SAFE, CLEAN WATER PROGRAM

FEASIBILITY STUDY REPORT

Regional Program Projects Module

PROJECT NAME	North Hollywood Park Stormwater Capture Project
PROJECT LEAD(S)	Los Angeles Department of Water and Power (LADWP)
SCW WATERSHED AREA	Upper Los Angeles River
PRELIMINARY SCORE	87
TOTAL SCW FUNDING REQUESTED	$ 92,394,000.00
YEAR 1 FUNDING REQUESTED	$ 1,848,000.00

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:	North Hollywood Park Stormwater Capture Project
Project Description:	Will capture 2,040 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:	$ 92,394,000.00
Phase(s) this application is requesting SCW funding for:	Design, Construction
Project Weather Type:	Dry
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:	34.1676
Longitude:	-118.38
Street Address:	11430 Chandler Boulevard
City:	Los Angeles
State:	CA
Zip Code:	91601
Municipality:	Los Angeles

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

Attachments for this Section	
Attachment Name	Description
1.2 - Location - North Hollywood.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 (SCW Program) GIS Tool, the North Hollywood Park Stormwater Capture Project (Project) is located in a disadvantaged community, as shown in the Attachment for Section 1.2 (Location). The Project will improve recreational opportunities at the park while creating a significant number of 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 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 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). Beyond the features geared toward organized sports, such as new natural turf soccer fields, new baseball fields, and LED lighting, the Project will also involve planting trees and California-native vegetation. New trails will expand active recreation such as jogging while additional green elements will provide health benefits to the community. Added shade will reduce the heat island effect, and the additional plants will provide air quality benefits to a community that is often out of attainment for air quality goals according to the South Coast Air Quality Management District.

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 to determine park needs in 188 study areas. By looking 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 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 wide range of local businesses.

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

The majority of the 4,866-acre Project drainage area is also in a DAC. The Project will capture 100 percent of the dry weather runoff from those areas. During a storm event, the Project will remove roughly 78 percent of Zinc and 64 percent of E. coli from runoff. Additional 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 2,040 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.

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, three new natural multipurpose soccer fields, three new baseball fields, a new LED sports lighting system for all fields, new hydration stations, and a minimum of 293 trees for carbon sequestration and reduction in heat island effect, etc.) are proposed 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 has 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. Please refer to Section 5.2 (Local Support) for more information on outreach meetings held to date.

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 the 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 - North Hollywood.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 North Hollywood Park Stormwater Capture Project is included in the Upper Los Angeles River (ULAR) Enhanced Watershed Management Plan (EWMP) Implementation Plan for compliance, identified as subwatershed numbers 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 North Hollywood 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 at large.

This multi-benefit Project will improve water quality in the Tujunga Wash watershed by implementing nature-based solutions and will increase local water supplies by recharging the groundwater basin. The proposed Project will divert, treat, and infiltrate approximately 2,040 AF of stormwater annually from a 4,866-acre drainage area while alleviating 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, and creation of new local jobs will also benefit the local community and are among many reasons why the Project has been able to secure the support of several community-based organizations.

The Project will add a minimum of 293 trees and several new recreational features that do not currently exist at the park. Proposed features include three new natural soccer fields, a pedestrian trail along the channel, and three upgraded baseball fields with new turf, dugouts, back-stops, batting cages, benches, and bleachers with integral shade structures. Other key features include nine new hydration stations, educational signage, and benches placed throughout the park. A new LED sports lighting system for all sports fields, permeable pavement and native landscaping for the main parking lots, and replacement and improvement of the irrigation system are expected to improve park safety, provide greater accessibility, and maintain greenery for the usage and enjoyment of residents in the community. Sixteen electric vehicle (EV) charging stations are also proposed for the main parking lots. 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. 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:	11.1 ac
Ponding Depth:	11 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:	122.1444 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 - North Hollywood.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:	4866.4 ac
Impervious Area:	2751.9 ac
Pervious Area:	2114.4999999999995 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	32.2 %	886.1118
Multi Family Residential	14.35 %	394.89765
Commercial	9.32 %	256.47708
Institutional	3.8 %	104.5722
Industrial	12.93 %	355.82067
Highways and Interstates	4.38 %	120.53322
Secondary Roads and Alleys	23.02 %	633.48738

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 %	4866.4

Attachments for this Section	
Attachment Name	Description
2.2 - Capture Area - North Hollywood.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)
Gravity Flow	150 cfs

Estimated Average Inflow Captured by Project:

0.97 cfs

Description of Diversion:

The Project will contain three gravity diversion structures to divert flow from the Tujunga Wash channel MTD-0030 near the park. The diversions are anticipated to have a typical maximum combined diversion rate of 150 cfs (50 cfs each) and an estimated average dry weather inflow of 0.97 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. The diversions will consist of a grated drop inlet structure with an inflatable rubber dam that helps push flows to a 42-inch diversion pipe that directs flow to the storage units. Diversion is anticipated to occur during all dry-weather periods while for wet-weather events, flows will be diverted at a continuous combined rate of 150 cfs until the infiltration galleries are full. 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 North Hollywood Park was conducted between April 10, 2020 and May 4, 2020, and found that the on-site soil at the site predominantly consists of Sand (SP & SW) and Silty Sand (SM) with interbedded layers of Sandy Silt (ML). The upper silt layers and silty sands with relative high fines content located at or below the base of the proposed infiltration basins should be over-excavated. Large diameter borings, backfilled with crushed rock, may be extended from the base of the infiltration gallery to increase hydraulic conductivity as an alternative to over-excavation. Based on the findings presented in the draft Soils Investigation Report, it can be assumed that the infiltration galleries north of Magnolia Boulevard exhibit an infiltration rate of 2.5 in/hr, while 3.5 in/hr can be assumed for all other galleries. A overall drawdown rate of 2.9 in/hr was used to model this Project in the SCW Projects Module. This drawdown rate is based on a weighted average of infiltration rates corresponding to the infiltration galleries. Historical reports show measured groundwater depths at approximately 10 ft below ground surface, about 100 ft to 185 ft higher than what was recorded in recent groundwater level monitoring performed 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 at the depths explored during the geotechnical site investigation, and the data suggests that groundwater will not impact the proposed structures. However, the park is located in a seismically active region, and incorporating seismic design parameters in accordance with 2019 CBC and the American Society of Civil Engineers (ASCE) Standard 7-16 will allow for a geotechnically feasible project. As the proposed Project site is located in an area of Los Angeles mapped as being within a Methane Zone, a methane survey was conducted and found that the design requirements must meet Methane Design Level IV. The draft Soils Investigation Report is included in the Attachment for Section 2.4.1 (Soils Investigation Report).

For this Project, both Hydrocalc v1.03 and the Los Angeles County Watershed Management Modeling System (WMMS) were used 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 Hydrocalc model uses the Modified Rational Method to generate the 24-hour hydrographs and the peak flow rate and storm volumes while the WMMS model uses explicit models with unique runoff characteristics assigned to each land use (depression storage, initial abstraction, etc.). For the hydraulic calculations, the EPA SWMM model was used to determine the flow depths and hydraulic grade line at the channel diversions. The model used the output hydrograph from the Hydrocalc model to generate the inflows. Initial model results indicate that both a drop structure and weir structure are functional diversion techniques for the locations. 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 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 the 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 an existing 60-inch LADWP water line within the park is the only known restricting utility for the Project. The proposed Project will be designed to avoid interfering with this water line, and adequate buffer will be maintained between the water line and proposed facilities per LADWP's guidelines. 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.

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 Report - North Hollywood.pdf	Draft Soils Investigation Report conducted for the Project.

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

Attachments for this Section	
Attachment Name	Description
2.4.3 - ROW & LACFCD Approval - North Hollywood.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 - North Hollywood.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 - North Hollywood.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 - North Hollywood.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. North Hollywood Park and its vicinity is identified in the ULAR EWMP as part of the 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 Dry Weather Info

The following is justification for this project to be categorized as a Dry Weather project:

This Project would typically be considered a wet weather project due to its expansive capacity to capture wet weather flows. However, the SCW Projects Module does not yet have an adequate scoring system for large regional projects, which has been acknowledged by the SCW Program Scoring Committee. Despite having been designed to offer significant storage capacity, it is not possible to capture the entire 85th percentile storm within existing site constraints due to the Project's large drainage area of 4,866 acres (with 2,752 acres of impervious area). Per the SCW Program Scoring Committee's suggestion for such projects, this Project has been designated as a dry weather project for scoring purposes. The Project will capture 100 percent of dry weather inflows in addition to a significant volume of wet weather flows, as shown in Section 4.2 (Benefit Magnitude). Despite its dry weather designation, this Project also provides significant community benefits, including flood management, as discussed in Section 5.1 (Community Investment Benefits).

Estimated Average Dry Weather Flow Rate:

0.97 cfs

The following method was used to estimate average captured flow:

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 Hydrology and Hydraulics 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 diversion rates proposed in the Project far exceed the average dry weather flow rate and provide ample storage volume for the daily anticipated runoff total (121 AF of storage with 2 AF of runoff per day). This ensures that 100 percent of the dry weather flows are captured and infiltrated.

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 - North Hollywood.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:

0.97 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 Hydrology and Hydraulics 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:	2800.384 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:	2041.424 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:	$ 4,733.20 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 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 approximately 2,040 AF of stormwater annually, meaning that 2,040 AF of water is being diverted from the flood control system. Said another way, this Project will add 2,040 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.

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 293 additional trees will be planted. Native plantings are also proposed around the on-site pre-k school and parking lots. 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. Throughout the park, the Project will also lay out new grass 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 plant additional native vegetation. By opening up the access road and enhancing it with landscaping and DG pedestrian trails, the Project will expand 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 throughout the park 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 3 illustrates the location of the waterway relative to the park.

Does this project create or enhance new recreational opportunities?	Yes	Recreational opportunities at the park will be expanded by adding three new natural multipurpose soccer fields, a new pedestrian trail along the channel, and upgrading three baseball fields outfitted with new turf, dugouts, back-stops, batting cages, benches, and bleachers with integral shade structures to enhance the experience for those watching games. A new LED sports lighting system will be installed around all the new sports fields, which will improve park safety and enhance nighttime activities for park users. The two main parking lots will be replaced with permeable pavement with native landscaping throughout, and ADA compliant access will be provided to the park facilities. Other key features include nine new hydration stations, educational signage, and benches placed throughout the park. Replacement and improvement of the irrigation system will better maintain the greenery for the usage and enjoyment of residents in the community. 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 16 EV charging stations in an effort to encourage a reduction in local carbon emissions. Park improvements will be finalized with input from the community through outreach and engagement. Figure 3 of the Attachment for Section 5.1 provides a visual overview of key recreational improvements.

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 pre-k school that is located on-site. The enhanced greenery will be enjoyed by students, teachers, staff, and parents. Native landscaping will also be incorporated in the area surrounding the school and the school parking lot. Only smaller native plantings that will not interfere with RAP's future plans for the recreation center will be selected in the area immediately surrounding the school. 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 4 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 293 trees to provide shade and help reduce the heat island effect. Upon maturity, 293 trees will provide an estimated 146,500 square feet of new canopy, assuming 500 square feet of added canopy per tree. The added trees will also 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 air quality in this disadvantaged community. 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 9,962 pounds sequestered annually for the minimum of 293 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 park.

Please describe the Outreach Plan for this project moving forward:

The outreach strategy for the Project is 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.pdf
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.pdf
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 Support Letter.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 and 4 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. 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.

Natural materials will be used for the ball fields and the new natural turf multi-purpose soccer fields. While sports fields may require non-native turf grasses, direction will be given to the landscape architects during detailed design to evaluate whether a native grass species, such as California Native Bentgrass (Agrostis pallens), could be used in lieu of more conventional bluegrass for the ball fields

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 two main 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. These are the only areas that will experience ground-disturbing activities. Please refer to Figure 3 of the Attachment for Section 5.1 for an illustration of the proposed changes to the parking lots at North Hollywood 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:
2.9 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 - North Hollywood.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	Pre-design, design, geotechnical, environmental, outreach, permitting, grant applications, grant reporting.	$ 29,431,000.00	12/2021
Construction	Bid & award, construction, construction management, post-construction management, outreach, grant reporting.	$ 157,224,000.00	10/2026
Total Funding:		$ 186,655,000.00	

Annual Cost Breakdown	
Annual Maintenance Cost:	$ 157,350.00
Annual Operation Cost:	$ 0.00
Annual Monitoring Cost:	$ 933,275.00
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*	$ 210,403,761.58
Module-generated Annualized Cost for Project*	$ 9,662,466.05
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 will 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.	$ 94,261,000.00	Commitment Received	7.2 - Cost Share - North Hollywood.pdf
Total Funding:		$ 94,261,000.00		

7.3 Funding Request

Total funding requested

$ 92,394,000.00

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	$ 1,848,000.00	Design	Pre-design, design, geotechnical, environmental, outreach, permitting, grant applications, grant reporting.
Total Year 1	$ 1,848,000.00		
Year 2	$ 2,772,000.00	Design	Design, geotechnical, environmental, outreach, permitting, grant applications, grant reporting.
Total Year 2	$ 2,772,000.00		
Year 3	$ 5,098,000.00	Design	Design, environmental, outreach, permitting, grant applications, grant reporting.
Year 3	$ 2,294,000.00	Construction	Bid & award, construction.
Total Year 3	$ 7,392,000.00		
Year 4	$ 10,164,000.00	Construction	Construction, construction management.
Total Year 4	$ 10,164,000.00		
Year 5	$ 14,784,000.00	Construction	Construction, construction management.
Total Year 5	$ 14,784,000.00		

Funding requested beyond 5 years	$ 55,434,000.00	Construction	Construction, construction management, post-construction management, grant reporting.
Total Funding requested beyond 5 years	$ 55,434,000.00		
Total Funding:	$ 92,394,000.00		

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 a 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 - North Hollywood.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 - North Hollywood.pdf	Vector minimization guidance.

8.3 Alternatives Studied

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

Based on an analysis using the United States Environmental Protection Agency (USEPA) System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN) optimization model, wet and dry weather flow analysis was conducted to produce two alternatives for the Project during the preliminary design phase. Alternative 1 was selected and is the subject of this report. Alternative 2 proposed the use of two infiltration galleries with only 2 diversion systems and the option of 10 drywells. While requiring less excavation due to the elimination of the third infiltration gallery, this alternative would capture 90 percent of the 85th-percentile storm runoff volume, would have a slightly lower infiltration rate, and simulated lower sediment, nutrients, and zinc load reduction. Alternative 2 was not selected because although it offered a lower capital cost, its lower capture yield and pollution load reduction did not ultimately meet design objectives. A variation of Alternative 2 that offers greater storage volume for stormwater capture and pollution load reduction may still be considered. Note that elements of the Project may continue to evolve as it moves through the preliminary design and planning phase. The BMP configuration may be optimized in order to preserve trees and minimize disruption to park activities. However, potential changes are not expected to substantially alter the Project concept and cost presented in this feasibility study.

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

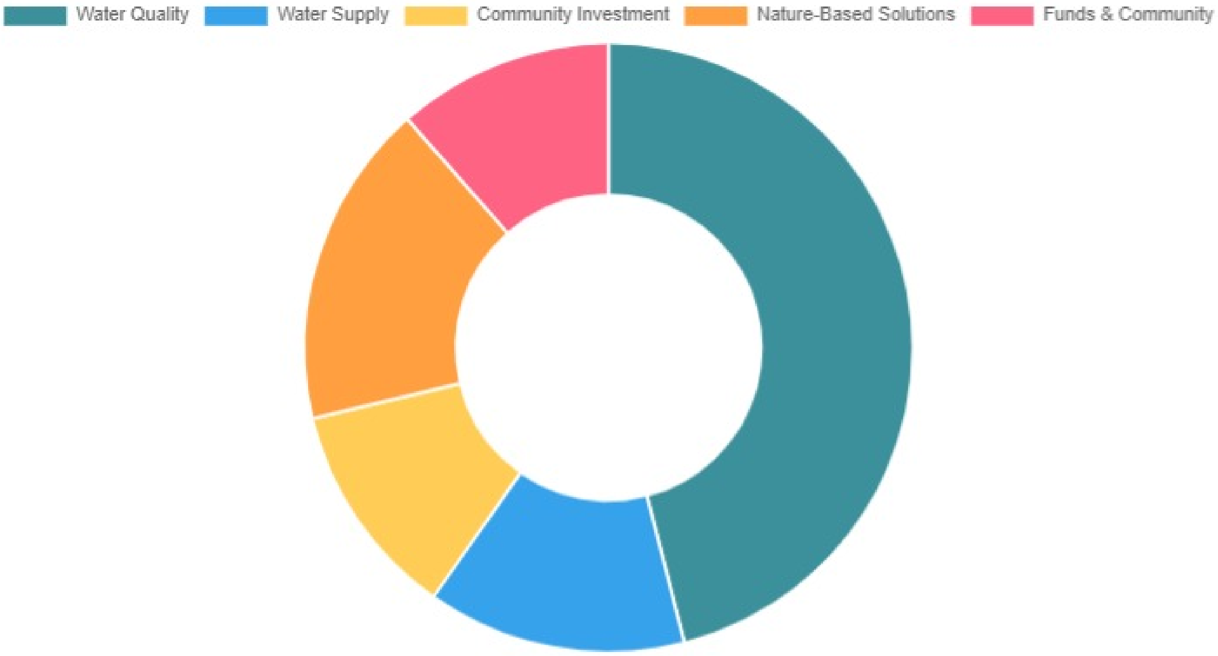
9 SCORING

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:
87 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.




% 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**	N/A	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**	N/A	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**	20	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**	20	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	**87**	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 NORTH HOLLYWOOD PARK STORMWATER CAPTURE PROJECT

The North Hollywood 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.

87
POINTS

COUNTY SCORE
Safe Clean Water (SCW) Program

WATER QUALITY BENEFITS

40/40

121 AF
BMP Storage Volume

4,866 acre
Tributary Area

0.97 cfs
Average Dry Weather Flow

SIGNIFICANT WATER SUPPLY BENEFITS

12/25

2,040 AF/YR
Captured

NATURE BASED SOLUTIONS

10/15

Trees to Add Shade and Reduce the Heat Island Effect by Using More Than
~300
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

50 %
LADWP Funding

50 %
SCW Funding

Total Project Est = $186M

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

North Hollywood Park is located at 11430 Chandler Boulevard, 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). The project is located at the confluence of the concrete-lined Central Branch Tujunga Wash, owned and operated by the Los Angeles County Flood Control District (LACFCD), and four other storm drains, owned and operated by either the City or LACFCD. Figure 1 shows that the park is bounded by SR-170 to the west, Chandler Boulevard to the north, and Tujunga Avenue to the east.

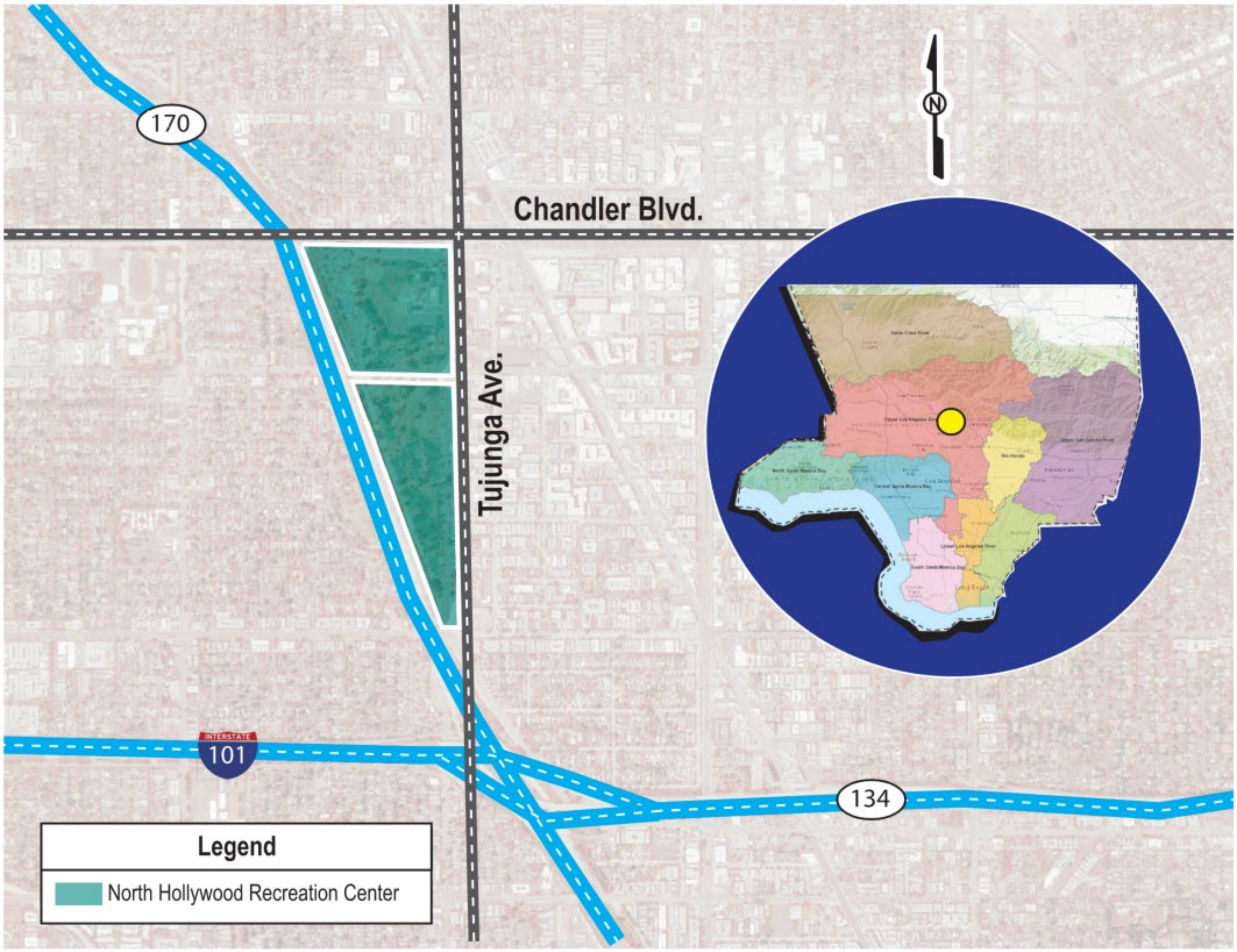


Figure 1 North Hollywood Park Location & Bounding Streets

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.

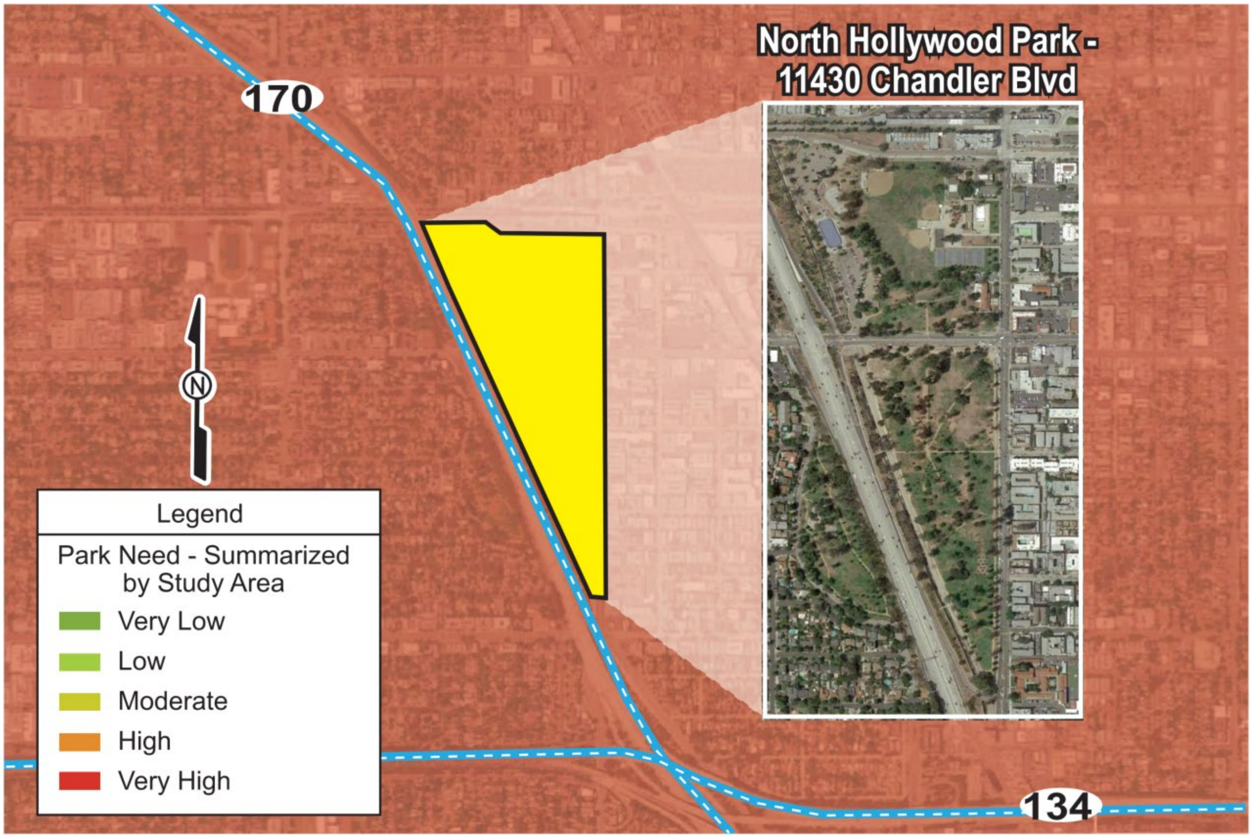


Figure 2 Map of Park Needs Surrounding North Hollywood Park

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

Much of the area surrounding North Hollywood 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 and ball fields will make the site more desirable to use and will therefore bring people together in the service of strengthening the community.

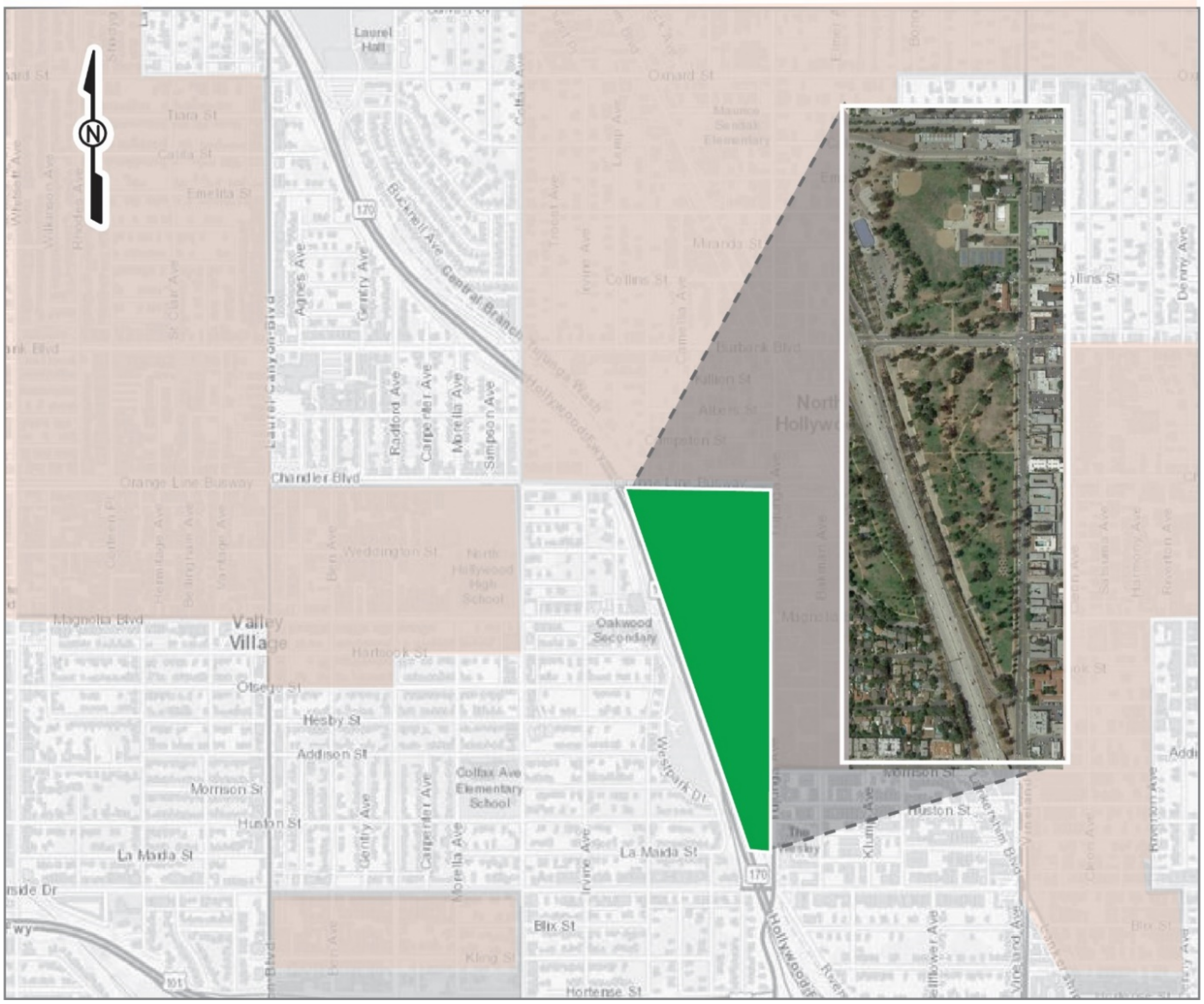


Figure 3 Disadvantaged Communities (Pink) in the Vicinity of North Hollywood Park

ATTACHMENTS FOR SECTION 2.1:

CONFIGURATION

2.1 Configuration

The proposed best management practices (BMPs) consist of the following elements, shown on Figure 1:

- Three diversion structures within the Tujunga Wash Central Branch Stream (Channel). See Figure 1 for approximate diversion structure locations. Each diversion is designed to divert 50 cfs from the channel via a grated drop inlet with a 42-inch RCP.
- An inflatable rubber dam immediately downstream of the southernmost diversion point.
- Three hydrodynamic separators- each within the park area and upstream of the respective infiltration gallery to treat the diverted stormwater.
- Three sedimentation basins will be used to remove finer sediment from diverted stormwater prior to entering infiltration galleries.
- Three pump stations- each downstream of the respective sedimentation basin to pump treated stormwater to the respective underground infiltration galleries.
- Three subsurface infiltration galleries- the first, located north of Magnolia Boulevard, covers approximately 7.3 acres. The second gallery, just south of Magnolia Boulevard and perpendicular to Otsego Street, spans approximately 3.2 acres. The final gallery north of Camarillo Street and perpendicular to Huston Street covers approximately 0.6 acres. All galleries are at a depth of 11 feet below ground level.

The Project proposes to add several new recreational features and greenery that will benefit the disadvantaged community. Figure 2 provides an overview of key community benefits, while Figure 3 includes visuals of a few of the many enhancements to the community. The following are landscape and park improvements that will be further evaluated during design:

- Three upgraded baseball fields with new shade structures, including new backstops, new bleachers, and dugouts.
- Three new natural multi-purpose soccer fields.
- New LED sports lighting system for all sports fields.
- A minimum net increase of 293 trees will be added to the park.
- Native plantings for the parking lot serving the preschool.
- Permeable pavement and native landscaping for the main parking lots.
- Sixteen new proposed electric vehicle (EV) charging stations.
- Nine new hydration stations throughout the park.
- Educational signage throughout the park to engage the community and promote sustainability awareness.
- The LACFCD access road will be improved to also serve as a pedestrian trail for recreation and improved access to waterway.
- Irrigation systems to be retrofitted in areas of construction and new irrigation circuits will be integrated. Connecting the irrigation systems to a recycled water irrigation line recently installed by LADWP will be explored during the design phase.
- Replacement of site furniture where construction disturbs surface features with, including adding park benches and trash receptacles. All replaced site furniture will provide universal access (of width and slope meeting California ADA guidelines). Exact locations will be determined with community feedback.

The following are the electrical and instrumentation components for the Project:

- Downward pointed sharp cut-off fixtures with energy-efficient LED fixtures will be implemented in areas that could benefit from more site area lighting.
- Installation of flow sensors with master control valves to reduce water waste from pipe or head breaks, if conditions permit.
- Replace existing Electrical Service and Lighting Control Enclosure with a new 480 V service panel to provide power for the three pump stations and other motors, with step-down transformer and 120/140 V subpanel to serve the instrumentation and smaller loads.
- Provide Honeywell PLC with Human-Machine Interface (HMI) connected to LASAN's SCADA network.
- SCADA for remote monitoring of flow meters, level monitoring, and alarms. Remote control will be provided for flow diversion gates and valves, pumping, and related equipment.
- An uninterruptible power supply shall be provided for the control system.

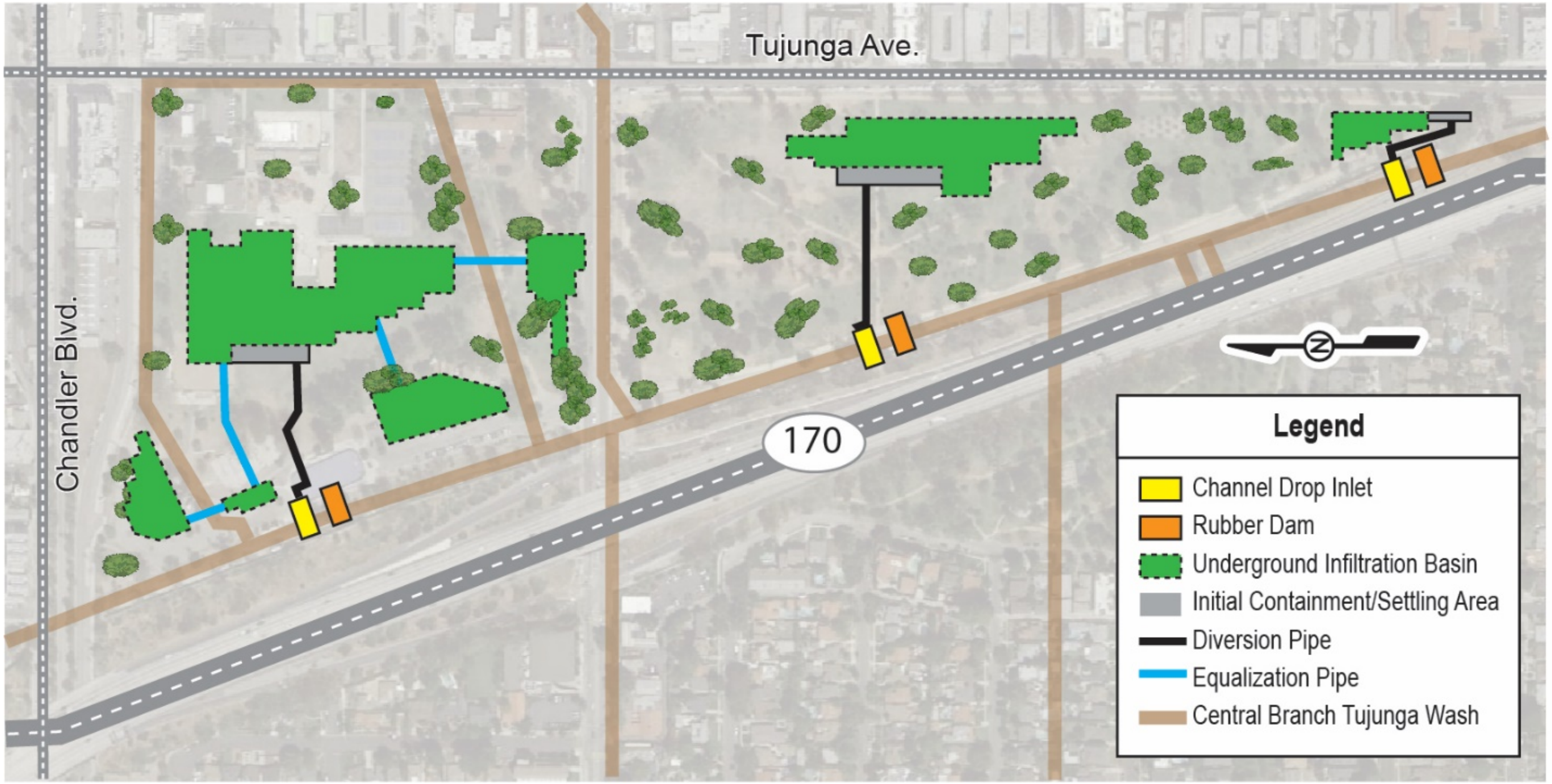


Figure 1 Stormwater Capture Project Features

Figure 2 Overview of Above-Ground Project Improvements

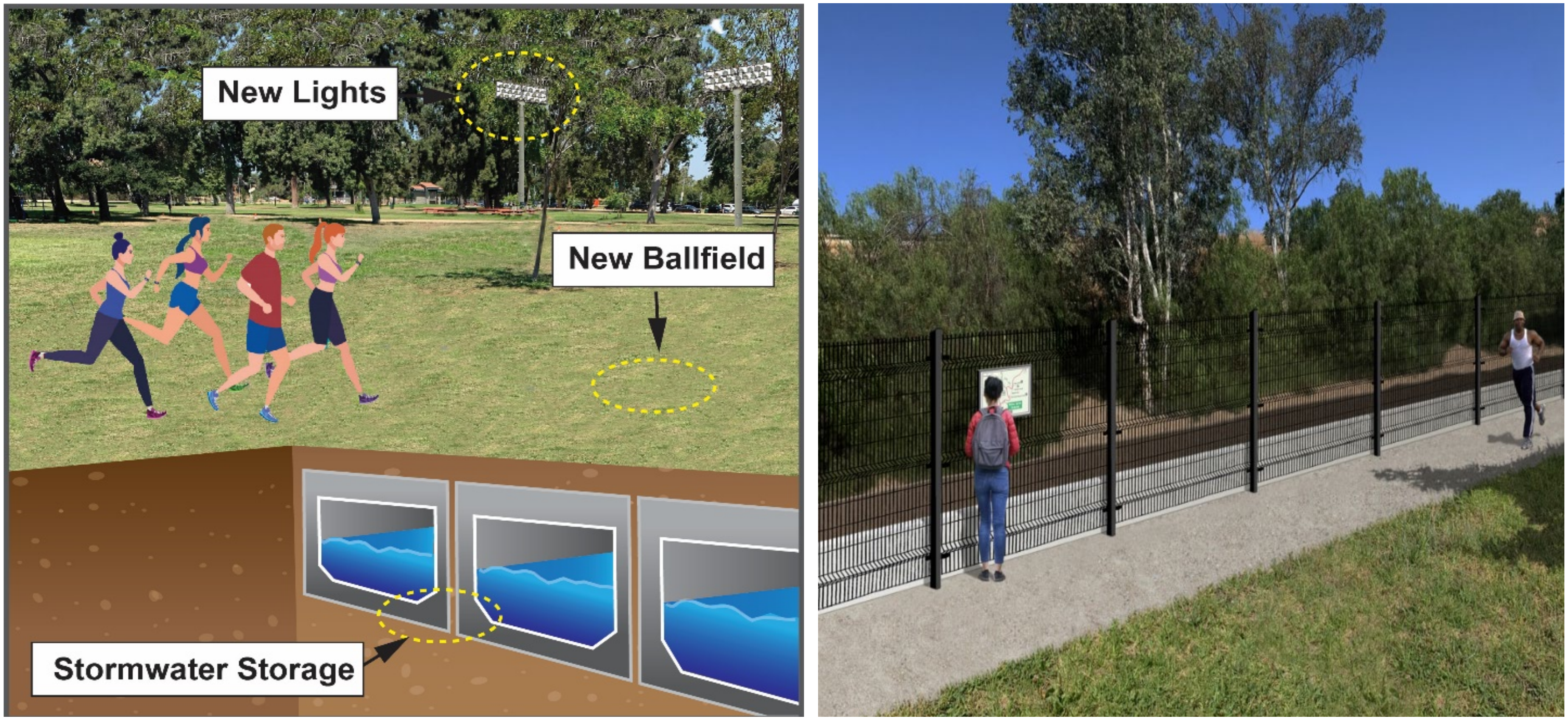


Figure 3 Illustrations of Some of the Project Improvements

The Project consists of three unique infiltration galleries for the three proposed diversions. For the purposes of the SCW Projects Module, these three systems are modeled collectively as a single project merged within this feasibility report. The module is not capable of performing calculations on multiple diversions and storage units within a project and the aggregated method shown in Table 1 can be used to represent the infiltration gallery. The storage depth is the same across the galleries, and the footprint areas have been aggregated for ease of entry into the SCW Projects Module.

