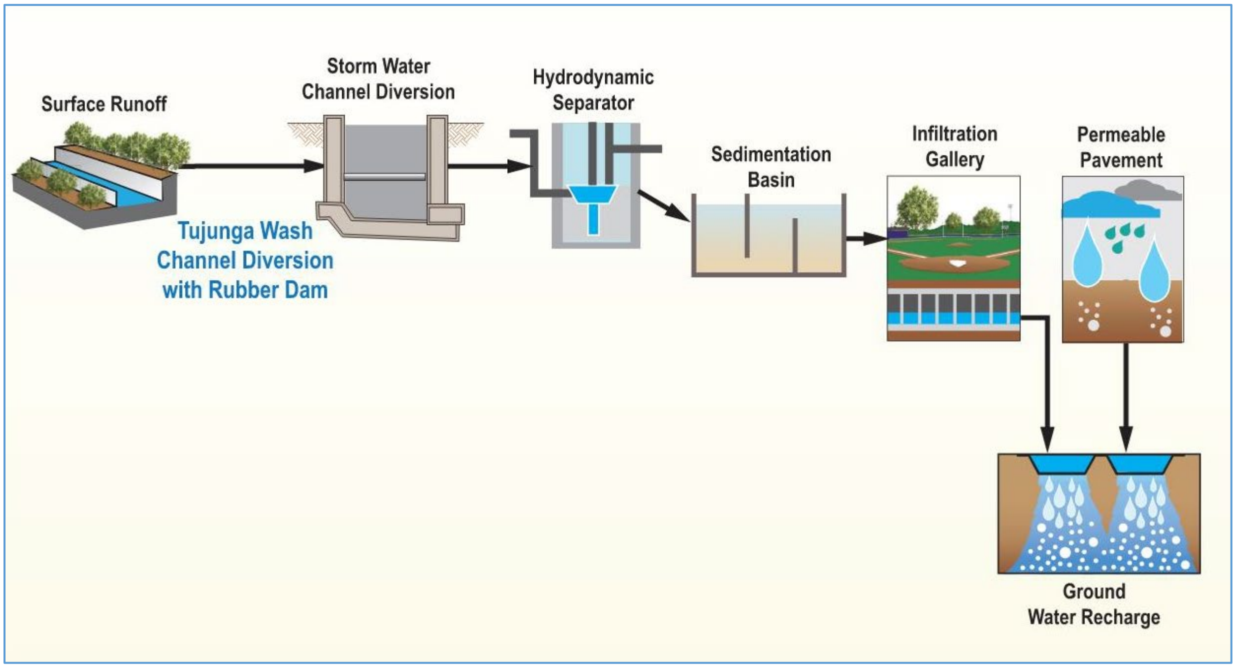


Figure 2 Process Flow Diagram for Valley Plaza Park South (Phase 2)

Safe, Clean Water Program
Groundwater Supply Confirmation

The Los Angeles Department of Water and Power (LADWP) proposes to implement three stormwater capture projects that will be constructed on facilities owned by the City of Los Angeles. These projects will treat stormwater runoff and recharge the San Fernando Groundwater Basin. These projects include the following:

- David M. Gonzales Recreation Center Stormwater Capture Project
- Valley Plaza Park Stormwater Capture Project
- North Hollywood Park Stormwater Capture Project

Each project is a part of an overall long term plan to enhance local water supply reliability. The principle of the projects involve capturing rainfall and runoff from open space and urban surface areas for either direct use or groundwater recharge.

The projects will capture and infiltrate stormwater through the use of diversion structures, catch basins, hydrodynamic separators, pump stations, underground infiltration galleries, and other stormwater components to recharge the San Fernando Groundwater Basin. The estimated annual wet weather capture volume was modeled using the EPA's Storm Water Management Model (SWMM 5.1) using 10-year historical rain data (1997-2007). The dry weather contribution was estimated based on low flow diversion monitoring data from 2012 to 2016, where the median value for dry weather runoff is approximately 84 gallons per day per impervious acre of land. The estimated combined total groundwater supply benefit based on this preliminary assessment is 2,100 acre-feet per year for these projects.

As a part of the Stormwater Capture Parks Program, these projects provide water supply, water quality and other multi-benefits to help achieve Los Angeles County's objectives as defined by the Safe, Clean Water Program Ordinance. Fully endorsed by the Upper Los Angeles River Area (ULARA) Watermaster, these projects are key to restoring and maintaining the health of the San Fernando Basin.

If you have any questions or require additional information, please contact Rafael Villegas, Manager of LADWP's Water Rights and Groundwater Management Group, at (213) 367-1289.

ATTACHMENTS FOR SECTION 4.2:

BENEFIT MAGNITUDE

ATTACHMENTS FOR SECTION 4.3:

COST EFFECTIVENESS

ATTACHMENTS FOR SECTION 5.1:

COMMUNITY INVESTMENT

5.1 Community Investment Benefits

Investing in this disadvantaged community, which has also been designated as a very high park needs area, is central to the Project. The Project concept was developed incorporating comments received from the community and the public at large during public engagement sessions. Design and construction of the Project will create a significant number of new jobs while prioritizing local hire, and upon completion, the Project will enhance the fabric of the community by upgrading the park. All seven community investment benefits are expected to be achieved by the Project, with at least 181 trees added and more native vegetation proposed at the nonprofit school that is located on-site. Other key features include upgraded athletic equipment, a proposed pedestrian trail along the open channel, new park benches, hydration stations, educational signage, lighting, replaced sod, enhanced irrigation at the park, proposed EV charging stations, and permeable pavement parking lots with native landscaping.

5.1.1 Improved flood management, flood conveyance, or flood risk mitigation

As shown in Figure 1, under current conditions there are a significant number of flooding complaints that have been reported within a two-mile radius of the drainage area that will be served by the Project. This portion of the San Fernando Valley has a well-documented history of flooding issues that are especially severe during large storm events.

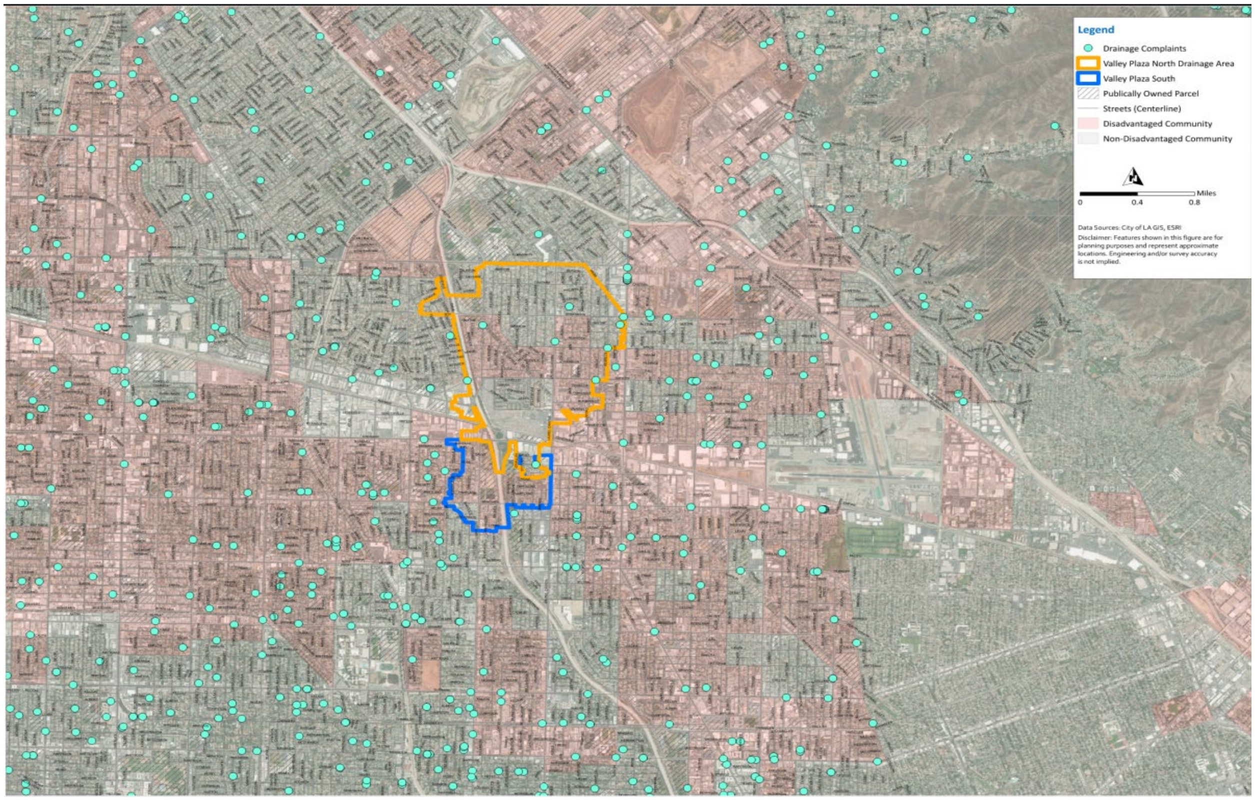


Figure 1 Flooding Complaints in the Vicinity of Valley Plaza Park

5.1.2 Creation, enhancement, or restoration of parks, habitat, or wetlands

Please refer to Section 5.1 (Community Investment Benefits) of the SCW Projects Module. More detail on recreational features is included in Section 5.1.4 below.