Table 1 Configuration Summary

Component	Dimension
Ponding Depth (ft)	11
Infiltration Footprint Area (acres)	11.1
Media Layer Depth (ft)	0.01⁽¹⁾
Media Layer Porosity	0.4
Underdrain Layer Depth (ft)	N/A⁽²⁾
Underdrain Layer Porosity	N/A⁽²⁾
Additional Components	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.

2.1.1 Process Description

The Project is considered an Infiltration Facility. Dry weather runoff and stormwater from the drainage area will be diverted from the Central Branch Tujunga Wash channel located to the West of the Project area. The Central Branch Tujunga Wash is owned and operated by LACFCD. Upon being intercepted by the diversion structures and rubber dam, the captured runoff will be routed to hydrodynamic separators, sedimentation basins, and then to pump stations where the water will be pumped to submerged infiltration galleries. Lastly, the captured and treated runoff will percolate down to replenish the groundwater basin. A process flow diagram for the Project proposal is shown in Figure 4.

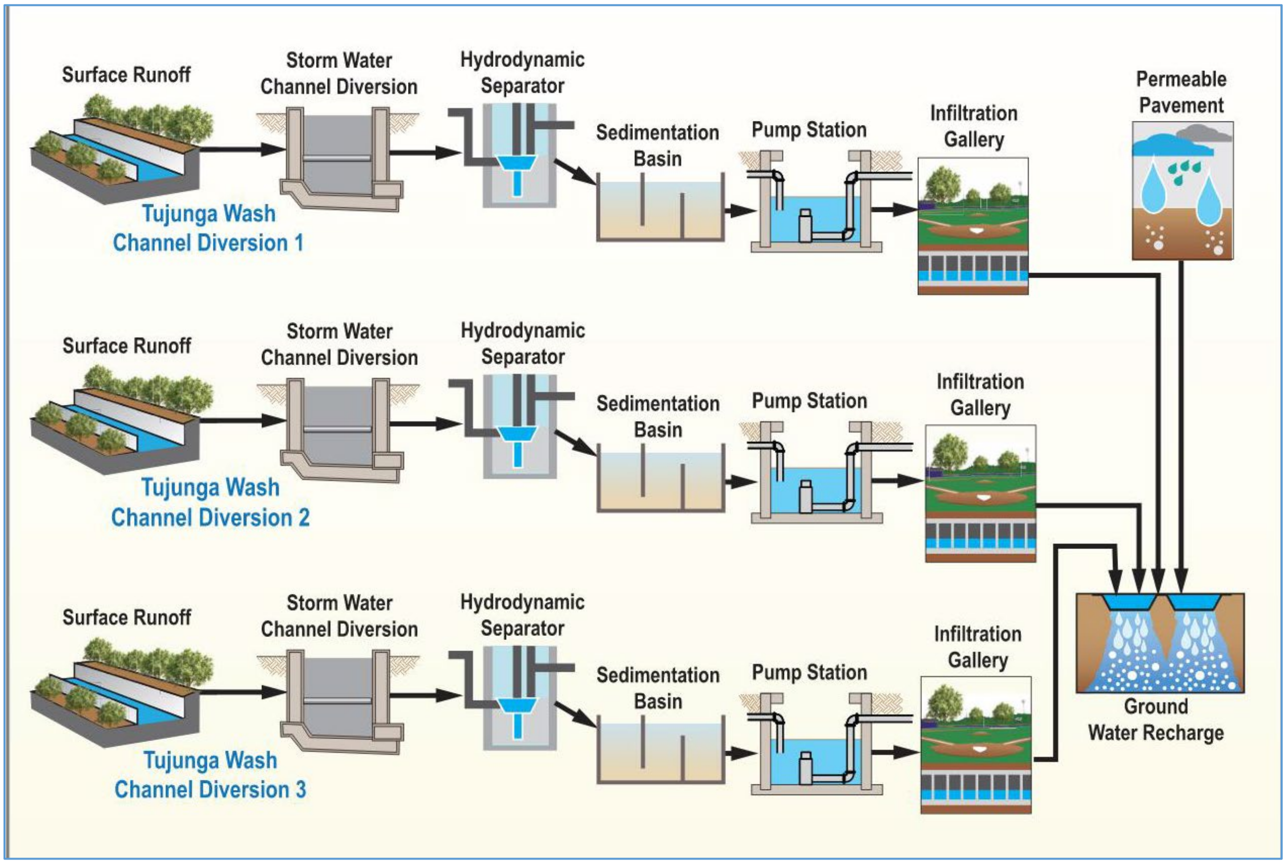


Figure 4 Process Flow Diagram

2.1.2 Intercept Project Component: Diversion Structure

Generated models of the 85th percentile storm show a runoff volume of 132.1 AF and a peak runoff rate of approximately 320 cfs. Complete capture of this modeled peak runoff is not feasible; however, the recommended Project has the ability to capture 92 percent of the 85th –percentile storm runoff volume. Three diversion structures, designed as 42-inch RCPs, will be constructed to allow each system to convey up to 50 cfs. An inflatable rubber dam and a grated drop inlet are proposed within the Channel to divert stormwater at the southernmost system. The rubber dam will match the width of the channel and reach a fully inflated height of 2 feet, to impede and divert flow into the grated drop inlet. The rubber dam will be flush with the Channel floor when deflated and will be protected by drivable steel plates to allow for maintenance trucks to drive over, if necessary. See Figure 5 for an image of an inflatable rubber dam and a grated drop inlet.

Figure 5 Inflatable Rubber Dam (Left) and Grated Drop Inlet (Right)

Upstream of the rubber dam, the grated drop inlet will be constructed with its invert set below the invert of the existing channel, to maintain channel hydraulics and ensure flood control protection. The diversion pipes will require a minimum of 0.5 percent slope to maintain the required diversion rate. See Figure 6 for a typical section of the grated drop inlet.

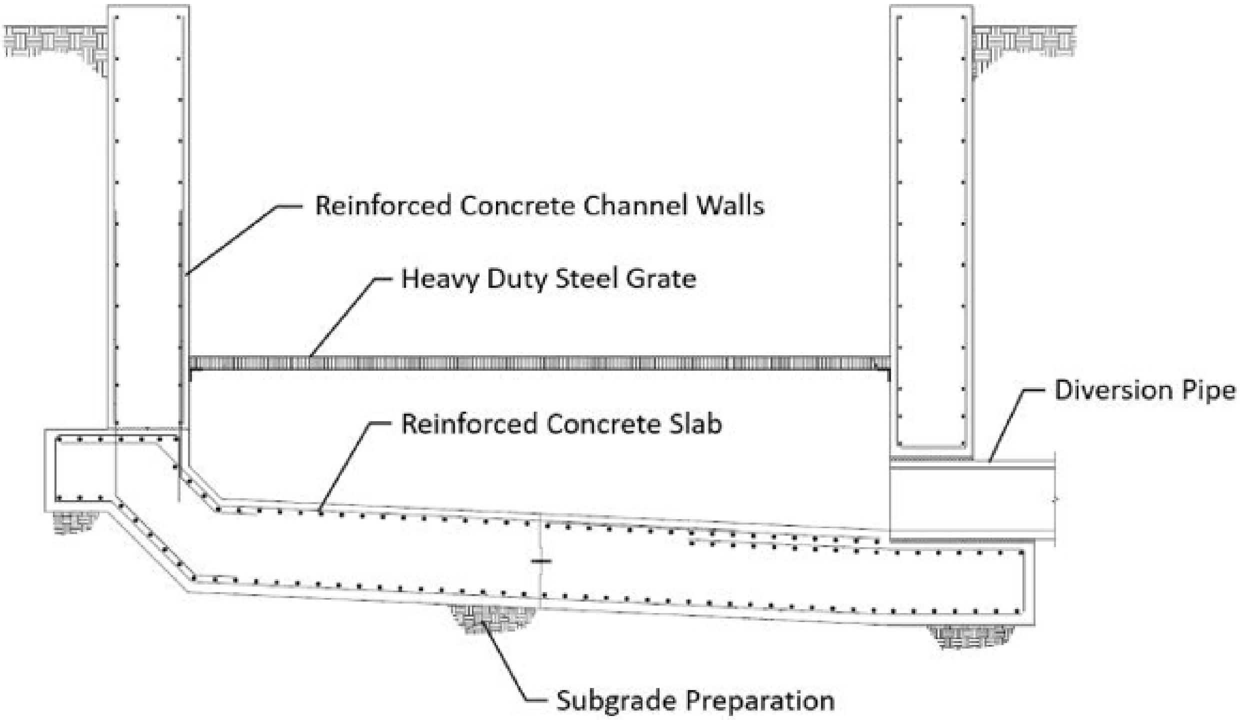


Figure 6 Typical Section of Grated Drop Inlet

2.1.3 Treatment Project Component: Hydrodynamic Separator & Sedimentation Basin

Pretreatment in the form of hydrodynamic separators will be an integral component in the treatment strategies prior to infiltration to extend the life of the stormwater BMP system. Hydrodynamic separators are key in separating and trapping debris, sediment, oil and grease from stormwater runoff. Contech's Continuous Deflective Separation (CDS) (or approved equivalent) is the recommended unit for this project as it meets 100% Gross Solids Removal and has high treatment flow capacity capabilities (up to 60 cfs). Stormwater enters the diversion chamber, is diverted to the unit's separation chamber using diversion weir guides, encounters swirl concentration and screen deflection for 100 percent floatables removal, moves through the separation screen and under the oil baffle, removing oils and grease, and then exits the system. This process will help reduce infiltration gallery O&M and will help protect the infiltration design capacity of the infiltration gallery. Refer to Figure 7 for illustration of this unit.

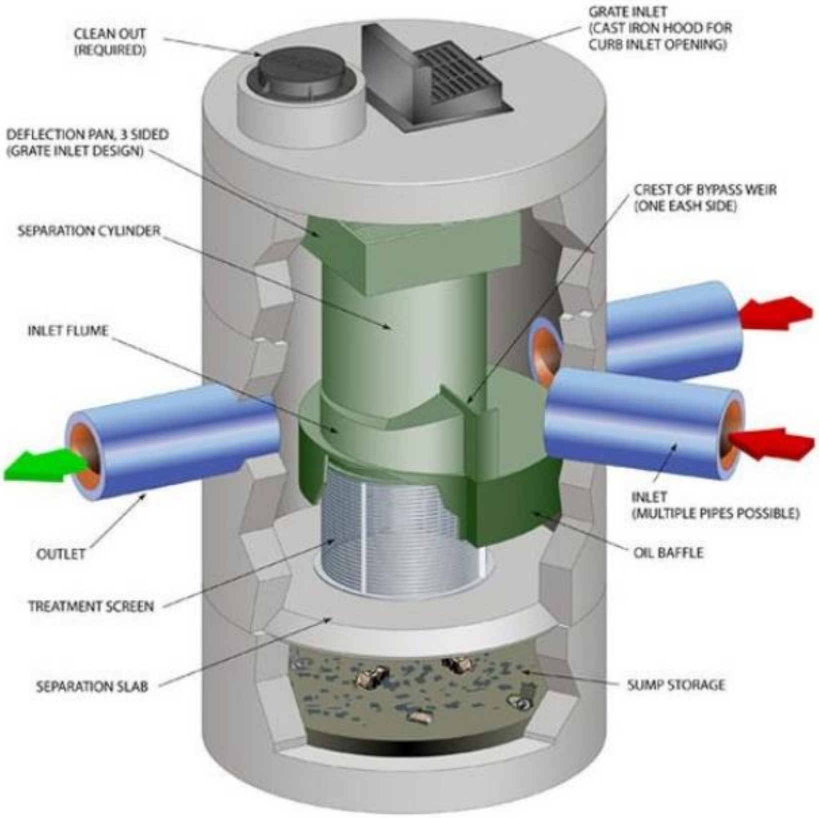


Figure 7 Contech CDS Unit

To remove finer sediments from diverted stormwater, additional pretreatment is recommended prior to stormwater entering the infiltration galleries. A sedimentation basin such as an underground sand filter or a second pretreatment device is to be installed upstream of each infiltration gallery. See Figure 8 for the underground sand filter configuration.

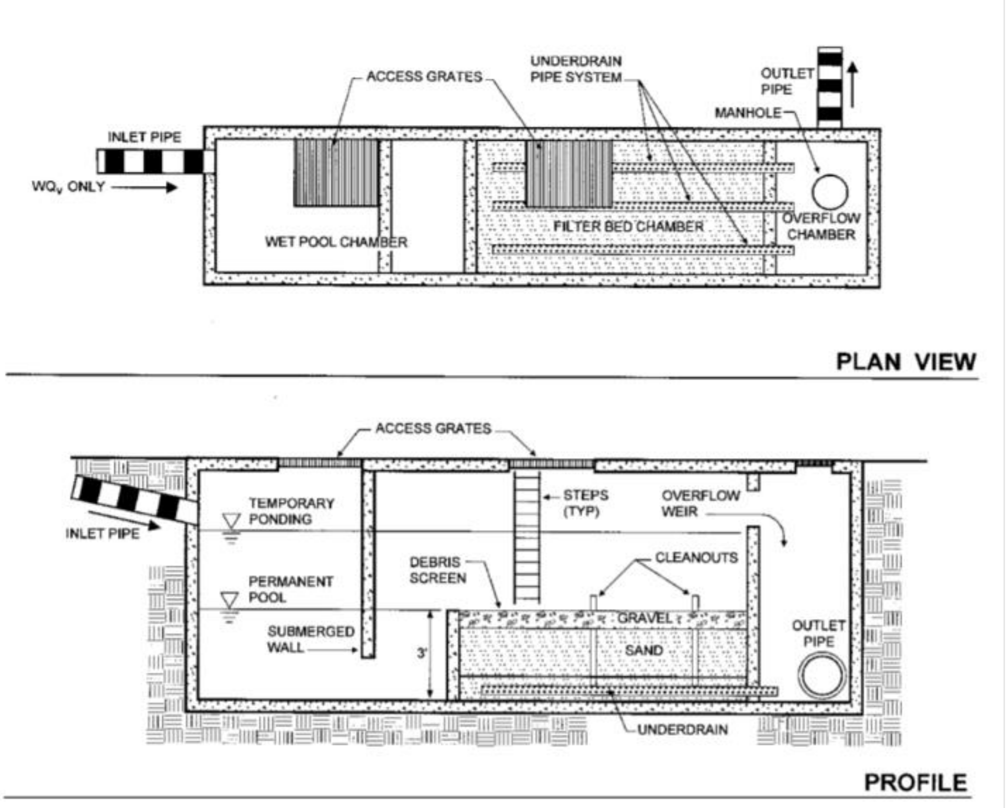


Figure 8 Underground Sand Filter

2.1.4 End Use Project Component: Pump Station and Subsurface Infiltration Gallery

Pumping systems will be required at each diversion point due to the depth of existing drainage facilities, adjacent land grades and the types of BMPs considered for the Project. Flows are anticipated to be highly variable between dry-weather and wet-weather operating events, so large duty pumps and smaller sump pumps will be provided to accommodate this variance. A 3 + 1 Pump configuration is recommended for the Project, meaning this design consists of three duty pumps, each capable of pumping 50 percent of the peak design flow, plus an additional pump to be provided and stored offsite. When a pump is removed for maintenance, the additional pump would be installed to provide redundancy.

Characteristics of the 3 + 1 pump configuration are as listed:

- Having lower operational costs due to lower horsepower required for each of the active pumps.
- Having slightly higher capital costs compared to a 3-pump configuration, as 4 pumps are required,
- Typically, larger wet well required to accommodate three pumps while mitigating cavitation due to vortex cycling,
- Under certain low flow pumping scenarios, cycling of pumps may be reduced.

Pumps will have horsepower requirements ranging from 122.5 hp to 131 hp for wet weather flow and 5 hp for dry weather flow, all at 72 percent efficiency.

Subsurface infiltration galleries will harvest and temporarily store stormwater runoff to eventually percolate through the bottom of the gallery and its subgrade layer into the groundwater basin. The three area footprints proposed for the galleries are, starting at the northernmost section, 7.3, 3.2, and 0.6 acres, respectively. The infiltration gallery has an infiltration rate capable of draining the gallery within a specified design drawdown time (usually up to 72 hours). It is important to note that stormwater runoff volumes are greater than the infiltration gallery's total storage capacity, however average annual infiltration vs gallery storage meets target recharge rates.

The StormPrism System by Precon (or approved equivalent) is recommended for this BMP as the greater void space (up to 97 percent) creates an open system, allowing for easier maintenance. Maintenance holes will be located strategically next to or within access paths. StormPrism Systems are multiple modular precast concrete systems designed to serve as underground storage and infiltration systems. These systems are made from durable, reinforced, and high-strength concrete. The advantage of these systems being located at various depths below ground level is that space above the galleries can be re-utilized and Park recreational facilities can be restored after gallery installation. A StormPrism System similar to the proposed galleries for this Project can be seen in Figure 9.

Figure 9 StormPrism System- example of proposed Infiltration Gallery

2.1.5 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 293 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 4,866 acres, as shown in Figure 1. The drainage area is entirely contained within the City of Los Angeles. 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.

Table 1 Jurisdictional Drainage Area

Agency	Tributary Percent	Land Area (acres)
City of Los Angeles	100.0%	4,866

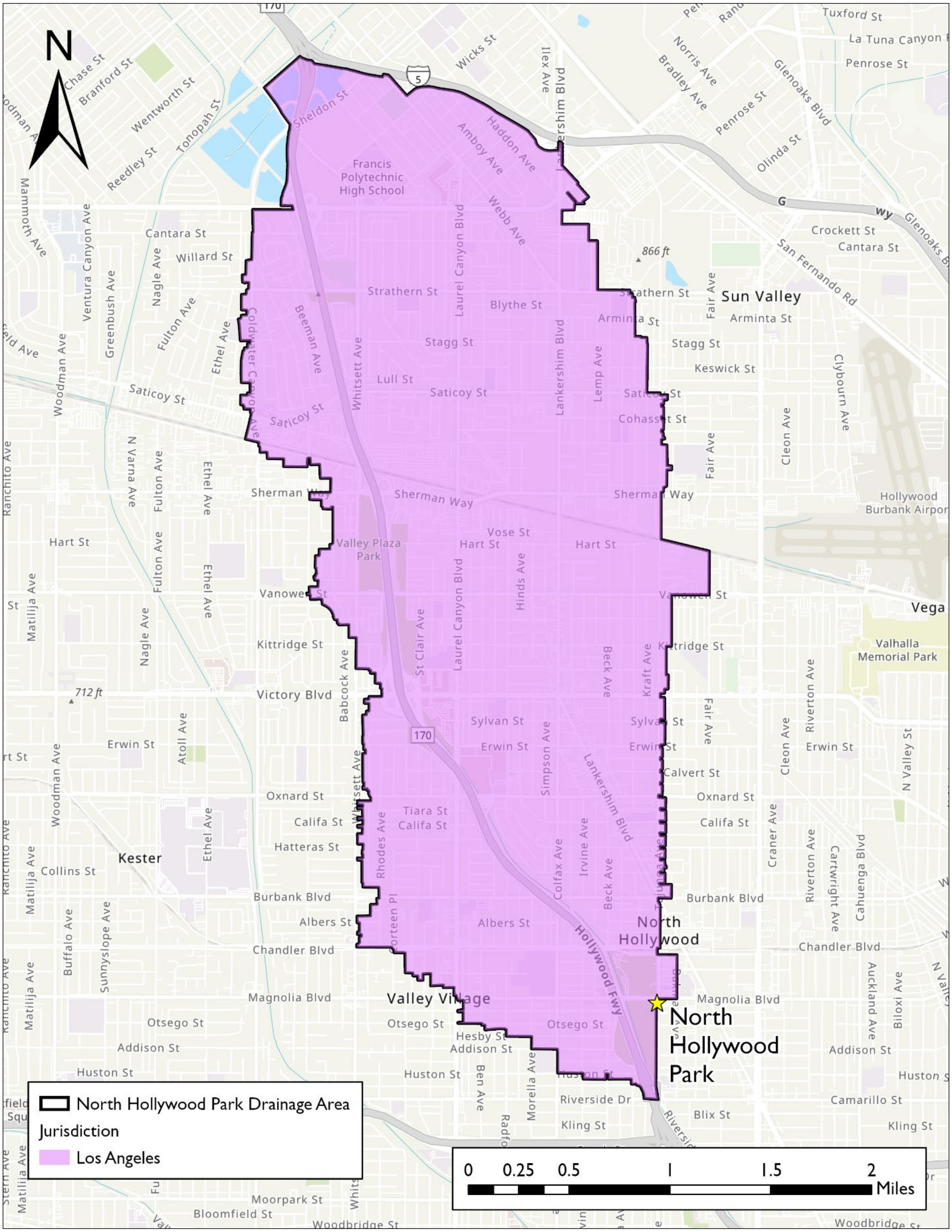


Figure 1 Drainage Area Map

Table 2 lists the land uses, area, and percent of total impervious acreage within the drainage area used in the development of the preliminary design report. 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 was completed. Based on the breakdown of land uses, the drainage area has a weighted average of 56 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 (2,752 acres). Figure 2 provides a graphical representation of the land use for the drainage area.

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

Land Use Classification	Area (acres)	Impervious Area (acres)	% of Total Impervious Acreage
Single-Family Residential	1,790.8	886.1	32.20%
Multi-Family Residential	594.0	394.9	14.35%
Commercial	348.3	256.5	9.32%
Institutional	173.9	104.6	3.80%
Industrial	525.5	355.8	12.93%
Transportation	243.1	120.5	4.38%
Secondary Roads	1,081.4	633.5	23.02%
Agriculture	44.2	0.0	0.0%
Vacant	65.2	0.0	0.0%
TOTAL	4,866.4	2,751.9	100%

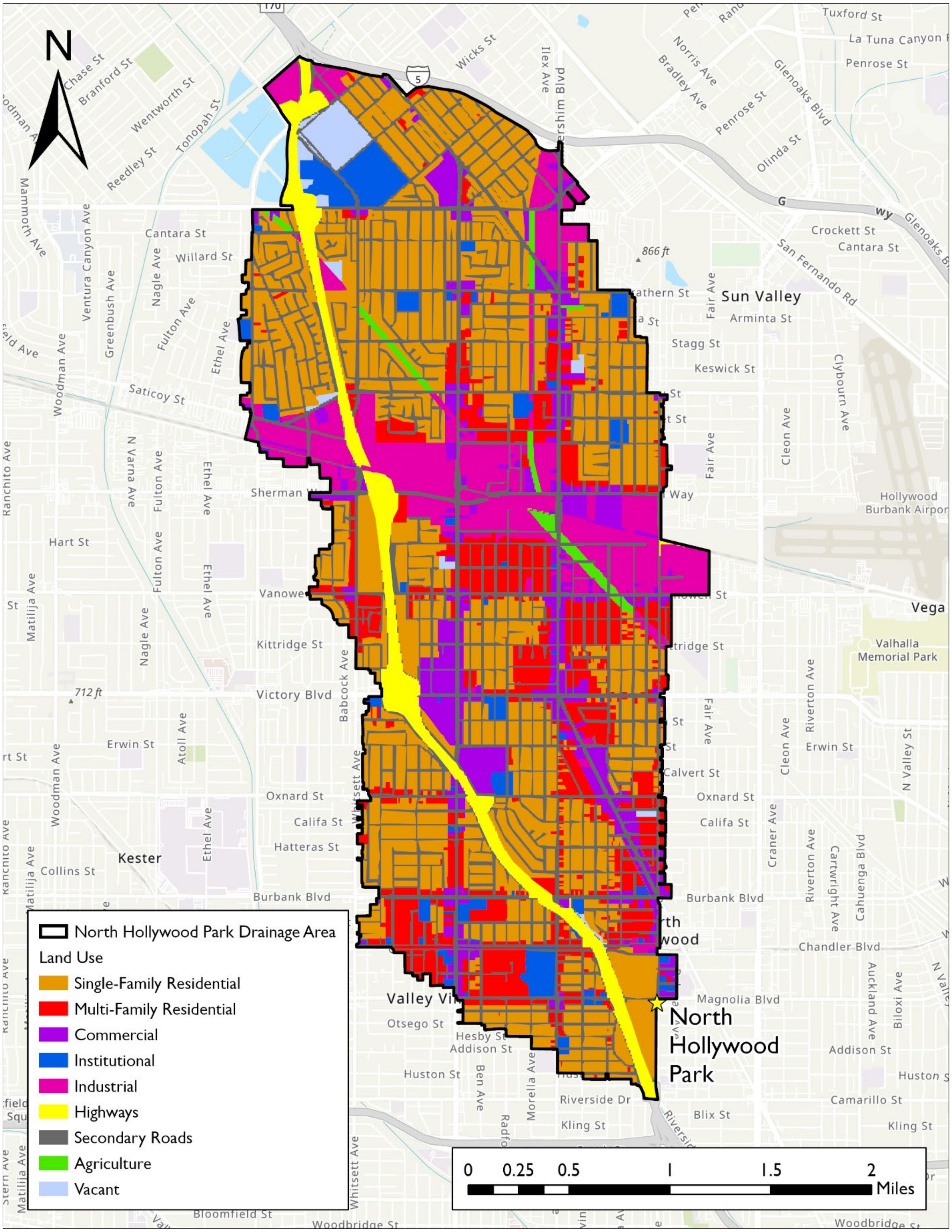


Figure 2 Drainage Area Land Uses

ATTACHMENTS FOR SECTION 2.4:

SITE CONDITIONS & CONSTRAINTS

2.4.1 Soils Investigation Reports

The geotechnical site investigation at North Hollywood Park was conducted between April 10, 2020, and May 4, 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 Report for North Hollywood Park is included in the following pages.

Geosyntec consultants

engineers | scientists | innovators

DRAFT SOILS INVESTIGATION REPORT

Task Order Solicitation (TOS) No. 25
Stormwater Capture Parks Program
North Hollywood Park, 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 LA0590B

June 2, 2020

Draft Soils Investigation Report

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DRAFT	DRAFT
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Project Number: LA0590B

June 2, 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
CFR	Code of Federal Regulations
CGS	California Geological Survey
City	Los Angeles Bureau of Engineering
cm/s	centimeters per second
CPT	Cone Penetration Test
CRR	cyclic resistance ratio
CSR	cyclic stress ratio
EPA	Environmental Protection Agency
ft	foot/feet
ft bgs	feet below ground surface
ft/s	feet per second
in./hr	inches per hour
LACPW	Los Angeles County Public Works
LEL	Lower Explosive Limit
MCE_G	Maximum Credible Earthquake Geometric Mean
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
pci	pounds per cubic inch
PGA_M	peak ground acceleration
PID	photoionization detector
ppm	parts per million
psf	pounds per square foot
PVC	polyvinyl chloride
PW	Public Works
RCB	reinforced concrete box
RWQCB	Regional Water Quality Control Board
SBT	soil behavior type
SCEDC	Southern California Earthquake Data Center
SGMA	Sustainable Groundwater Management Act
SHPO	State Office of Historic Preservation

SPT	standard penetration test
SR	State Route
SVOCs	semi-volatile organic compounds
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
VOCs	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 – North Hollywood Park, 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

North Hollywood Park is located in the East San Fernando Valley in the upper Tujunga Wash Watershed within the San Fernando Groundwater Basin. The park is north of US Highway 101 (US 101) freeway and east of the State Route 170 (SR-170) freeway in the North Hollywood neighborhood of the City of Los Angeles. It is bordered by the SR-170 freeway to the west and south, Chandler Boulevard to the north, and Tujunga Avenue to the east. Magnolia Boulevard, running east-west, divides the Site into a northern park area and a southern park area. There are no pedestrian pathways providing a direct connection between the northern and southern portions of the park. Refer to Figure 1 for a map of the park 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 North Hollywood Park concept consists of capturing runoff from an approximately 2,319-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 an 11-acre underground infiltration basin (UIB) constructed below the park. The basin is envisioned to store approximately 4,715,000 cubic feet of stormwater.

North Hollywood 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 park to assess each site’s potential for inclusion in the program.

The conceptual design for North Hollywood Park 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, three channel drop inlets spaced evenly along the channel will each intercept flows 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 one of several UIBs. The Project components include drop inlets from the open channel, actuated valve vaults, pump stations, hydrodynamic separators, flow measuring stations, and a series of interconnected underground infiltration galleries that will include an initial containment/settling area.

The preliminary concept also includes a series of rubber dams constructed within the channel to help control stormwater diversion into the facility. If rubber dams are planned to be used as part of the infrastructure at the Site, we would envision that the anchorage of the dams 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 dams 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 North Hollywood Park. 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 testing (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 North Hollywood Park was conducted between 10 April and 4 May 2020. Onsite activities consisted of soil boring, sampling, and logging, seismic cone penetration testing, and temporary infiltration well installation, testing, and abandonment. More specifically, the site exploration consisted of the following:

- Eight hollow-stem borings (NH-HSA-12,13,14,15,16,17,18,19) to depths between approximately 12 and 82 ft bgs;
- Twelve hollow-stem borings (NH-HSA-1,2,3,4,5,6,7,8,9,10,11,12A) to depths between approximately 31 and 82 ft bgs with installation of infiltration test wells (12 temporary infiltration test wells);
- Seventeen CPTs to depths between approximately 24 and 53 ft bgs with shear wave velocity measurements in all soundings;
- Twelve constant head infiltration tests in the 12 test wells, which were installed in the hollow-stem borings to depths between approximately 25 and 50 ft bgs.

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.

Twelve of the hollow-stem auger borings were converted into temporary infiltration test wells, and the remaining eight 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 into 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 NH-HSA-1,3,5,6,7,9,11,12A), from 15 ft to 25 ft bgs (for boreholes NH-HSA-4,10), and from 40 ft to 50 ft (for boreholes NH-HSA-2, 8);
- 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 the 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.

Twelve 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 (40 to 50 ft bgs) to assess the 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 four test well 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, the 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 17 CPT soundings were advanced to depths as great as 53 ft bgs at 12 different locations (CPT-1 through CPT-12). Immediately adjacent to CPT locations 1, 3, 5, 8, and 9, second soundings were attempted (CPT-1A, -3A, -5A, -8A, and -9A) after hitting refusal at the initial locations. Even with second attempts, no soundings were able to advance past a depth of 53 ft bgs due to refusal. Refer to Table 1 for a summary of all CPT depths.

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 all CPT soundings, 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 Environmental Laboratory Screening

During hollow-stem auger sample logging, PID readings greater than zero parts per million (ppm) were recorded for soil samples collected from the borings. While many recorded readings were generally below 4.0 ppm, readings as great as 34.8 ppm were recorded. Refer to a Table 4 for a summary of PID readings greater than 4.0 ppm.

Organic odors were noted for soil samples collected near surface (i.e., depth of 5 to 10 ft bgs), particularly in the southern and easternmost portions of the site. Organic odors were noted on some samples collected from as deep as 35 ft bgs at HSA-2 and 65 ft bgs at HSA-3. No evidence of soil discoloration associated with the organic odors was observed.

Portions of select samples were placed in jars and shipped to Eurofins Calscience to test for the presence of volatile organic compounds (VOCs) according to Environmental Protection Agency (EPA) Test Method 8260B and semi-volatile organic compounds (SVOCs) according to EPA Test Method 8270C. Laboratory test results indicate that none of the VOCs or SVOCs included in the screening were detected. Laboratory test data are provided in Appendix E.

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 on the eastern margin of 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 Shell Service Station Regional Water Quality Control Board (RWQCB) cleanup site, approximately 550 ft to the south, confirm subsurface conditions generally matching the above descriptions to depths up to 131.5 ft bgs [Golder, 2017]. Beneath the park, the base of the Saugus Formation and the base of Quaternary alluvial sediments is approximately 800 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 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 9.6 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 19 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 18 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 that crosses the northwest corner of the site, as depicted in Figures 4 and 5.

3.3 Site History

Aerial photos of the North Hollywood area taken in the late 1920s indicate that the Site was used as a plant nursery and/or for crop production until 1928, when portions of the Site were cleared and converted into a recreational park. The Tujunga Wash ran along the western edge of the park prior to construction of the SR-170 freeway in the early 1960s. Portions of the Site appear to have been located along the banks of the Tujunga Wash before the installation of channelization features that helped define the eastern boundary of the waterway. During the mid-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] indicates the former presence of a cluster of nine groundwater monitoring wells located approximately 600 ft southeast of the southern tip of the Site. The information provided on GeoTracker indicates that the wells were installed in conjunction with a leaking underground storage tank clean-up below a former Shell Gas Station situated at the northeast corner of Camarillo Street and Tujunga Avenue. The case was closed by the RWQCB in 2010, and the monitoring wells were abandoned in 2011 [GeoTracker, 2020].

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 or around 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 for any future projects on channel structures greater than 50 years old, upon concurrence with the State Office of Historic Preservation. Since the structure is over 50 years old, a study should be considered to determine whether the structure is eligible for listing in the National Register of Historic Places and whether it is considered historic property under Section 106 of the NHPA.

3.4 Surface Conditions

The park is bordered by the SR-170 freeway to the west and south, Chandler Boulevard to the north, and Tujunga Avenue to the east. The Site consists of two parcels situated along both the north (24.5 acres) and south (19 acres) of east- to west-trending Magnolia Boulevard, which enters the site at Tujunga Avenue and exits the site as an underpass beneath the SR-170 freeway. The proposed 11-acre underground infiltration galleries are spread across both parcels.

In general, the Site is relatively flat in an east-west direction and has a gentle slope in the north-south direction, with an overall relief of approximately 22 ft. The elevation ranges from approximately +636 ft mean sea level (MSL) (by Chandler Boulevard to the north end) to + 614 ft MSL (by the SR-170 freeway entrance to 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 17 to 37 ft above the Site with a side slope of approximately 2.5:1 horizontal to vertical (H:V). The western boundary descends toward the canal at an approximate inclination of 2.5:1 (H:V).

In the north parcel, there are various facilities such as a recreation center, swimming pool, baseball fields, tennis courts, skateboard area, basketball courts, parking lots, maintenance yard, and park administration buildings. The south parcel of the site is mainly used as a recreational park for running and walking on various trails. The vegetation of the both parcels is mainly grass, shrubs, and some trees.

The geophysical utility locating performed in support of the drilling activities detected the presence multiple electric and communication lines, as well as a network 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 twenty hollow-stem auger borings indicates that the subsurface at the Site predominantly consists of Sand (SP & SW) and Silty Sand (SM) with interbedded layers Sandy Silt (ML) in the upper 30 to 35 ft bgs. The upper approximately 5 ft bgs is believed to consist generally of artificial fills, while the material below consists predominantly of young alluvium.

Within the portion of the site south of Magnolia Boulevard, an upper silty layer up to 15-ft thick with fines contents ranging from 40 to 65 percent was encountered immediately below the fill at several locations. A second silty layer, with some clay, varying between 6- to 10-ft thick was encounter at some locations. Below the silt, silty sands were generally found to contain a greater proportion of sand and less silt at depths greater than 40 to 45 ft bgs. Soil samples collected from depth at boring locations HSA-3 and HSA-18 indicate the presence of a Sandy Silt (ML) layer at approximately 70 to 75 ft bgs.

North of Magnolia Boulevard, an upper layer of Sandy Silt (ML) and Silty Sand (SM) up to 25 ft thick, with fines contents generally between 40 and 70 percent, was encountered below the fill mantle across a majority of the area. This silty layer is generally underlain by Silty Sands (SM) and Sands (SP and SW); however, a second silty layer up to 12 ft thick was also encountered at some locations, particularly near the northern and southern ends of this portion of the park. Pockets of Sandy Silty Clay (CL-ML) and Silty Clayey Sand (SC-SM) were encountered within and just below these silty layers at some locations. HSA-16, the only exploration north of Magnolia that extended below depth of 50 ft bgs indicates the presence of some gravel and clay at an approximate depth of 70 ft bgs.

Based on the recorded SPT values, sand and silty sand layers in the upper 25 to 30 ft exhibited very loose to very dense relative density; whereas, layers below depths of 30 to 40 ft bgs generally transition from medium dense to very dense with depth. Soil samples collected were typically brown or dark brown and moist to wet at the time of our investigation.

Cross sections of the Site developed to illustrate inferred subsurface stratigraphy are provided in Figures 6 through 9. 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 6.

3.5.2 Groundwater

Groundwater monitoring reports compiled in the California 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 107 to 194 ft bgs between the years 2009 and 2018 at the monitoring wells located between approximately 615 ft and 1.7 miles from the Site.

Figure 10 contains an excerpt from a CGS 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 10 ft bgs. This groundwater level is on the order of 100 ft to 185 ft higher than what was recorded in recent ground water level measurements by others in the project area. 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 CGS has not identified Alquist-Priolo Earthquake Fault Zones for the Van Nuys Quadrangle [CGS, 1998], where the Site is located. As such, a site-specific investigation for fault rupture hazard is not expected to be required by the building official.

However, based on the Quaternary fault and fold database for the United States [USGS and CGS, 2020], an active or potentially active fault (defined as exhibiting displacement within the last 11,000 years and 1.6 million years, respectively) may potentially underlie the Site. That fault is an unnamed possible fault in North Hollywood, which is estimated to cross the northwest corner of the park. Information about the unnamed possible fault is limited. Per the USGS Quaternary fault database this feature is identified as a Class A fault with its most recent deformation in the last 15,000 years. The dip direction, slip sense, and slip rate are all unspecified. The database shows the possible fault as 5 km in length. The location of the trace of the fault is attributed to Weber and others [Weber et al., 1980] who note an apparent east-northeast trending linear break in topography on maps published in 1901 and 1926 by the USGS, and additionally cite recent elevation change data that may mark the trace of an east-trending fault at the location. Figure 5 provides a detailed view illustrating the location of the mapped extent of this feature per USGS Quaternary fault database relative to the proposed construction. No further information related to this fault was available at the time this report was prepared.

The scope of this investigation did not include a detailed assessment of the nature of this potential fault rupture hazard or assessment of impacts due to surface fault rupture at the site.

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 11. The CGS map indicates that the Site is located 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. Due to the Site's location within 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.

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 20-ft free face along the flood channel adjacent to the Site, liquefaction of soils within the upper approximately 40 ft would be considered to contribute to lateral spreading. An evaluation of lateral spreading was conducted, as described in Section 5.

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 and 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, 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 with localized pockets of silty clay and clayey sand with low plasticity. 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. Although the Site is outside an identified oil field, information provided on Well Finder indicates the presence of an abandoned well outside the northwestern Site boundary and immediately adjacent to the open canal. Records indicate that the 2,995 ft-deep well did not encounter oil during drilling and was plugged and abandoned in 1961 [CalGEM, 2020].

4.10 Methane Gas

The Site is located within a mapped City of Los Angeles Methane Zone. A methane survey was carried out by Ninyo & Moore between the dates of 22 April and 1 May 2020. The Methane Survey report prepared by Ninyo & Moore and dated 18 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 (inches of water)**	**Ord #175790 Methane Design Level**
MD-19	6,150	12%	0.2	Level IV
Notes: ppm – parts per million LEL – methane = 50,000 ppm % – percent				

Based on results of this methane gas survey, Ninyo & Moore concludes that methane gas exists in the soil beneath the location of the infiltration galleries at the site. Ninyo & Moore recommends that in the methane mitigation design for the proposed construction at the site be prepared [sic] in accordance with the LADBS Municipal Ordinance No. 175790 requirements for Methane Design Level IV.

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 [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 $5x10^{-4}$ centimeters per second (cm/s) [0.64 inches per hour (in./hr)] to $9x10^{-3}$ cm/s [8.4 in./hr]. The field measurements obtained at each test location are summarized in Table 6.

5.1.2 Hydraulic Conductivity Estimation Using CPT Correlation

Hydraulic conductivity values were also estimated from CPT data by implementing the correlations presented by Robertson [2010] using Soil Behavior Type Index, Ic. These values were compared to the field-measured values and used to help develop estimated infiltration rates for soil layers not assessed during the field infiltration testing.

5.1.3 Design Infiltration Rate

As noted in Section 3.5.1, layers of Sandy Silt [ML] are present in the upper 30 to 35 ft bgs across a significant portion of the site. Figures 6 through 9 illustrate the locations of these layers relative to the bases of the proposed UIBs.

Because fine-grained soils such as silt and clay are not generally conducive to infiltration, these upper silt layers and silty sands with relative high fines contents located at or below the base of the proposed UIBs should be overexcavated to remove the lower permeability material. The overexcavation for the galleries should be continued until materials exposed in the base of the excavation have a fines content of less 25 percent. The geotechnical engineer should observe the base of the excavation to identify that the lower permeability layers have been completely removed. The overexcavated materials should be replaced with free-draining granular backfill.

Approximate depths of required removals for each basin location are indicated in the table below, along with the corresponding infiltration rates that may be used for design purposes.

As an alternative to overexcavation, large diameter borings, backfilled with crushed rock, may be extended from the base of the infiltration gallery to the higher infiltration materials at depth. The infiltration rate for these stone columns will depend on spacing, depth, fill material, and overall footprint. Modeling of specific configurations would be required to develop infiltration rates for this type of system and are not within the scope of this investigation.

In the portion of the Site north of Magnolia, infiltration rates generally improve with depth due to the presence of cleaner sands below a layer of silty sand. To take advantage of this, basins constructed within this area may be founded at lower elevations where sandier material provides better infiltration. The table provides an option for either shallower basins founded on Silty Sand (Option 1) and deeper basins founded on Sand and Silty Sand (Option 2).

Basin Location (Refer to Figures 6-9 for Basin Locations)	**Assumed Base of Excavation**	**Measured Infiltration Rate, cm/s (in./hr)**	**Infiltration Rate Estimated from CPT Correlation, cm/s (in./hr)**	**Design Infiltration Rate, cm/s (in./hr)**
Section A-A' Approx. Sta. 0+30 to 3+65	El. 580 ft	2.8×10^{-3} (3.9) [HSA-2]	5.0×10^{-3} (7.1)	2.5×10^{-3} (3.5)
Section A-A' Approx. Sta. 10+00 to 17+30	El. 585 ft	7.9×10^{-4} (1.1) [HSA-3]	5.0×10^{-3} (7.1)	2.5×10^{-3} (3.5)
Basins North of Magnolia Boulevard – Option 1: Founded in Silty Sand	Refer to Figure 12	3.5×10^{-3} (4.9) [HSA-12]	1.0×10^{-3} (1.4)	1.7×10^{-3} (2.5)
Basins North of Magnolia Boulevard – Option 2: Founded in Sand/Silty Sand	Refer to Figure 12	5.9×10^{-3} (8.4) [HSA-8]	5.0×10^{-3} (7.1)	2.5×10^{-3} (3.5)

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 100 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 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 more than 50 ft bgs (note: historic high groundwater level of approximately 10 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 ASCE Standard 7-16. The center of the park at a latitude and longitude of 34.164 degrees North and 118.381 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 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 12 CPT soundings with seismic shear wave measurement. The interpreted shear wave velocity of the upper 30 m (V_{S30}), evaluated according to Equation 20.4-1 [ASCE 7-16], is 1040 feet per second (ft/s). Based on the V_{S30} of 1040 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 seismic-induced 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. (12.8-2) 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 a calculation of C_s and be used in the 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 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 bgs. 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, 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.

In the event that existing slopes need to be reconstructed as a result of temporary construction grades, these slopes should be reconstructed to no steeper than the existing condition or an inclination of 2:1 (H:V), whichever is less. If these reconstructed slopes surcharge an existing or proposed retaining wall, the geotechnical engineer should be consulted to develop appropriate recommendations regarding the reconstructed slope.

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 partially open bottoms to facilitate infiltration.

Proprietary precast systems, such as the 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 sections provide geotechnical recommendations we expect to be required to support the precast system design finalization. In providing these recommendations, it is our assumption that a significant overexcavation and replacement with free draining granular backfill within the subsurface below the UIB, as a result of considerations described in Section 5.1, will be required in many areas of the site. In the area south of Magnolia, it is assumed that overexcavation and replacement will extend to depths greater than 30 ft bgs within the subsurface below the UIB. Additionally, in the areas to the north of Magnolia, some overexcavation and replacement may be required to achieve infiltration objectives, and this is reflected in the recommendations provided below.

As an alternative to overexcavation, large diameter borings, backfilled with crushed rock, may be extended from the base of the infiltration gallery to the higher infiltration materials at depth. The infiltration rate for these stone columns will depend on spacing, depth, fill material, and overall footprint. Modeling of specific configurations would be required to develop infiltration rates for this type of system and are not within the scope of this investigation.

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. These adjoining base slabs 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.

5.7.1.1 North of Magnolia

In the area north of Magnolia where overexcavation and replacement, as described in Section 5.1, extends to depths greater than 30 ft bgs, allowable bearing pressures of 3,000 pounds per square foot (psf) can be used for the mat foundation placed directly on gravel fill on top of prepared native ground. The UIB system should be designed to be able to accommodate a static settlement of about 2.5 inches. Approximately 1 inch of this static settlement should be expected to occur during, or shortly after, construction. Differential settlements of about 1/2 of this total settlement (approximately 1 inch) should be expected over a distance of 30 ft.

In areas where mat foundations are placed at the base of the UIB (approximately 17 ft bgs) without overexcavation and replacement, an allowable bearing pressure of 2,000 psf can be used for the mat foundation placed directly on the prepared competent native material or on compacted soil or gravel fill on top of prepared native ground. The UIB system should be designed to accommodate a static settlement of about 4 inches in this case. Approximately 1 inch of this static settlement should be expected to occur during, or shortly after, construction with the remainder occurring over the long term. Differential settlements of about 1/2 of this total settlement (approximately 2 inches) should be expected over a distance of 30 ft.

5.7.1.2 South of Magnolia

In the area south of Magnolia where overexcavation and replacement, as described in Section 5.1, extends to depths greater than 30 ft bgs, allowable bearing pressures of 3,000 psf can be used for the mat foundations placed directly on compacted soil or gravel fill on top of prepared native ground. The UIB system should be designed to accommodate a static settlement of about 2 inches. Approximately 1 inch of this static settlement should be expected to occur during, or shortly after, construction. Differential settlements of about 1/2 of this total settlement (approximately 1 inch) should be expected over a distance of 30 ft.

If the UIB system is founded at a depth of 17 ft bgs without overexcavation, it should be designed to accommodate a static settlement of about 3 inches. Approximately 2 inches of this static settlement should be expected to occur during, or shortly after, construction. Differential settlements of about 1/2 of this total settlement (approximately 1 inch) should be expected over a distance of 30 ft.

5.7.1.3 General

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 that 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 3 ft wide and embedded at least 30 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 3-ft wide strip foundation, an allowable bearing pressure of 2,000 pounds per square foot (psf) can be used when embedded a minimum of 30 inches into the adjacent subgrade. This allowable bearing pressure can be increased by 350 psf for each additional 6 inches of embedment. Additionally, an increase of 200 psf is allowed for each additional 6 inches of footing width over 3 ft up to 5 ft. The increase in the allowable bearing capacity is capped at a maximum of 3,000 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 3 and 5 ft, the estimated static settlement under allowable pressure is less than 3 inches. The majority of the static settlement should occur during, or shortly after, construction. The UIB system should be designed to be able accommodate differential settlements of about 1/2 of the total settlement (approximately 1.5 inches) 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) peak ground acceleration (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 Evaluations

Liquefaction 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 107 ft to 194 ft bgs. The depth to historic high ground water level at the Site is estimated as 10 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, 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

Given this low likelihood of return to the historic high groundwater elevation and the fact that the base of the facility requires separation from groundwater to operate, the elevation of the base of the proposed UIB, approximately 17 ft bgs, was conservatively selected, in lieu of the "historic high" groundwater elevation, as the assumed location of the phreatic surface for the liquefaction assessment.

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_M 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 on exploration data from Geosyntec's site investigations at CPT-1 through CPT-12, where these investigations penetrated a depth of at least 37 ft bgs. Analysis was performed for the (2/3) PGA_M input using (2/3) PGA_M = 0.63g and M_w = 6.77. (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 CPT carried below 37 ft encountered refusal at its total depth, indicating very dense soils and no liquefaction potential below this depth.

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 assumed analysis groundwater level (i.e., 17 ft bgs) indicate estimated liquefaction-induced settlements at the base of the proposed foundations of 0.5 to 3 inches. It is assumed that approximately 1.5 inches of this settlement at the foundation level may be differential settlement.

5.7.3.2 Lateral Spreading

Evaluations of lateral spreading as a result of liquefaction were conducted using the same inputs as those for liquefaction.

Methodology

The lateral displacement predicted at any location on the site is a function of the height of the free face (H), the distance to the free face (L), and the soil's susceptibility to liquefaction. Lateral deformations were estimated at each CPT investigation location using the Zhang et al. [2004] methodology for level ground with free face conditions. For lateral spread to propagate towards the free face, the liquefiable layers need to be relatively thick and continuous; therefore, lateral displacement is often limited to a depth of 2H, based on the soil's ability to move laterally into the channel. A free face height of 20 ft was assumed to be representative of conditions along the channel at the western edge of the Site. Contributions to lateral deformations below 2H (40 ft bgs) were ignored. Lateral spread was assumed not to progress beyond a distance of 50 times the height of the free face in this study, based on a review of more recent case histories from the 2010 and 2011 Canterbury, New Zealand earthquakes.

Results

Each CPT was evaluated using the methods outlined above. The results of this evaluation indicate that the following ranges of lateral spread may be expected within the following distances from the flood control channel along the western portion of the Site. The detailed calculations for lateral spreading are shown in Appendix E.

Distance from Flood Control Channel (ft)	**Estimated Lateral Displacement at Ground Surface (inches)**
0 to 125	30” to 55”
125 to 600	10” to 30”
600 to 1000	6” to 10”
>1000	No lateral spread anticipated

5.7.3.3 Dry Sand Settlement

Given the assumed analysis groundwater elevation, dry sand settlements are assumed to occur above the UIB foundation level and would be impactful to surface features. In the (2/3) PGA_M case, the estimated seismically induced dry sand settlement at the ground surface was estimated to range from 0 to 5.5 inches. Differential settlements over a span of 30 ft were estimated to be approximately half of this amount (~3 inches) . 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 a case that UIB is proposed to be designed using general backfill, such as 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 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 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 rule, 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 ($5.3*H^{2.9}$) 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 a reinforced concrete box (RCB) diversion structure, actuated vault valve, hydrodynamic separator, and sedimentation basin, in addition to vaults for pumps and flow measuring devices. General lateral earth pressure recommendations provided in Section 5.7 can be used for the design of these structures along with the bearing pressures described below.

5.8.1 South of Magnolia

Assuming small mat-type foundations with base of footings depth greater than 5 ft bgs, a bearing capacity of 5,000 psf can be used in the design of these features. Total static settlement is estimated to be less than 1 inches for structures with foundation up to approximately 5 ft square. Up to ½ of these total settlements should be expected to occur as differential settlement across these footings.

5.8.2 North of Magnolia

Assuming small mat-type foundations with base of footings depth greater than 5 ft bgs, a bearing capacity of 2,000 psf can be used in the design of these features. Total static settlement is estimated to be less than 1.5 inches for structures with a foundation up to approximately 5 ft square. Total static settlement is estimated to be less than 3.5 inches for structures with a foundation up to approximately 10 ft square. Up to ½ of these total settlements should be expected to occur as differential settlement across these footings. If settlement tolerances indicate that the expected settlements for the provided

For mat-type foundations with base of footings depth at 10 ft bgs, a bearing capacity of 2,000 psf can be used in the design of these features. Total static settlement is estimated to be less than 2 inches for structures with a foundation up to approximately 10 ft square. Up to ½ of these total settlements should be expected to occur as differential settlement across these footings.

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 Public Works [LACPW, 2013], soils are considered corrosive when soluble sulfate concentrations in the soil are equal or greater than 2,000 ppm (or milligram per kilogram (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 the 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 American Concrete Institute (ACI)-318-11 [2011], Tables 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 50 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&M) plan be developed as part of the design and implemented by the City. This O&M 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 the 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-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 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.

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TABLES

DRAFT - FOR DISCUSSION PURPOSES ONLY

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

Exploration Name	Exploration Type	Surface Elevation (feet, MSL)[1]	Depth Advanced (feet)	Date Advanced	Performed By
NH-HSA-1	Hollow-Stem Auger	616	31.5	4/24/2020	Geosyntec
NH-HSA-2	Hollow-Stem Auger	614	51.5	4/24/2020	Geosyntec
NH-HSA-3	Hollow-Stem Auger	619	81.5	4/23/2020	Geosyntec
NH-HSA-4	Hollow-Stem Auger	624	31.5	4/23/2020	Geosyntec
NH-HSA-5	Hollow-Stem Auger	625	31.5	4/23/2020	Geosyntec
NH-HSA-6	Hollow-Stem Auger	631	31.5	4/22/2020	Geosyntec
NH-HSA-7	Hollow-Stem Auger	632	31.5	4/27/2020	Geosyntec
NH-HSA-8	Hollow-Stem Auger	632	51.5	4/22/2020	Geosyntec
NH-HSA-9	Hollow-Stem Auger	636	31.5	4/21/2020	Geosyntec
NH-HSA-10	Hollow-Stem Auger	637	31.5	4/21/2020	Geosyntec
NH-HSA-11	Hollow-Stem Auger	640	31.5	4/21/2020	Geosyntec
NH-HSA-12	Hollow-Stem Auger	636	12	4/10/2020	Geosyntec
NH-HSA-12A	Hollow-Stem Auger	637	31.5	4/27/2020	Geosyntec
NH-HSA-13	Hollow-Stem Auger	639	31.5	4/10/2020	Geosyntec
NH-HSA-14	Hollow-Stem Auger	637	50.5	4/10/2020	Geosyntec
NH-HSA-15	Hollow-Stem Auger	636	31.5	4/27/2020	Geosyntec
NH-HSA-16	Hollow-Stem Auger	635	81.5	4/21/2020	Geosyntec
NH-HSA-17	Hollow-Stem Auger	632	31.5	4/27/2020	Geosyntec
NH-HSA-18	Hollow-Stem Auger	625	81.5	4/22/2020	Geosyntec
NH-HSA-19	Hollow-Stem Auger	618	31.5	4/24/2020	Geosyntec
NH-CPT-1	Cone Penetration Test	616	23.76	4/29/2020	Geosyntec
NH-CPT-1A	Cone Penetration Test	616	42.99	4/29/2020	Geosyntec
NH-CPT-2	Cone Penetration Test	614	38.13	4/30/2020	Geosyntec
NH-CPT-3	Cone Penetration Test	619	41.61	4/30/2020	Geosyntec
NH-CPT-3A	Cone Penetration Test	619	41.28	4/30/2020	Geosyntec
NH-CPT-4	Cone Penetration Test	624	39.84	4/30/2020	Geosyntec
NH-CPT-5	Cone Penetration Test	625	46.33	4/30/2020	Geosyntec
NH-CPT-5A	Cone Penetration Test	625	46.4	4/30/2020	Geosyntec
NH-CPT-6	Cone Penetration Test	631	44.49	4/28/2020	Geosyntec
NH-CPT-7	Cone Penetration Test	632	46.73	4/28/2020	Geosyntec
NH-CPT-8	Cone Penetration Test	635	46.53	4/28/2020	Geosyntec
NH-CPT-8A	Cone Penetration Test	635	37.4	4/28/2020	Geosyntec
NH-CPT-9	Cone Penetration Test	636	51.32	4/29/2020	Geosyntec
NH-CPT-9A	Cone Penetration Test	636	52.76	4/29/2020	Geosyntec
NH-CPT-10	Cone Penetration Test	637	49.8	4/29/2020	Geosyntec
NH-CPT-11	Cone Penetration Test	640	46.13	4/28/2020	Geosyntec
NH-CPT-12	Cone Penetration Test	625	40.56	4/30/2020	Geosyntec

Notes:

1. MSL = Mean Sea Level.

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Table 2
Summary of Geotechnical Laboratory Test Results
North Hollywood Park - 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)	
NH-HSA-1	S-1	SPT	5-6.5	SM	Silty Sand			49.0	NP	NP	NP		15.4				
NH-HSA-1	S-2	SPT	10-11.5	SM	Silty Sand				NP	NP	NP						
NH-HSA-1	S-3	SPT	15-16.5	ML	Sandy Silt			53.0					11.0				
NH-HSA-1	S-6	SPT	30-31.5	SM	Silty Sand			47.0	NP	NP	NP		11.5				
NH-HSA-2	S-1	SPT	5-6.5	ML	Sandy Silt			54.0					17.6				SE=18
NH-HSA-2	S-2	SPT	10-11.5	SM	Silty Sand			22.0					6.0				
NH-HSA-2	S-3A	SPT	15-16	SM	Silty Sand	2.0	58.0	40.0					11.0				
NH-HSA-2	S-5	SPT	25-26.5	ML	Silt with Sand			71.0					19.6				
NH-HSA-2	S-6	SPT	30.5-31	ML	Silt with Sand				26	23	3						
NH-HSA-2	S-7A	Cal Mod	35.5-36	ML								79.6	72.3	137.2			
NH-HSA-2	S-8	SPT	40-41.5	SP-SM	Poorly-graded Sand with Silt and Gravel	34.0	59.4	6.6					2.2				
NH-HSA-3	S-1	SPT	5-6.5	SM	Silty Sand			35.0					14.3				
NH-HSA-3	S-3	SPT	15-16.5	SP-SM	Poorly-graded Sand with Silt			13.0					3.6				
NH-HSA-3	S-5A	Cal Mod	25.5-26	SM	Silty Sand			39.0				113.3	5.1	119.1			
NH-HSA-3	S-6	SPT	30-31.5	SC-SM	Silty, Clayey Sand				25	20	5						
NH-HSA-3	S-7	SPT	35-36.5	SM	Silty Sand			36.0					5.1				
NH-HSA-3	S-10	SPT	50-51.5	SP	Poorly-graded Sand	14.0	81.5	4.5					1.7				
NH-HSA-3	S-11	SPT	55-56.5	ML	Sandy Silt				23	21	2						
NH-HSA-3	S-15	SPT	75-76.5	ML	Silt with Sand			80.0					27.3				
NH-HSA-3	S-16A	Cal Mod	80.5-81	SM	Silty Sand			44.0				114.3	16.2	132.8			
NH-HSA-3	S-16B	Cal Mod	81-81.5	SM	Silty Sand				NP	NP	NP	122.4	13.8	139.3			
NH-HSA-4	B-1	Bulk	1-5	SM													SE=34
NH-HSA-4	S-1	SPT	5-6.5	SM	Silty Sand			37.0					15.4				
NH-HSA-4	S-2	SPT	10-11.5	SM	Silty Sand				NP	NP	NP		12.1				
NH-HSA-4	S-3	SPT	15-16.5	SM	Silty Sand		50.0	50.0					12.4				
NH-HSA-4	S-4	SPT	20-21.5	SM	Silty Sand			40.0					10.6				
NH-HSA-4	S-5B	SPT	26-26.5	ML	Sandy Silt			59.0					17.3				
NH-HSA-4	S-6	SPT	30-31.5	ML	Sandy Silt			64.0					16.1				
NH-HSA-5	S-1	SPT	5-6.5	ML	Sandy Silt			54.0	NP	NP	NP		14.3				
NH-HSA-5	S-2	SPT	10-11.5	ML	Sandy Silt		37.0	63.0					14.0				
NH-HSA-5	SH-1	Shelby	15-16	SM								106.3	11.8	118.8			
NH-HSA-5	S-3	SPT	20-21.5	SM	Silty Sand		54.0	46.0					7.5				
NH-HSA-5	S-5	SPT	30-31.5	ML	Sandy Silt			64.0					13.5				
NH-HSA-6	S-1A	SPT	5-5.5	SP-SM	Poorly-graded Sand with Silt			8.1					6.9				
NH-HSA-6	S-1B	SPT	5.5-6	SM	Silty Sand			42.0					13.3				
NH-HSA-6	S-2	SPT	10-11.5	ML	Sandy Silt			62.0					18.1				
NH-HSA-6	SH-1	Shelby	20-21	ML								110.1	10.6	121.8			
NH-HSA-6	S-4	SPT	25-26.5	SM	Silty Sand		52.0	48.0					10.4				
NH-HSA-6	S-5A	SPT	30-31.3	SP	Poorly-graded Sand			3.8					1.6				
NH-HSA-7	S-1A	SPT	5-5.4	SM	Silty Sand			34.0					9.4				
NH-HSA-7	S-1B	SPT	5.4-6.5	ML	Silt with Sand		27.0	73.0	30	26	4		24.0				
NH-HSA-7	SH-1	Shelby	10-11	ML								106.4	15.0	122.4			
NH-HSA-7	S-2	SPT	15-16.5	SM	Silty Sand			41.0					5.3				
NH-HSA-7	S-4	SPT	30-31.5	ML	Sandy Silt		47.0	53.0					8.0				
NH-HSA-8	B-1	Bulk	1-5	SM													SE=32
NH-HSA-8	S-1A	SPT	5-5.3	SP-SM	Poorly-graded Sand with Silt			9.0					6.5				
NH-HSA-8	S-2	SPT	10-11.5	ML	Sandy Silt			68.0	26	22	4		22.1				
NH-HSA-8	S-4	SPT	20-21.5	ML	Sandy Silt		48.0	52.0					19.0				
NH-HSA-8	S-6C	Cal Mod	30.5-31	CL-ML								104.8	21.4	127.2			1-D
NH-HSA-8	S-6D	Cal Mod	31-31.5	CL-ML	Sandy Silty Clay			66.0	26	20	6	104.8	21.8	127.6			
NH-HSA-8	S-8	SPT	40-41.5	SP-SM	Poorly-graded Sand with Silt	5.0	85.0	10.0					3.7				
NH-HSA-8	S-10	SPT	50-51.5	SM	Silty Sand with Gravel	37.0	46.0	17.0					5.9				
NH-HSA-9	B-1	Bulk	1-5	SM													SE=23
NH-HSA-9	S-1	SPT	5-6.5	SM	Silty Sand			42.0	NP	NP	NP		13.2				
NH-HSA-9	S-2	SPT	10-11.5	SM	Silty Sand			48.0					9.3				
NH-HSA-9	SH-1	Shelby	15-16	SM								107.1	13.8	121.9			
NH-HSA-9	S-4	SPT	25-26.5	ML	Sandy Silt		49.0	51.0					7.0				
NH-HSA-9	S-5B	SPT	30.7-31.5	ML	Sandy Silt			53.0					12.6				
NH-HSA-10	S-1	SPT	5-6.5	SM	Silty Sand			14.0					7.7				
NH-HSA-10	S-2	SPT	10-11.5	ML	Sandy Silt			52.0					8.5				
NH-HSA-10	S-4A	Cal Mod	20.5-21	SM								102.6	7.4	110.2			
NH-HSA-10	S-5	SPT	25-26.5	SM	Silty Sand			41.0					3.7				
NH-HSA-10	S-6B	SPT	30.5-31.5	ML	Sandy Silt			60.0					8.8				
NH-HSA-11	B-1	Bulk	1-5	SM													SE=14
NH-HSA-11	S-1	SPT	5-6.5	SM	Silty Sand			27.0	NP	NP	NP		6.6				
NH-HSA-11	S-2	SPT	10-11.5	ML	Sandy Silt			55.0					10.3				
NH-HSA-11	S-3A	Cal Mod	15.5-16	SM	Silty Sand			29.0	27	23	4						
NH-HSA-11	S-3B	Cal Mod	16-16.5	SM								114.2	5.5	120.5			
NH-HSA-11	S-6	SPT	30-31.5	ML	Sandy Silt			60.0					9.7				
NH-HSA-12	S-1B	SPT	5.4-6.5	SM	Silty Sand	6.0	76.0	18.0					7.0				
NH-HSA-12	S-2	SPT	10-11.5	SM	Silty Sand			42.0	21	19	2		12.2				
NH-HSA-12A	S-1	SPT	10-11.5	SM	Silty Sand				NP	NP	NP						
NH-HSA-12A	S-2A	SPT	15-16	SM	Silty Sand			26.0					11.6				
NH-HSA-12A	S-3	SPT	20-21.5	SM	Silty Sand		67.0	33.0					6.3				
NH-HSA-12A	S-5	SPT	30-31.5	SW	Well-graded Sand with Gravel	18.0	77.2	4.8					1.6				

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Table 2
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North Hollywood Park - 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)	
NH-HSA-13	S-1B	SPT	5.5-6.5	SP	Poorly-graded Sand	3.0	93.7	3.3					1.2				
NH-HSA-13	S-2	SPT	10-11.5	ML	Sandy Silt		43.0	57.0					8.5				
NH-HSA-13	S-3	SPT	15-16.5	ML	Sandy Silt		49.0	51.0					7.0				
NH-HSA-13	S-6	SPT	30-31.5	SP-SM	Poorly-graded Sand with Silt	7.0	86.7	6.3					1.6				
NH-HSA-14	S-1	SPT	5-6.5	SM	Silty Sand			37.0					11.5				
NH-HSA-14	S-3	SPT	15-16.5	SW-SM	Well-graded Sand with Silt and Gravel	23.0	69.9	7.1					1.6				
NH-HSA-14	S-7	SPT	35-36.5	SP	Poorly-graded Sand	2.0	93.4	4.6					1.5				
NH-HSA-14	S-9	SPT	45-46.5	SP	Poorly-graded Sand with Gravel	19.0	77.4	3.6					1.8				
NH-HSA-15	S-1	SPT	5-6.5	SM	Silty Sand			36.0					9.1				SE=18
NH-HSA-15	S-2	SPT	10-11.5	CL-ML	Sandy Silty Clay			57.0					9.6				
NH-HSA-15	S-3	SPT	15-16.5	CL-ML	Sandy Silty Clay			58.0					7.3				
NH-HSA-15	S-4A	Cal Mod	20.5-21	SC-SM								99.3	7.2	106.4			
NH-HSA-15	S-4B	Cal Mod	21-21.5	SC-SM	Silty Clayey Sand			36.0	23	18	5	108.4	3.8	112.5			
NH-HSA-15	S-6	SPT	30-31.5	SM	Silty Sand			37.0					7.0				
NH-HSA-16	B-1	Bulk	1-5	SM	Silty Sand												SE=27
NH-HSA-16	S-1A	SPT	5-5.3	SM	Silty Sand			13.0					8.5				
NH-HSA-16	S-2	SPT	10-11.5	CL-ML	Sandy Silty Clay			69.0	24	19	5		17.7				
NH-HSA-16	S-3	SPT	15-16.5	SM	Silty Sand			42.0	NP	NP	NP		12.7				
NH-HSA-16	S-4	SPT	20-21.5	SM	Silty Sand			47.0					13.0				
NH-HSA-16	SH-1	Shelby	25-27.5	SM	Silty Sand			34.0				101.4	10.9	112.5			
NH-HSA-16	S-5B	SPT	30.3-31.5	SM	Silty Sand			36.0					11.2				
NH-HSA-16	S-6A	Cal Mod	35.5-36	SM								108.5	5.7	114.7			
NH-HSA-16	S-7	SPT	40-41.5	SP	Poorly-graded Sand	10.0	86.2	3.8					2.5				
NH-HSA-16	S-8	SPT	45-46.5	SM									11.1				
NH-HSA-16	S-10C	SPT	55.7-56.3	SM									7.7				
NH-HSA-16	S-12	SPT	65-66.5	SP-SM	Poorly-graded Sand with Silt and Gravel	36.0	56.2	7.8					3.8				
NH-HSA-16	S-14	SPT	75-76.5	SC-SM	Silty, Clayey Sand	5.0	61.0	34.0	23	19	4		11.7				
NH-HSA-17	S-1B	SPT	5.5-6.5	ML	Sandy Silt			67.0	30	26	4		24.0				
NH-HSA-17	S-3	SPT	15-16.5	ML	Sandy Silt			54.0					10.9				
NH-HSA-17	S-5	SPT	25-26.5	ML	Sandy Silt			58.0					9.8				
NH-HSA-17	S-6B	SPT	30.5-31.5	SM	Silty Sand			50.0	22	20	2		10.1				
NH-HSA-18	S-1	SPT	5-6.5	SM	Silty Sand			30.0					6.6				SE=25
NH-HSA-18	SH-1	Shelby	15-17.5	SM	Silty Sand			22.5				99.5	4.8	104.2			
NH-HSA-18	S-3	SPT	20-21.5	SM	Silty Sand		72.0	28.0					3.2				
NH-HSA-18	S-6	SPT	35-36.5	ML	Silt with Sand		25.0	75.0					17.1				
NH-HSA-18	S-7	SPT	40-41.5	SM	Silty Sand	8.0	79.0	13.0					3.9				
NH-HSA-18	S-12	SPT	65-66.5	SW-SM	Well-graded Sand with Silt	4.0	88.7	7.3					2.1				
NH-HSA-18	S-15	SPT	80-81.5	ML	Silt with Sand				33	26	7		25.6				
NH-HSA-19	B-1	Bulk	1-5	SM	Silty Sand												SE=19
NH-HSA-19	S-1A	SPT	5-5.3	SM	Silty Sand			34.0					11.6				
NH-HSA-19	S-2	SPT	10-11.5	SM	Silty Sand			44.0					8.6				
NH-HSA-19	SH-1	Shelby	25-26	SM								95.8	10.1	105.5			
NH-HSA-19	S-5B	SPT	30.7-31.5	ML	Sandy Silt			62.0					13.2				

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)

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Table 3
Summary of Soil Chemical Test Results
North Hollywood Park - 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)
NH-HSA-8	S-1B	5.3-6.5	SM	1.4	0.0001	0.7	0.0001	93,800	27,470	7.17	235	0.45	0.2	ND	ND	13.0	6.4	1.4	14.3	2.7	6.5	56.6

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

DRAFT - FOR DISCUSSION PURPOSES ONLY

Table 3
Summary of Soil Chemical Test Results
North Hollywood Park - 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)
NH-HSA-8	S-1B	5.3-6.5	SM	1.4	0.0001	0.7	0.0001	93,800	27,470	7.17	235	0.45	0.2	ND	ND	13.0	6.4	1.4	14.3	2.7	6.5	56.6

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
Summary of PID Readings
North Hollywood Park - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

Borehole Nr.	Date	Sample Depth (ft bgs)	PID Reading (ppm)
NH-HSA-10	4/21/2020	20-21.5	8.4
NH-HSA-9	4/21/2020	10-11.5	4.7
NH-HSA-16	4/21/2020	70-71.5	4.4
NH-HSA-6	4/22/2020	30-31.3	4.2
NH-HSA-18	4/22/2020	30-31.5	6.7
NH-HSA-18	4/22/2020	35-36.5	5.2
NH-HSA-18	4/22/2020	40-41.5	23.3
NH-HSA-18	4/22/2020	45-45.8	19.6
NH-HSA-18	4/22/2020	50-50.5	8.9
NH-HSA-18	4/22/2020	55.5-56.5	8.5
NH-HSA-18	4/22/2020	60-61.5	5.0
NH-HSA-18	4/22/2020	70-71.5	14.7
NH-HSA-18	4/22/2020	75-76.5	10.4
NH-HSA-3	4/23/2020	25-25.5	5.3
NH-HSA-3	4/23/2020	40-40.4	34.8
NH-HSA-3	4/23/2020	45-46.5	10.1
NH-HSA-3	4/23/2020	65-66.5	7.2
NH-HSA-3	4/23/2020	70-71.5	5.1
NH-HSA-3	4/23/2020	75-76.5	7.1
NH-HSA-5	4/23/2020	10-11.5	5.3
NH-HSA-1	4/24/2020	5-6.5	22.1
NH-HSA-1	4/24/2020	10-11.5	8.7
NH-HSA-1	4/24/2020	15-16.5	20.2
NH-HSA-1	4/24/2020	25-26.5	7.1
NH-HSA-2	4/24/2020	10-11.5	20.1
NH-HSA-2	4/24/2020	20-21.5	17
NH-HSA-2	4/24/2020	40-41.5	7.2
NH-HSA-2	4/24/2020	45-46.5	9.7
NH-HSA-2	4/24/2020	50-50.5	18.2
NH-HSA-19	4/24/2020	30-30.7	4.8
NH-HSA-15	4/27/2020	15-16.5	4.6

Table 5
Regional Quaternary Faults
North Hollywood Park - 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	Crosses NW Corner of Park	
Verdugo Fault	Late Quaternary	NW	NE	Reverse	3.4 mi	NE
Hollywood Fault	Latest Quaternary	076°	Vertical	Left-Lateral	4.4 mi	SSE
Northridge Hills Fault	Late Quaternary	NW	Unspecified	Unspecified	6.9 mi	NW
Sierra Madre Fault Zone (San Fernando Section)	Historic	085°	50° N	Thrust	8.0 mi	NNE
Santa Monica Fault	Latest Quaternary	086°	30°-70° N	Reverse	8.2 mi	S
Mission Hills Fault Zone	Late Quaternary	W	Unspecified	Reverse	9.0 mi	NNW
Northridge Blind Thrust	Historic	ESE	35° S	Thrust	10 mi	N
San Gabriel Fault Zone	Late Quaternary	NW	70° NE - Vertical	Right-Lateral	12 mi	NNE
Puente Hills Blind Thrust	Historic	WNW	29° N	Thrust	22 mi	SE
San Andreas Fault Zone	Historic	293°	Vertical	Right-Lateral	31 mi	NNE

Table 6a
Idealized Subsurface Profile - South of Magnolia Boulevard
North Hollywood Park - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

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)
0	5	Silty, Clayey Sand and Silty Sand (SC-SM & SM)	-(1)		110-125		
5	0-15	Sandy Silt and Silty Sand (ML & SM)	40-65	4-37	115-125		
5-20	5-25	Silty Sand (SM)	20-40	1-56	100-120	33.3	50
28	6-10	Sandy Silt and Silty Clayey Sand (ML & SC-SM)	40-75	9-54	130-140		
32-38	8-15	Silty Sand (SM)	25-40	>20	120-130		
45-55	5-20	Sand with Silt (and Gravel) and Silty Sand (SP-SM & SW-SM)	5-10	>38	115-130		
55	5	Sandy Silt and Silty Sand (ML & SM)	-(1)	13-24	110-130		
60-64	10-12	Silty Sand (SM)	-(1)	>32	110-130		
72-74	10+	Sandy Silt and Silty Sand (ML & SM)	45-80	>15	125-140		

1. No laboratory test data for this layer.

Table 6b
Idealized Subsurface Profile - North of Magnolia Boulevard
North Hollywood Park - TOS-25 Stormwater Capture Parks Program
Los Angeles, CA

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)
0	5	Silty, Clayey Sand and Silty Sand (SC-SM & SM)	-(1)		110-125
5	0-10	Sand with Silt and Silty Sand (SP, SP-SM & SM)	3-35	0-32	110-125
5-8	0-25	Sandy Silt, Sandy Silty Clay and Silty Sand (ML, CL-ML & SM)	40-70	2-28	120-130
18-25	0-25	Silty Sand and Silty Clayey Sand (SM & SC-SM)	25-40	5-28	105-125
25-35	0-12	Sandy Silt and Sandy Silty Clay (ML & CL-ML)	45-65	10-24	120-130
30-40	10-18	Sand with Silt and Silty Sand (SP, SW, SP-SM, & SM)	4-10	9-52	110-120
40-50	5-15	Silty Sand (SM)	15-30	14-43	110-125
45-60	10-17	Sand with Silt and Silty Sand (SP, SP-SM, & SM)	5-10	>32	110-120
70	5	Silty Sand with Gravel (SM)	-(1)	>50	110-125
75	5	Silty, Clayey Sand (SC-SM)	30-40	>18	115-130
80	5+	Silty Sand (SM)	-(1)	>41	110-125

1. No laboratory test data for this layer.

Table 7
Summary of Field-Measured Hydraulic Conductivity
North Hollywood Park - 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)
NH-HSA-1	4/30/2020	20ft to 30ft	SM	9.4E-04	1.1E-03
NH-HSA-2	4/30/2020	40ft to 50ft	SP-SM	2.4E-03	2.8E-03
NH-HSA-3	4/29/2020	20ft to 30ft	SM	8.4E-04	7.9E-04
NH-HSA-4	4/29/2020	15.7ft to 25ft	SM	8.4E-04	1.3E-03
NH-HSA-5	4/28/2020	20ft to 30ft	SM	3.1E-04	4.5E-04
NH-HSA-6	4/24/2020	20ft to 30ft	ML, SM	2.7E-03	1.7E-03
NH-HSA-7	4/28/2020	20ft to 30ft	ML, SM	2.5E-03	3.6E-03
NH-HSA-8	4/24/2020	41.4ft to 50ft	SP-SM	5.9E-03	9.2E-03
NH-HSA-9	4/23/2020	20ft to 30ft	ML, SM	1.3E-03	9.8E-04
NH-HSA-10	4/23/2020	15ft to 25ft	ML, SM	5.4E-04	5.2E-04
NH-HSA-11	4/27/2020	20ft to 30ft	SM	1.8E-03	1.2E-03
NH-HSA-12A	4/27/2020	20ft to 30ft	SM	3.5E-03	3.5E-03

Table 8

Seismic Design Parameters

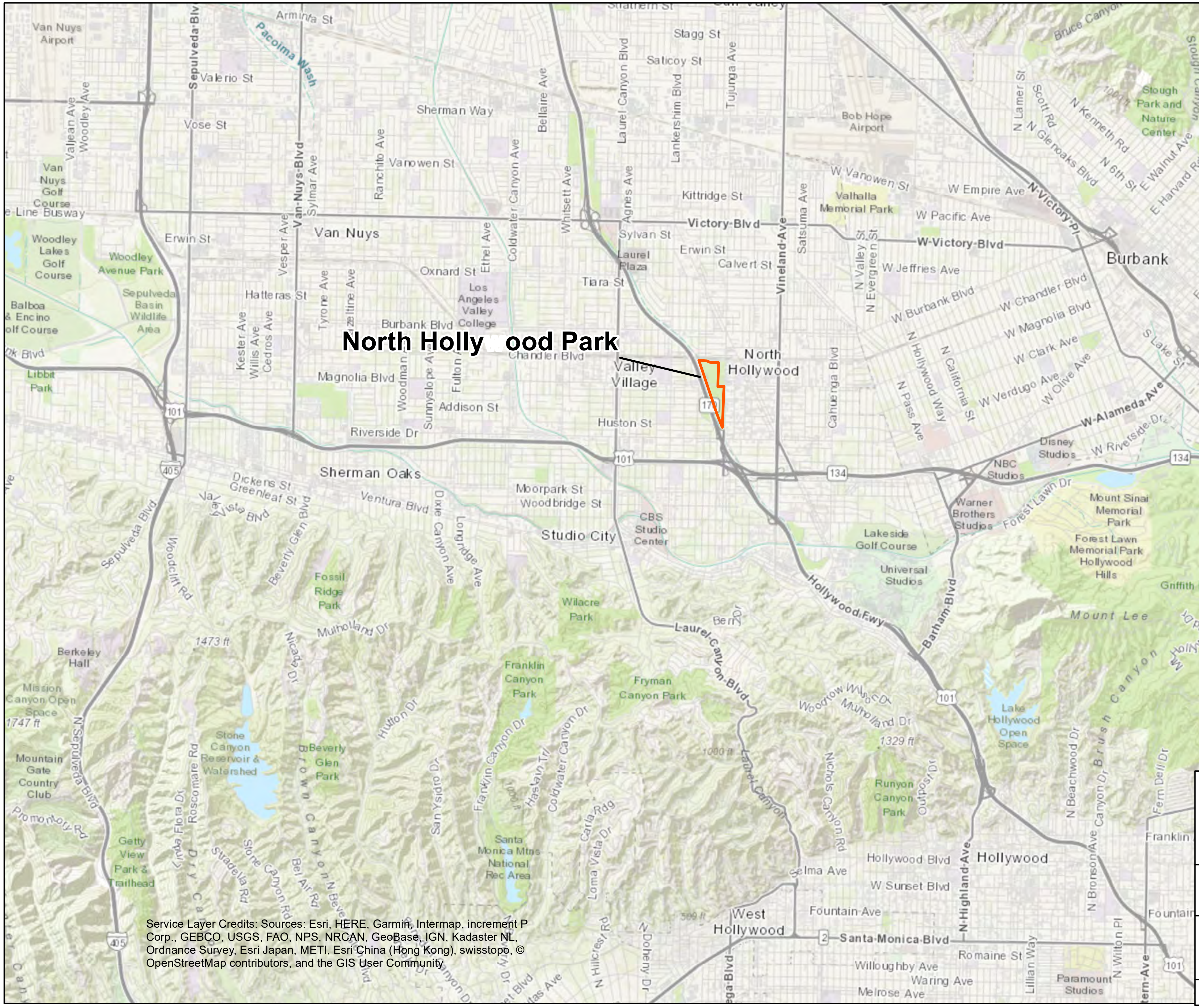
North Hollywood Park - TOS-25 Stormwater Capture Parks Program