5.1.3 Improved public access to waterways

Improvements will include removing deteriorating fencing to allow the park to extend onto the existing access road and to provide additional native vegetation. By opening up the access road and enhancing it with landscaping and DG pedestrian trails, the Project will expand the park usage and improve access to the waterway. Educational signage will be implemented to include factoids about the Los Angeles River's ecology, including plants and wildlife that are currently a part of the river's ecosystem. Figure 2 depicts the existing conditions along the open channel as well as the proposed improvements.

Figure 2 Left: Existing Conditions Along the Waterway Right: Proposed Improvements Along the Waterway

5.1.4 Enhanced or new recreational opportunities

Figure 3 and Figure 4 illustrate key recreational improvements at Valley Plaza Park North and Valley Plaza Park South, respectively. Note that recreational features will be finalized with feedback from the community and with approval from RAP. Please refer to Section 5.1 (Community Investment Benefits) of the SCW Projects Module for details.

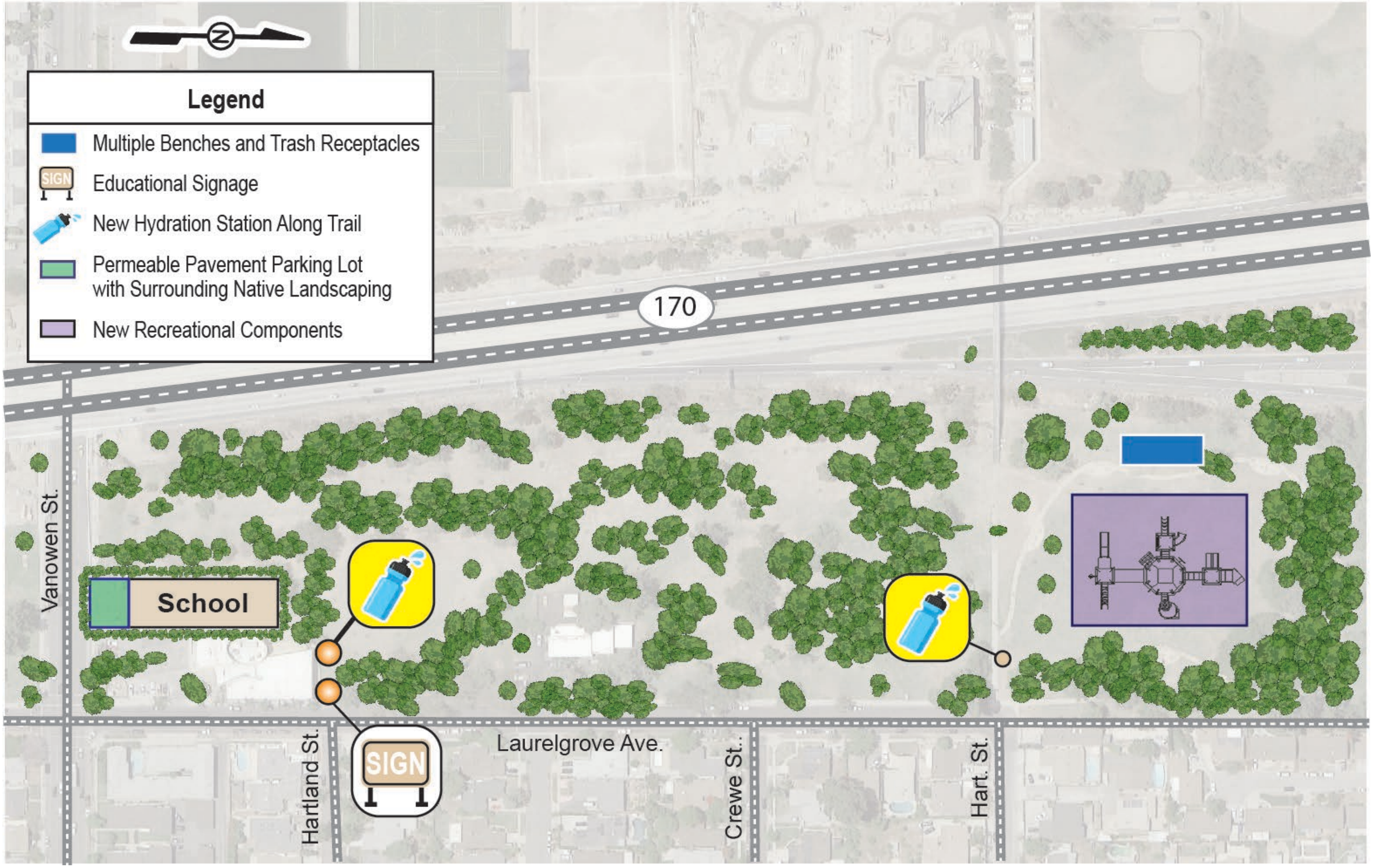


Figure 3 Key Above-Ground Features at Valley Plaza Park North

Figure 4 Key Above-Ground Features at Valley Plaza Park South

5.1.5 Greening of schools

The Project proposes to replace the parking lot for the nonprofit school with permeable pavement and to incorporate native landscaping in the area immediately surrounding the school and parking lot. Figure 3, above, outlines the location of the school relative to the added greenery at the parking lot and throughout the park. Figure 5, below, provides a more detailed visual representation of the proposed improvements to the parking lot of the school.

Figure 5 Existing School Parking Lot (Left) Compared to Proposed Improvements (Right)

5.1.6 Reducing local heat island effect and increasing shade

Please refer to Section 5.1 (Community Investment Benefits) of the SCW Projects Module.

5.1.7 Increasing shade or the number of trees or other vegetation

Please refer to Section 5.1 (Community Investment Benefits) of the SCW Projects Module.

5.2 Local Support (Outreach)

Figure 6 depicts an example of outdoor banners that have been placed at the park, providing information to the public and guiding members of the community to an online survey that solicits community feedback.

Figure 6 Example Outreach Banners

Table 1 below provides a summary of outreach conducted by the time of submittal of this report.

Table 1 Community Outreach Events Conducted

Forum	Audience	Date	Summary
Virtual – WebEx	Council District 2	May 6, 2020	Presented overview of project, project details, and answered staff questions.
Virtual – Zoom	Key Stakeholders	June 25, 2020	Presented overview of project, project details, and answered stakeholder questions.
Virtual – Zoom	Community	August 20, 2020	Presented overview of project, project details, and answered questions from the community

The Project was able to garner support from several organizations because it provides crucial benefits to the disadvantaged community, ranging from improved recreational opportunities to an enhanced local ecosystem with air quality benefits for the area within the vicinity of the underserved park. This application includes support letters from Pacoima Beautiful, Council for Watershed Health, Mountains Recreation and Conservation Authority, City of Los Angeles Council District 2, and ULAR EWMP Watershed Management Group.

6.1 Nature-Based Solutions

The parking lot for the school located at Valley Plaza Park North will be replaced with permeable pavement and will incorporate native landscaping, as shown in Figure 5. The recreation center parking lot at Valley Plaza Park South will also include permeable pavement and native landscaping, as shown in Figure 7 below.

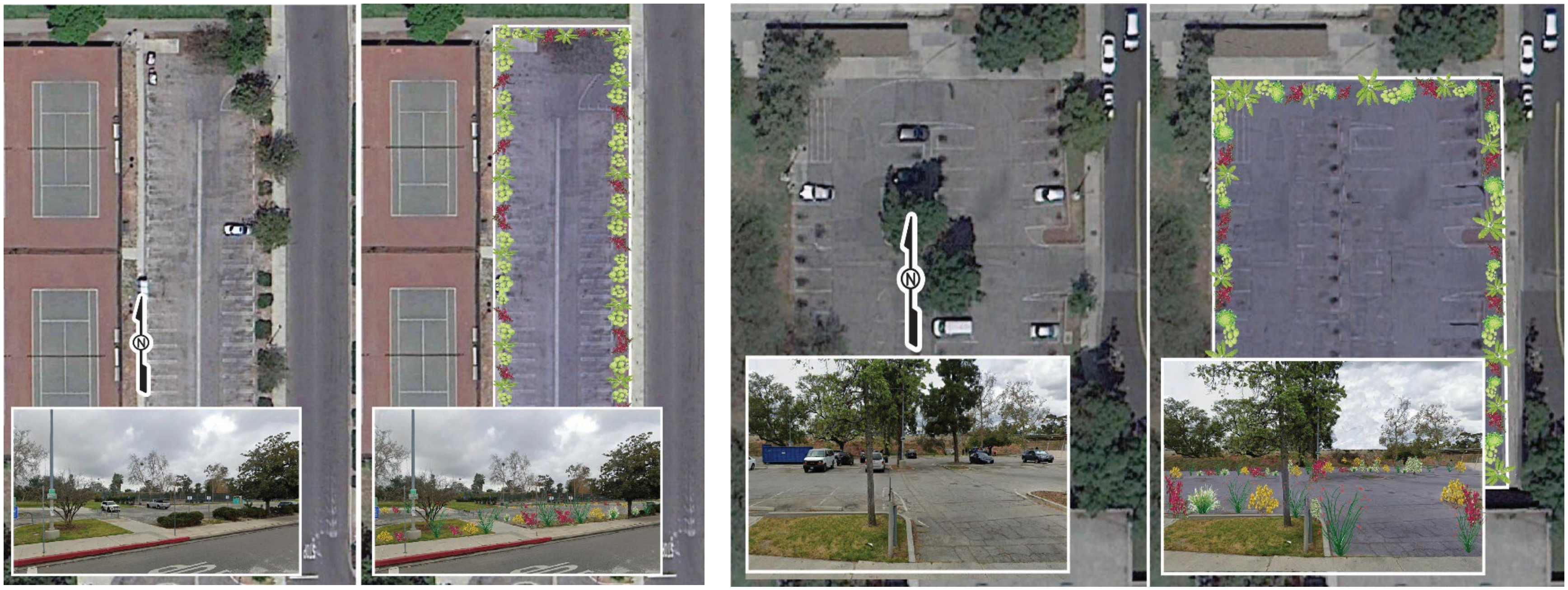


Figure 7 Recreation Center Parking Lot with and without Proposed Improvements

Table 2 is an example initial tree list, but specific species of trees and other plants will be confirmed during the detailed design phase of the Project.

Table 2 Example Tree Species

Recommended Trees for Turf Areas	Recommended Trees for Dry Non-turf Areas
Afrocarpus gracilior	Cercis occidentalis
Arbutus ‘Marina’	Chilopsis linearis ‘Bubba’ or ‘Timeless Beauty’
Dalbergia sissoo	Dalbergia sissoo
Geijera parviflora	Hesperocyparis forbesii
Handroanthus impetiginosus	Leptospermum ‘Dark Shadows’
Jacaranda mimosifolia	Parkinsonia 'Desert Museum'
Lophostemon confertus	Pinus eldarica
Pinus torreyana	Quercus agrifolia (natural form)
Pinus eldarica	Tecoma stans
Pistacia chinensis	Vachellia farnesiana
Pistacia ‘Red Push’	Vitex agnus-castus
Prosopis 'Maverick'	
Quercus agrifolia (natural form)	
Quercus buckleyi	
Quercus shumardii	
Taxodium mucronatum	
Tipuana tipu	

ATTACHMENTS FOR SECTION 5.2:

LOCAL SUPPORT

Pacoima Beautiful

ENVIRONMENTAL EDUCATION. LEADERSHIP DEVELOPMENT & ADVOCACY

August 24, 2020

Mr. David R. Pettijohn, Director of Water Resources
Los Angeles Department of Water and Power
111 North Hope Street, Room 1460
Los Angeles, CA 90012

Subject: Stormwater Capture Parks Program

Dear Mr. Pettijohn,

On behalf of Pacoima Beautiful, we are pleased to support the Los Angeles Department of Water and Power's (LADWP) implementation of the Stormwater Capture Parks Program (Program).

The Program will provide improvements that will benefit both the community and the urban watershed. This includes replenishing the San Fernando Groundwater Basin with up to 2,912 acre-feet of stormwater per year from a 5,686-acre drainage area, improving the water quality in the Los Angeles River, alleviating localized flooding, and enhancing recreational amenities across nice parks.

Pacoima Beautiful is a grassroots organization that has long supported policies, programs and projects that will create a safer and cleaner community. The Program is aligned with Pacoima Beautiful's mission to promote a healthy and sustainable San Fernando Valley.

As a result, I fully support the Program and LADWP's application for funding through the Los Angeles County's Safe Clean Water Program.

If you have any questions about this letter of support, please contact me at (818) 899-2454 or via email at vpadilla@pacoimabeautiful.org.

Sincerely,

Veronica Padilla

Veronica Padilla
Executive Director

Cc: Mr. Art Castro
Manager of Watershed Management
Los Angeles Department of Water and Power
111 North Hope Street, Room 308
Los Angeles, CA 90012

13520 Van Nuys Blvd. Suite 200, Pacoima, CA 91331 • (818) 899-2454 • Fax (818) 485-4306
www.pacoimabeautiful.org

COUNCIL FOR
WATERSHED HEALTH

November 20, 2019

Mr. David R. Pettijohn, Director of Water Resources
Los Angeles Department of Water and Power
111 North Hope Street, Room 1460
Los Angeles, CA 90012

Subject: Letter of Support for the Stormwater Capture Park Program

Dear Mr. Pettijohn,

On behalf of Council for Watershed Health, we are pleased to support the Los Angeles Department of Water and Power's (LADWP) implementation of the $230.1 Million Stormwater Capture Parks Program (Program). The Program will provide improvements that will benefit both the community and the urban watershed. This includes replenishing the San Fernando Groundwater Basin with approximately 2,900 acre-feet of stormwater per year, improving the water quality in the Los Angeles River, alleviating localized flooding, and enhancing recreational amenities. The following nine projects comprise the Program with estimated annual yields:

- Strathern Park North – 294 AFY
- Valley Plaza Park North – 457 AFY
- Valley Plaza Park South – 136 AFY
- Whitsett Fields Park North – 98 AFY
- Alexandria Park – 91 AFY
- North Hollywood Park – 1,176 AFY
- Valley Village Park – 134 AFY
- Fernangeles Park – 192 AFY
- David M. Gonzales Rec Center – 335 AFY

Our Vision 2025 inspires Council for Watershed Health to work toward a Southern California that is a model of sustainable, urban watershed management, with clean waters, reliable local water supplies, restored native habitats, ample parks and open spaces, integrated flood management, and revitalized rivers and urban centers. We believe the proposed suite of LADWP multi-benefit park project enhancements will be an important step towards increasing localized stormwater capture potential while improving water quality in our rivers and ocean. As a result, we fully support the Project and LADWP's application for funding through the Los Angeles County's Safe Clean Water Program. If you have any questions, please feel free to contact me at eileen@watershedhealth.org or by phone at 213-229-9945.

Sincerely,

Eileen Alduenda
Executive Director, Council for Watershed Health

Cc: Mr. Art Castro | Manager of Watershed Management
Los Angeles Department of Water and Power
111 North Hope Street, Room 308
Los Angeles, CA 90012

MOUNTAINS RECREATION & CONSERVATION AUTHORITY
Los Angeles River Center & Gardens
570 West Avenue Twenty-Six, Suite 100
Los Angeles, California 90065
Phone (323) 221-9944 Fax (323) 221-9934

November 22, 2019

Mr. David R. Pettijohn, Director of Water Resources
Los Angeles Department of Water and Power
111 North Hope Street, Room 1460
Los Angeles, CA 90012

Subject: Letter of Support for the Stormwater Capture Park Program

Dear Mr. Pettijohn,

On behalf of Mountains Recreation & Conservation Authority (MRCA), we are writing in support of the Los Angeles Department of Water and Power's (LADWP) implementation of the $230.1 Million Stormwater Capture Parks Program (Program). The Program will provide improvements that will benefit both the community and the urban watershed. This includes replenishing the San Fernando Groundwater Basin with approximately 2,900 acre-feet of stormwater per year, improving the water quality in the Central Branch of Tujunga Wash and ultimately the Los Angeles River, alleviating localized flooding, and enhancing recreational amenities.

The Program complements efforts underway by our joint powers authority partner the Santa Monica Mountains Conservancy (SMMC), with support by the MRCA, to address the unique needs of the Upper Los Angeles River Watershed. The SMMC's legislatively created Upper Los Angeles River and Tributaries (ULART) Working Group is currently working on the development of a Revitalization Plan for the Upper Los Angeles River Watershed, as mandated by Assembly Bill 466 and Senate Bill 1126. The anticipated completion date of this plan is Spring/Summer 2020. The Revitalization Plan studies the Upper LA River and Tributaries and throughout this process and has identified upwards of 200+ Opportunity Areas throughout Aliso Canyon Wash, Pacoima Wash, Tujunga Wash, Verdugo Wash, Burbank Western Channel, and the Arroyo Seco.

LADWP staff have provided the ULART team with details on the Program's nine project sites that are located along the Central Branch of the Tujunga Wash and these sites will be included within the ULART Revitalization Plan as Opportunity Areas. Aside from an introductory analysis, the Working Group did not study the Central Branch of Tujunga Wash, yet the nine distributed project sites of LAWDP's Program offer an excellent way from top to bottom to implement a water quality and re-use system. The Program benefits the Working Group's effort because it essentially further expands the identified projects throughout the ULART area, without significant resources needing to be utilized by the ULART team. We hope that the Program can go further to implement varying kinds of multi-benefit green infrastructure improvements that will complement the type of projects proposed in the ULART Revitalization Plan (e.g. use of natural systems, regional connectivity, wildlife corridors, tree planting for urban cooling, etc.) and encourage your

A local public agency exercising joint powers of the Santa Monica Mountains Conservancy, the Conejo Recreation & Park District, and the Rancho Simi Recreation & Park District pursuant to Section 6500 et seq. of the Government Code.

staff to meet with the ULART team to identify how to further improve your proposed projects.

For these reasons, we support the Program and LADWP's application for funding through the Los Angeles County's Safe Clean Water Program. If you have any questions about this letter of support, please contact me at (323) 221-9944 ext. 190.

Sincerely,

Brian Baldauf
Chief of Watershed Planning

Cc: Mr. Art Castro
Manager of Watershed Management
Los Angeles Department of Water and Power
111 North Hope Street, Room 308
Los Angeles, CA 90012

PAUL KREKORIAN
LOS ANGELES CITY COUNCILMEMBER

November 25, 2019

David R. Pettijohn
Director of Water Resources
Los Angeles Department of Water and Power
111 North Hope Street, Room 1460
Los Angeles, CA 90012

Subject: Letter of Support for the Stormwater Capture Parks Program

Dear Mr. Pettijohn:

I would like to express my support for the implementation by the Los Angeles Department of Water and Power (LADWP) of the $230.1 Million Stormwater Capture Parks Program (Program). When completed, the Program will help develop new local supplies to improve long term supply reliability for the City of Los Angeles. The Program consists of multi-beneficial efforts that will help replenish the San Fernando Groundwater Basin, improve the water quality of the Los Angeles River and the ocean, reduce localized flooding, and enhance open space recreation, with many of those efforts located in my District.