Los Angeles, CA

Seismic Hazard Parameter	Value
Approximate Site Latitude	34.164° N
Approximate Site Longitude	118.381° W
Average Shear Wave Velocity of the top 100 ft (30 m), V_{S30}	1040 ft/s
Site Class	D
Mapped Short Period Spectral Response Acceleration, S_s (1)	2.053 g
Mapped 1-second Spectral Response Acceleration, S_1 (1)	0.668 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}	2.053 g
Site-modified 1-second Spectral Response Acceleration, S_{M1}	1.136 g
Design Short Period Spectral Response Acceleration, S_{DS}	1.369 g
Design 1-second Spectral Response Acceleration, S_{D1}	0.757 g
Mapped MCE_G Peak Ground Acceleration, PGA (1)	0.860 g
Site Coefficient, F_{PGA}	1.1
Site Class Adjusted MCE_G Peak Ground Acceleration, PGA_M	0.946 g

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

FIGURES



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
North Hollywood Park

TOS- 25 Stormwater Capture Program
Los Angeles, California

0	0.5	1	2	Miles

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Figure 1

Project No: LA0590B
June 2020

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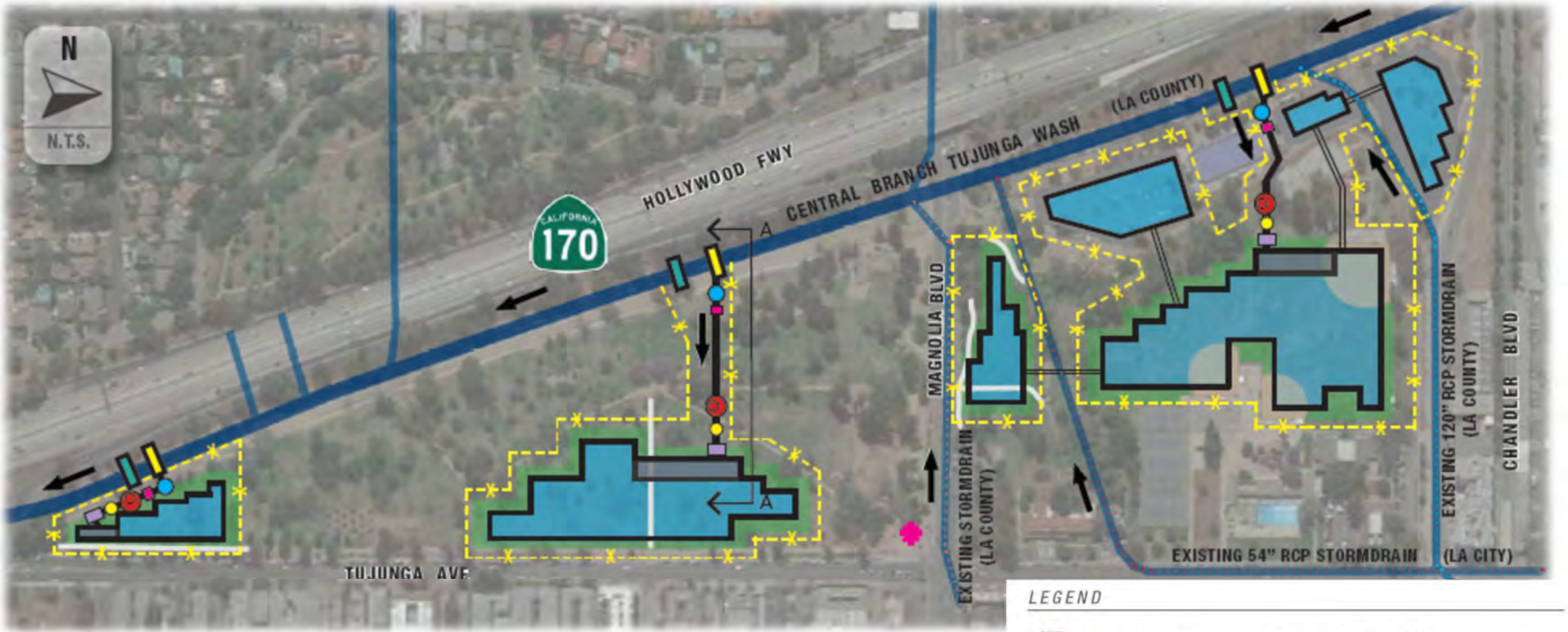
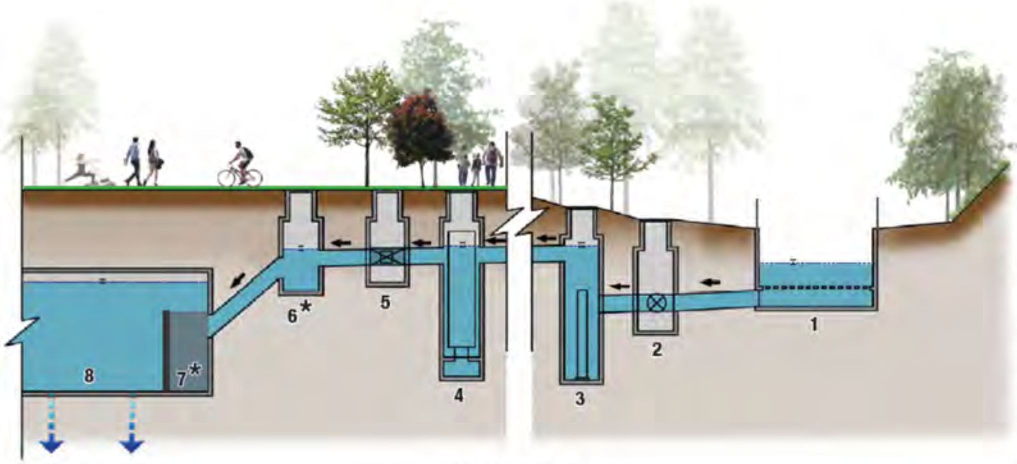


PLAN

LEGEND

▬	Channel Drop Inlet	▬	Diversion Pipe
▬	Rubber Dam*	═	Equalization Pipe *
●	Actuated Valve Vault	‐ ✱ ‐	Construction Fence
●	Hydrodynamic Separator	▨	New Baseball Fields
■	Pump	▨	Replace Sod/Irrigation System
●	Flow Measuring Device	▨	Replace Walking Trail Paths
■	Sedimentation Basin*	▨	Replace Parking Lots
▭	Underground Infiltration Basin	✱	Educational Signage
▨	Initial Containment/Settling Area	*	Innovative Addition to Original Concept



SECTION A-A

SECTION COMPONENT KEY

1 Channel Drop Inlet
2 Actuated Valve Vault
3 Pump
4 Hydrodynamic Separator
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

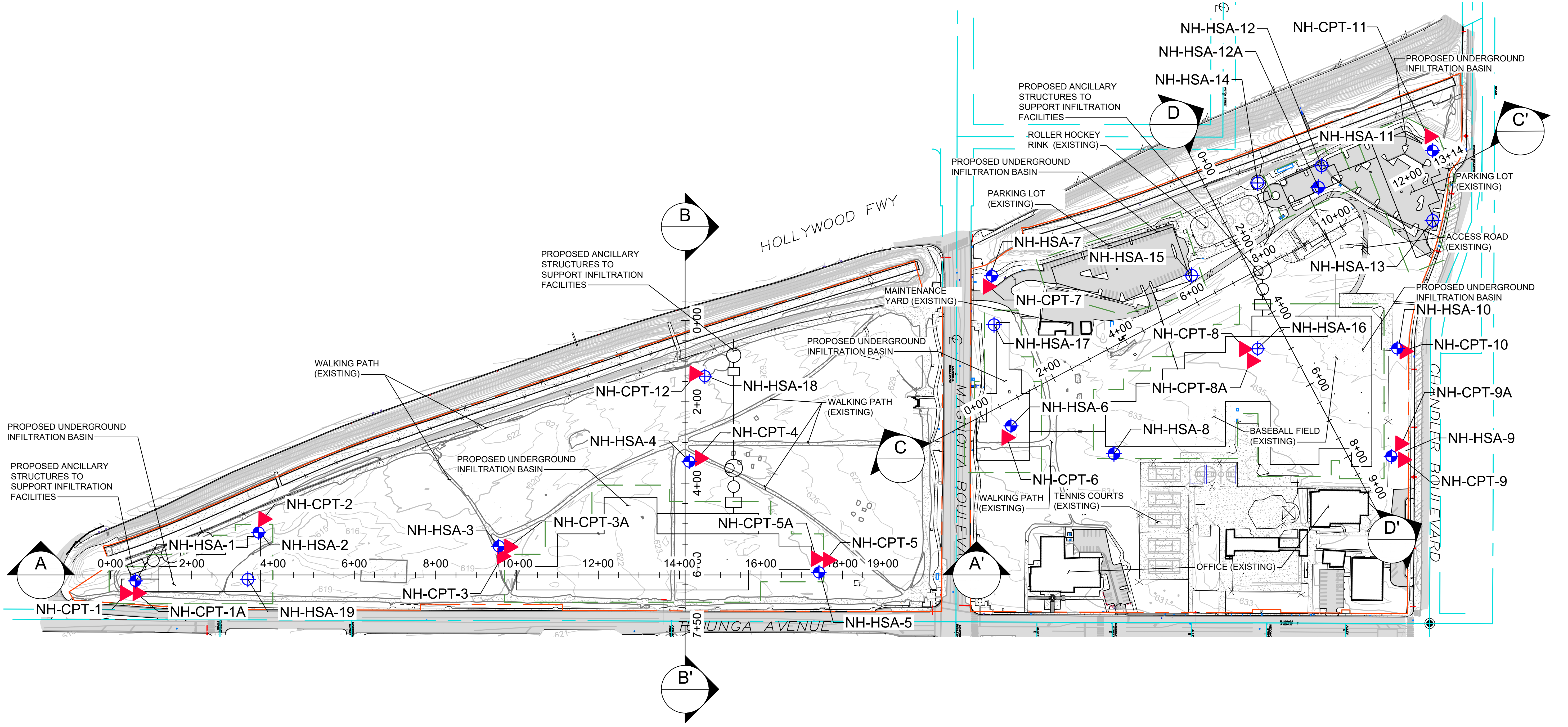
Conceptual Site Plan
North Hollywood Park

TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec
consultants

Figure
2

Project No: LA0590B
JUNE 2020



LEGEND

—— 731 ——	EXISTING GROUND MAJOR CONTOUR (5')
————	EXISTING GROUND MINOR CONTOUR (1')
————	PROPERTY LINE
————	EXISTING ROADWAY CENTERLINE
—— ——	RIGHT-OF-WAY
▬	ASPHALT PAVEMENT
—— 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.

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

Geosyntec
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FIGURE
3

PROJECT NO: LA0590B
JUNE 2020

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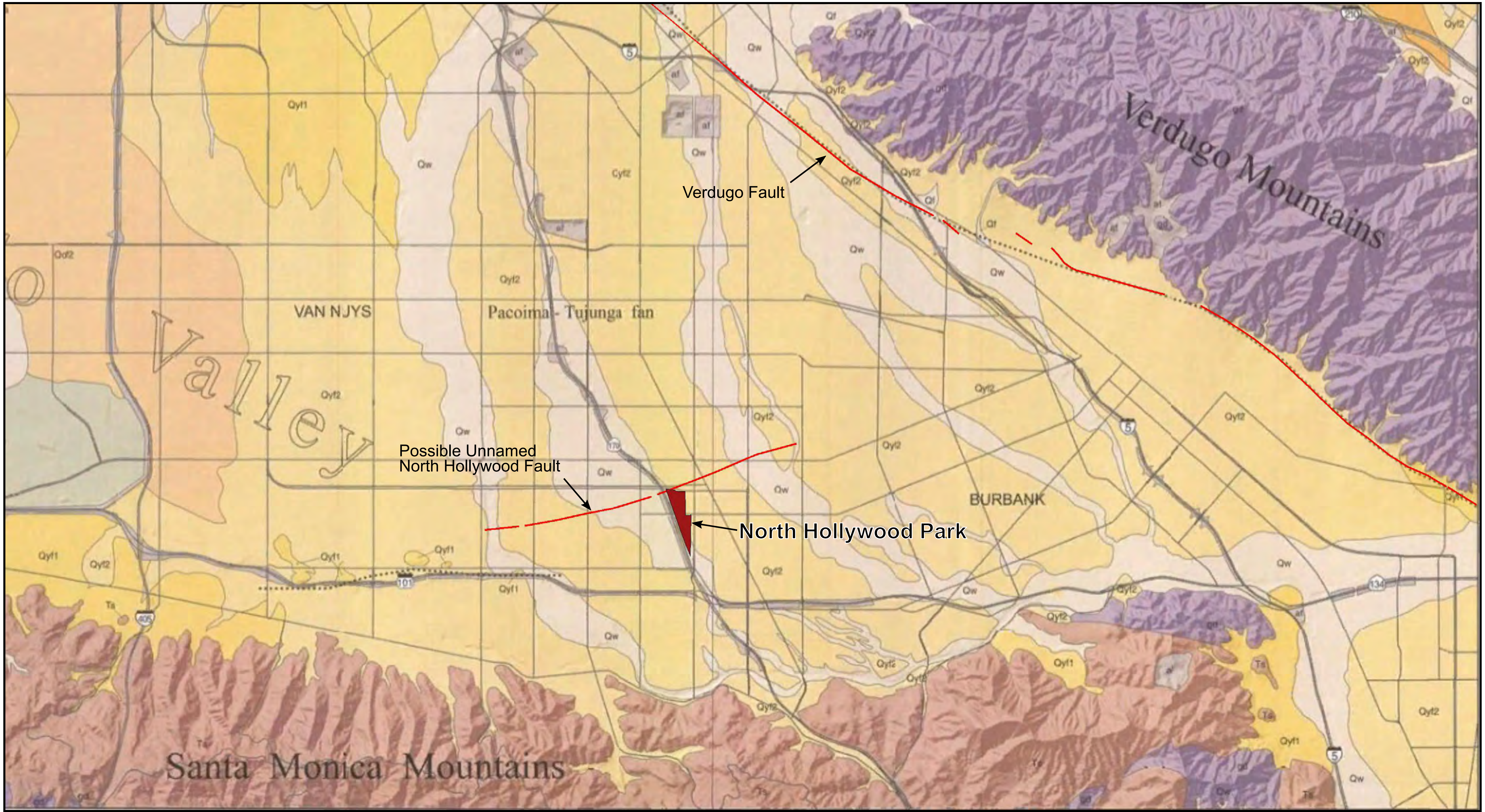

LEGEND

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 Qyoa1 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
North Hollywood Park
TOS-25 Stormwater Capture Program
Los Angeles, California

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Figure
4

Project No: LA0590B
JUNE 2020

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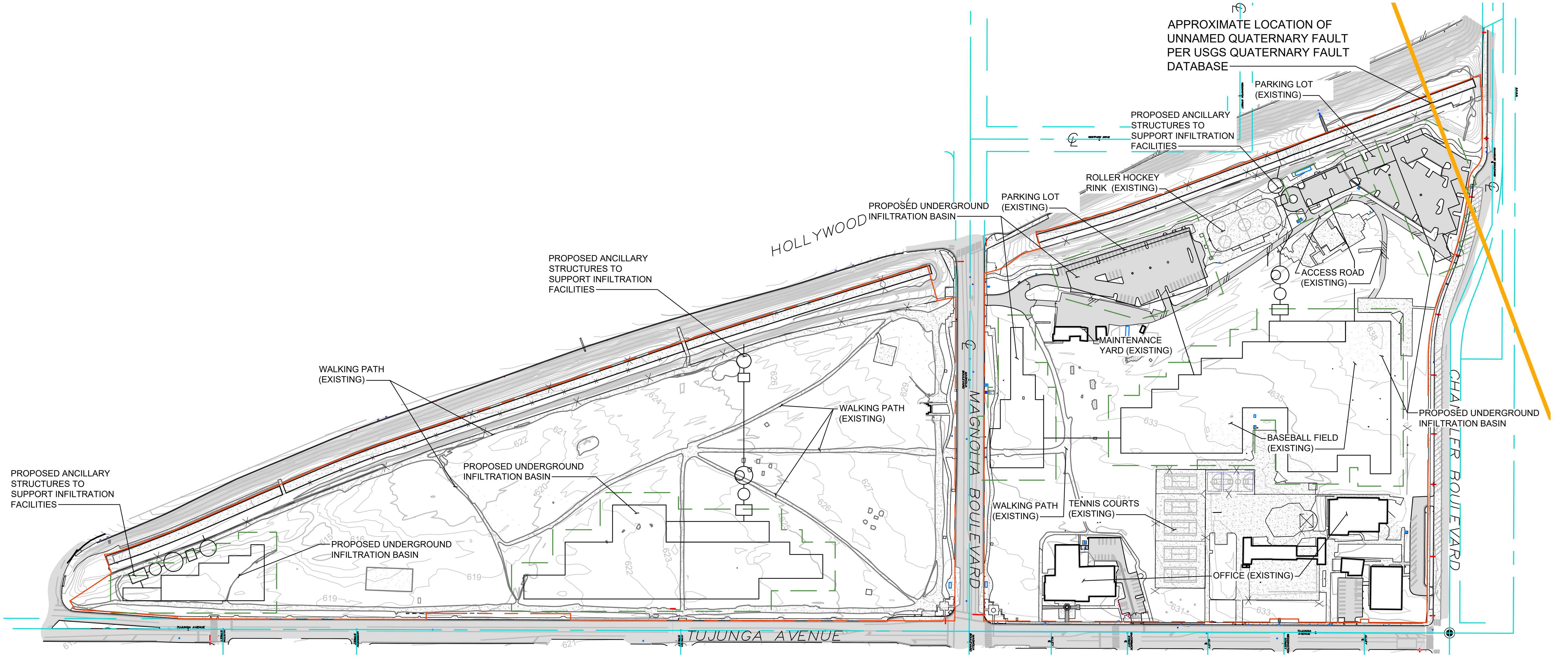

0 250
SCALE IN FEET

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
━━━━	UNNAMED QUATERNARY FAULT

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.

MAP OF UNNAMED QUATERNARY FAULT
NORTH HOLLYWOOD PARK
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec consultants

FIGURE
5

PROJECT NO: LA0590B
JUNE 2020

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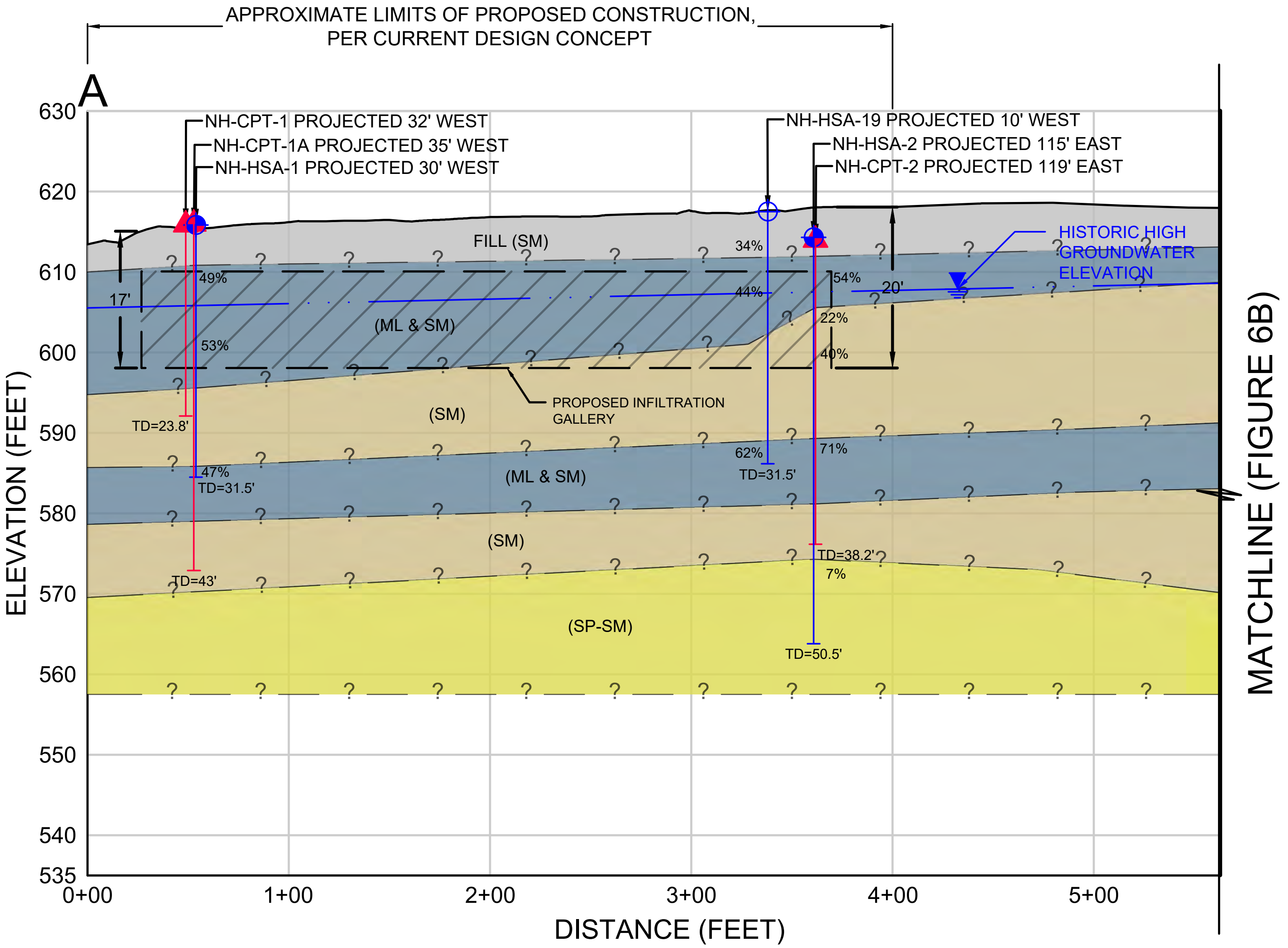


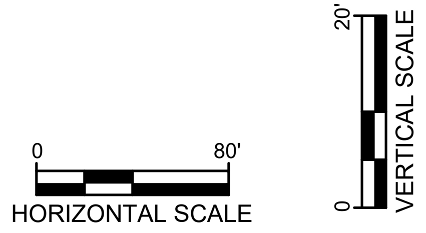
GEOLOGIC CROSS SECTION A-A'

LEGEND

- ⬜ ARTIFICIAL FILL (SM & SC-SM)
- 🟨 SAND, SILT AND GRAVEL (SP-SM & SW-SM)
- 🟦 SANDY SILT AND SILTY SAND (ML & SM)
- 🟫 SILTY SAND (SM)
- ⌖ HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
- ◉ HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
- ▲ CONE PENETRATION TEST (GEOSYNTEC, 2020)
- | 36% FINES CONTENT (%)

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 6 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.



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

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FIGURE
6A

PROJECT NO: LA0590B
JUNE 2020

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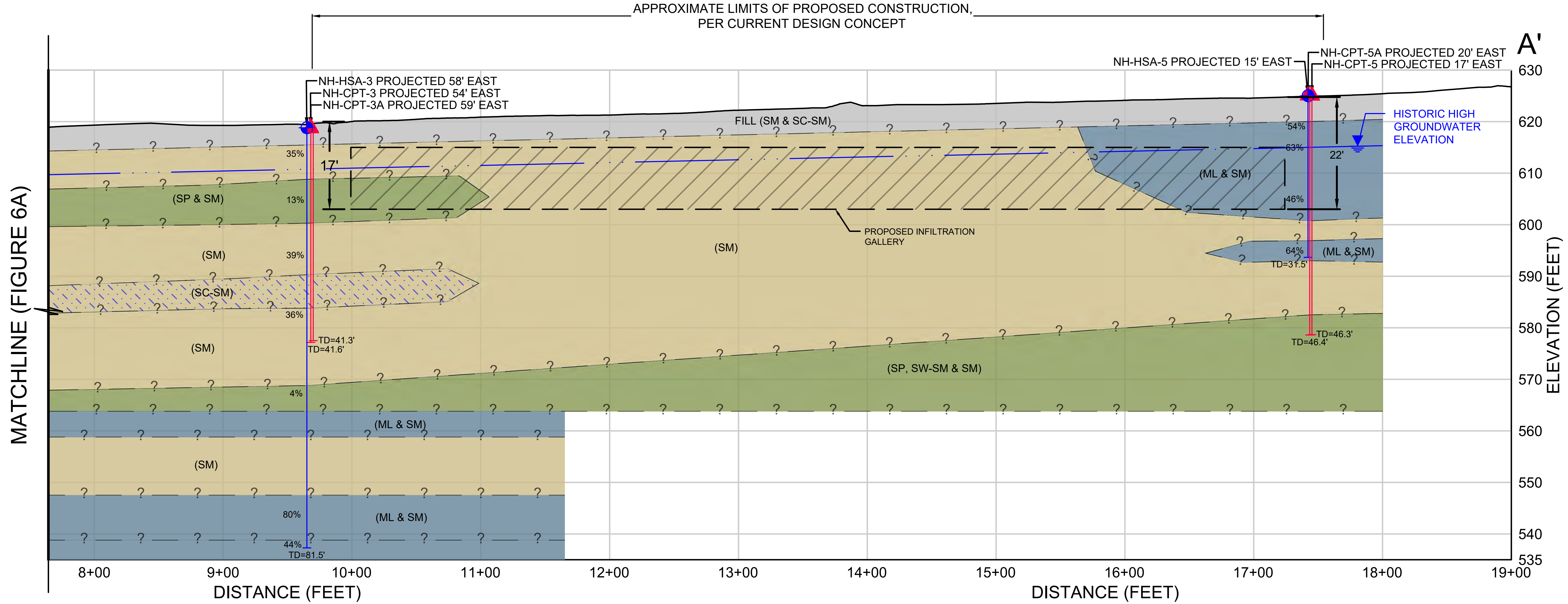


GEOLOGIC CROSS SECTION A-A' (CONTINUED)

LEGEND

▨	ARTIFICIAL FILL (SM & SC-SM)
🟩	SAND, SILTY SAND (SP, SW, SP-SM, SW-SM & SM) [FC<15%]
🟦	SANDY SILT AND SILTY SAND (ML & SM)
▨	SILTY CLAYEY SAND (SC-SM)
🟨	SILTY SAND (SM)
⊕	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
◒	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
▲	CONE PENETRATION TEST (GEOSYNTEC, 2020)
| 36%	FINES CONTENT (%)

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 6 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.

0 80'
HORIZONTAL SCALE

0 20'
VERTICAL SCALE

CROSS SECTION A-A' (CONTINUED)
NORTH HOLLYWOOD PARK
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

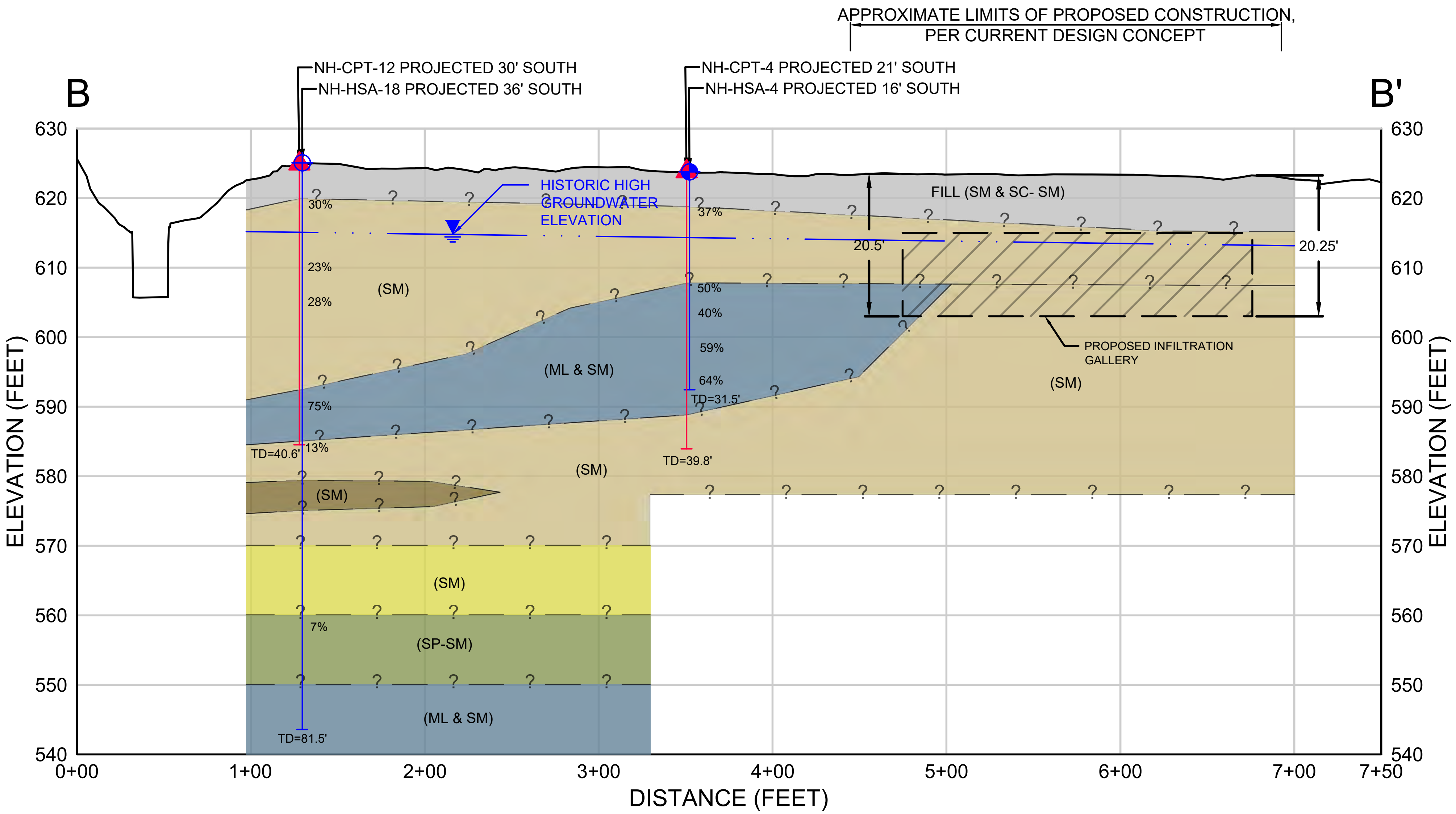
Geosyntec
consultants

FIGURE
6B

PROJECT NO: LA0590B
JUNE 2020

W:\CADD\N\NORTH HOLLYWOOD PARK\FIGURES\GEOLOGIC CROSS SECTIONS\LA0590F001 - Last Saved by: KViswanathan on 6/2/20

DRAFT - FOR DISCUSSION PURPOSES ONLY



GEOLOGIC CROSS SECTION B-B'

LEGEND

⬜	ARTIFICIAL FILL (SM & SC-SM)	⌖	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
🟨	SAND, SILT AND GRAVEL (SP-SM & SW-SM)	◒	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
🟩	SAND, SILTY SAND (SP, SW, SP-SM, SW-SM & SM) [FC<15%]	▲	CONE PENETRATION TEST (GEOSYNTEC, 2020)
🟦	SANDY SILT AND SILTY SAND (ML & SM)	| 36%	FINES CONTENT (%)
🟫	SILTY SAND (SM)		
■	SILTY SAND AND GRAVEL (SM)		

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 6 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.

0 80'
HORIZONTAL SCALE

0 20'
VERTICAL SCALE

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

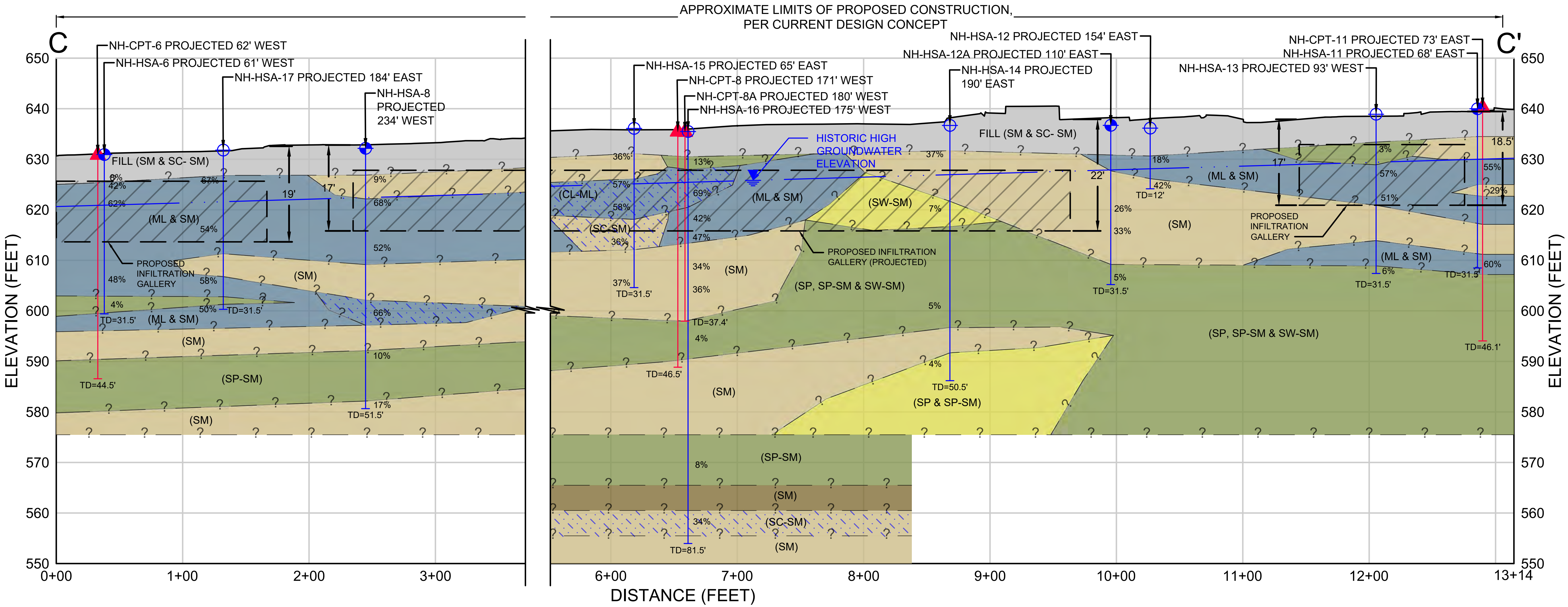
Geosyntec
consultants

FIGURE
7

PROJECT NO: LA0590B
JUNE 2020

W:\CADD\NNORTH HOLLYWOOD PARK\FIGURES\GEOLOGIC CROSS SECTIONS\LA0590F001 - Last Saved by: KViswanathan on 6/2/20

DRAFT - FOR DISCUSSION PURPOSES ONLY



GEOLOGIC CROSS SECTION C-C'

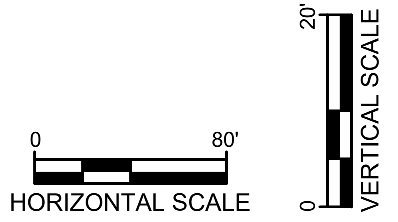
LEGEND

⬜	ARTIFICIAL FILL (SM, SC-SM)
🟨	SAND, SILT AND GRAVEL (SP-SM & SW-SM)
🟩	SAND, SILTY SAND (SP, SW, SP-SM, SW-SM & SM) [FC<15%]
🟦	SANDY SILT AND SILTY SAND (ML & SM)
▨	SANDY SILTY CLAY (CL-ML)
▨	SILTY CLAYEY SAND (SC-SM)
▭	SILTY SAND (SM)
🟫	SILTY SAND AND GRAVEL (SM)

⊕	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
◕	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
▲	CONE PENETRATION TEST (GEOSYNTEC, 2020)
| 36%	FINES CONTENT (%)

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 6 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.



CROSS SECTION C-C'
NORTH HOLLYWOOD PARK
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec
consultants

PROJECT NO: LA0590B
JUNE 2020

FIGURE
8

W:\CADD\NNORTH HOLLYWOOD PARK\FIGURES\GEOLOGIC CROSS SECTIONS\LA0590F001 - Last Saved by: KViswanathan on 6/2/20

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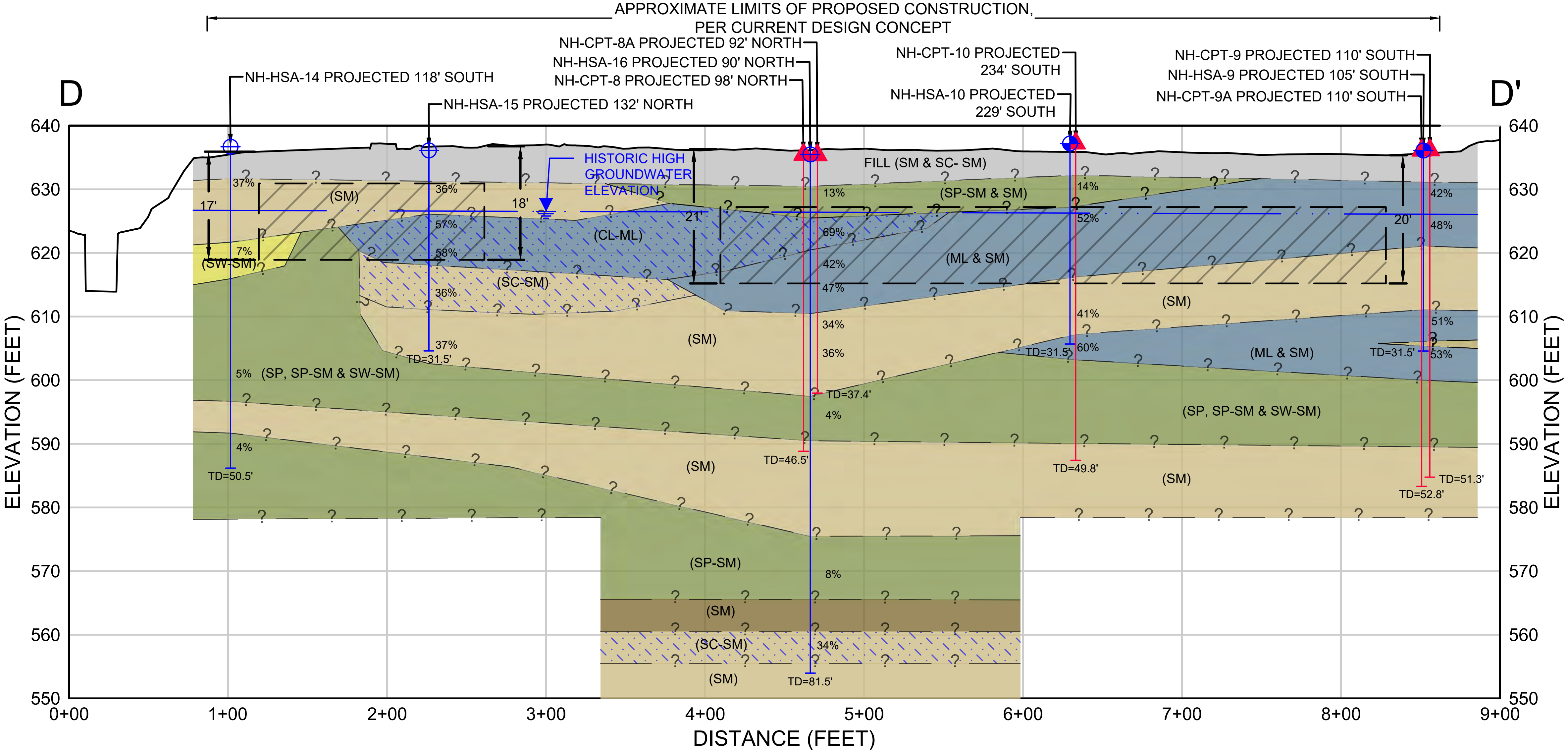

GEOLOGIC CROSS SECTION D-D'

LEGEND

⬜	ARTIFICIAL FILL (SM, SC-SM)
🟨	SAND, SILT AND GRAVEL (SP-SM & SW-SM)
🟩	SAND, SILTY SAND (SP, SW, SP-SM, SW-SM & SM) [FC<15%]
🟦	SANDY SILT AND SILTY SAND (ML & SM)
▨	SANDY SILTY CLAY (CL-ML)
▨	SILTY CLAYEY SAND (SC-SM)
🟧	SILTY SAND (SM)
🟫	SILTY SAND AND GRAVEL (SM)
⌖	HOLLOW-STEM AUGER BORING (GEOSYNTEC, 2020)
◈	HOLLOW-STEM AUGER BORING WITH TEMPORARY INFILTRATION TEST WELL (GEOSYNTEC, 2020)
▲	CONE PENETRATION TEST (GEOSYNTEC, 2020)
| 36%	FINES CONTENT (%)

NOTES:

1. REFER TO THE CHARACTERISTIC SOIL PROFILE PROVIDED IN TABLE 6 FOR DETAILED DESCRIPTIONS OF THE MATERIAL WITHIN EACH ZONE.
2. GROUNDWATER WAS NOT ENCOUNTERED AT ANY INVESTIGATION LOCATIONS.