I applaud LADWP's collaboration with multiple City departments to implement the Program at nine city park locations. The Program isss estimated to capture an annual total yield of approximately 2,900 acre-feet per year (AFY), with the following seven projects located in my district, totaling 2,386 AFY:

- Strathern Park North – 294 AFY
- Valley Plaza Park North – 457 AFY
- Valley Plaza Park South – 136 AFY
- Whitsett Fields Park North – 98 AFY
- Alexandria Park – 91 AFY
- North Hollywood Park – 1,176 AFY
- Valley Village Park – 134 AFY

Throughout my time on the Council, I have made it my priority to support local projects that provide multi-benefits, including enhancement of our neighborhoods, while promoting environmental stewardship and sustainability in the process.

I support LADWP's efforts to increase stormwater capture and to develop local and sustainable water supplies that are critically important to the local communities and to the City's environmental stewardship. As a result, I also wholeheartedly support LADWP's application for funding for the above listed seven projects through Los Angeles County's Safe Clean Water (SCW) Program. I strongly believe that funding from the SCW Program is essential to the timely implementation of these important projects while helping to mitigate cost impacts to the City's economically disadvantaged ratepayers.

If you have any questions about this letter of support, please contact Julia Gould, Policy Deputy, at 213-473-7002.

Very truly yours,

Paul Krekorian

Paul Krekorian
Los Angeles City Councilmember

Cc: Mr. Art Castro
Manager of Watershed Management
Los Angeles Department of Water and Power
111 North Hope Street, Room 308
Los Angeles, CA 90012

October 8, 2020

Mr. David R. Pettijohn, Director of Water Resources
Los Angeles Department of Water and Power
111 North Hope Street, Room 1460
Los Angeles, CA 90012

Safe Clean Water Program

RE: Letter of Support for the Department of Water and Power's David M Gonzales, Valley Plaza North and South, and North Hollywood Park Projects under the Upper Los Angeles Enhanced Watershed Management Plan

Dear Watershed Area Steering Committee:

The Upper Los Angeles Watershed Management Group (ULAR WMG) would like to express our collective support for the Department of Water and Power's (DWP) David M Gonzales, Valley Plaza North and South, and North Hollywood Park Stormwater Capture Projects and their application for Measure W funding. As a collaborator on these Projects, we are well familiarized with the scope of intended work, which includes the construction of underground infiltration galleries to capture and infiltrate stormwater and dry weather flows, recharging the San Fernando Groundwater Basin, and tailored to meet our compliance efforts as detailed in the Upper Los Angeles River (ULAR) Enhanced Watershed Management Program (EWMP). In addition, it will provide vital community enhancement benefits in the form of park improvements and educational signage in an areal extent that is within—and surrounded by—Disadvantaged Communities (DAC).

The ULAR EWMP was developed with the intention of utilizing a multi-pollutant approach that maximizes the retention and use of urban runoff as a resource for groundwater recharge and irrigation, while also creating additional benefits for the communities in the ULAR watershed through a combination "toolbox" of Distributed and Regional Stormwater Projects to address applicable stormwater quality regulations. DWP's four Park Projects will target pollutants through volume capture from three LA River-adjacent subwatershed areas (664949, 665249, and 668649) that require 13-63% Critical Load Reduction to meet the City's compliance targets—and will capture, treat and store an incredible ~2300AF of collective flows annually during 85th percentile storm events—eliminating nearly all of the Regional BMP requirements in two subwatershed areas and exceeding the third. As such, the David M Gonzales, Valley Plaza North and South, and North Hollywood Park Projects are considered crucial Regional Projects of the ULAR EWMP Implementation Plan, helping us strive to achieve our Recipe for Final EWMP Compliance as detailed in Appendix 7.A.44-45 and 51.

The ULAR WMG recognizes the need and value of prioritizing stormwater projects within our ULAR Watershed Management Area (WMA) and are focused on high-priority Projects that best capture local water and reduces our reliance on imported sources—further strengthening the need for these Projects to be actualized to attain our Region's water quality and resiliency goals. As such, as the ULAR Watershed Lead—on behalf of the ULAR WMG—we offer our full support to the Department of Water and Power in its effort to obtain Measure W grant funding for their collective Park Projects. We are confident that these Projects will help to restore the water quality and beneficial uses of the LA River and contribute towards the overarching compliance efforts of the ULAR EWMP.

Sincerely,

Dawn M Petschauer

Dawn Petschauer
Upper LA River Watershed Lead
On behalf of the ULAR EWMP WMG

cc: Art Castro, Department of Water and Power
Peter Tonthat, Department of Water and Power
Noel Le, Department of Water and Power
Alfredo Magallanes, City of Los Angeles, LASAN

ATTACHMENTS FOR SECTION 7.1:

COST & SCHEDULE

7.1 Cost and Schedule

A breakdown of the Project capital cost, including a detailed construction cost estimate, was produced for this Project and included at the end of this attachment. The cost estimate is broken up into two phases: Valley Plaza Park North and Valley Plaza Park South. In developing the cost estimate, the following factors were considered: local market conditions, labor prevailing wage rates, Caltrans' equipment rates, site accessibility, Los Angeles market factors, level of design, and risk factors. Quantity take-offs were developed based on the 30 percent design plans. The cost estimate does not explicitly include Taxes, Contractor Overhead, Profit and Risk or an owner's reserve for change orders. CEQA, Outreach and Legal Support are assumed to be included in the design costs and are thus not included as separate line items.

The O&M costs were developed on the basis that the City would maintain various components of the system throughout the 40-year life cycle. Refer to Table 1 and Table 2 below for a summary of annual O&M costs. Monitoring costs were calculated as 0.5% of the capital cost for 40 years.

Table 1 Annual O&M Cost Estimate for Valley Plaza Park North

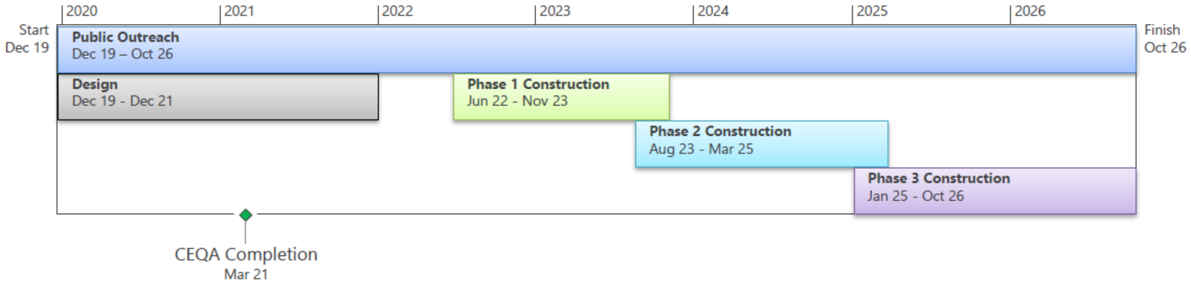
Description	Frequency	No. of Times per Year	Unit Price	Total
Pump Station				**$16,250 ($20,250[1])**
Dry Season Inspection and Cleaning (Vacuum)	Bi-monthly	3	$750	$2,250
Dry Season Inspection and Cleaning (Vacuum)	Monthly	6	$750	$4,500
Electrical Usage	Monthly	12	$625 ($960[1])	$7,500 ($11,500[1])
Valve Maintenance	As-needed	1	$1,000	$1,000
Control Panel Maintenance	As-needed	1	$1,000	$1,000
Common Maintenance Items				**$3,300**
Vacuum Truck Rental	Bi-monthly	6	$550	$3,300
Channel Diversion and Pretreatment				**$39,000**
Pump Station – Inspection, Cleaning, and Maintenance	Monthly	12	$750	$9,000
Diversion Structure – Inspection and Cleaning	Monthly	12	$250	$3,000
Pretreatment Device – Vacuum	Monthly	12	$1,500	$18,000
Sedimentation Basin – Inspection and Cleaning	Monthly	12	$750	$9,000
Storage				**$16,000**
Dry Season Inspection and Cleaning (Vacuum)	Bi-annually	2	$4,000	$8,000
Wet Season Inspection and Cleaning (Vacuum)	Bi-annually	2	$4,000	$8,000
Total				**$74,550 ($78,550[1])**
[1] Cost for Option 1				

Table 2 Annual O&M Cost Estimate for Valley Plaza Park South

Description	Frequency	No. of Times per Year	Unit Price	Total
Common Maintenance Items				**$3,300**
Vacuum Truck Rental	Bi-monthly	6	$550	$3,300
Channel Diversion and Pretreatment				**$30,000**
Rubber Dam System – Inspection and Cleaning	Monthly	12	$750	$9,000
Diversion Structure – Inspection and Cleaning	Monthly	12	$250	$3,000
Pretreatment Device – Vacuum	Monthly	12	$1,500	$18,000
Storage				**$16,000**
Dry Season Inspection and Cleaning (Vacuum)	Bi-annually	2	$4,000	$8,000
Wet Season Inspection and Cleaning (Vacuum)	Bi-annually	2	$4,000	$8,000
Total				**$49,300**

The Project's detailed design is expected to be complete in December of 2021. Construction is expected to commence in August 2023 and end October 2026, for a total duration of about 3 years. A preliminary schedule is included in the figure below.

Figure Stormwater Capture Parks Program Schedule



<u>Preliminary Construction Phasing*</u>

Phase 1:	Valley Village, Strathern, Fernangeles & D. M. Gonzales
Phase 2:	Valley Plaza No. & North Hollywood Part 1
Phase 3:	No. Hollywood Part 2, Valley Plaza So., Alexandria & Whitsett

*Construction schedules will be carefully managed and rolled out sequentially, as funding becomes available, to reduce impacts to the community.

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: Valley Plaza Park North Stormwater Capture Project - Alternative 2

Scope: Diversion of dry- and wet-weather flows from the Central Branch Tujunga Wash. Installation of a diversion structure, pretreatment device, pump station, storm drain piping, underground infiltration facility as well as site landscaping.

Work Order: TBA

Client Dept.: Bureau of Engineering

Project Manager: Andy Flores

Project Engineer: Nate Schreiner, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
STORMWATER CAPTURE PARKS PROGRAM				***$ 16,115,110***
Stormwater Improvements				***$ 15,289,475***
Clearing and Grubbing	SF	158,994	$ 0.60	$ 95,396
Basin Excavation	CY	87,012	$ 11.00	$ 957,132
Basin Gravel Base	CY	1,694	$ 62.00	$ 105,028
Basin Materials & Installation (22 AC-FT)	LS	1	$ 8,150,000.00	$ 8,150,000
Basin Aggregate (Side) Backfill	CY	16,890	$ 40.00	$ 675,605
Basin Soil (Top) Backfill	CY	32,935	$ 29.00	$ 955,101
Basin Excess Soil Hauling	CY	54,077	$ 35.00	$ 1,892,711
Basin Pipe Connections	EACH	3	$ 5,000.00	$ 15,000
Basin Maintenance Holes	EACH	3	$ 16,500.00	$ 49,500
Diversion Structure (includes channel modification)	LS	1	$ 150,000.00	$ 150,000
Actuated Slide Gate and Trash Rack Structure	LS	1	$ 100,000.00	$ 100,000
Pretreatment Device (30 cfs)	EACH	1	$ 136,500.00	$ 136,500
Pump Station Wet Well	LS	1	$ 730,000.00	$ 730,000
Valve Vault	EACH	1	$ 25,000.00	$ 25,000
Flow Meter Vault	EACH	1	$ 20,000.00	$ 20,000
RCB Diversion Pipe (includes excavation, installation, and backfill)	LF	100	$ 575.00	$ 57,500
Pumps and Controls	LS	1	$ 710,000.00	$ 710,000
Valves, Force Mains, and Misc Mechanical	LS	1	$ 200,000.00	$ 200,000
Flow and Level Devices	LS	1	$ 40,000.00	$ 40,000
480V Electrical Service	LS	1	$ 70,000.00	$ 70,000
Electrical MCC/Wiring	LS	1	$ 100,000.00	$ 100,000
SCADA PLC/Panel	LS	1	$ 35,000.00	$ 35,000
Miscellaneous Electrical	LS	1	$ 20,000.00	$ 20,000
Park Improvements				***$ 825,636***
Fence Removal	LF	125	$ 7.00	$ 875
Finish Grading	SF	158,994	$ 0.45	$ 71,547
Tree Removal	EACH	41	$ 350.00	$ 14,350
Irrigation Removal	LS	1	$ 3,500.00	$ 3,500
Concrete Maintenance Road	SF	11,406	$ 6.90	$ 78,701
Chain Link Fence	LF	125	$ 32.00	$ 4,000
Chain Link Fence Gate	EACH	1	$ 400.00	$ 400
Educational Signage	LS	1	$ 13,000.00	$ 13,000
Turf Lawn	SF	158,994	$ 0.50	$ 79,497
Tree Planting	EACH	264	$ 520.00	$ 137,280
Irrigation System (including all components and mainline)	SF	158,994	$ 2.50	$ 397,485
90-Day Plant Establishment	LS	1	$ 25,000.00	$ 25,000
PARK IMPROVEMENTS OUTSIDE STORMWATER CAPTURE PARKS PROGRAM				***$ 18,625***

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: Valley Plaza Park North Stormwater Capture Project - Alternative 2

Scope: Diversion of dry- and wet-weather flows from the Central Branch Tujunga Wash. Installation of a diversion structure, pretreatment device, pump station, storm drain piping, underground infiltration facility as well as site landscaping.

Work Order: TBA

Client Dept.: Bureau of Engineering

Project Manager: Andy Flores

Project Engineer: Nate Schreiner, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
Hydration Station	EACH	1	$ 8,625.00	$ 8,625
Domestic Water POC and Lateral	LS	1	$ 10,000.00	$ 10,000
Subtotal (1)				**$ 16,133,735**

Mobilization - 0% to 7% of Subtotal (1), used **2%**	$ 322,675
Permits Allowances - 1% to 3% of Subtotal (1), used **1.5%**	$ 242,006
Other Allowances - 5% of Subtotal (1), used **3%**	$ 484,012
Subtotal (2)	**$ 17,182,428**

Estimating Contingency - 10% to 25% of Subtotal (2), used **15%**	$ 2,577,364
Subtotal (3)	**$ 19,759,792**

Escalation - **3%** per year of Subtotal (3), used **compound amount factor: (1+i)^n**	$ 1,203,371
Subtotal (4)	**$ 20,963,164**

Construction Contingency - 10% to 20% of Subtotal (4), used **15%**	$ 3,144,475
Total Estimated Project Construction Cost	**$ 24,108,000**

Project Right of Way Estimated Cost	**$ -**

Design Phases Cost (Per City Budget Guidelines for Proposition O Projects), used **21.2%**	$ 5,110,896
Construction Phases Cost (Per City Budget Guidelines for Proposition O Projects), used **13.25%**	$ 3,194,310
Total Estimated Project Cost	**$ 32,413,206**

Assumptions: Escalation: Assumes mid point of construction 2023-2022= 2 years, use 4% for Escalation Rate, Compound

Prepared by: Daniel Lee, PE   Date: 9/11/2020

Checked by: Elva Pangilinan, PE   Date:

Approved by: Jason Fussel, PE   Date:

Client Approval: Andy Flores   Date:

Revised: October 12, 2015

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: Valley Plaza Park South Stormwater Capture Project - Alternative 1

Scope: Diversion of dry- and wet-weather flows from the Central Branch Tujunga Wash. Installation of a diversion structure, pretreatment device, storm drain piping, underground infiltration facility as well as site landscaping.

Work Order: TBA

Client Dept.: Bureau of Engineering

Project Manager: Andy Flores

Project Engineer: Bryan Powell, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
STORMWATER CAPTURE IMPROVEMENTS				***$ 9,444,540***
Stormwater Components				***$ 8,860,024***
Clearing and Grubbing	SF	125,602	$ 0.20	$ 25,120
Finish Grading	SF	125,602	$ 0.45	$ 56,521
Excavation for Basin	CY	49,231	$ 11.00	$ 541,546
Shoring for Basin	SF	30,992	$ 24.00	$ 743,808
Hauling for Basin	CY	23,892	$ 35.00	$ 836,208
Underground Infiltration Basin (11 AC-FT)	LS	1	$ 4,980,000.00	$ 4,980,000
Backfill and Compaction for Basin	CY	25,340	$ 29.00	$ 734,855
Backfill of Sides (Aggregate) for Basin	CY	1,274	$ 40.00	$ 50,969
Gravel Base for Basin	CY	947	$ 35.00	$ 33,137
Pipe Penetration/Connection to Underground Infiltration Basin	EACH	1	$ 2,300.00	$ 2,300
Flap Gate	EACH	1	$ 4,650.00	$ 4,650
Access Opening (includes steps)	EACH	2	$ 16,500.00	$ 33,000
Air Vents and Pipes	EACH	2	$ 415.00	$ 830
Diversion Structure (includes channel demolition)	LS	1	$ 195,000.00	$ 195,000
Pretreatment Device (50 cfs)	EACH	1	$ 136,500.00	$ 136,500
Actuated Valve and Vault	EACH	1	$ 26,000.00	$ 26,000
Flow Meter and Vault	EACH	1	$ 25,000.00	$ 25,000
Pneumatic Gate (Rubber Dam) System	LS	1	$ 150,000.00	$ 150,000
Prefabricated Shelter for Pneumatic Gate (Rubber Dam) System	LS	1	$ 35,000.00	$ 35,000
Concrete Pad for Prefabricated Shelter	SF	700	$ 14.00	$ 9,800
36" Pipe (includes excavation, installation, and backfill)	LF	99	$ 220.00	$ 21,780
Replace Existing Electrical Enclosure	LS	1	$ 55,000.00	$ 55,000
Flow and Level Measurement Devices	LS	1	$ 35,000.00	$ 35,000
480V Electrical Service	LS	1	$ 8,000.00	$ 8,000
Electrical MCC/Wiring	LS	1	$ 60,000.00	$ 60,000
SCADA PLC/Panel/Programming/Testing/Startup	LS	1	$ 60,000.00	$ 60,000
Park Restoration				***$ 584,517***
Fence Removal	LF	818	$ 7.00	$ 5,726
AC Trail Removal	SF	2,658	$ 4.00	$ 10,632
Light Removal	EACH	2	$ 1,200.00	$ 2,400
Tree Removal	EACH	25	$ 350.00	$ 8,750
Irrigation Removal	LS	1	$ 3,500.00	$ 3,500
AC Trail	SF	2,658	$ 4.50	$ 11,961
Concrete Maintenance Road	SF	23,505	$ 4.90	$ 115,175
Chain Link Fence	LF	818	$ 32.00	$ 26,176
Chain Link Fence Gate	EACH	1	$ 400.00	$ 400
Educational Signage	LS	1	$ 13,000.00	$ 13,000
Light Pole	EACH	2	$ 3,500.00	$ 7,000
Turf Lawn	SF	100,759	$ 0.50	$ 50,380
Tree Planting	EACH	101	$ 520.00	$ 52,520
Irrigation System (including all components and mainline)	SF	100,759	$ 2.50	$ 251,898
90-Day Plant Establishment	LS	1	$ 25,000.00	$ 25,000

Revised: October 12, 2015

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: Valley Plaza Park South Stormwater Capture Project - Alternative 1

Scope: Diversion of dry- and wet-weather flows from the Central Branch Tujunga Wash. Installation of a diversion structure, pretreatment device, storm drain piping, underground infiltration facility as well as site landscaping.