0 80'
HORIZONTAL SCALE

0 20'
VERTICAL SCALE

CROSS SECTION D-D'
NORTH HOLLYWOOD PARK
TOS-25 STORMWATER CAPTURE PROGRAM
LOS ANGELES, CALIFORNIA

Geosyntec
consultants

FIGURE
9

PROJECT NO: LA0590B
JUNE 2020

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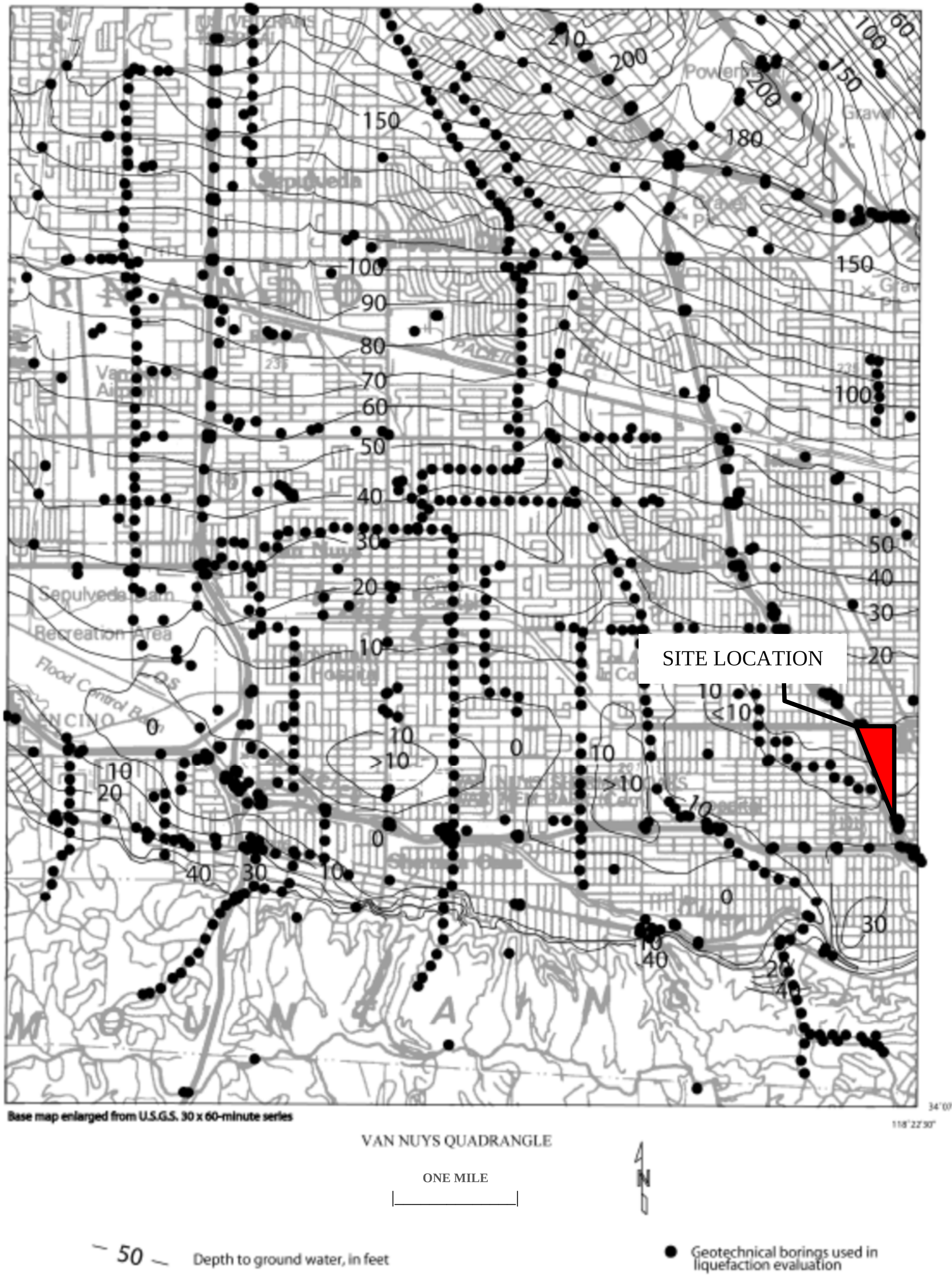


Base map enlarged from U.S.G.S. 30 x 60-minute series

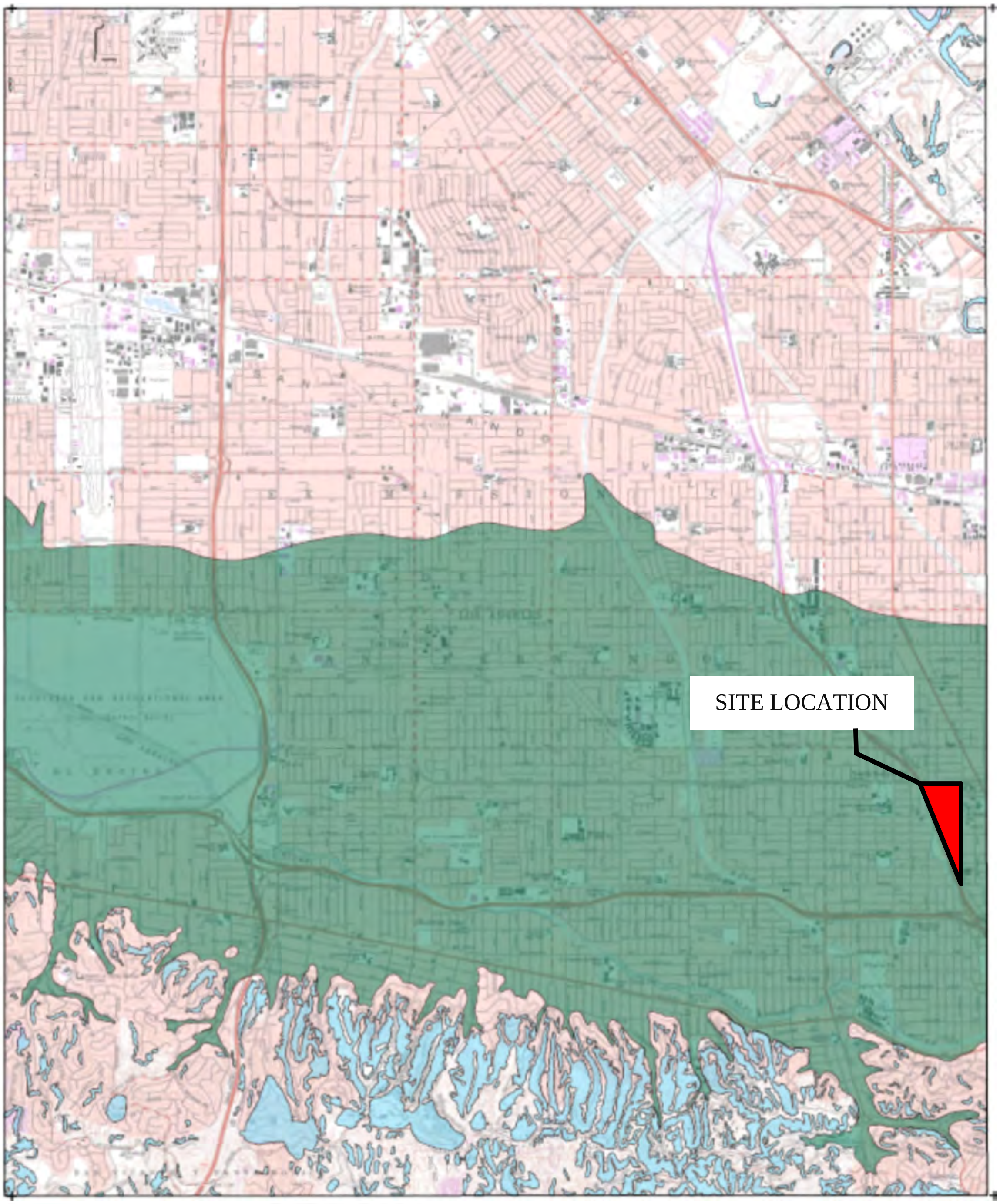
NOTE: IMAGE EXTRACTED FROM SEISMIC HAZARD ZONE REPORT FOR THE VAN NUYS 7.5-MINUTE QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA (CGS 1997)

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

Geosyntec
consultants

Figure
10

Project No: LA0590B
JUNE 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
North Hollywood Park
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

Figure 11

Project No: LA0590B

JUNE 2020

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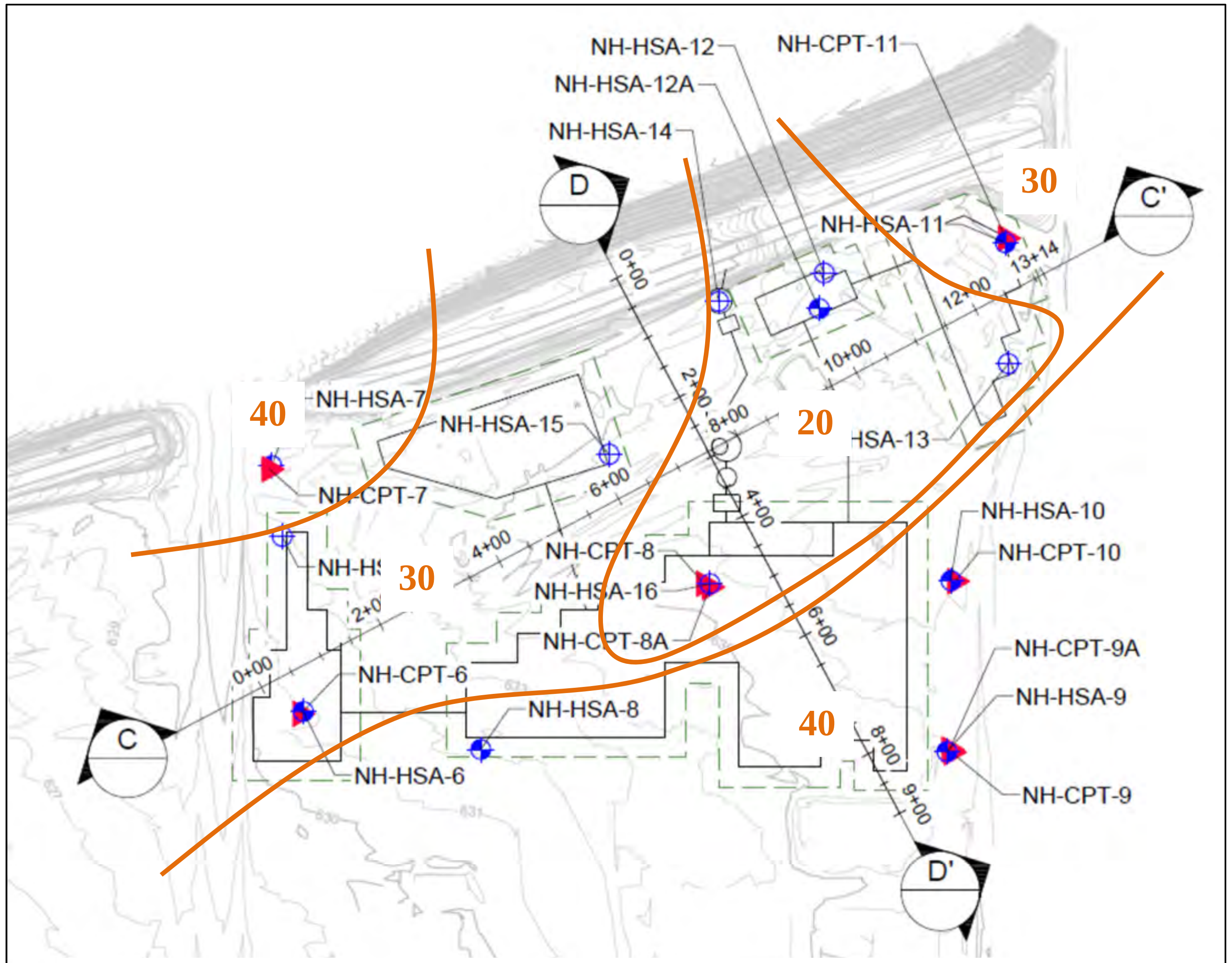
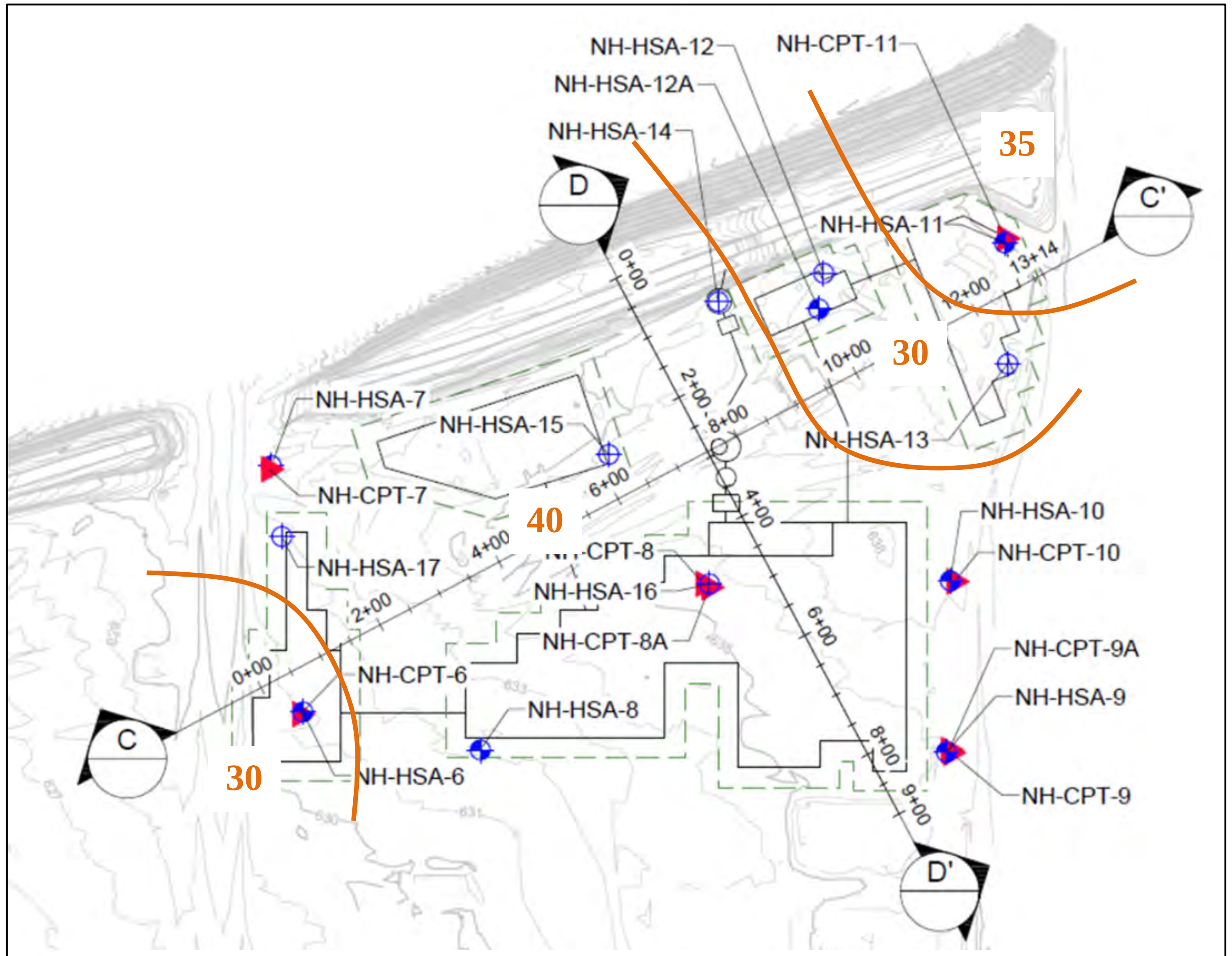


APPROXIMATE DEPTH TO SILTY SAND [SM] (FT-BGS)



APPROXIMATE DEPTH TO SAND AND SILTY SAND [SP & SM] (FT-BGS)

OCSD-11x17NL4-Without Scale and North Arrow.doc

Approximate Depths of Potential Infiltration Receptors – Area North of Magnolia Boulevard
North Hollywood Park
TOS-25 Stormwater Capture Program
Los Angeles, California

Geosyntec consultants

Figure 12

Project No: LA0590B

JUNE 2020

APPENDIX A

Boring Logs

Geosyntec consultants

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PROJECT TOS #25 - North Hollywood Park Stormwater Capture
PROJECT LOCATION Los Angeles, CA
PROJECT NUMBER LA0590B

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

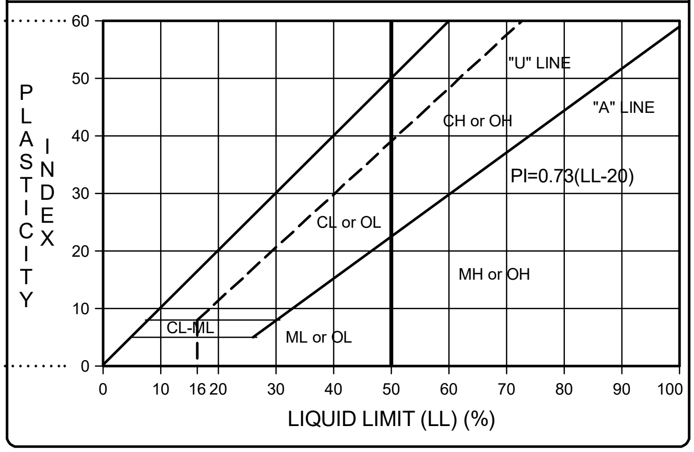
PARTICLE SIZE IDENTIFICATION

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

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 NH-HSA-1 **SHEET** 1 **OF** 2
START DRILL DATE Apr 24, 20
FINISH DRILL DATE Apr 24, 20
LOCATION Los Angeles, CA
ELEVATION DATA:
GROUND SURF. 615.83
TOP OF CASING
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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.	TYPE	BLOWS PER 6"	N VALUE	RECOVERY (%)	PID READING (ppm)	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
	615	Silty SAND (SM): dark brown; moist to wet; fine sand; (0,65,35); non-plastic; strong organic odor.								0720										
	614			B-1					1.7		Hand auger to 5-ft. b.g.s.									
	613																			
	612																			
5	611																			
	610	Increase in fines content; (0,51,49); very loose; slight organic odor.		S-1		1 1 2	3	100	22.1	0730				49		15.4		NP	NP	NP
	609																			
	608																			
	607																			
10	606																			
	605	Sandy SILT (ML): brown; moist; fine sand; (0,45,55); firm; non-plastic; rapid dilatancy.		S-2		2 4 4	8	100	8.7	0733								NP	NP	NP
	604																			
	603																			
	602																			
15	601																			
	600	(0,47,53).		S-3		2 3 4	7	100	20.2	0736				53		11.0				
	599																			
	598																			
	597																			
20	596																			
	595	Silty SAND (SM): brown; moist; fine sand; (0,55,45); medium dense; non-plastic.		S-4A S-4B		4 13 17	30	100 100	2.8 0.2	0740										
	594																			
	593																			
	592																			
25	591																			
	590	(0,55,45); dense; trace 1/4 in. to 1 in. gravel.		S-5		8 14 22	36	100	7.1	0744										
	589																			
	588																			
	587																			
30	586																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.15934
EASTING -118.37927
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 NH-HSA-1 **SHEET** 2 **OF** 2
START DRILL DATE Apr 24, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 24, 20 **GROUND SURF.** 615.83
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	585	(0,53,47); medium dense; no gravel.	▨	S-6		4 6 6	12	94	2.7	0748				47		11.5		NP	NP	NP
	584	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								0750										
	583																			
	582																			
35	581																			
	580																			
	579																			
	578																			
	577																			
40	576																			
	575																			
	574																			
	573																			
	572																			
45	571																			
	570																			
	569																			
	568																			
	567																			
50	566																			
	565																			
	564																			
	563																			
	562																			
55	561																			
	560																			
	559																			
	558																			
	557																			
60	556																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.15934
EASTING -118.37927
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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Suite 150
Huntington Beach, CA 92648
Tel: (714) 969-0800
Fax: (714) 969-0820

GS FORM: GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-2 **SHEET** 1 **OF** 2
START DRILL DATE Apr 24, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 24, 20 **GROUND SURF.** 614.29
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
		Sandy Silt (ML): dark brown; moist to wet; fine sand; (0,45,55); non-plastic; strong organic odor.								0820										
	613			B-1					1.7		Hand auger to 5-ft. b.g.s.									
	612																			
	611																			
	610																			
5	609	Sandy Silt (ML): dark brown; moist to wet; fine sand; (0,46,54); very soft; non-plastic; organic odor.		S-1		0 1 1	2	100	1.3	0828	SPT sample - push to 6 in.			54		17.6				
	608																			
	607																			
	606																			
	605																			
10	604	Silty SAND (SM): brown; moist; fine to medium sand; (0,78,22); very loose; non-plastic; slight organic odor.		S-2		1 1 1	2	100	20.1	0832				22		6.0				
	603																			
	602																			
	601																			
	600																			
15	599	Increase in fines content; (2,58,40); loose.		S-3A		3 5	15	83	1.8	0835				40	2	11.0				
	598	Silty SAND with Gravel (SM): brown; moist; fine to coarse sand; (15,70,15); medium dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-3B		10		100	2.8											
	597																			
	596																			
	595																			
20	594	Silty SAND (SM): brown; moist; fine to coarse sand; (5,75,20); medium dense; non-plastic; 1/4 in. to 1/2 in. gravel; strong organic odor.		S-4		10 13 14	27	100	17.0	0838										
	593																			
	592																			
	591										Hard drilling - 23-ft to 24-ft b.g.s.									
	590																			
25	589	SILT with Sand (ML): brown; moist to wet; fine sand; (0,29,71); stiff; low plasticity; slow dilatancy; trace 1/4 in.gravel; slight organic odor.		S-5		2 3 5	8	100	1.1	0843				71		19.6				
	588																			
	587																			
	586																			
	585																			
30																				

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

NORTHING 34.16018
EASTING -118.37975
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 NH-HSA-2 **SHEET** 2 **OF** 2
START DRILL DATE Apr 24, 20
FINISH DRILL DATE Apr 24, 20
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B
ELEVATION DATA:
GROUND SURF. 614.29
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.	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
	583	(0,30,70); no gravel; no organic odor.	S-6	1 3 5	8	100	3.8	0847								26	23	3
35	579	Decrease in fines content; (0,40,60); slow dilatancy; organic odor. at 35.3 ft. - transitions to olive gray; reddish brown iron oxide mottling.	S-7 S-7A S-7B	8 29 43	48	100 100 100	2.4	0852	Hard drilling - 35-ft to 40-ft b.g.s.	79.6				72.3				
	577	Silty SAND (SM): brown; moist; fine to medium sand; (0,80,20); dense; non-plastic; trace 1/4 in. gravel.							35-ft to 50-ft b.g.s. - 1 in. to 3 in. gravel observed.									
40	574	Poorly-graded SAND with Silt and Gravel (SP-SM): reddish brown; moist; predominantly fine-grained with medium to coarse sand; (34,59,7); very dense; non-plastic; 1/4 in. to 1 in. gravel. at 40.8 ft. - transitions to brown.	S-8	15 26 42	68	100	7.2	0901				6.6	34	2.2				
45	569	Decrease in gravel content; (20,70,10); 1/4 in. to 1 1/4 in. gravel. at 45.6 ft. - 3 in. gravel bed.	S-9	28 50/6	50/6	73	9.7	0906	Hard drilling - 45-ft to 50-ft b.g.s.									
50	564	Decrease in gravel content; becomes dry to moist; (15,75,10); 1/4 in. to 1/2 in. gravel.	S-10	50/6	REF	33	18.2	0913 0920										
	562	Terminated Boring at 51.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.																
55	559																	
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 34.16018
EASTING -118.37975
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 NH-HSA-3 **SHEET** 1 **OF** 3
START DRILL DATE Apr 23, 20
FINISH DRILL DATE Apr 23, 20
ELEVATION DATA:
GROUND SURF. 618.81
TOP OF CASING
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	618	Silty SAND (SM): dark brown; moist; fine sand; (0,65,35); non-plastic; trace roots; strong organic odor.								0730										
	617			B-1					2.6		Hand auger to 5-ft. b.g.s.									
	616																			
	615																			
	614																			
5	613	Very loose; trace 1/4 in. gravel; organic odor.		S-1		1 1 2	3	100	3.7	0741				35		14.3				
	612																			
	611																			
	610																			
	609																			
10	608	Decrease in fines content; brown; fine to medium sand; (0,85,15); loose; slight organic odor.		S-2		1 3 4	7	94	3.9	0745										
	607																			
	606																			
	605																			
	604																			
15	603	Decrease in fines content; (0,87,13); no organic odor.		S-3		1 2 3	5	100	1.2	0748				13		3.6				
	602																			
	601																			
	600																			
	599																			
20	598	Increase in fines content; (0,60,40); medium dense; non-plastic.		S-4		7 9 12	21	89	1.5	0751										
	597																			
	596																			
	595																			
	594																			
25	593	(0,61,39), dense; slight organic odor.		S-5 S-5A S-5B		16 22 31	35	100 100 100	5.3	0754		113.3		39		5.1				
	592																			
	591																			
	590																			
	589																			
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 34.16184
EASTING -118.37957
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 NH-HSA-3 **SHEET** 2 **OF** 3
START DRILL DATE Apr 23, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 23, 20 **GROUND SURF.** 618.81
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
	588	Silty, Clayey SAND (SC-SM): dark brown; moist; fine sand; (0,60,40); medium dense; low plasticity; trace 1/4 in. gravel.		S-6		4 6 8	14	94	1.9	0758								25	20	5
	587																			
	586																			
	585																			
	584																			
35	583	Silty SAND (SM): brown; moist; fine to medium sand; (0,64,36); medium dense; non-plastic.		S-7		6 9 11	20	100	2.4	0802				36		5.1				
	582	at 36.3 ft. - reddish brown iron oxide mottling.																		
	581																			
	580																			
	579																			
40	578	Silty SAND (SM): reddish brown; dry to moist; fine to coarse sand; (10,75,15); very dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-8A S-8B		11 25 26	51	100 100	34.8 2.5	0807										
	577	at 40.4 ft. - becomes brown; 1/4 in. to 1 in. gravel.																		
	576																			
	575																			
	574										Hard drilling - 44-ft to 49-ft b.g.s.									
45	573	Increase in fines content; (10,70,20). at 45.7 ft. - 3 in. gravel bed.		S-9		42 50/5	50/5	83	10.1	0812										
	572																			
	571																			
	570																			
	569																			
50	568	Poorly-graded SAND (SP): brown; dry to moist; fine to coarse sand; (14,82,4); very dense; non-plastic; 1/4 in. to 1 in. gravel.		S-10		17 39 50/4	89/10	100	3.7	0821				4.5	14	1.7				
	567																			
	566										Hard drilling - 52-ft to 56-ft b.g.s.									
	565																			
	564																			
55	563	Sandy SILT (ML): brown; moist; fine to medium sand; (5;30;65); very stiff; low plasticity; 1/4 in. gravel.		S-11		7 13 17	30	100	1.4	0826								23	21	2
	562																			
	561																			
	560																			
	559																			
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 34.16184
EASTING -118.37957
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 NH-HSA-3 **SHEET** 3 **OF** 3
START DRILL DATE Apr 23, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 23, 20 **GROUND SURF.** 618.81
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	558	Silty SAND (SM): brown; moist; fine to medium sand; (0,75,25); very dense; non-plastic; trace gravel.	S-12	14 34 36	70	100	3.7	0832										
	557																	
	556																	
	555																	
	554																	
65	553	Increase in fines content; (5;65;30); dense; 1/4 in. to 1 in. gravel; slight organic odor.	S-13	9 19 26	45	100	7.2	0838										
	552																	
	551																	
	550																	
	549																	
70	548	Decrease in fines content; (10;70;20); very dense; 1/4 in. to 1 1/4 in. gravel.	S-14	28 50/6	50/6	100	5.1	0845										
	547																	
	546																	
	545																	
	544																	
75	543	SILT with Sand (ML): olive gray to brown; moist to wet; fine sand; (0,20,80); very stiff; low plasticity; slow dilatancy; medium dry strength.	S-15	4 9 14	23	100	7.1	0852				80						
	542																	
	541																	
	540																	
	539																	
80	538	Silty SAND (SM): dark brown; moist to wet; fine sand; (0;56;44); very dense; non-plastic.	S-16	8	>50	100	1.7	0901										
			S-16A	27		100				114.3		44		16.2				
			S-16B	50/4		100				122.4				13.8		NP	NP	NP
	537	Terminated Boring at 81.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.						0905										
	536																	
	535																	
85	534																	
	533																	
	532																	
	531																	
	530																	
90	529																	

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

NORTHING 34.16184
EASTING -118.37957
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 NH-HSA-4 **SHEET** 1 **OF** 2
START DRILL DATE Apr 23, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 23, 20 **GROUND SURF.** 623.78
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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

				SAMPLE								LABORATORY RESULTS						ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	GRAPHIC LOG	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
	623	Silty SAND (SM): dark brown; moist to wet; fine to medium sand; (0,65,35); non-plastic.								0955										
	622			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	621																			
	620																			
	619																			
5	618	(0,63,37); very loose; trace gravel; slight organic odor.		S-1		0 0 1	1	100	1.4	1005	SPT sample - push to 12 in.			37		15.4				
	617																			
	616																			
	615																			
	614																			
10	613	Decrease in fines content; moist; (0,70,30); loose.		S-2		2 2 3	5	100	0.6	1009								NP	NP	NP
	612																			
	611																			
	610																			
	609																			
15	608	Silty SAND (SM): brown; moist; fine sand; (0,50,50); loose; non-plastic; slight organic odor.		S-3		2 3 5	8	100	2.1	1012				50	0	12.4				
	607																			
	606																			
	605																			
	604																			
20	603	Decrease in fines content; (0,60,40); no organic odor.		S-4		2 3 5	8	100	0.2	1016				40		10.6				
	602																			
	601																			
	600																			
	599																			
25	598	Slight organic odor.		S-5A		3 4 5	9	100	0.6	1019										
	597	Sandy SILT (ML): brown; moist to wet; fine sand; (0,41,59); firm; non-plastic.		S-5B				100						59		17.3				
	596																			
	595																			
30	594																			

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 34.16311
EASTING -118.38029
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 NH-HSA-4 **SHEET** 2 **OF** 2
START DRILL DATE Apr 23, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 23, 20 **GROUND SURF.** 623.78
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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

				SAMPLE								LABORATORY RESULTS						ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	GRAPHIC LOG	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
	593	Increase in fines content; (0,36,64); stiff; rapid dilatancy.		S-6		3 5 7	12	94	0.3	1022				64		16.1				
	592	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1025										
	591																			
	590																			
35	589																			
	588																			
	587																			
	586																			
	585																			
40	584																			
	583																			
	582																			
	581																			
	580																			
45	579																			
	578																			
	577																			
	576																			
	575																			
50	574																			
	573																			
	572																			
	571																			
	570																			
55	569																			
	568																			
	567																			
	566																			
	565																			
60	564																			

CONTRACTOR Martini Drilling **NORTHING** 34.16311
EQUIPMENT CME-75 **EASTING** -118.38029
DRILL MTHD Hollow Stem Auger **COORDINATE SYSTEM:**
DIAMETER 8-inch
LOGGER K. Viswanathan **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 NH-HSA-5 **SHEET** 1 **OF** 2
START DRILL DATE Apr 23, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 23, 20 **GROUND SURF.** 625.02
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
		Silty SAND (SM): dark brown; moist to wet; fine to medium sand; (0,70,30); non-plastic; trace roots; strong organic odor.								1100										
	624			B-1					0.7		Hand auger to 5-ft. b.g.s.									
	623																			
	622																			
	621																			
5	620	Sandy SILT (ML): brown; moist; fine sand; (0,46,54); very soft; non-plastic; slight organic odor.		S-1		0 1 1	2	100	0.4	1111	SPT sample - push to 6 in.			54		14.3		NP	NP	NP
	619																			
	618																			
	617																			
	616																			
10	615	Increase in fines content; (0,37,63); soft; slight organic odor.		S-2		1 2 2	4	100	5.3	1115				63	0	14.0				
	614																			
	613																			
	612																			
	611																			
15	610	Silty SAND (SM): brown; moist; fine sand; (0,60,40); non-plastic.		SH-1				79	0.0	1119		106.3				11.8				
	609																			
	608																			
	607																			
	606																			
20	605	Increase in fines content; (0,54,46); medium dense; low plasticity; slight organic odor.		S-3		3 6 10	16	100	0.3	1122				46	0	7.5				
	604																			
	603																			
	602																			
	601																			
25	600	Decrease in fines content; (0,65,35); slight organic odor.		S-4		4 8 10	18	100	3.8	1126										
	599																			
	598																			
	597																			
	596																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16398
EASTING -118.37944
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 NH-HSA-5 **SHEET** 2 **OF** 2
START DRILL DATE Apr 23, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 23, 20 **GROUND SURF.** 625.02
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	594	Sandy SILT (ML): brown; moist; fine sand; (0,36,64); stiff; non-plastic; rapid dilatancy.	▥	S-5	◿	2 5 5	10	89	1.0	1130				64		13.5				
	593	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1133										
	592																			
	591																			
35	590																			
	589																			
	588																			
	587																			
	586																			
40	585																			
	584																			
	583																			
	582																			
	581																			
45	580																			
	579																			
	578																			
	577																			
	576																			
50	575																			
	574																			
	573																			
	572																			
	571																			
55	570																			
	569																			
	568																			
	567																			
	566																			
60																				

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

NORTHING 34.16398
EASTING -118.37944
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 NH-HSA-6 **SHEET** 1 **OF** 2
START DRILL DATE Apr 22, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 22, 20 **GROUND SURF.** 630.91
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	630	Silty SAND (SM): dark brown; moist; fine to medium sand; (0,70,30); non-plastic; organic odor.						0915										
			B-1				1.1		Hand auger to 5-ft. b.g.s.									
	629																	
	628																	
	627																	
5	626	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (0,92,8); non-plastic; strong organic odor.	S-1A	1	1	100	2.1	0921				8.1		6.9				
	625		S-1B	0 1		100						42		13.3				
	624	Silty SAND (SM): dark brown; moist; fine sand; (0,58,42); very loose; non-plastic; trace roots; strong organic odor.																
	623																	
	622																	
10	621	Sandy SILT (ML): dark brown; moist; fine sand; (0,38,62); soft; low plasticity.	S-2	0 1 3	4	100	0.0	0925	SPT sample - push to 6 in.			62		18.1				
	620																	
	619																	
	618																	
	617																	
15	616	Decrease in fines content; (0,45,55); firm; trace organics; organic odor.	S-3	2 4 4	8	100	0.8	0929										
	615																	
	614																	
	613																	
	612																	
20	611	Increase in fines content; (0,35,65); non-plastic; trace gravel.	SH-1			79	0.0	0934		110.1				10.6				
	610																	
	609																	
	608																	
	607																	
25	606	Silty SAND (SM): brown; moist; fine sand; (0,52,48); medium dense; non-plastic; organic odor.	S-4	3 7 16	23	100	1.8	0938				48	0	10.4				
	605																	
	604																	
	603																	
	602																	
30	601																	

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 34.16524
EASTING -118.38057
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 NH-HSA-6 **SHEET** 2 **OF** 2
START DRILL DATE Apr 22, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 22, 20 **GROUND SURF.** 630.91
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
	600	Poorly-graded SAND (SP): brown; dry to moist; predominantly fine-grained with medium sand; (0,96,4); loose; non-plastic; trace 1/4 in. gravel; strong organic odor.		S-5A		6 5 4	9	79	4.2	0943		1.6		3.8						
	599	Sandy SILT (ML): dark brown; moist; fine sand; (0,35,65); low plasticity; trace organics; strong organic odor.		S-5B				100		0948										
	598																			
	597	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.																		
35	596																			
	595																			
	594																			
	593																			
	592																			
40	591																			
	590																			
	589																			
	588																			
	587																			
45	586																			
	585																			
	584																			
	583																			
	582																			
50	581																			
	580																			
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	578																			
	577																			
55	576																			
	575																			
	574																			
	573																			
	572																			
60	571																			

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

NORTHING 34.16524
EASTING -118.38057
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

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-7 **SHEET** 1 **OF** 2
START DRILL DATE Apr 27, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 27, 20 **GROUND SURF.** 631.74
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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 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
	631	Silty SAND (SM): brown; moist; fine to coarse sand; (0,70,30); non-plastic; trace roots and 1/4 in. gravel; organic odor.								0935	13 in. rock encountered. Hand auger to 5-ft. b.g.s.									
	630			B-1					0.2											
5	626	(0,66,34).		S-1A		1	2	100	1.5	0952				34		9.4				
		SILT with Sand (ML): dark brown; moist to wet; fine sand; (0,27,73); very soft; low plasticity; slow to rapid dilatancy; slight organic odor.		S-1B		1 1		100	1.3					73	0	24.0		30	26	4
10	621	(0,30,70).		SH-1				79		0958		106.4				15.0				
15	616	Silty SAND (SM): brown; moist; fine to medium sand; (0,59,41); medium dense; non-plastic.		S-2		4 8 10	18	100	0.4	1002				41		5.3				
20	611					3 8 10	18	0		1006	No recovery.									
25	606	Decrease in fines content; (0,70,30).		S-3		4 9 13	22	100	0.2	1009										
	605	Sandy SILT (ML): brown; moist; fine sand; (0,45;55); very stiff; non-plastic; trace 1/4 in. gravel.																		
30	602																			