Work Order: TBA

Client Dept.: Bureau of Engineering

Project Manager: Andy Flores

Project Engineer: Bryan Powell, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
PARK IMPROVEMENTS				***$ 128,290***
Hydration Station	EACH	1	$ 8,625.00	$ 8,625
Trash Receptacle	EACH	4	$ 233.00	$ 932
Domestic Water POC and Lateral	LS	1	$ 10,000.00	$ 10,000
Parking Lot and Roundabout Asphalt Grind and Overlay	SF	21,265	$ 2.50	$ 53,163
Parking Lot and Roundabout Restriping	LF	2,082	$ 0.75	$ 1,562
Parking Lot Wheelstops	EACH	54	$ 83.50	$ 4,509
EV Charging Stations	EACH	5	$ 9,900.00	$ 49,500
Subtotal (1)				**$ 9,572,830**

Mobilization - 0% to 7% of Subtotal (1), used **2%**	$ 191,457
Permits Allowances - 1% to 3% of Subtotal (1), used **1.5%**	$ 143,592
Other Allowances - 5% of Subtotal (1), used **3%**	$ 287,185
Subtotal (2)	**$ 10,195,064**
Estimating Contingency - 10% to 25% of Subtotal (2), used **15%**	$ 1,529,260
Subtotal (3)	**$ 11,724,324**
Escalation - **3%** per year of Subtotal (3), used **compound amount factor: (1+i)^n**	$ 1,867,381
Subtotal (4)	**$ 13,591,705**
Construction Contingency - 10% to 20% of Subtotal (4), used ~ **15%**	$ 2,038,756
Total Estimated Project Construction Cost	**$ 15,631,000**
Project Right of Way Estimated Cost	**$ -**
Design Phases Cost (Per City Budget Guidelines for Proposition O Projects), used **21.2%**	$ 3,313,772
Construction Phases Cost (Per City Budget Guidelines for Proposition O Projects), used **13.25%**	$ 2,071,108
Total Estimated Project Cost	**$ 21,015,880**

Assumptions: Escalation: Assumes mid point of construction 2025 = 5 years, use 3% for Escalation Rate, Compound amount factor: (1+i)^n

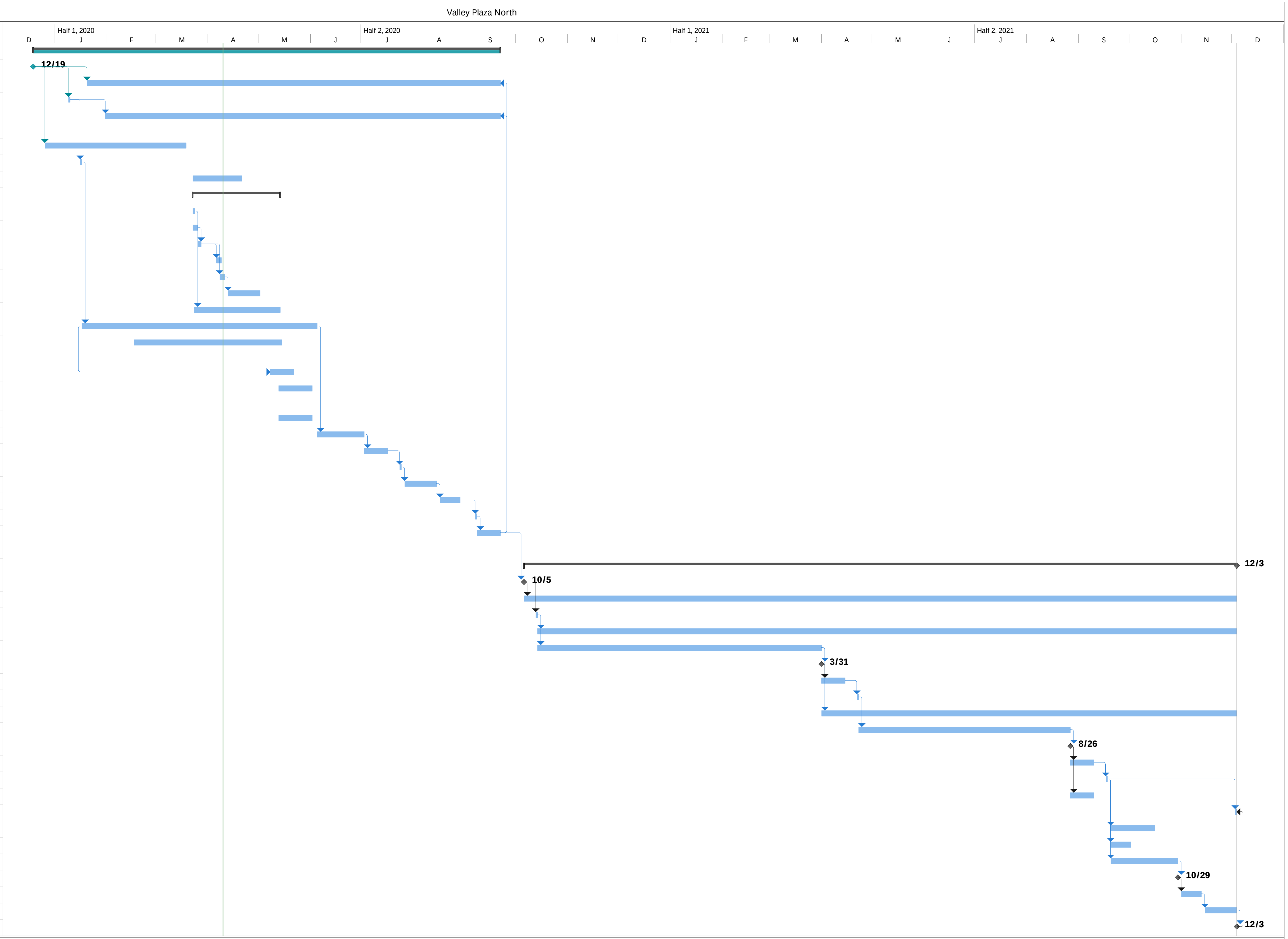
Prepared by: Austin McCollum, PE Date: 8/12/2020

Checked by: Elva Pangilinan, PE Date:

Approved by: Jason Fussel, PE Date:

Valley Plaza North

ID	Task Name	Duration	Start	Finish
1	**PREDESIGN PHASE**	**198 days**	**Thu 12/19/19**	**Mon 9/21/20**
2	NTP	0 days	Thu 12/19/19	Thu 12/19/19
3	PM and Weekly Meetings	176 days	Mon 1/20/20	Mon 9/21/20
4	Kickoff Meeting	1 day	Thu 1/9/20	Thu 1/9/20
5	Predesign Community Outreach	167 days	Fri 1/31/20	Mon 9/21/20
6	Research	60 days	Thu 12/26/19	Wed 3/18/20
7	Site Visit	1 day	Thu 1/16/20	Thu 1/16/20
8	Site Surveying	21 days	Mon 3/23/20	Mon 4/20/20
9	**Geotechnical Investigation**	**38 days**	**Mon 3/23/20**	**Wed 5/13/20**
10	Location Marking	1 day	Mon 3/23/20	Mon 3/23/20
11	Dig Alert	3 days	Mon 3/23/20	Wed 3/25/20
12	Geophysical Locating	2 days	Thu 3/26/20	Fri 3/27/20
13	HAS Drilling	3 days	Mon 4/6/20	Wed 4/8/20
14	Infiltration Testing	3 days	Wed 4/8/20	Fri 4/10/20
15	Lab Testing Complete	15 days	Mon 4/13/20	Fri 5/1/20
16	Report	37 days	Tue 3/24/20	Wed 5/13/20
17	Preliminary Design	100 days	Fri 1/17/20	Thu 6/4/20
18	Hydrology & Hydraulics Analysis/Memo	64 days	Mon 2/17/20	Thu 5/14/20
19	Utility Potholing	10 days	Fri 5/8/20	Thu 5/21/20
20	Rough Construction Schedule	14 days	Wed 5/13/20	Mon 6/1/20
21	Class C Estimate	14 days	Wed 5/13/20	Mon 6/1/20
22	Draft PDR	20 days	Fri 6/5/20	Thu 7/2/20
23	City Review	10 days	Fri 7/3/20	Thu 7/16/20
24	Draft PDR Review Meeting	1 day	Fri 7/24/20	Fri 7/24/20
25	Draft Final PDR	15 days	Mon 7/27/20	Fri 8/14/20
26	City Review	10 days	Mon 8/17/20	Fri 8/28/20
27	Draft Final Review Meeting	1 day	Mon 9/7/20	Mon 9/7/20
28	Final PDR	10 days	Tue 9/8/20	Mon 9/21/20
29				
30	**DESIGN PHASE**	**304 days**	**Mon 10/5/20**	**Fri 12/3/21**
31	NTP	0 days	Mon 10/5/20	Mon 10/5/20
32	PM and Weekly Meetings	304 days	Tue 10/6/20	Fri 12/3/21
33	Kickoff Meeting	1 day	Tue 10/13/20	Tue 10/13/20
34	Design Phase Outreach	298 days	Wed 10/14/20	Fri 12/3/21
35	50% Design Development	121 days	Wed 10/14/20	Wed 3/31/21
36	50% Submittal	0 days	Wed 3/31/21	Wed 3/31/21
37	City Review	10 days	Thu 4/1/21	Wed 4/14/21
38	50% Review Meeting	1 day	Thu 4/22/21	Thu 4/22/21
39	Utility Coordination	177 days	Thu 4/1/21	Fri 12/3/21
40	90% Design Development	90 days	Fri 4/23/21	Thu 8/26/21
41	90% Submittal	0 days	Thu 8/26/21	Thu 8/26/21
42	City Review	10 days	Fri 8/27/21	Thu 9/9/21
43	90% Review Meeting	1 day	Fri 9/17/21	Fri 9/17/21
44	Constructability Review	10 days	Fri 8/27/21	Thu 9/9/21
45	Permitting/Plan Check	1 day	Fri 12/3/21	Fri 12/3/21
46	Easement Services	20 days	Mon 9/20/21	Fri 10/15/21
47	SWPPP	10 days	Mon 9/20/21	Fri 10/1/21
48	100% Design Development	30 days	Mon 9/20/21	Fri 10/29/21
49	100% Submittal	0 days	Fri 10/29/21	Fri 10/29/21
50	City Review	10 days	Mon 11/1/21	Fri 11/12/21
51	Final Design Development	15 days	Mon 11/15/21	Fri 12/3/21
52	Final Design Submittal	0 days	Fri 12/3/21	Fri 12/3/21



Project: TOS 25 Schedule_Valley
Date: Fri 4/10/20

Task	▬	Summary	▬	Inactive Milestone	◇	Duration-only	▬	Start-only	[	External Milestone	◆	Path Predecessor Summary Task	▬	Manual Progress	▬
Split	┈	Project Summary	▬	Inactive Summary	▬	Manual Summary Rollup	▬	Finish-only	]	Deadline	⬇	Path Predecessor Normal Task	▬		
Milestone	◆	Inactive Task	▭	Manual Task	▬	Manual Summary	▬	External Tasks	▬	Path Predecessor Milestone Task	◆	Progress	▬		

Valley Plaza South

ID	Task Name	Duration	Start	Finish
1	**PREDESIGN PHASE**	**188 days**	**Thu 12/19/19**	**Mon 9/7/20**
2	NTP	0 days	Thu 12/19/19	Thu 12/19/19
3	PM and Weekly Meetings	170 days	Tue 1/14/20	Mon 9/7/20
4	Kickoff Meeting	1 day	Thu 1/9/20	Thu 1/9/20
5	Predesign Community Outreach	157 days	Fri 1/31/20	Mon 9/7/20
6	Research	60 days	Thu 12/26/19	Wed 3/18/20
7	Site Visit	1 day	Thu 1/16/20	Thu 1/16/20
8	Site Surveying	21 days	Mon 3/23/20	Mon 4/20/20
9	**Geotechnical Investigation**	**40 days**	**Mon 3/23/20**	**Fri 5/15/20**
10	Location Marking	1 day	Mon 3/23/20	Mon 3/23/20
11	Dig Alert	3 days	Mon 3/23/20	Wed 3/25/20
12	Geophysical Locating	1 day	Fri 3/27/20	Fri 3/27/20
13	CPT	1 day	Tue 4/7/20	Tue 4/7/20
14	HAS Drilling	2 days	Thu 4/9/20	Fri 4/10/20
15	Infiltration Testing	2 days	Mon 4/13/20	Tue 4/14/20
16	Lab Testing Complete	17 days	Mon 4/13/20	Tue 5/5/20
17	Report	39 days	Tue 3/24/20	Fri 5/15/20
18	Preliminary Design	90 days	Fri 1/17/20	Thu 5/21/20
19	Hydrology & Hydraulics Analysis/Memo	64 days	Mon 2/17/20	Thu 5/14/20
20	Utility Potholing	10 days	Fri 5/8/20	Thu 5/21/20
21	Rough Construction Schedule	14 days	Wed 5/13/20	Mon 6/1/20
22	Class C Estimate	14 days	Wed 5/13/20	Mon 6/1/20
23	Draft PDR	20 days	Fri 5/22/20	Thu 6/18/20
24	City Review	10 days	Fri 6/19/20	Thu 7/2/20
25	Draft PDR Review Meeting	1 day	Fri 7/10/20	Fri 7/10/20
26	Draft Final PDR	15 days	Mon 7/13/20	Fri 7/31/20
27	City Review	10 days	Mon 8/3/20	Fri 8/14/20
28	Draft Final Review Meeting	1 day	Mon 8/24/20	Mon 8/24/20
29	Final PDR	10 days	Tue 8/25/20	Mon 9/7/20
30				
31	**DESIGN PHASE**	**304 days**	**Mon 9/21/20**	**Fri 11/19/21**
32	NTP	0 days	Mon 9/21/20	Mon 9/21/20
33	PM and Weekly Meetings	304 days	Tue 9/22/20	Fri 11/19/21
34	Kickoff Meeting	1 day	Tue 9/29/20	Tue 9/29/20
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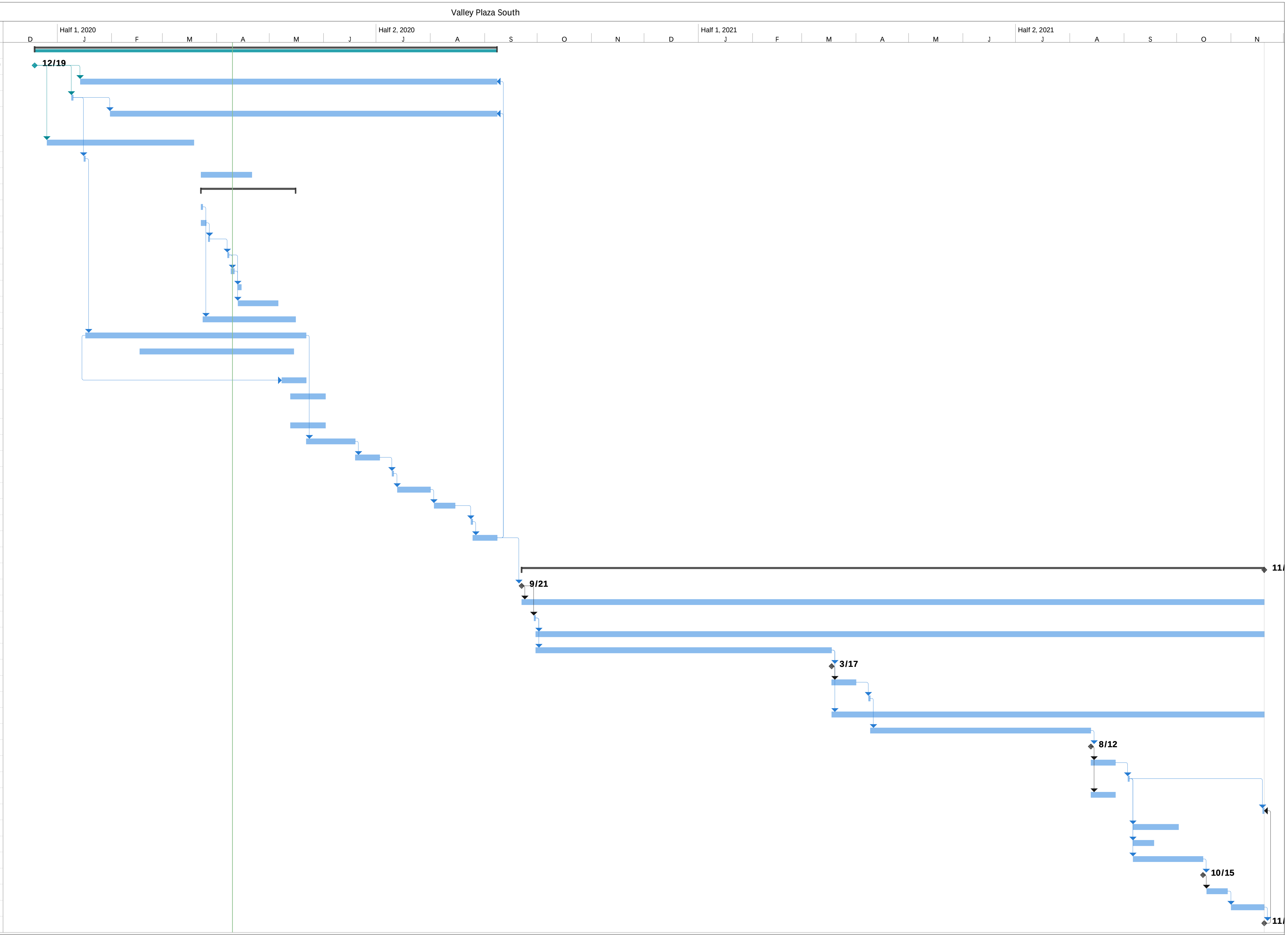
36	50% Design Development	121 days	Wed 9/30/20	Wed 3/17/21
37	50% Submittal	0 days	Wed 3/17/21	Wed 3/17/21
38	City Review	10 days	Thu 3/18/21	Wed 3/31/21
39	50% Review Meeting	1 day	Thu 4/8/21	Thu 4/8/21
40	Utility Coordination	177 days	Thu 3/18/21	Fri 11/19/21
41	90% Design Development	90 days	Fri 4/9/21	Thu 8/12/21
42	90% Submittal	0 days	Thu 8/12/21	Thu 8/12/21
43	City Review	10 days	Fri 8/13/21	Thu 8/26/21
44	90% Review Meeting	1 day	Fri 9/3/21	Fri 9/3/21
45	Constructability Review	10 days	Fri 8/13/21	Thu 8/26/21
46	Permitting/Plan Check	1 day	Fri 11/19/21	Fri 11/19/21
47	Easement Services	20 days	Mon 9/6/21	Fri 10/1/21
48	SWPPP	10 days	Mon 9/6/21	Fri 9/17/21
49	100% Design Development	30 days	Mon 9/6/21	Fri 10/15/21
50	100% Submittal	0 days	Fri 10/15/21	Fri 10/15/21
51	City Review	10 days	Mon 10/18/21	Fri 10/29/21
52	Final Design Development	15 days	Mon 11/1/21	Fri 11/19/21
53	Final Design Submittal	0 days	Fri 11/19/21	Fri 11/19/21