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 34.16511
EASTING -118.38178
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 NH-HSA-7 **SHEET** 2 **OF** 2
START DRILL DATE Apr 27, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 27, 20 **GROUND SURF.** 631.74
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	601	(0,47,53).		S-4		3 6 6	12	100	0.1	1013				53	0	8.0				
	600	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1017										
	599																			
	598																			
	597																			
35																				
	596																			
	595																			
	594																			
	593																			
	592																			
40																				
	591																			
	590																			
	589																			
	588																			
	587																			
45																				
	586																			
	585																			
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	580																			
	579																			
	578																			
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	576																			
	575																			
	574																			
	573																			
	572																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16511
EASTING -118.38178
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 NH-HSA-8 **SHEET** 1 **OF** 2
START DRILL DATE Apr 22, 20
FINISH DRILL DATE Apr 22, 20
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B
ELEVATION DATA:
GROUND SURF. 632.15
TOP OF CASING

				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
		Silty SAND (SM): dark brown; moist; fine to medium sand; (0,65,35); non-plastic; strong organic odor.								0745										
	631			B-1					0.4		Hand auger to 5-ft. b.g.s.									
	630																			
	629																			
	628																			
5	627	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium sand; (0,91,9); non-plastic.		S-1A S-1B		1 0 1	1	100 100	0.0	0750				9.0		6.5				
	626																			
	625	Silty SAND (SM): dark brown; moist; fine to medium sand; (0,65,35); very loose; low-plasticity.																		
	624																			
	623																			
10	622	Sandy SILT (ML): brown; moist to wet; fine sand; (0,32,68); very soft; low to medium plasticity.		S-2		0 0 1	1	100	0.0	0755	SPT sample - push to 12 in.			68		22.1		26	22	4
	621																			
	620																			
	619																			
	618																			
15	617	Decrease in fines content; (0,40,50); stiff; low-plasticity.		S-3		1 4 5	9	100	0.0	0758										
	616																			
	615																			
	614																			
	613																			
20	612	Decrease in fines content; (0,48,52); firm; slight organic odor.		S-4		1 2 6	8	100	0.1	0802				52	0	19.0				
	611																			
	610																			
	609																			
	608																			
25	607	Silty SAND (SM): brown; moist; fine to medium sand; (0;65;35); medium dense; non-plastic; no organic odor.		S-5		4 9 11	20	100	0.0	0806										
	606																			
	605																			
	604																			
	603																			
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 34.16597
EASTING -118.38038
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 NH-HSA-8 **SHEET** 2 **OF** 2
START DRILL DATE Apr 22, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 22, 20 **GROUND SURF.** 632.15
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
		Sandy SILTY CLAY (CL-ML): brown; moist; fine sand; (0,34,66); stiff; low to medium plasticity; slow dilatancy.	▨	S-6A S-6B S-6C S-6D		4 6 8	9	100 100 100 100	0.0	0810		 104.8 104.8		 66		 21.4 21.8		 26	 20	 6
	601		▨																	
	600		▨																	
	599		▨																	
	598		▨																	
35	597	Silty SAND (SM): brown; moist; fine to medium sand; (0,65,35); medium dense; low plasticity; rapid dilatancy.	░	S-7		2 6 9	15	100	0.0	0814										
	596		░																	
	595		░																	
	594		░																	
	593		░																	
40	592	Poorly-graded SAND with Silt (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (5,85,10); medium dense; non-plastic; 1/4 in. to 1/2 in. gravel.	░	S-8		6 13 13	26	89	0.0	0817				10	5	3.7				
	591		░																	
	590		░																	
	589		░																	
	588		░																	
45	587	Becomes dense; 1/4 in. to 3/4 in. gravel.	░	S-9		9 15 23	38	100	0.0	0822										
	586		░																	
	585		░																	
	584		░																	
	583		░																	
50	582	Silty SAND with Gravel (SM): brown; moist; fine to coarse sand; (37,46,17); very dense; non-plastic; 1/4 in. to 1 1/2 in. gravel.	░	S-10		9 22 50/5	72/11	67	0.2	0827				17	37	5.9				
	581		░																	
	580	Terminated Boring at 51.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								0830										
	579																			
	578																			
55	577																			
	576																			
	575																			
	574																			
	573																			
60																				

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

NORTHING 34.16597
EASTING -118.38038
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 NH-HSA-9 **SHEET** 1 **OF** 2
START DRILL DATE Apr 21, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 21, 20 **GROUND SURF.** 636.08
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
		Silty SAND (SM): dark brown; moist; fine to medium sand; (0,65,35); low plasticity; trace roots; strong organic odor.								0830										
	635			B-1					0.4		Hand auger to 5-ft. b.g.s.									
	634																			
	633																			
	632																			
5	631	Increase in fines content; (0,58,42); very loose; organic odor.		S-1		1 1 2	3	100	1.7	0838				42		13.2		NP	NP	NP
	630																			
	629																			
	628																			
	627																			
10	626	Increase in fines content; (0,52,48); trace roots; organic odor.		S-2		1 1 2	3	100	4.7	0843				48		9.3				
	625																			
	624																			
	623																			
	622																			
15	621	Silty SAND (SM): brown; dry to moist; fine sand; (0,65,35); low plasticity.		SH-1				79	0.0	0847		107.1				13.8				
	620																			
	619																			
	618																			
	617																			
20	616	Becomes moist; increase in fines content; (0,60,40); medium dense; low plasticity; rapid dilatancy; organic odor.		S-3		3 5 9	14	100	3.7	0851										
	615																			
	614																			
	613																			
	612																			
25	611	Sandy SILT (ML): brown; moist; fine sand; (0,49,51); very stiff; low plasticity; rapid dilatancy; slight organic odor.		S-4		6 9 10	19	100	0.7	0855				51	0	7.0				
	610																			
	609																			
	608																			
	607																			
30																				

CONTRACTOR Martini Drilling **NORTHING** 34.16787
EQUIPMENT CME-75 **EASTING** -118.38038
DRILL MTHD Hollow Stem Auger **COORDINATE SYSTEM:**
DIAMETER 8-inch
LOGGER K. Viswanathan **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 NH-HSA-9 **SHEET** 2 **OF** 2
START DRILL DATE Apr 21, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 21, 20 **GROUND SURF.** 636.08
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
		Poorly-graded SAND with Silt (SP-SM): brown; dry to moist; predominantly fine-grained with medium to coarse sand; (5,85,10); non-plastic; 1/4 in. gravel.		S-5A		4	14	63	0.1	0900										
	605			S-5B		7 7		100						53		12.6				
	604	Sandy SILT (ML): brown; moist; fine sand; (0,47,53); stiff; non-plastic; rapid dilatancy.								0910										
	603	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.																		
	602																			
35	601																			
	600																			
	599																			
	598																			
	597																			
40	596																			
	595																			
	594																			
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	589																			
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55	581																			
	580																			
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	578																			
	577																			
60																				

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

NORTHING 34.16787
EASTING -118.38038
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 NH-HSA-10 **SHEET** 1 **OF** 2
START DRILL DATE Apr 21, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 21, 20 **GROUND SURF.** 637.18
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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 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
		Silty SAND (SM): dark brown; dry to moist; fine sand; (0,80,20); low plasticity; trace roots; slight organic odor.								0715										
	636			B-1					0.7		Hand auger to 5-ft. b.g.s.									
5	632	Silty SAND (SM): brown; moist; fine to medium sand; (0;86;14); very loose; non-plastic; trace roots; organic odor.		S-1		1 1 2	3	100	1.1	0726				14		7.7				
10	627	Sandy SILT (ML): brown; moist; fine sand; (0;48;52); soft; non-plastic; rapid dilatancy.		S-2		1 2 2	4	100	2.5	0730				52		8.5				
15	622	(0;45;55); firm.		S-3		2 3 4	7	100	2.0	0734										
20	617	Silty SAND (SM): brown; dry to moist; fine sand; (0;55;45); medium dense; non-plastic; strong organic odor.		S-4 S-4A S-4B		7 11 18	19	100 100 100	8.4	0738		102.6				7.4				
25	612	(0,59,41); trace gravel; slight organic odor.		S-5		3 6 9	15	100	0.7	0742				41		3.7				
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 34.16788
EASTING -118.38122
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 NH-HSA-10 **SHEET** 2 **OF** 2
START DRILL DATE Apr 21, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 21, 20 **GROUND SURF.** 637.18
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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

				SAMPLE								LABORATORY RESULTS						ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	GRAPHIC LOG	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
		(0;55;45); no gravel; no organic odor.		S-6A		4	11	50	0.0	0746										
	606	Sandy SILT (ML): brown; moist; fine sand; (0,40,60); stiff; low plasticity; rapid dilatancy.		S-6B		5 6		92						60		8.8				
	605	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								0750										
	604																			
	603																			
35	602																			
	601																			
	600																			
	599																			
	598																			
40	597																			
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55	582																			
	581																			
	580																			
	579																			
	578																			
60																				

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

NORTHING 34.16788
EASTING -118.38122
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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BOREHOLE LOG

BORING NH-HSA-11 **SHEET** 1 **OF** 2
START DRILL DATE Apr 10, 20
FINISH DRILL DATE Apr 10, 20
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B
ELEVATION DATA:
GROUND SURF. 639.99
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.)	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 (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
		ASPHALTH CONCRETE (3").							1040										
	639	AGGREGATE BASE (6").																	
	638	Silty, Clayey SAND (SC-SM): dark brown; moist; fine to medium sand; (5,65,30); low-plasticity; trace 1/4 in. to 1/2 in. gravel.	B-1					0.0	1042	Hand auger to 5-ft. b.g.s.									
	637																		
	636																		
5	635	Silty SAND (SM): brown; moist; fine to medium sand; (0,73,27); loose; non-plastic.	S-1		2 3 3	6	100	0.1	1045				27		6.6		NP	NP	NP
	634																		
	633																		
	632																		
	631																		
10	630	Sandy SILT (ML): brown; moist; fine sand; (0,45,55); firm; non-plastic.	S-2		1 3 2	5	100	0.0	1048				55		10.3				
	629																		
	628																		
	627																		
	626																		
15	625	Silty SAND (SM): dark brown; moist; fine to medium sand; (10,61,29); dense; low plasticity; 1/4 in. to 1/2 in. gravel.			14	33		0.1	1053										
	624		S-3A		22		100						29				27	23	4
			S-3B		27		100				114.2				5.5				
	623	Increase in fines content: brown; (0,60,40); non-plastic; trace gravel.																	
	622																		
	621																		
20	620	Decrease in fines content; (0,70,30); medium dense.	S-4		5 7 15	22	100	0.0	1057										
	619	Transitions to grayish brown.																	
	618																		
	617																		
	616																		
25	615	Brown; increase in fines content; (0,60,40).	S-5		3 6 11	17	100	0.1	1102										
	614																		
	613																		
	612																		
	611																		
30	610																		

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 34.16810
EASTING -118.38288
COORDINATE SYSTEM:

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

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BOREHOLE LOG

BORING NH-HSA-11 **SHEET** 2 **OF** 2
START DRILL DATE Apr 10, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 10, 20 **GROUND SURF.** 639.99
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

				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
	609	Sandy SILT (ML): brown; moist; fine sand; (0,40,60); stiff; non-plastic; rapid dilatancy.		S-6		5 5 5	10	72	0.0	1108				60		9.7				
	608	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								1114										
	607																			
	606																			
35	605																			
	604																			
	603																			
	602																			
	601																			
40	600																			
	599																			
	598																			
	597																			
	596																			
45	595																			
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	586																			
55	585																			
	584																			
	583																			
	582																			
	581																			
60	580																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16810
EASTING -118.38288
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 NH-HSA-12 **SHEET** 1 **OF** 1
START DRILL DATE Apr 10, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 10, 20 **GROUND SURF.** 636.14
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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 (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
		ASPHALTH CONCRETE (3.5").							0740										
	635	AGGREGATE BASE (6.5").																	
		Silty, Clayey SAND (SC-SM): dark brown; moist; fine to medium sand; (5,75,25); low-plasticity; trace 1/4 in. gravel.	B-1					0.0	0742	Hand auger to 5-ft. b.g.s.									
5	631	Increase in fines content; mottled dark brown and brown; (0,65,35).	S-1A S-1B		3 4 6	10	100 100	0.0	0744				18	6	7.0				
	630	Silty SAND (SM): brown; moist; fine to coarse sand; (6,76,18); loose; low plasticity; 1/4 in. to 1/2 in. gravel.																	
10	626	Silty SAND (SM): dark brown; moist; fine to medium sand; (0,58,42); medium dense; low-plasticity; trace 1/8 in. gravel.	S-2		3 6 7	13	100	0.0	0748				42		12.2		21	19	2
	624	Terminated Boring at 12 ft. below ground surface due to refusal. After completion of drilling, borehole was backfilled with soil cuttings with cement and bentonite, and capped with a concrete patch.							0753	0753 - Refusal in drilling - concrete encountered. Relocated boring (HSA-12B) 3-ft. to the east.									

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16736
EASTING -118.38273
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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BOREHOLE LOG

BORING NH-HSA-12A **SHEET** 1 **OF** 2
START DRILL DATE Apr 27, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 27, 20 **GROUND SURF.** 636.70
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	636	Silty SAND (SM): brown; moist to wet; fine to medium sand; (5,70,25); non-plastic; 1/2 in. to 1 1/4 in. gravel.								0730										
	635			B-1					0.1		Hand auger to 5-ft. b.g.s.									
	634																			
	633																			
	632										4-ft to 6-ft b.g.s - 1 in. to 2 in. gravel observed.									
5	631	Medium dense.				11 8 8	16	0		0742	No recovery.									
	630																			
	629																			
	628																			
	627																			
10	626	1/4 in. to 1 in . gravel.		S-1		4 9 8	17	100	1.4	0746								NP	NP	NP
	625																			
	624																			
	623																			
	622																			
15	621	Becomes moist; (5,69,26); very loose.		S-2A		1 2 2	4	100	2.0	0749				26		11.6				
	620	Decrease in fines content; (5,75,20); 1/4 in. to 1/2 in. gravel.		S-2B				100	1.3											
	619																			
	618																			
	617																			
20	616	Increase in fines content; (0,67,33); medium dense; trace 1/4 in. gravel;		S-3		5 9 11	18	94	1.3	0752				33	0	6.3				
	615																			
	614																			
	613																			
	612																			
25	611	Decrease in fines content; (0,75,25).		S-4		3 7 9	16	100	1.2	0756										
	610																			
	609																			
	608																			
	607																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16734
EASTING -118.38256
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 NH-HSA-12A **SHEET** 2 **OF** 2
START DRILL DATE Apr 27, 20
FINISH DRILL DATE Apr 27, 20
ELEVATION DATA:
GROUND SURF. 636.70
TOP OF CASING
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

				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
	606	Well-graded SAND with Gravel (SW): brown; dry to moist; fine to coarse sand; (18,77,5); dense; non-plastic; 1/4 in. to 1 in. gravel.	▨	S-5	/	9 17 19	36	89	1.0	0801				4.8	18	1.6				
	605	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was converted to infiltration test well.								0805										
	604																			
	603																			
	602																			
35																				
	601																			
	600																			
	599																			
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	597																			
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	577																			
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 34.16734
EASTING -118.38256
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 NH-HSA-13 **SHEET** 1 **OF** 2
START DRILL DATE Apr 10, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 10, 20 **GROUND SURF.** 638.89
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
		ASPHALTH CONCRETE (4").						1208										
	638	AGGREGATE BASE (4").																
	637	Silty, Clayey SAND (SC-SM): dark brown; moist; fine to medium sand; (5,70,25); low-plasticity; 1/4 in. gravel.	B-1				0.0	1210	Hand auger to 5-ft. b.g.s.									
5	634	Increase in fines content; (0,70,30); trace 1/8 in. gravel.	S-1A	4	13	100	0.0	1213										
	633	Poorly-graded SAND (SP): light brown; dry to moist; predominantly fine-grained with medium to coarse sand; (3,94,3); medium dense; 1/4-in. to 3/4-in. gravel.	S-1B	6 7								3.3	3	1.2				
10	629	Sandy SILT (ML): brown; moist; fine to medium sand; (0,43,57); firm; non-plastic.	S-2	2 2 3	5	100	0.0	1216				57	0	8.5				
15	624	Decrease in fines content; (0,49,51).	S-3	3 4 4	8	100	0.0	1220				51	0	7.0				
20	619	Silty SAND (SM): brown; moist; fine to coarse sand; (5,70,25); medium dense; non-plastic; 1/4 in. gravel.	S-4	6 8 7	15	94	0.0	1223										
25	614	Increase in fines content; (0,60,40).	S-5	4 5 7	12	100	0.0	1227										
30	609																	

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 34.16811
EASTING -118.38229
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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Fax: (714) 969-0820

GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-13 **SHEET** 2 **OF** 2
START DRILL DATE Apr 10, 20
FINISH DRILL DATE Apr 10, 20
ELEVATION DATA:
GROUND SURF. 638.89
TOP OF CASING
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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

				SAMPLE								LABORATORY RESULTS								
																		ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	GRAPHIC LOG	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
	608 607	Poorly-graded SAND with Silt (SP-SM): light brown; moist; predominantly fine-grained with medium to coarse sand; (7,87,6); medium dense; 1/4 in. to 3/4 in. gravel.		S-5		8 11 13	24	83	0.0	1232 1236				6.3	7	1.6				
	606 605	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was backfilled high-solids cement-bentonite slurry.																		
35	604 603 602 601 600																			
40	599 598 597 596 595																			
45	594 593 592 591 590																			
50	589 588 587 586 585																			
55	584 583 582 581 580																			
60	579																			

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16811
EASTING -118.38229
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 NH-HSA-14 **SHEET** 1 **OF** 2
START DRILL DATE Apr 10, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 10, 20 **GROUND SURF.** 636.69
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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 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 (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX
	636	Silty SAND (SM): dark brown; moist; fine to medium sand; (10,60,30); low-plasticity; 1/4 in. to 1 in. gravel.								0848										
	635			B-1					0.0	0850	Hand auger to 5-ft. b.g.s.									
	634																			
	633																			
	632																			
5	631	Silty SAND (SM): mottled brown and dark brown; moist; fine to medium sand; (0,63,37); loose; non-plastic.		S-1		2 2 2	4	100	0.0	0852				37		11.5				
	630	at 5.8-ft. - 2 in. clay seam.																		
	629																			
	628																			
	627																			
10	626	Becomes brown; (5,70,25); medium dense; 1/4 in. gravel.		S-2		2 6 8	14	100	0.0	0854										
	625																			
	624																			
	623																			
	622																			
15	621	Well-graded SAND with Silt and Gravel (SW-SM): grayish brown; dry to moist; fine to coarse sand; (23,70,7); very dense; 1/4 in. to 1 in. gravel.		S-3		7 36 50/5	86/11	50	0.0	0858				7.1	23	1.6				
	620																			
	619																			
	618																			
	617																			
20	616	Well-graded SAND with Silt (SW-SM): brown; dry to moist; fine to coarse sand; (5,85,10); medium dense; non-plastic; 1/4 in. gravel.		S-4		6 8 18	26	83	0.0	0903										
	615																			
	614																			
	613																			
	612																			
25	611	Becomes dense; 1/4 in. to 1/2 in. gravel.		S-5		10 16 20	36	89	0.0	0908										
	610																			
	609																			
	608																			
	607																			
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 34.16693
EASTING -118.38259
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 NH-HSA-14 **SHEET** 2 **OF** 2
START DRILL DATE Apr 10, 20
FINISH DRILL DATE Apr 10, 20
ELEVATION DATA:
GROUND SURF. 636.69
TOP OF CASING
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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						ATTERBERG LIMITS		
				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 (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
	606	Poorly-graded SAND (SP): brown; moist; predominantly fine-grained with medium to coarse sand; (0,95,5); dense; non-plastic.		S-6		10 17 21	38	89	0.0	0912										
	605																			
	604																			
	603																			
	602																			
35		(2,93,5); very dense; 1/4 in. gravel.		S-7		10 21 30	51	100	0.0	0916				4.6	2	1.5				
	601																			
	600																			
	599																			
	598																			
	597																			
40		Silty SAND (SM): brown; moist; fine to coarse sand; (5,75,20); dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-8		11 16 17	33	100	0.2	0922										
	596																			
	595																			
	594																			
	593																			
	592																			
45		Poorly-graded SAND with Gravel (SP): brown; dry to moist; predominantly fine-grained with medium to coarse sand; (19,77,5); very dense; 1/4 in. to 1 in. gravel.		S-9		15 23 36	59	100	0.2	0926				3.6	19	1.8				
	591																			
	590																			
	589																			
	588																			
	587																			
50						50/5	REF	0		0931 0934	No Recovery.									
	586	Terminated Boring at 50.5 ft. below ground surface. After completion of drilling, borehole was backfilled high-solids cement-bentonite slurry.																		
	585																			
	584																			
	583																			
	582																			
55																				
	581																			
	580																			
	579																			
	578																			
	577																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16693
EASTING -118.38259
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 NH-HSA-15 **SHEET** 1 **OF** 2
START DRILL DATE Apr 27, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 27, 20 **GROUND SURF.** 636.10
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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 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
		Silty SAND (SM): dark brown; moist; fine to medium sand; (0,70,30); non-plastic; trace roots and 1/4 in. gravel; strong organic odor.								0840										
	635			B-1					1.6		Hand auger to 5-ft. b.g.s.									
	634																			
	633																			
	632																			
5	631	Increase in fines content; (0,64,36); very loose; no organic odor and roots.		S-1		1 1 1	2	100	0.2	0848				36		9.1				
	630																			
	629																			
	628																			
	627																			
10	626	Sandy SILTY CLAY (CL-ML): brown; moist; fine sand; (0,43,57); firm; low plasticity.		S-2		1 2 3	5	100	1.0	0852				57		9.6				
	625																			
	624																			
	623																			
	622																			
15	621	(0,42,58); very stiff.		S-3		5 7 9	16	100	4.6	0856				58		7.3				
	620																			
	619																			
	618																			
	617																			
20	616	Silty, Clayey SAND (SC-SM): brown; moist; fines to medium sand; (0,64,36); medium dense; low to medium plasticity; trace 1/4 in. gravel; slight organic odor		S-4		8	18	50	2.1	0859										
				S-4A		12		100				99.3				7.2				
	615			S-4B		15		100				108.4		36		3.8		23	18	5
	614																			
	613																			
	612																			
25	611	Silty SAND (SM): brown; moist; fine to medium sand; (0,70,30); medium dense; non-plastic.		S-5		2 6 10	16	83	1.9	0902										
	610																			
	609																			
	608																			
	607																			
30																				

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

NORTHING 34.16649
EASTING -118.38184
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 NH-HSA-15 **SHEET** 2 **OF** 2
START DRILL DATE Apr 27, 20
FINISH DRILL DATE Apr 27, 20
ELEVATION DATA:
GROUND SURF. 636.10
TOP OF CASING
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX
	605	Increase in fines content; (0,63,37).		S-6		3 7 9	16	94	2.9	0907				37		7.0				
	604	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite grout.								0910										
	603																			
	602																			
35	601																			
	600																			
	599																			
	598																			
	597																			
40	596																			
	595																			
	594																			
	593																			
	592																			
45	591																			
	590																			
	589																			
	588																			
	587																			
50	586																			
	585																			
	584																			
	583																			
	582																			
55	581																			
	580																			
	579																			
	578																			
	577																			
60																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16649
EASTING -118.38184
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 NH-HSA-16 **SHEET** 1 **OF** 3
START DRILL DATE Apr 21, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 21, 20 **GROUND SURF.** 635.48
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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	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
	635	Silty SAND (SM): dark brown; moist; fine to coarse sand; (0,70,30); non-plastic; trace roots; strong organic odor.								0950										
	634			B-1					0.0		Hand auger to 5-ft. b.g.s.									
	633																			
	632																			
	631																			
5	630	Decrease in fines content; (0,87,13); very loose; non-plastic; slight organic odor.		S-1A S-1B		0	0	100 100	0.1	0958	SPT sample - push to 18 in.			13		8.5				
	629																			
	628																			
	627																			
	626																			
10	625	Sandy SILTY CLAY (CL-ML): brown; moist; fine sand; (0;31;69); very soft; low-plasticity.		S-2		1 1 1	2	100	0.7	1001				69		17.7		24	19	5
	624																			
	623																			
	622																			
	621																			
15	620	Silty SAND (SM): brown; moist; fine to medium sand; (0,58,42); loose; non-plastic; slight organic odor.		S-3		1 3 4	7	100	1.5	1006				42		12.7		NP	NP	NP
	619																			
	618																			
	617																			
	616																			
20	615	Increase in fines content; (0,53,47).		S-4		2 4 4	8	100	0.4	1009				47		13.0				
	614																			
	613																			
	612																			
	611																			
25	610	Silty SAND (SM): brown; moist; fine to medium sand; (0,66,34); non-plastic.		SH-1				92	0.0	1013		101.4		34		10.9				
	609																			
	608																			
	607																			
	606																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16690
EASTING -118.38120
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 NH-HSA-16 **SHEET** 2 **OF** 3
START DRILL DATE Apr 21, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 21, 20 **GROUND SURF.** 635.48
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	605	(0,64,36); loose; non-plastic.		S-5A S-5B		3 4 4	8	66 100	0.0	1018				36		11.2				
	604																			
	603																			
	602																			
	601																			
35	600	(0,65,35); dense.		S-6 S-6A S-6B		11 17 29	31	100 100 100	0.0	1023		108.5				5.7				
	599																			
	598																			
	597																			
	596																			
40	595	Poorly-graded SAND (SP): brown; moist; predominantly fine-grained with medium to coarse sand; (10,86,4); medium dense; non-plastic; 1/4 in. to 1 in. gravel.		S-7		4 13 14	27	83	0.0	1028				3.8	10	2.5				
	594																			
	593																			
	592																			
	591																			
45	590	Silty SAND (SM): brown; moist; fine to coarse sand; (0,75,25); medium dense; non-plastic; reddish brown iron oxide mottling.		S-8		4 6 9	15	100	0.0	1032						11.1				
	589																			
	588																			
	587																			
	586																			
50	585	Decrease in fines content; (5,75,20); becomes dense; 1/4 in. to 3/4 in. gravel; no iron oxide mottling.		S-9		19 23 25	48	100	0.1	1036										
	584																			
	583										Hard drilling - 52-ft to 55-ft b.g.s.									
	582																			
	581																			
55	580	Silty SAND (SM): reddish brown; moist; fine to medium sand; (0,60,40); non-plastic; iron oxide mottling.		S-10A S-10B S-10C S-10D		1 2 13	15	100 100 100 100	0.4	1041						7.7				
	579	Silty SAND (SM): brown; moist; fine to coarse sand; (0,70,30); medium dense; non-plastic; reddish brown iron oxide mottling. at 56.3-ft. - 3 in. gravel bed.																		
	578																			
	577																			
	576																			
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 34.16690
EASTING -118.38120
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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Fax: (714) 969-0820

GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-16 **SHEET** 3 **OF** 3
START DRILL DATE Apr 21, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 21, 20 **GROUND SURF.** 635.48
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	575	Poorly-graded SAND with Silt and Gravel (SP-SM): brown; moist; predominantly fine-grained with medium to coarse sand; (35;55;10); very dense; non-plastic; 1/4 in. to 1 in. gravel.		S-11		50/5	REF	56	1.4	1046										
	574																			
	573										Hard drilling - 62-ft to 75-ft b.g.s.									
	572																			
	571																			
65	570	Decrease in fines content; (36,56,8); 1/4 in. to 1 in. gravel.		S-12		45 50/4	50/4	73	0.6	1057				7.8	36	3.8				
	569																			
	568																			
	567																			
	566																			
70	565	Silty SAND with Gravel (SM): brown; moist; fine to coarse sand; (20,65,15); very dense; non-plastic; 1/4 in. to 1 1/4 in. gravel; reddish brown iron oxide mottling. at 70.3-ft. - 3 in. gravel bed.		S-13		44 50/3	50/3	61	4.4	1104										
	564																			
	563																			
	562																			
	561																			
75	560	Silty, Clayey SAND (SC-SM): brown; moist to wet; fine sand; (5,61,34); medium dense; low plasticity; slow dilatancy; 1/4 in. to 3/4 in. gravel.		S-14		3 10 16	26	100	0.7	1113				34	5	11.7		23	19	4
	559																			
	558																			
	557																			
	556																			
80	555	Silty SAND (SM): brown; moist to wet; fine to medium sand; (5,65,30); very dense; non-plastic; 1/4 in. gravel.		S-15		19 36 28	64	100	0.0	1118										
	554	Terminated Boring at 81.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite grout.								1120										
	553																			
	552																			
	551																			
85	550																			
	549																			
	548																			
	547																			
	546																			
90																				

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

NORTHING 34.16690
EASTING -118.38120
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: GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-17 **SHEET** 1 **OF** 2
START DRILL DATE Apr 27, 20
FINISH DRILL DATE Apr 27, 20
LOCATION Los Angeles, CA
ELEVATION DATA:
GROUND SURF. 631.80
TOP OF CASING
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

				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
	631	Silty SAND (SM): dark brown; moist; fine to medium sand; (0,75,25); non-plastic; strong organic odor.								1045										
	630			B-1					0.4		Hand auger to 5-ft. b.g.s.									
	629																			
	628																			
	627																			
5				S-1A		1	1	100	0.9	1055										
	626	Sandy Silt (ML): brown; moist to wet; fine sand; (0,33,67); very soft; low plasticity; slow to rapid dilatancy.		S-1B		0 1		100	2.3					67		24.0		30	26	4
	625																			
	624																			
	623																			
	622																			
10																				
	621	Decrease in fines content; (0,40,60); stiff; none to low plasticity; rapid dilatancy.		S-2		2 4 5	9	94	1.2	1059										
	620																			
	619																			
	618																			
	617																			
15																				
	616	Decrease in fines content; (0,46,54).		S-3		2 5 6	11	100	2.0	1103				54		10.9				
	615																			
	614																			
	613																			
	612																			
20				S-4A		3	11	100	3.2	1107										
	611	Silty SAND (SM): brown; moist; fine to medium sand; (0,65,35); medium dense; non-plastic.		S-4B		6 5		100	2.1											
	610																			
	609																			
	608																			
	607																			
25																				
	606	Sandy SILT (ML): brown; dry to moist; fine sand; (0,42,58); stiff; non-plastic; rapid dilatancy.		S-5		3 5 6	11	100	0.0	1110				58		9.8				
	605																			
	604																			
	603																			
	602																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16515
EASTING -118.38143
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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GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-17 **SHEET** 2 **OF** 2
START DRILL DATE Apr 27, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 27, 20 **GROUND SURF.** 631.80
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	601	Silty SAND (SM): brown; moist; fine to coarse sand; (0,80,20); non-plastic; trace 1/4 in. gravel.		S-6A		3	7	100	0.8	1113										
				S-6B		3 4		100	0.7					50		10.1		22	20	2
	600	Silty SAND (SM): brown; moist; fine sand; (0,50,50); loose; low plasticity.								1115										
	599	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite grout.																		
	598																			
35	597																			
	596																			
	595																			
	594																			
	593																			
40	592																			
	591																			
	590																			
	589																			
	588																			
45	587																			
	586																			
	585																			
	584																			
	583																			
50	582																			
	581																			
	580																			
	579																			
	578																			
55	577																			
	576																			
	575																			
	574																			
	573																			
60	572																			

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

NORTHING 34.16515
EASTING -118.38143
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 NH-HSA-18 **SHEET** 1 **OF** 3
START DRILL DATE Apr 22, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 22, 20 **GROUND SURF.** 625.08
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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 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 (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
		Silty SAND (SM): dark brown; moist; fine to medium sand; (0,70,30); non-plastic; trace roots; slight organic odor.								1025										
	624			B-1					0.1		Hand auger to 5-ft. b.g.s.									
	623																			
	622																			
	621																			
5	620	Silty SAND (SM): brown; moist; fine to medium sand; (0,70,30); very loose; non-plastic; rapid dilatancy.		S-1		1 1 2	3	100	0.1	1033				30		6.6				
	619																			
	618																			
	617																			
	616																			
10	615	Becomes loose.		S-2		3 4 4	8	100	0.0	1038										
	614																			
	613																			
	612																			
	611																			
15	610	Decrease in fines content; (0,77,23).		SH-1				92	0.0	1041		99.5		22.5		4.8				
	609																			
	608																			
	607																			
	606																			
20	605	Increase in fines content; (0,72,28); medium dense.		S-3		5 8 17	25	100	2.2	1046				28	0	3.2				
	604																			
	603																			
	602																			
	601																			
25	600	(0,70,30).		S-4		4 8 12	20	78	1.3	1050										
	599																			
	598																			
	597																			
	596																			
30																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16317
EASTING -118.38103
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 NH-HSA-18 **SHEET** 2 **OF** 3
START DRILL DATE Apr 22, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 22, 20 **GROUND SURF.** 625.08
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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		
		Decrease in fines content; fine to coarse sand; (5,70,25); dense; 1/4 in. to 3/4 in. gravel.		S-5		7 13 17	30	100	6.7	1054										
	594																			
	593																			
	592																			
	591																			
35	590	SILT with Sand (ML): brown; moist; fine to medium sand; (0,25,75); stiff; non-plastic.		S-6		2 4 6	10	89	5.2	1059				75	0	17.1				
	589																			
	588																			
	587																			
	586																			
40	585	Silty SAND (SM): reddish brown; moist; fine to coarse sand; (8,79,13); dense; non-plastic; 1/4 in. to 3/4 in. gravel.		S-7		7 18 24	42	100	23.3	1101				13	8	3.9				
	584																			
	583																			
	582																			
	581																			
45	580	Becomes brown; (5,75,20); non-plastic; 1/4 in. to 1/2 in. gravel.		S-8A		50/6	REF	66	19.6	1105										
	579	Silty SAND with Gravel (SM): light brown; dry to moist; fine to coarse sand; (25;60;15); non-plastic; 1/4 in. to 1 1/4 in. gravel.		S-8B				100	6.9											
	578																			
	577																			
	576																			
50	575	Silty SAND (SM): brown; moist; fine to coarse sand; (10,70,20); very dense; non-plastic; 1/4 in. to 1/2 in. gravel. at 50.5-ft. - 4 in. gravel bed.		S-9A S-9B S-9C		35 50/5	50/5	100 100 100	8.9 5.1 7.2	1112	Hard drilling - 50-ft to 52-ft b.g.s.									
	574																			
	573																			
	572																			
	571																			
55	570	1/4 in. to 3/4 in. gravel; reddish brown iron oxide mottling. at 55.5-ft. - 3 in. cemented sand seam.		S-10A S-10B		50/5	REF	100 25	7.0 8.5	1117	55-ft to 65-ft b.g.s. - 1 in. to 3 in. gravel observed.									
	569																			
	568																			
	567																			
	566																			
60																				

CONTRACTOR Martini Drilling **NORTHING** 34.16317
EQUIPMENT CME-75 **EASTING** -118.38103
DRILL MTHD Hollow Stem Auger **COORDINATE SYSTEM:**
DIAMETER 8-inch
LOGGER K. Viswanathan **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:
GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-18 **SHEET** 3 **OF** 3
START DRILL DATE Apr 22, 20
FINISH DRILL DATE Apr 22, 20
LOCATION Los Angeles, CA
ELEVATION DATA:
GROUND SURF. 625.08
TOP OF CASING
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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

				SAMPLE								LABORATORY RESULTS						ATTERBERG LIMITS		
DEPTH (ft-bgs)	ELEVATION (ft)	DESCRIPTION	GRAPHIC LOG	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
	564	Well-graded SAND with Silt (SP-SM): brown; moist; fine to coarse sand; (4;89;7); very dense; non-plastic; 1/4 in. to 1/2 in. gravel.		S-11		18 33 39	72	100	5.0	1125										
	563																			
	562																			
	561																			
65	560	No gravel; (0;90;10); dense.		S-12		12 22 25	47	100	2.4	1130	Hard drilling.			7.3	4	2.1				
	559																			
	558																			
	557																			
	556																			
70	555	Becomes very dense.		S-13		15 26 34	60	100	14.7	1145										
	554																			
	553																			
	552																			
	551																			
75	550	Becomes dense.		S-14		12 20 23	43	100	10.4	1152										
	549																			
	548	at 76.3-ft - 3 in. silt seam.																		
	547																			
	546																			
80	545	SILT with Sand (ML): olive gray; moist to wet; fine sand; (0,20,80); very stiff; low to medium plasticity; slow dilatancy.		S-15		4 6 10	16	100	0.0	1156						25.6		33	26	7
	544																			
	543	Terminated Boring at 81.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite grout.								1200										
	542																			
	541																			
85	540																			
	539																			
	538																			
	537																			
	536																			
90																				

CONTRACTOR Martini Drilling
EQUIPMENT CME-75
DRILL MTHD Hollow Stem Auger
DIAMETER 8-inch
LOGGER K. Viswanathan
NORTHING 34.16317
EASTING -118.38103
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:
GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-19 **SHEET** 1 **OF** 2
START DRILL DATE Apr 24, 20 **ELEVATION DATA:**
FINISH DRILL DATE Apr 24, 20 **GROUND SURF.** 617.51
LOCATION Los Angeles, CA **TOP OF CASING**
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B

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
	617	Silty SAND (SM): dark brown; moist; fine to medium sand; (5,70,25); non-plastic; 1/2 in. to 1 1/4 in. gravel; trace roots and organics; organic odor.								1030										
	616			B-1					0.2		Hand auger to 5-ft. b.g.s.									
	615																			
	614																			
	613																			
5	612	Increase in fines content; (0,66,34); very loose.		S-1A		2	2	100	0.8	1034				34		11.6				
				S-1B		1		100												
	611	Decrease in fines content; brown; moist; (0,75,25).		S-1C		1		100												
	610																			
	609																			
	608																			
10	607	Increase in fines content; fine sand; (0,56,44); loose.		S-2		2 4 4	8	100	3.0	1038				44		8.6				
	606																			
	605																			
	604																			
	603																			
15	602	(0,55,45); medium dense.		S-3		5 10 10	20	94	1.1	1043										
	601																			
	600																			
	599																			
	598																			
20	597	Decrease in fines content; fine to medium sand; (0,80,20); medium dense.		S-4		5 11 14	25	100	1.5	1047	Shelby sample - refusal at 6 in.									
	596																			
	595																			
	594																			
	593																			
25	592	Increase in fines content; (0,70,30).		SH-1				50	0.0	1052		95.8				10.2				
	591																			
	590																			
	589																			
	588																			
30																				

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

NORTHING 34.16012
EASTING -118.37934
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

03-GEOTECH2 LA0590B - NORTH HOLLYWOOD.GPJ GEOSNTEC.GDT 5/29/20

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GS FORM:
GEOTECH2 01/04

BOREHOLE LOG

BORING NH-HSA-19 **SHEET** 2 **OF** 2
START DRILL DATE Apr 24, 20
FINISH DRILL DATE Apr 24, 20
LOCATION Los Angeles, CA
PROJECT TOS #25 - North Hollywood Park Stormwater Capture
NUMBER LA0590B
ELEVATION DATA:
GROUND SURF. 617.51
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	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
	587	Decrease in fines content; (5,75,20); loose; 1/4 in. to 1 in. gravel; slight organic odor.		S-5A		4	12	100	4.8	1057										
	586	Sandy SILT (ML): brown; moist; fine sand; (0,38,62); stiff; non-plastic; rapid dilatancy.		S-5B		5 7		100	2.3	1100				62		13.2				
	585	Terminated Boring at 31.5 ft. below ground surface. After completion of drilling, borehole was backfilled with high-solids cement-bentonite grout.																		
	584																			
	583																			
35	582																			
	581																			
	580																			
	579																			
	578																			
40	577																			
	576																			
	575																			
	574																			
	573																			
45	572																			
	571																			
	570																			
	569																			
	568																			
50	567																			
	566																			
	565																			
	564																			
	563																			
55	562																			
	561																			
	560																			
	559																			
	558																			
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 34.16012
EASTING -118.37934
COORDINATE SYSTEM:

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 – North Hollywood Park
N. Hollywood, CA
April 28-30, 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 – North Hollywood Park project located in N. Hollywood, California. The work was performed by Kehoe Testing & Engineering (KTE) on April 28-30, 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 17 locations to determine the soil lithology. A summary is provided in **TABLE 2.1**.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
NH-CPT-1	23	Refusal
NH-CPT-1A	42	Refusal
NH-CPT-2	38	Refusal
NH-CPT-3	41	Refusal
NH-CPT-3A	41	Refusal
NH-CPT-4	39	Refusal
NH-CPT-5	46	Refusal
NH-CPT-5A	46	Refusal
NH-CPT-6	44	Refusal
NH-CPT-7	46	Refusal
NH-CPT-8	46	Refusal
NH-CPT-8A	37	Refusal
NH-CPT-9	51	Refusal
NH-CPT-9A	52	Refusal
NH-CPT-10	49	Refusal
NH-CPT-11	46	Refusal
NH-CPT-12	40	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 locations NH-CPT-1, NH-CPT-1A, NH-CPT-2, NH-CPT-3, NH-CPT-4, NH-CPT-5, NH-CPT-6, NH-CPT-7, NH-CPT-8, NH-CPT-9, NH-CPT-10, NH-CPT-11 & NH-CPT-12, 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
President

05/05/20-wt-1436

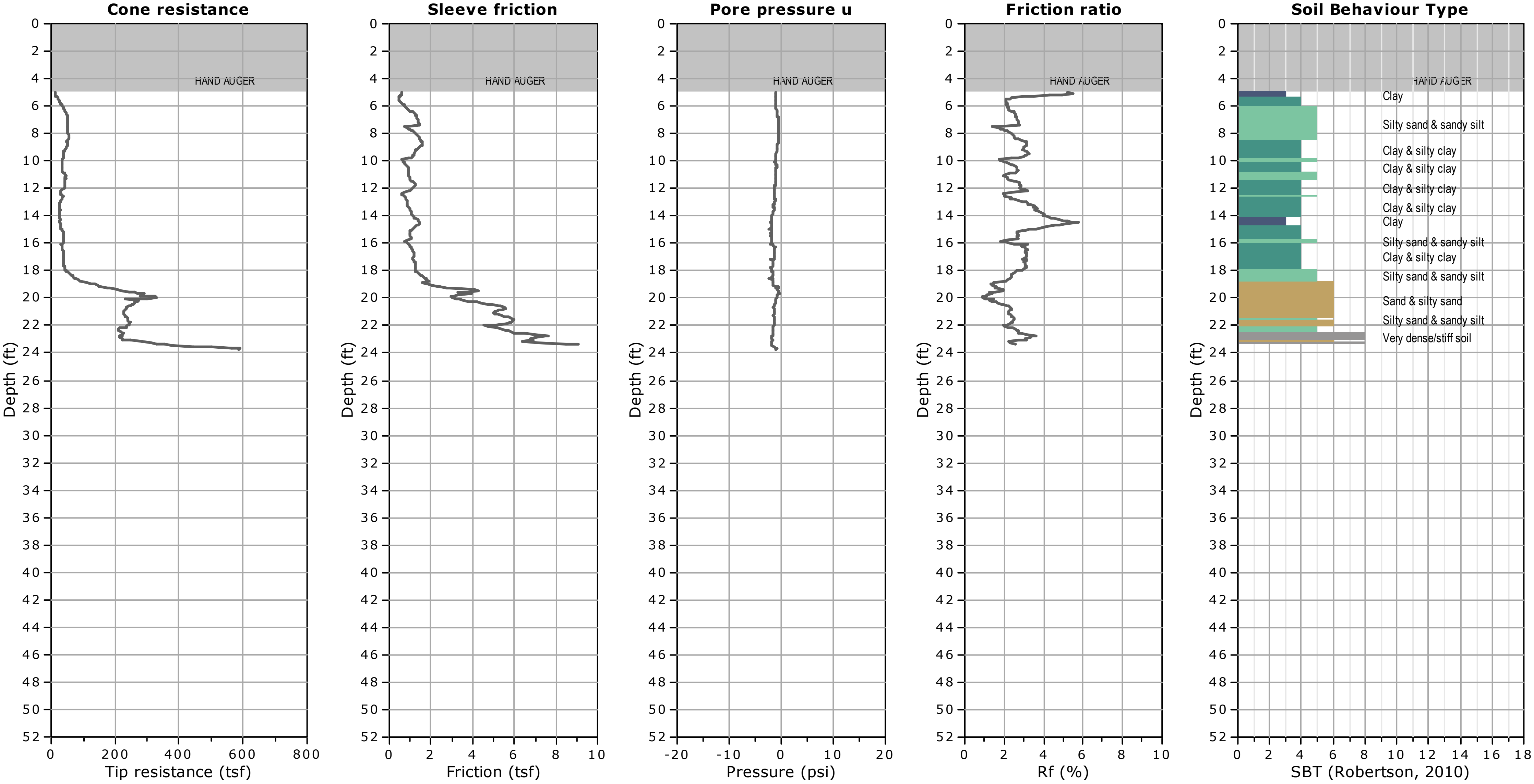
APPENDIX

DRAFT - FOR DISCUSSION PURPOSES ONLY

Kehoe Testing and Engineering
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-1
Total depth: 23.76 ft, Date: 4/29/2020



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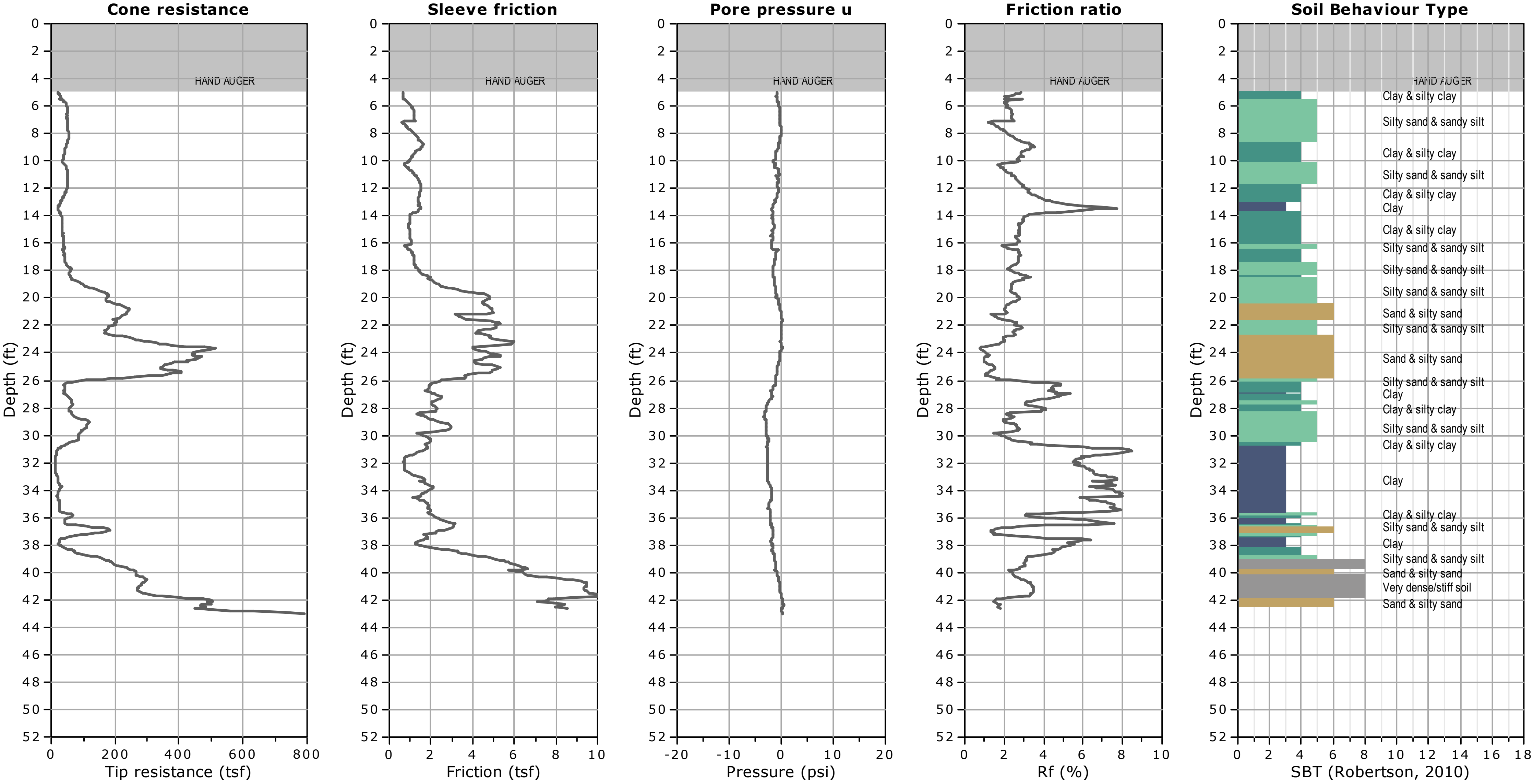
714-901-7270
steve@kehoetesting.com
www.kehoetesting.com

Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-1A
Total depth: 42.99 ft, Date: 4/29/2020



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714-901-7270
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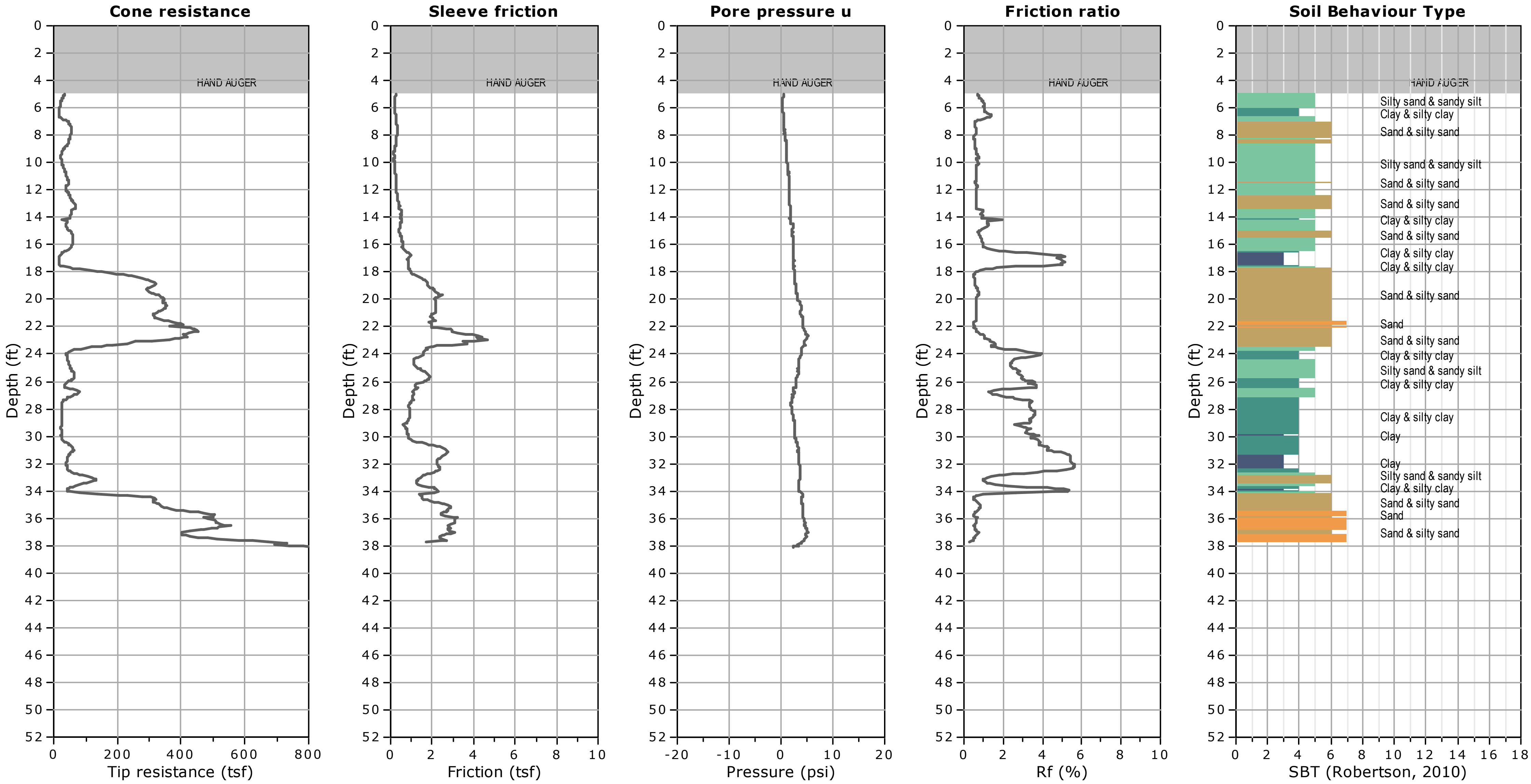
www.kehoetesting.com

Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-2
Total depth: 38.13 ft, Date: 4/30/2020



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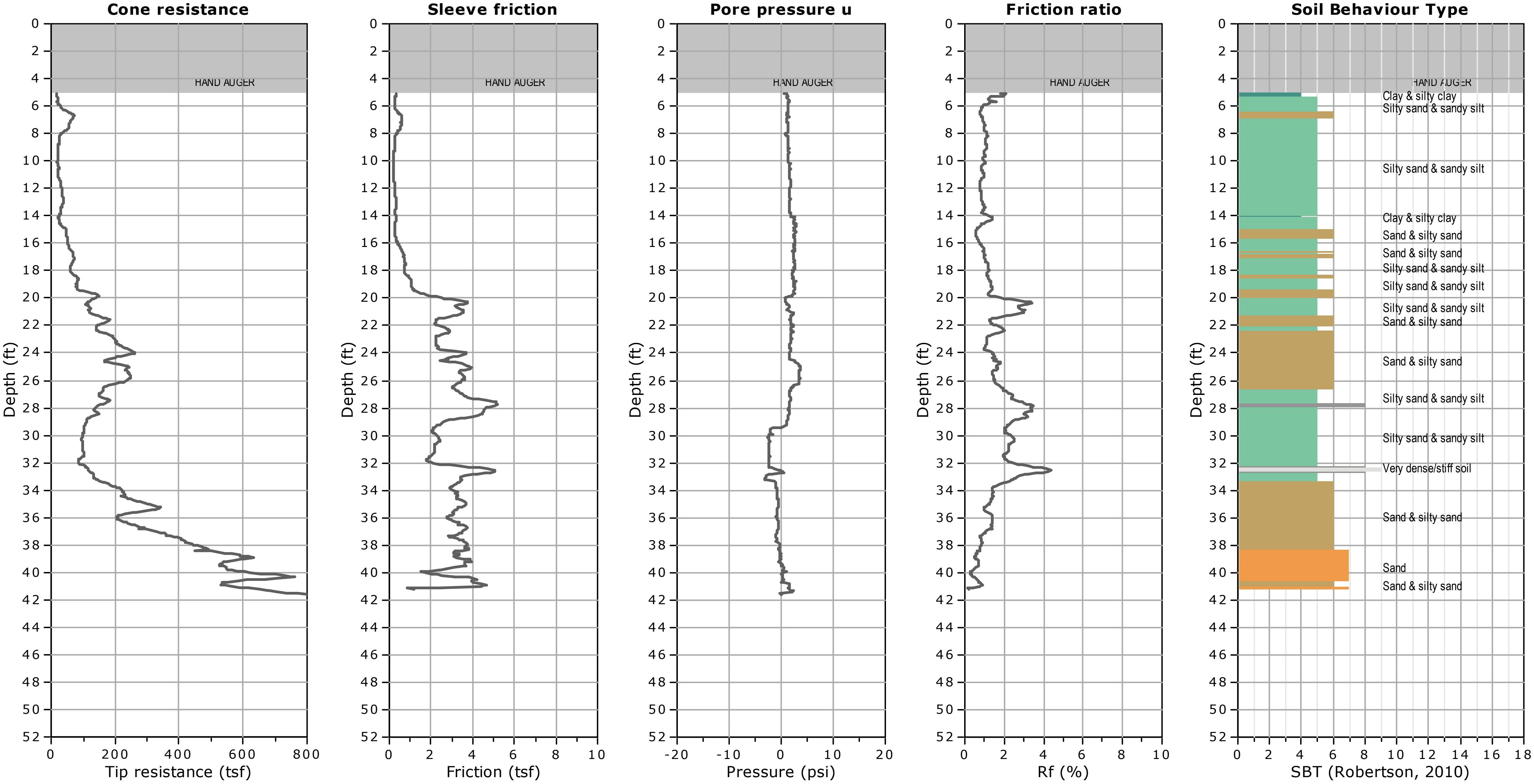
www.kehoetesting.com

Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-3
Total depth: 41.61 ft, Date: 4/30/2020



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steve@kehoetesting.com
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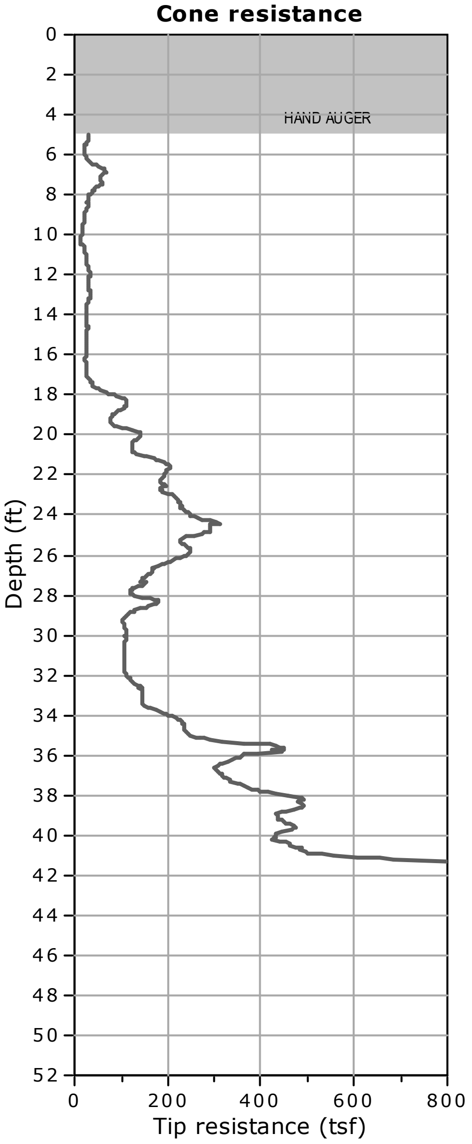
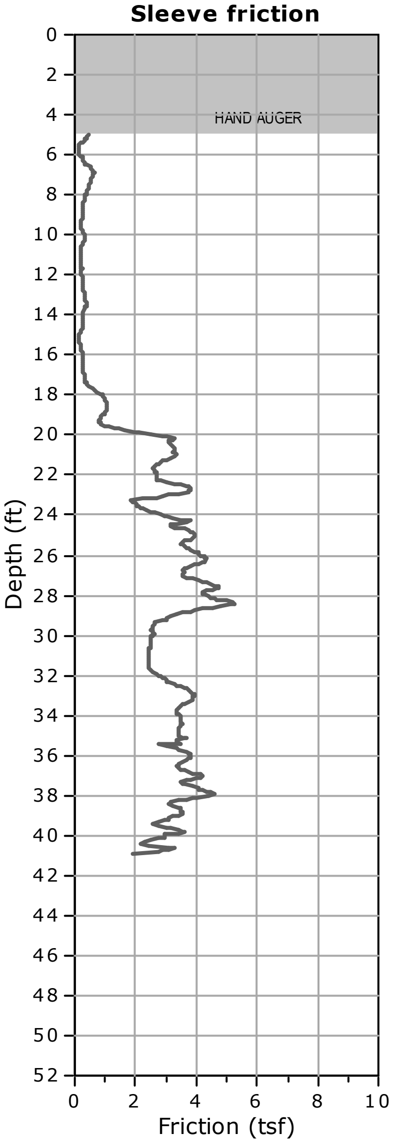
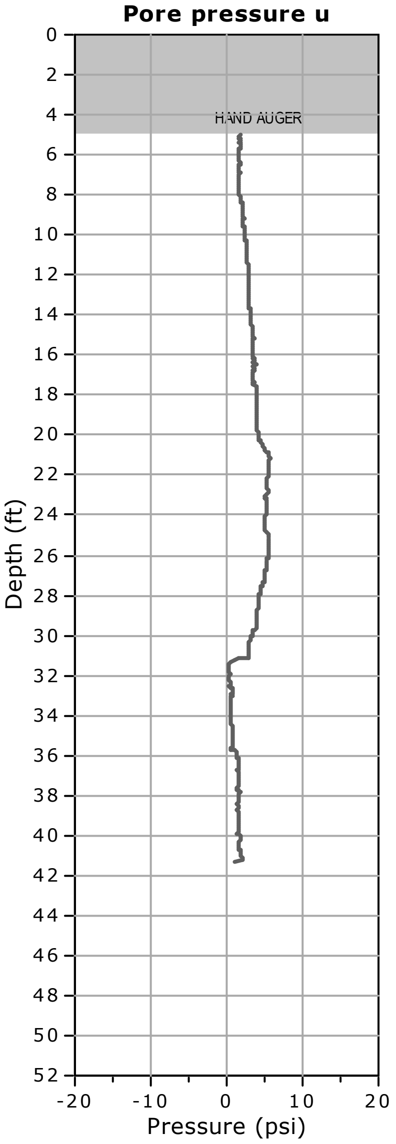
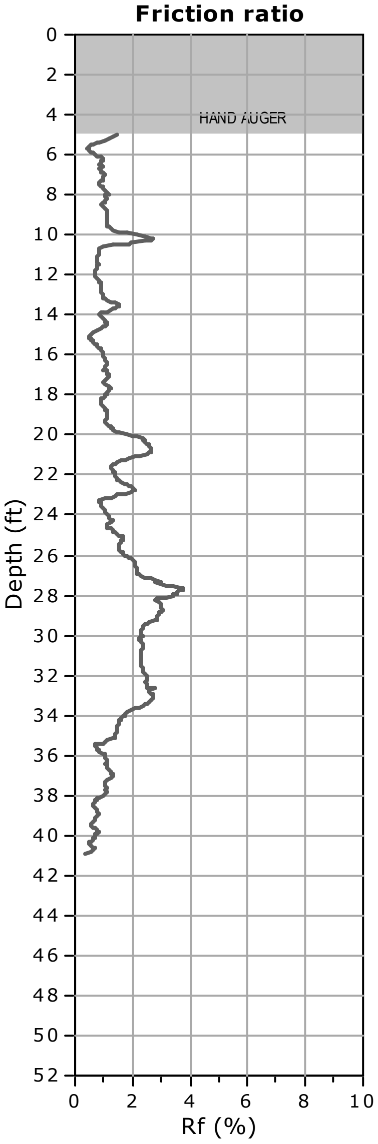
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

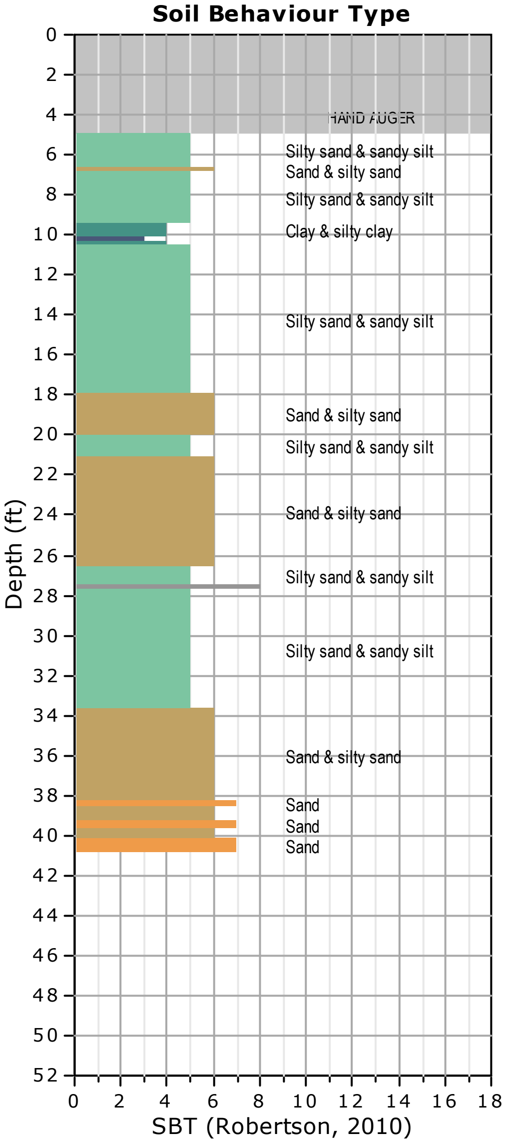
NH-CPT-3A
Total depth: 41.28 ft, Date: 4/30/2020











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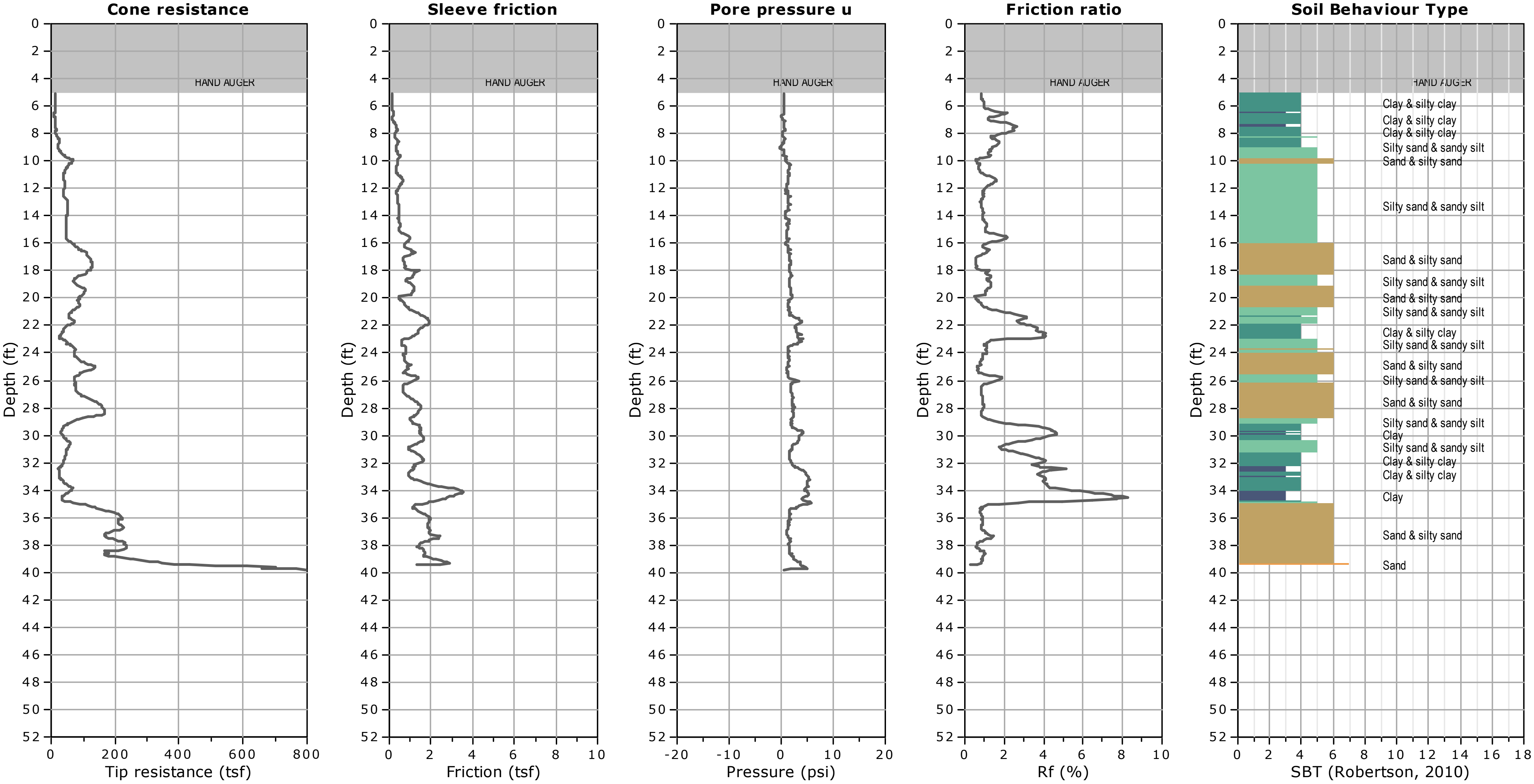
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

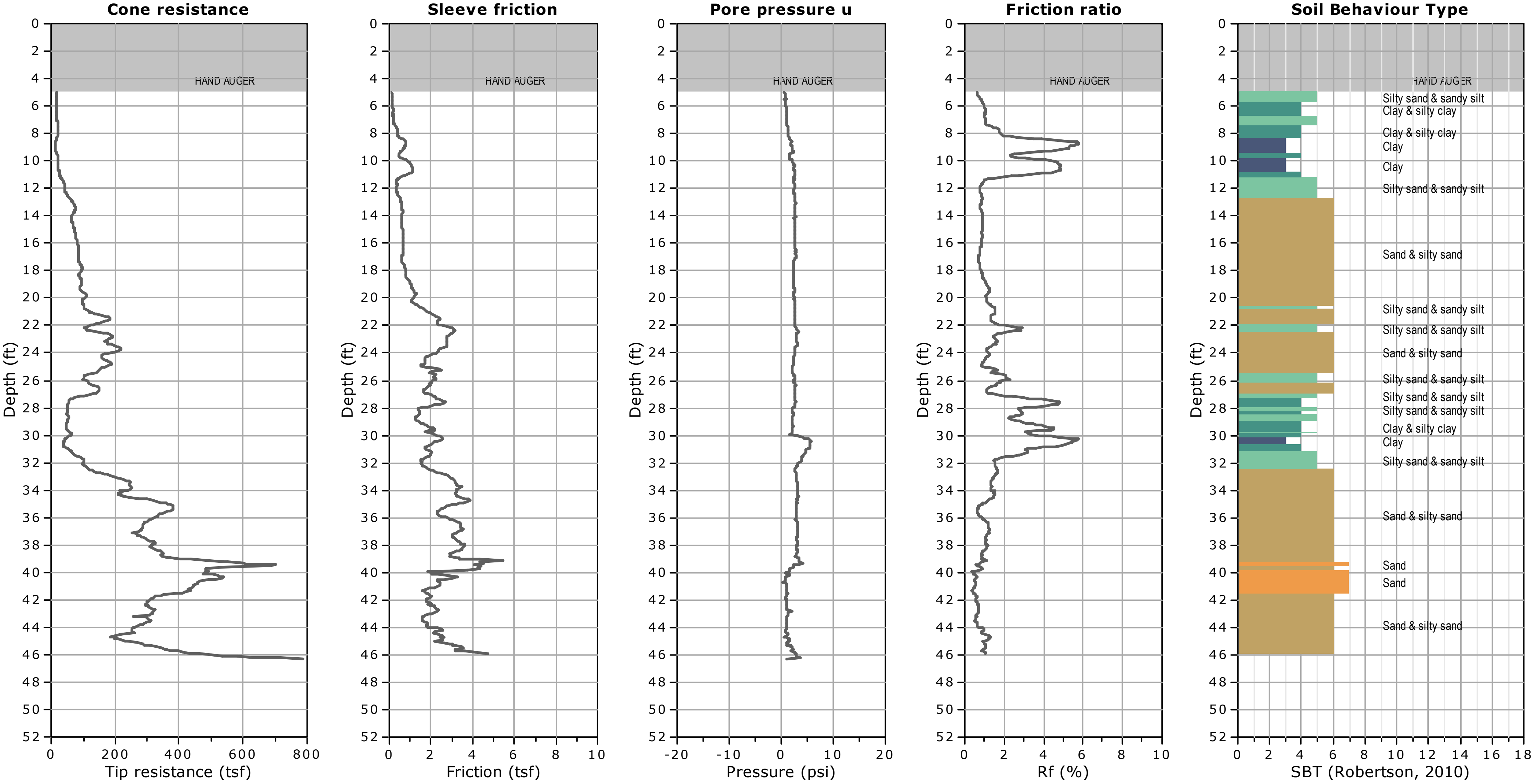
NH-CPT-4
Total depth: 39.84 ft, Date: 4/30/2020



Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-5

Total depth: 46.33 ft, Date: 4/30/2020



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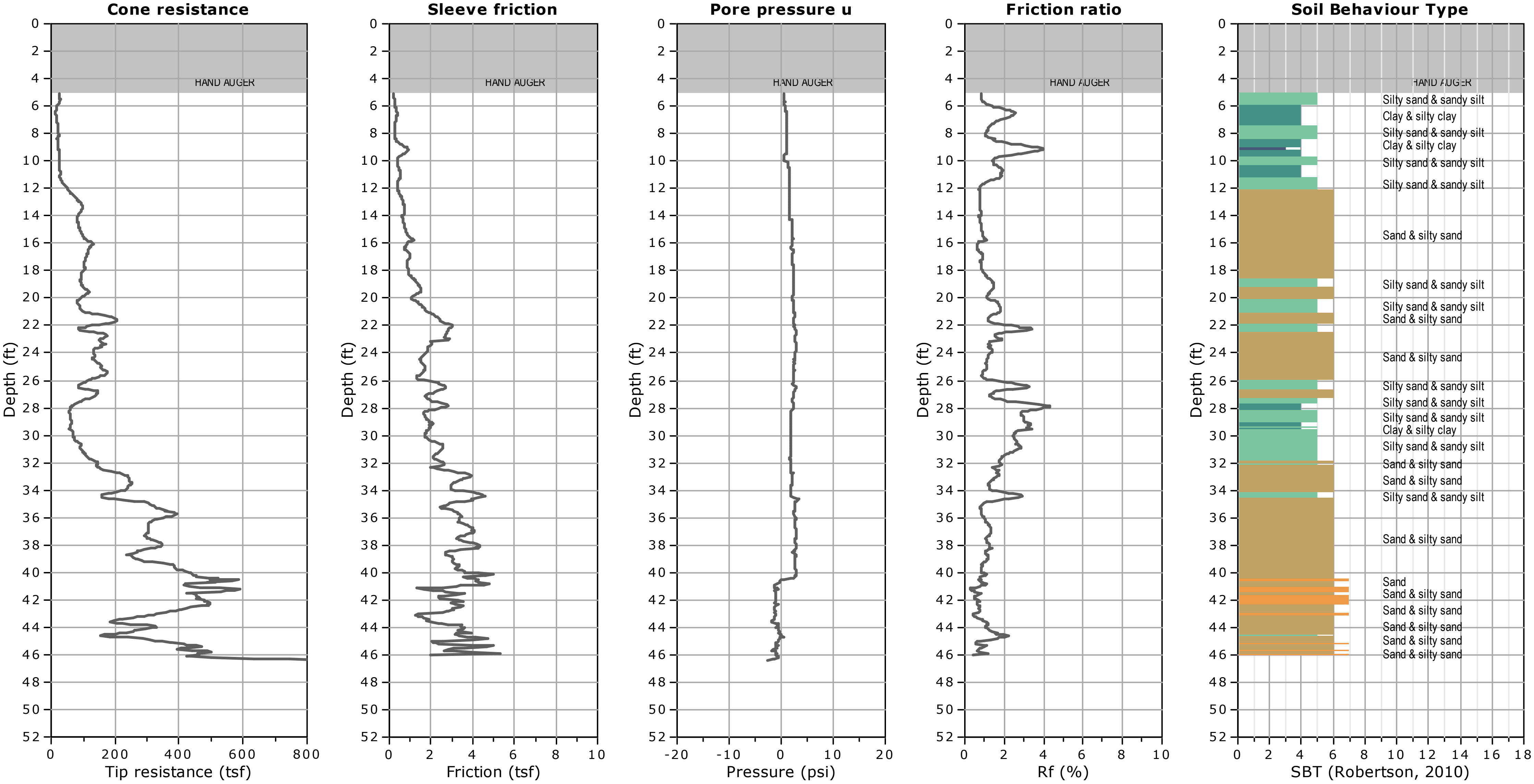
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-5A
Total depth: 46.40 ft, Date: 4/30/2020



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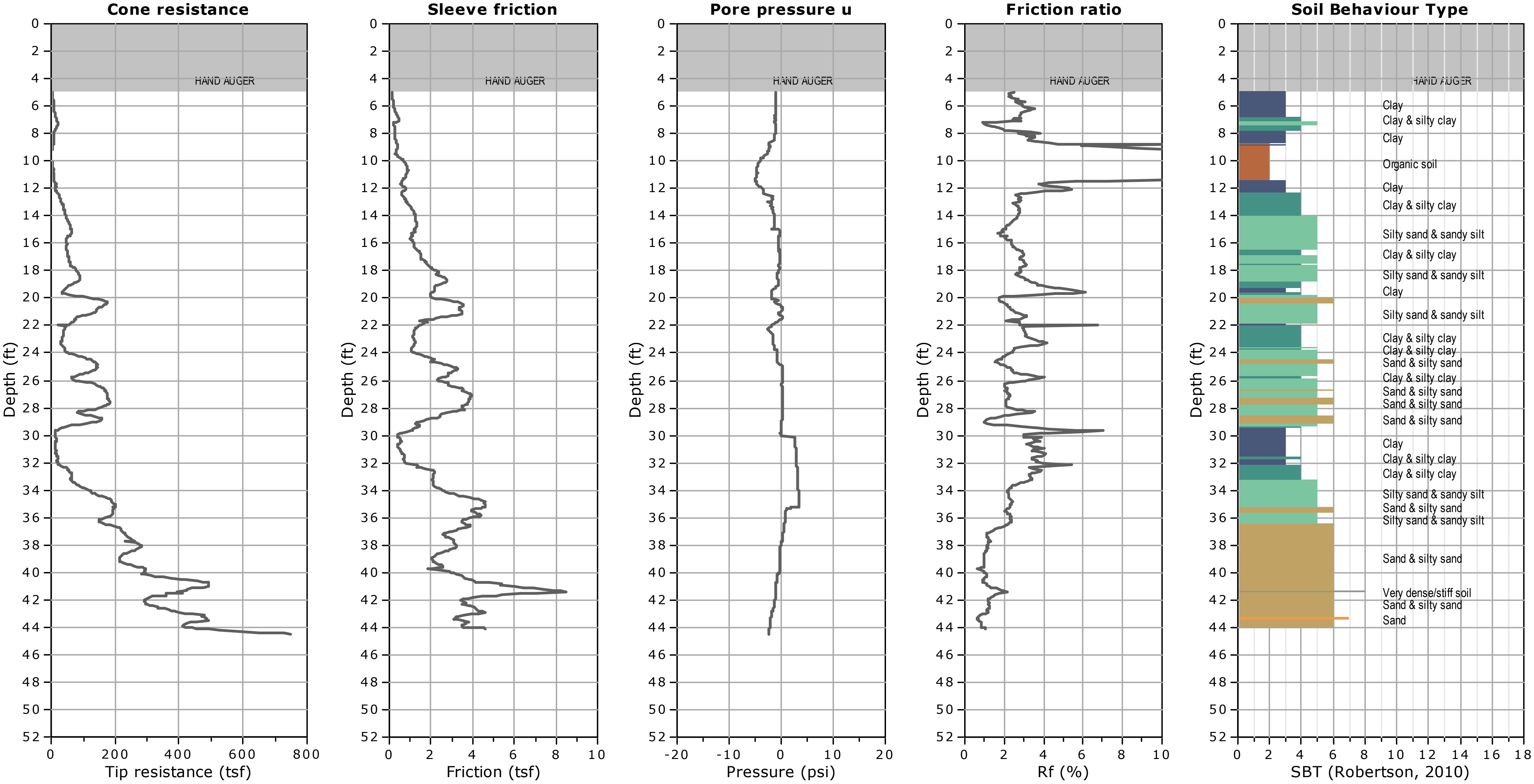
Project: Tetra Tech / N. Hollywood Park