Project: TOS 25 Schedule_Valley
Date: Fri 4/10/20

- Task
- Split
- Milestone ◆
- Summary
- Project Summary
- Inactive Task
- Inactive Milestone ◇
- Inactive Summary
- Manual Task
- Duration-only
- Manual Summary Rollup
- Manual Summary
- Start-only [
- Finish-only]
- External Tasks
- External Milestone ◆
- Deadline ⬇
- Path Predecessor Milestone Task ◆
- Path Predecessor Summary Task
- Path Predecessor Normal Task
- Progress
- Manual Progress

ATTACHMENTS FOR SECTION 7.2:

COST SHARE

7.2 Cost Share

LADWP has committed to matching 50 percent of the total capital cost of the Project. The dollar-to-dollar funding match, which will rely on LADWP's general fund, will support the Project as it moves through the construction phase and will create a significant number of new jobs while prioritizing local hire. Documentation of leveraged funds is included in the following pages.

Safe, Clean Water Program

Summary of Funding Sources

The Los Angeles Department of Water and Power (LADWP) is committed to the implementation of stormwater capture projects to enhance local groundwater supplies, improve water quality and provide various community benefits. LADWP commits to funding the following projects in the amount equal to 50% of the capital cost of each project by using LADWP's general funds as well as potential grant funds.

Project Name	Percent Funding Match
David M. Gonzales Recreation Center Stormwater Capture Project	50%
Valley Plaza Park Stormwater Capture Project	50%
North Hollywood Park Stormwater Capture Project	50%

If you have any questions or require additional information, please contact Mr. Art Castro, Manager of LADWP's Watershed Group at (213) 367-2966.

ATTACHMENTS FOR SECTION 8.1:

ENVIRONMENTAL DOCUMENTS AND PERMITS

8.1 Environmental Documents and Permits

8.1.1 Immediate Impact

Immediate impacts stemming from the Project implementation would consist of noise and traffic control at less-than-significant levels. Noise impacts that arise from exposure to construction activities and construction machinery operation specifications to curb noise impacts will be indicated to the contractors of the proposed Project. Traffic controls will be established to mitigate impacts on traffic that may arise from construction activities and scheduling.

Construction impacts to trees and existing recreational features will be minimized. However, open fields will have construction impacts that will limit their use. Additionally, periodic maintenance of the facilities will need to be coordinated with park staff to mitigate negative impacts to planned park activities.

8.1.2 Cumulative Impact

No other projects are known near the proposed Project that would have a cumulative impact and trigger further review beyond the Mitigated Negative Declaration (MND) prepared by LADWP.

8.1.3 Potential CEQA Categorization

As the lead agency per CEQA, LADWP is developing an MND for the Stormwater Capture Parks Program projects. The MND will outline any environmental issues and define any necessary mitigation. The current status is that the Draft MND is under development by LADWP and is expected to be available for public review in October 2020. It is not anticipated that NEPA would apply, though if any federally derived funding were to be identified for the Project, that funding could trigger a need to complete NEPA documentation.

8.1.4 Permitting

An example planning-level project schedule, including estimated time for permitting, is included in Table 1 below. The Project includes alteration to an LACFCD right of way and will involve diverting stormwater from the LACFCD system. LADWP will initiate coordinating with the LACFCD early in the design and process and apply for necessary permits in a timely manner.

Table 1 Project Schedule Summary

Preliminary Project Schedule

Task Name	YR1-FY20/21				YR2-FY21/22				YR3-FY22/23				YR4-FY23/24				YR5-FY24/25			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Planning	🟩																			
Baseline Monitoring		🟩	🟩	🟩	🟩															
Design		🟩	🟩	🟩	🟩	🟩														
Permitting					🟩	🟩														
Procurement					🟩	🟩	🟩													
Construction - South								🟩	🟩	🟩	🟩	🟩	🟩							
Construction - North													🟩	🟩	🟩	🟩	🟩	🟩	🟩	
Outreach	🟩				🟩		🟩		🟩		🟩		🟩		🟩		🟩		🟩	
Operation & Maintenance																				🟩

Table 2 provides a list of the permits anticipated to be required for the Project and an estimate of timing to complete the permitting process. Permit requirements should be revisited and confirmed during detailed design.

Table 2 Anticipated Permitting Requirements

Agency	Potential Review and/or Approval
U.S. Army Corps of Engineers	Section 404 Permit
California Department of Fish and Wildlife (CDFW)	Consultation with CDFW regarding the Section 1602 Lake and Streambed Alteration Agreement and the California Endangered Species Act (CESA)
California Department of Transportation (Caltrans)	Review and approval
Los Angeles Regional Water Quality Control Board (RWQCB)	NPDES No. CAS004001
State Water Resources Control Board (SWRCB)	NPDES General Permit (A Storm Water Pollution Prevention Plan will be prepared during detail design) Section 401 Permit
Los Angeles County Flood Control District (LACFCD)	Flood Construction Permit for BMP installation
Greater Los Angeles County Vector Control District (LACVCD)	Consultation and approval
South Coast Air Quality Management District (SCAQMD)	Preparation of large operation notification, as relevant and compliance with Rule 403 construction dust mitigation measures by Construction Contractor
City of Los Angeles	Building, Grading, Electrical, and Plumbing Permits from the Department of Building & Safety Disabled Access approval from the Department of Building & Safety Soils Report approval from the Department of Building & Safety Haul Route approval from the Department of Building & Safety Storm Drain, Construction, and Excavation Permits from the Bureau of Engineering SUSMP review by LA Sanitation LID Ordinance compliance by LA Sanitation Planning and zoning review by the Department of City Planning Traffic Control Plan prepared by the Tetra Tech team for Review by the Department of Transportation Parking lot landscape clearance by the Department of City Planning Access Review by Fire Department Tree removal/relocation review by Department of Recreation and Parks Clearance by the Cultural Affairs Department

ATTACHMENTS FOR SECTION 8.2:

VECTOR MINIMIZATION

8.2 Vector Minimization

Managing mosquitoes and other vectors in stormwater management structures is critical for protecting public health. With careful planning, such structures can be designed, built, operated, and maintained in a way that minimizes opportunities for the proliferation of vectors.

Although the Project is in its early phases, vector minimization and coordination with the Local Vector Control agency will be essential for the Project's long-term success. Thus, LADWP intends to mitigate and minimize vectors by consulting the State of California's Department of Public Health checklist for minimizing vector production in stormwater management structures.

Dry and wet systems require different types of vector control strategies. Because the Project will include only wet systems, guidelines for both are provided below.

Furthermore, the Project is a closed system, with water being diverted from an existing underground stormwater pipe to underground infiltration facilities. As a result, the Project is unlikely to contribute to a vector issue. Nonetheless, the above described coordination will still be performed.

8.2.1 Wet Systems

Wet systems are any structures designed with features such as sumps, vaults, and/or basins that hold water longer than four days and include structures that hold water permanently. Examples include open catch basins, concrete retention basins, Delaware sand filters, and a variety of underground proprietary devices.

Proposed strategies to explore further in the design phase include, but are not limited to, the following:

- Sealing (completely or partially) sumps, vaults, and/or basins that hold water longer than four days.
- Using tight fitting covers with gaps or holes no greater than 1/16-inch (2mm).
- Sealing pick holes or using mosquito proof inserts when using manhole covers.
- Maintaining inlet/outlet conveyance pipes submerged to prevent adult mosquito entry into the main water storage area.
- Fitting conveyance pipes with flapper valves, collapsible fabric tubes, or other barriers to prevent adult mosquito entry into main water storage area.
- Designing structures with safe and sufficient access to permanent water areas for inspection, maintenance, and/or vector control activities when needed.
- Inspecting the BMP components as suggested in the Project O&M guidelines and adjusting as necessary.
- Providing clearly visible signage with information indicating the type of structure (e.g., extended detention basin), ownership, and contact information.

ATTACHMENTS FOR SECTION 8.6:

TECHNICAL REPORTS

ATTACHMENTS FOR SECTION 8.7:

OTHER