Location: N. Hollywood, CA

NH-CPT-6

Total depth: 44.49 ft, Date: 4/28/2020



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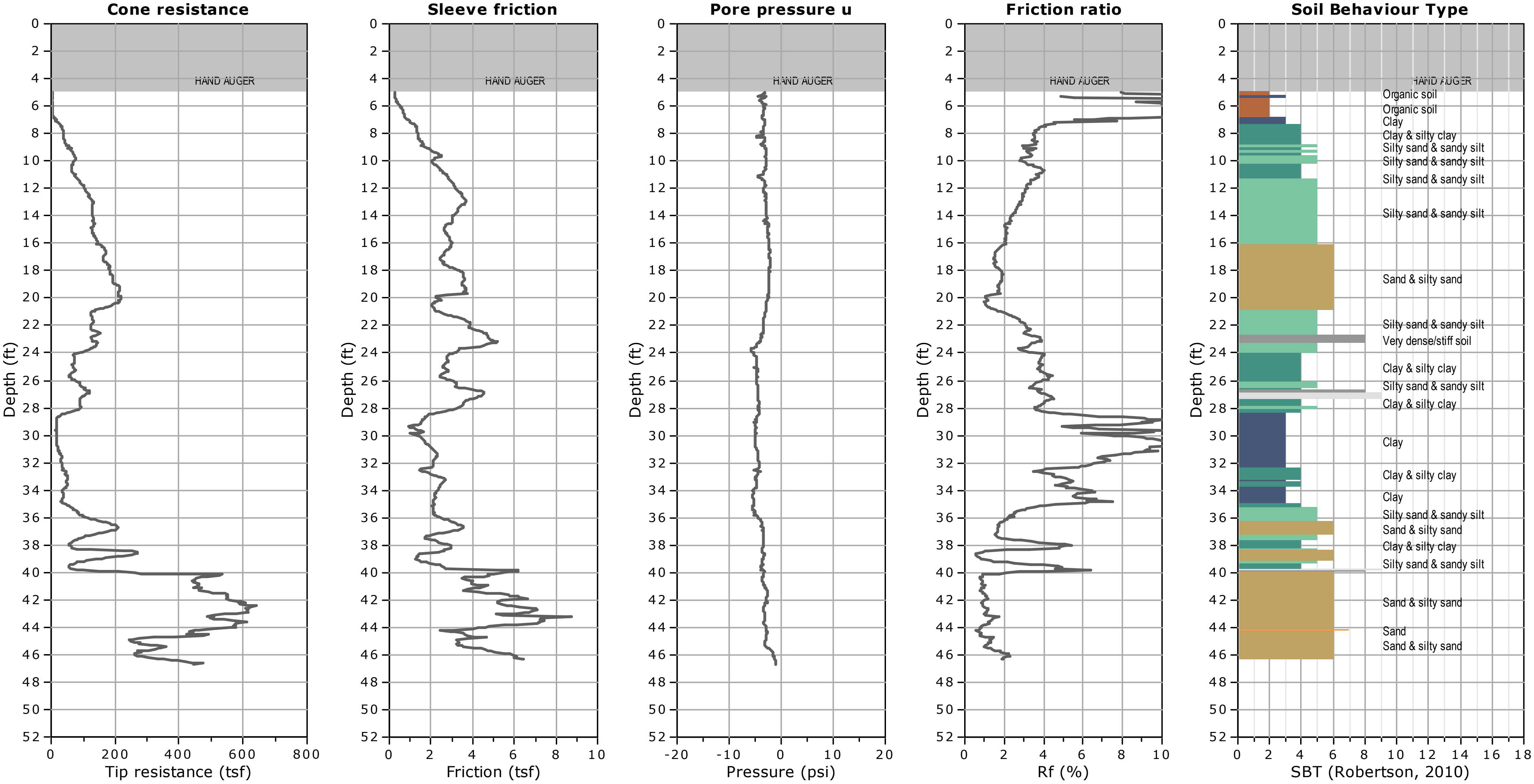
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-7
Total depth: 46.73 ft, Date: 4/28/2020



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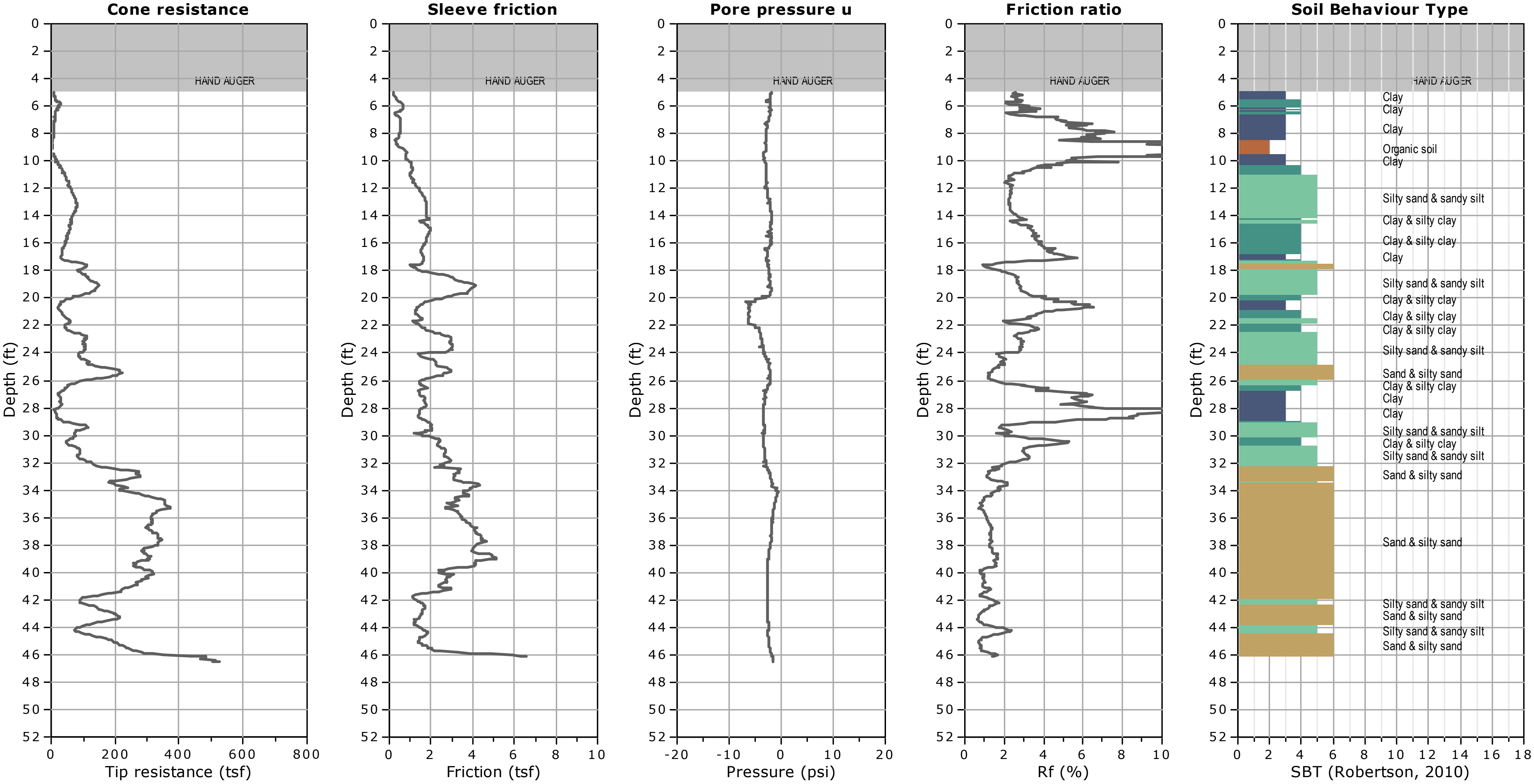
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-8
Total depth: 46.53 ft, Date: 4/28/2020



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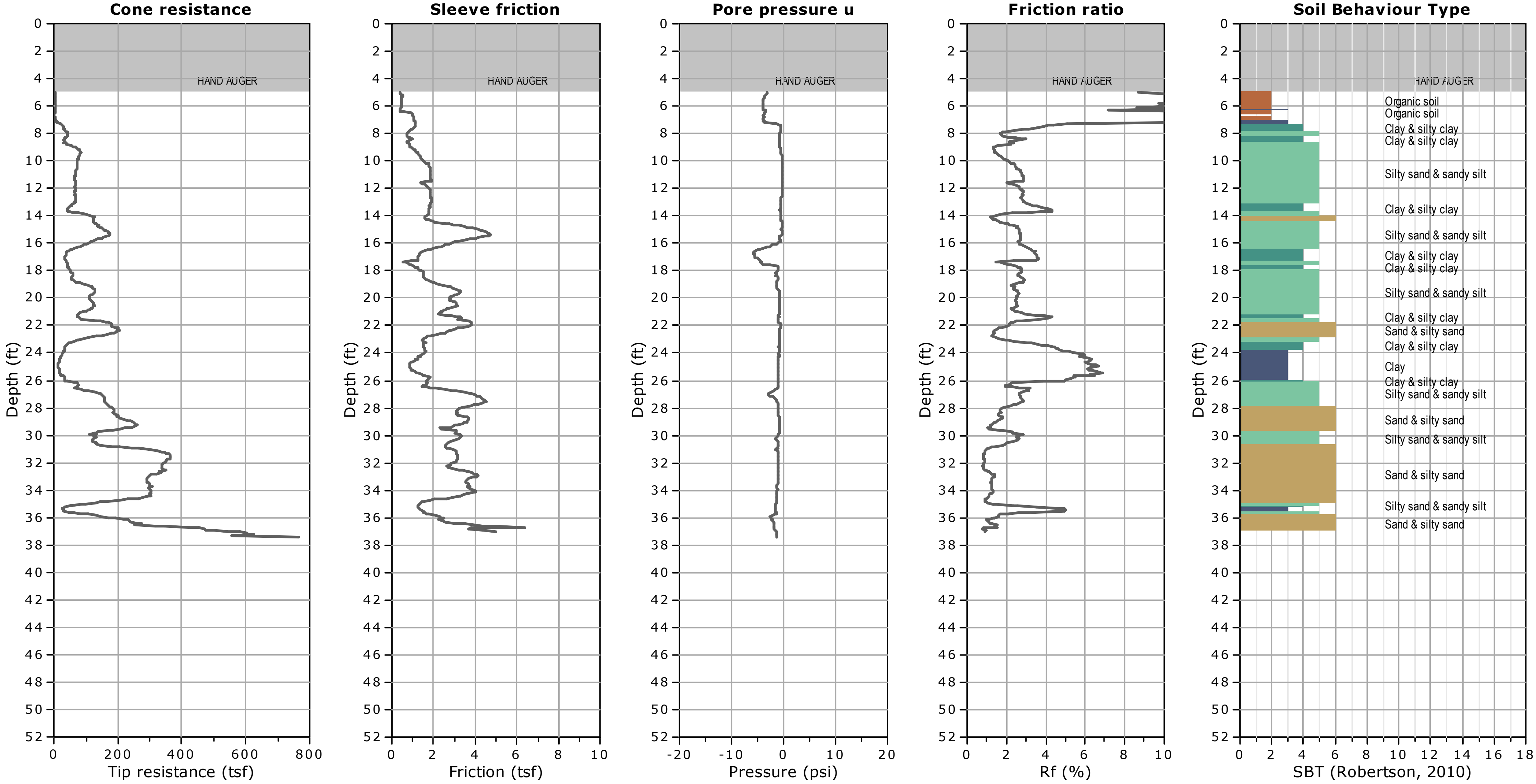
Project: Tetra Tech / N. Hollywood Park
Location: N. Hollywood, CA

NH-CPT-8A
Total depth: 37.40 ft, Date: 4/28/2020



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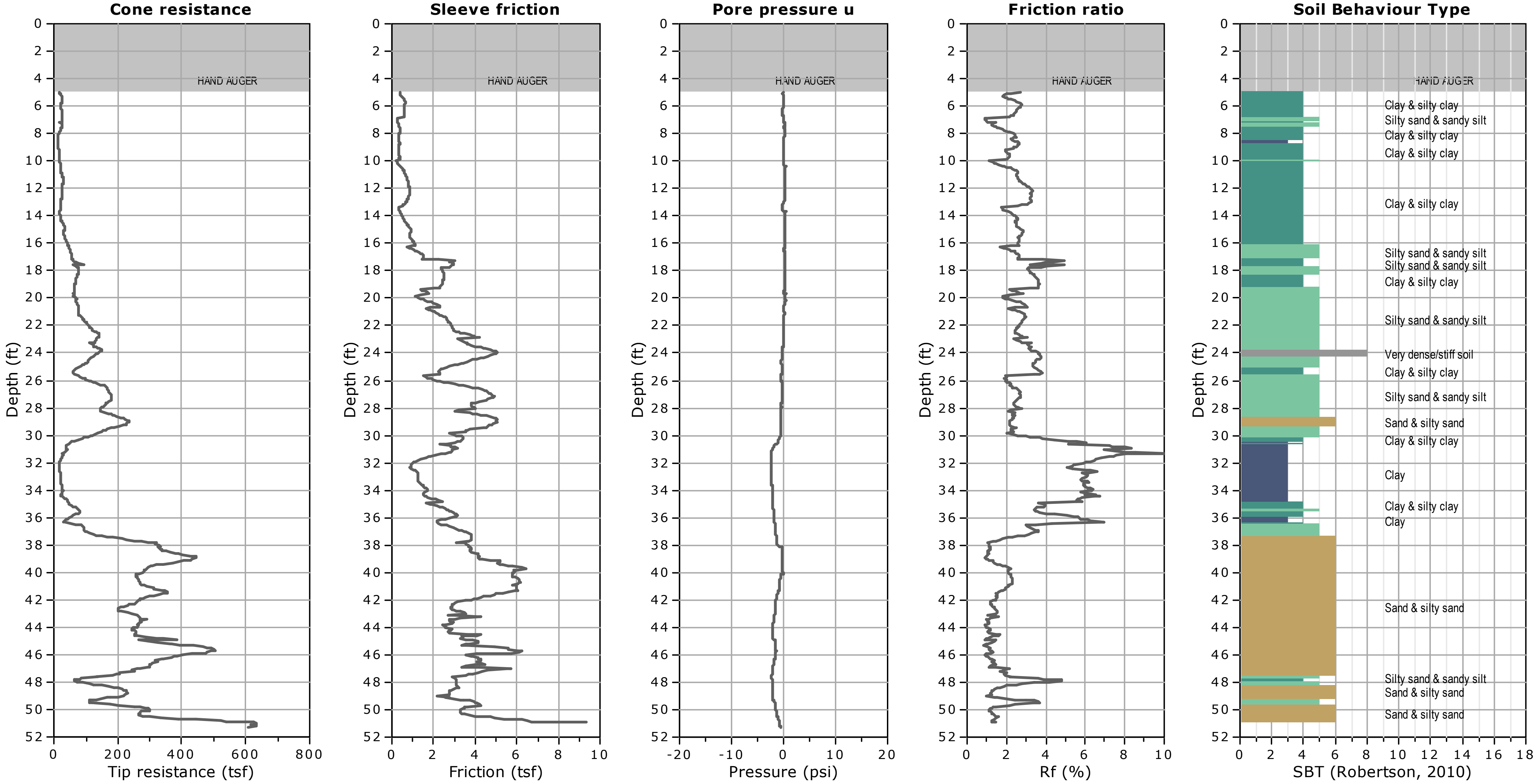
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-9
Total depth: 51.32 ft, Date: 4/29/2020



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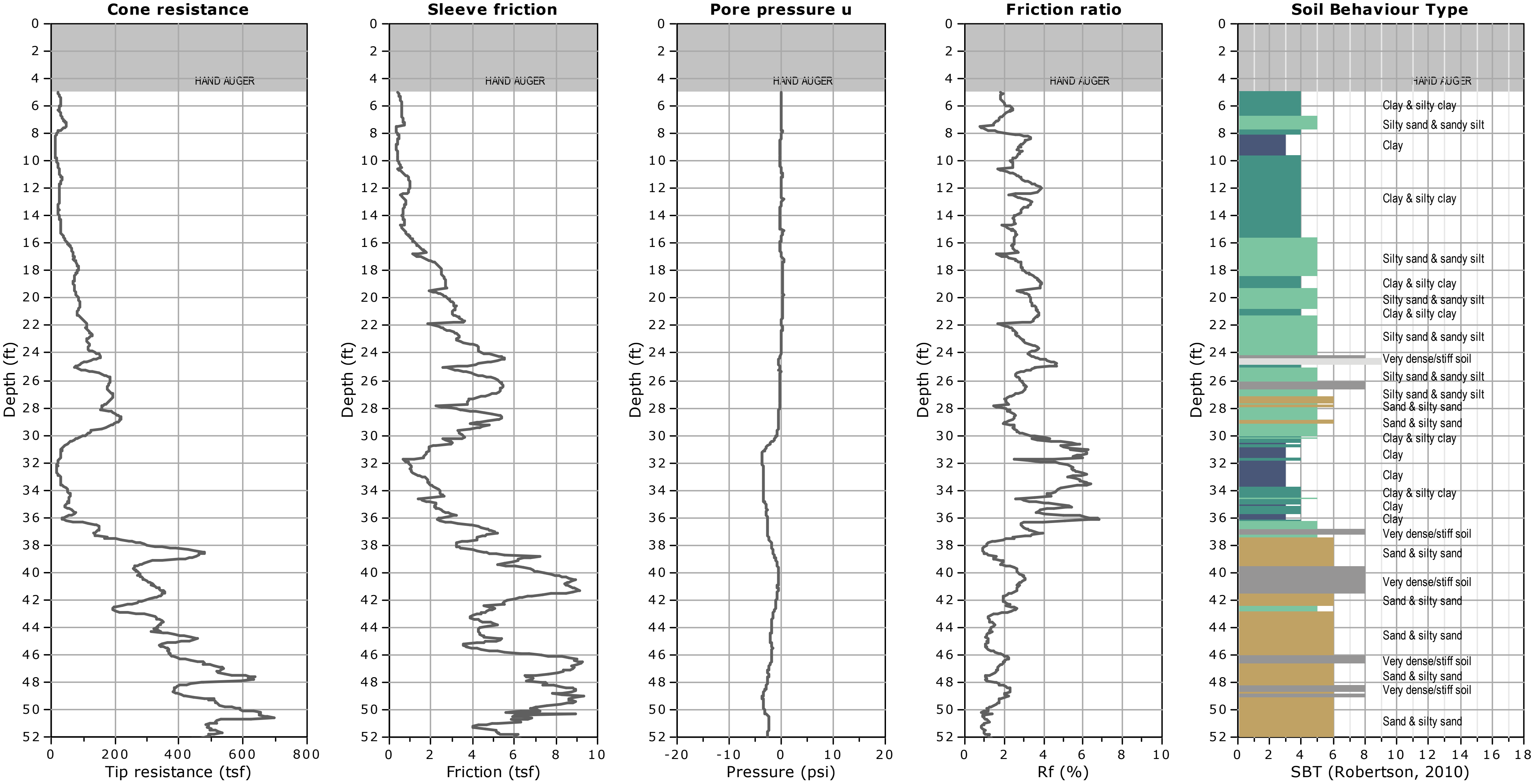
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-9A
Total depth: 52.76 ft, Date: 4/29/2020



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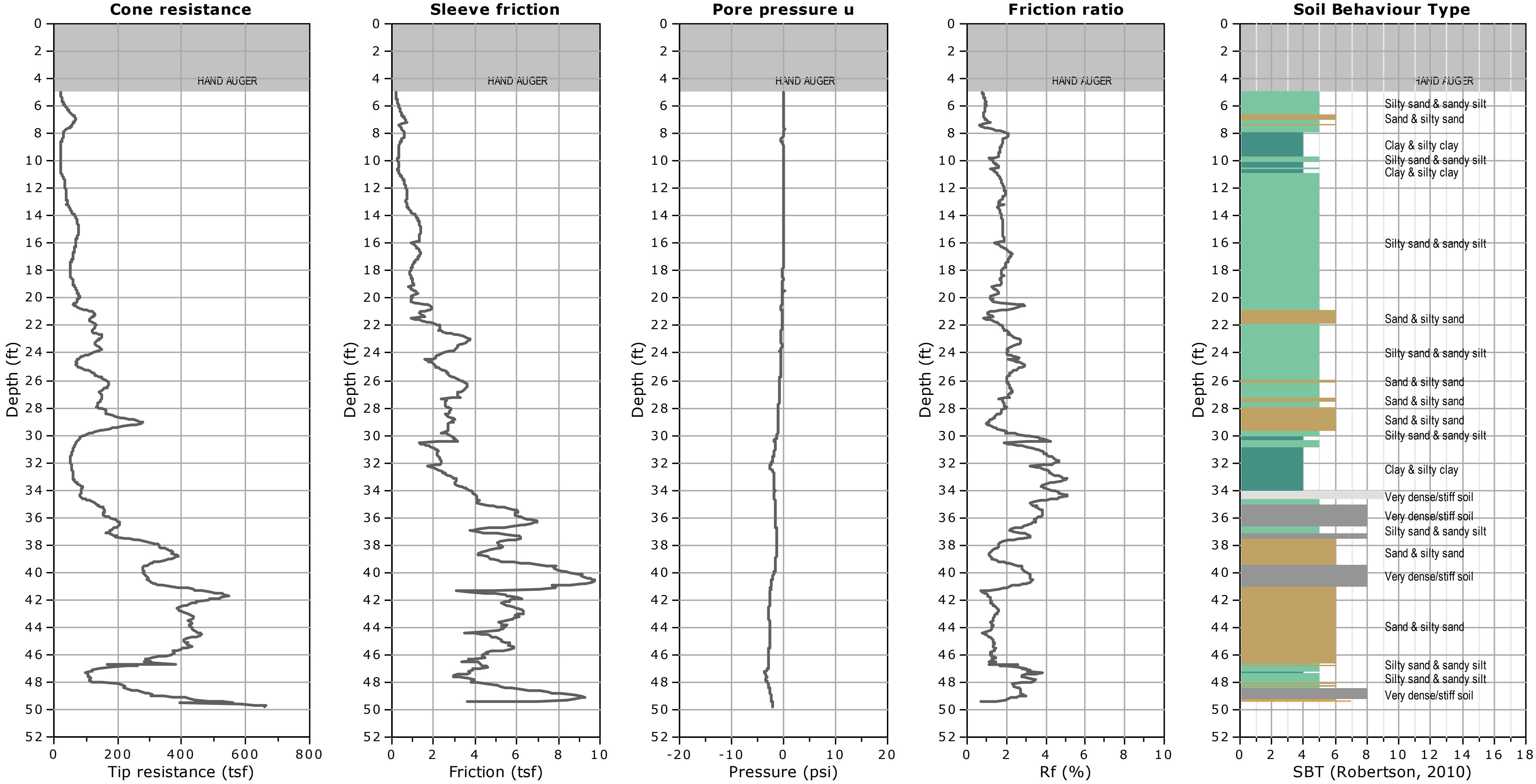
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-10
Total depth: 49.80 ft, Date: 4/29/2020



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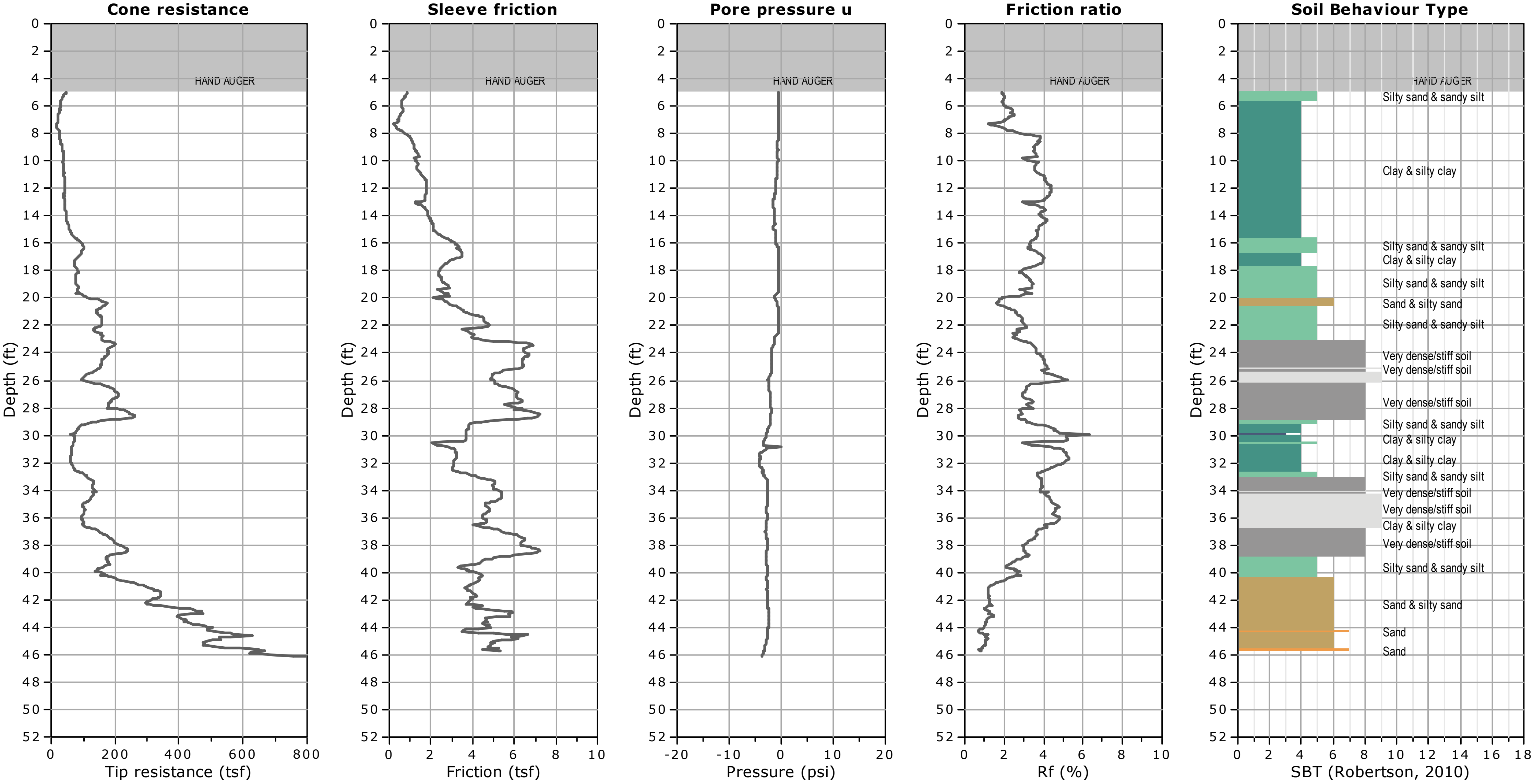
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-11
Total depth: 46.13 ft, Date: 4/28/2020



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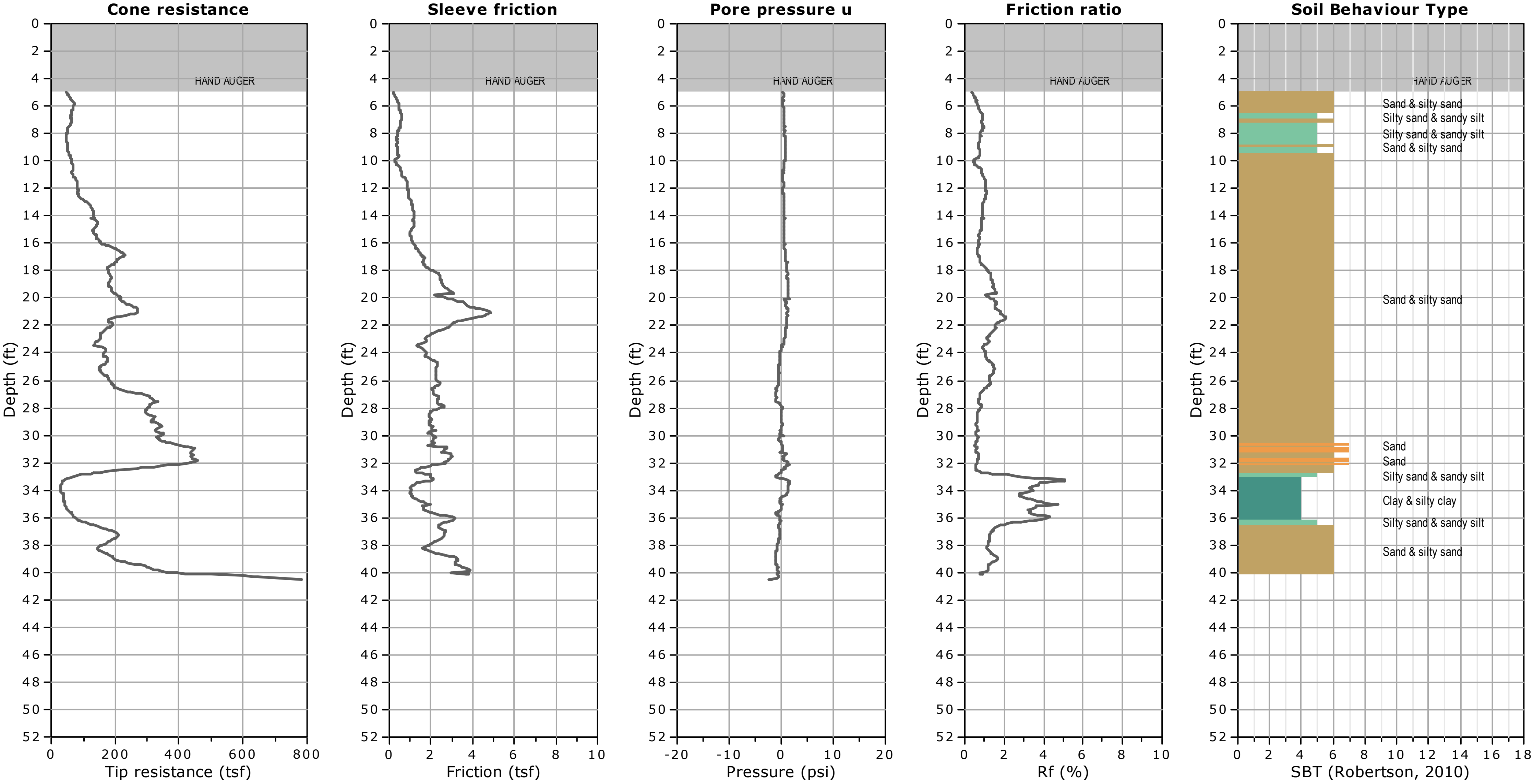
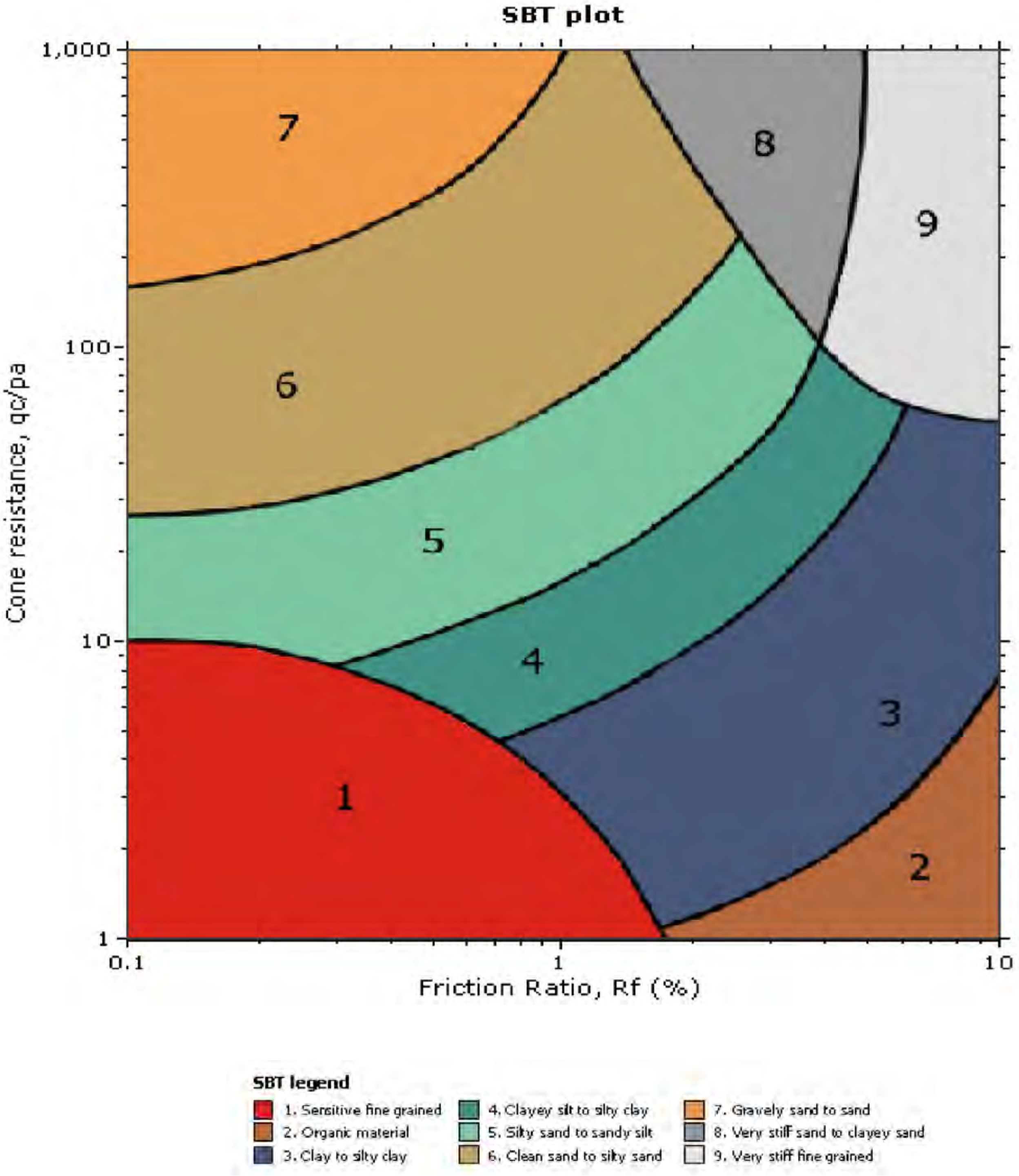
Project: **Tetra Tech / N. Hollywood Park**
Location: **N. Hollywood, CA**

NH-CPT-12
Total depth: 40.56 ft, Date: 4/30/2020




SBT plot
1,000
100
10
1
0.1
1
10
Cone resistance, qc/pa
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
N. Hollywood Park
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)
NH-CPT-1	10.10	9.10	9.32	14.24	654	
	20.05	19.05	19.15	29.00	661	666
	23.72	22.72	22.81	32.05	712	1198
NH-CPT-1A	30.05	29.05	29.12	37.80	770	1098
	40.12	39.12	39.17	49.12	797	888
	42.91	41.91	41.96	51.72	811	1072
NH-CPT-2	10.04	9.04	9.26	16.04	577	
	20.08	19.08	19.18	30.72	624	676
	30.02	29.02	29.09	43.56	668	771
	38.09	37.09	37.14	51.04	728	1077
NH-CPT-3	10.07	9.07	9.29	15.52	598	
	20.01	19.01	19.11	28.80	664	740
	30.02	29.02	29.09	38.20	761	1061
	39.99	38.99	39.04	47.32	825	1091
	41.56	40.56	40.61	48.72	834	1120
NH-CPT-4	10.01	9.01	9.23	17.12	539	
	20.08	19.08	19.18	28.86	665	848
	30.02	29.02	29.09	40.22	723	872
	39.83	38.83	38.88	50.20	775	981

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)

Tetra Tech
N. Hollywood Park
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)
NH-CPT-5	10.04	9.04	9.26	15.40	601	
	20.11	19.11	19.21	26.98	712	860
	30.02	29.02	29.09	39.08	744	816
	40.03	39.03	39.08	48.58	804	1052
	46.29	45.29	45.33	54.04	839	1145
NH-CPT-6	10.04	9.04	9.26	17.88	518	
	20.11	19.11	19.21	30.08	639	816
	30.09	29.09	29.16	41.76	698	851
	40.03	39.03	39.08	53.74	727	828
	44.46	43.46	43.51	57.18	761	1286
NH-CPT-7	10.07	9.07	9.29	18.00	516	
	20.08	19.08	19.18	28.28	678	963
	30.15	29.15	29.22	39.40	742	902
	40.09	39.09	39.14	48.48	807	1093
	46.69	45.69	45.73	54.28	843	1137
NH-CPT-8	10.04	9.04	9.26	20.00	463	
	20.05	19.05	19.15	33.40	573	739
	30.12	29.12	29.19	45.16	646	853
	40.06	39.06	39.11	55.00	711	1008
	46.52	45.52	45.56	61.12	745	1054

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)

Tetra Tech
N. Hollywood Park
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)
NH-CPT-9	10.37	9.37	9.58	17.24	556	
	20.14	19.14	19.24	31.24	616	690
	30.12	29.12	29.19	42.08	694	917
	40.09	39.09	39.14	54.68	716	790
	50.07	49.07	49.11	62.50	786	1275
	51.28	50.28	50.32	63.50	792	1209
NH-CPT-10	10.04	9.04	9.26	16.04	577	
	20.05	19.05	19.15	29.64	646	728
	30.35	29.35	29.42	40.16	733	976
	39.99	38.99	39.04	50.40	775	940
	49.51	48.51	48.55	59.72	813	1020
NH-CPT-11	10.07	9.07	9.29	13.58	684	
	20.21	19.21	19.31	24.50	788	918
	30.18	29.18	29.25	35.64	821	892
	40.12	39.12	39.17	43.88	893	1204
	46.10	45.10	45.14	49.12	919	1140
NH-CPT-12	10.04	9.04	9.26	13.60	681	
	20.01	19.01	19.11	23.64	809	982
	30.02	29.02	29.09	34.88	834	887
	40.06	39.06	39.11	44.00	889	1099

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 North Hollywood Park Stormwater Capture
Project Number: 200-20043-20001-01(LA0590B)
Date: 4/10/20, 04/21/20 - 4/27/2020
Sample ID:
Sampled:

Date Tested: 5/13/2020 - 05/18/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Fine grained, Moist, Dark Brown	(SM-ML) Sandy Silt, Fine grained, Moist, Dark Brown	(SM-ML) Sandy Silt, Fine grained, Moist, Dark Brown	(SM-ML) Sandy Silt, Fine grained, Moist, Dark Brown	(SM-ML) Sandy Silt, Fine grained, Moist, Dark Brown	(SM-ML) Sandy Silt, Fine grained, Moist, Dark Brown	(SC-CL) Sandy Clay, Moist, Dark Brown	(MH) Silt	
BORING #	NH-HSA-1	NH-HSA-1	NH-HSA-1	NH-HSA-1	NH-HSA-2	NH-HSA-2	NH-HSA-2	NH-HSA-2	
DEPTH (ft)	5-6.5	10-11.5	15-16.5	30-31.5	5-6.5	10-11.5	25-26.5	30.5-31	
SAMPLE #	S-1	S-2	S-3	S-6	S-1	S-2	S-5	S-6	
HEIGHT OF SAMPLE	SPT	SPT	SPT	SPT	SPT	SPT	SPT	SPT	
WEIGHT OF SAMPLE (g)	SPT	SPT	SPT	SPT	SPT	SPT	SPT	SPT	
TARE (g)	196.3	---	93.5	82.4	85.6	82.3	96.2	---	
TARE + SAMPLE WET (g)	700.9	---	322.4	544.0	964.1	348.4	334.2	---	
TARE + SAMPLE DRY (g)	633.7	---	299.7	496.5	832.80	333.40	295.2	---	
MOISTURE CONTENT (%)	15.4	---	11.0	11.5	17.6	6.0	19.6	---	
DRY DENSITY (pcf)	NT	---	NT	NT	NT	NT	NT	---	
PASSING #200 (%)	49	NT	53	47	54	22	71	NT	
PLASTIC INDEX (%)	**NP**	**NP**	NT	**NP**	NT	NT	NT	3.0	
SAND EQUIVALENT	NT	NT	NT	NT	18	NT	NT	NT	

NT: Not Tested | NP: Non Plastic

CALIFORNIA TESTING & INSPECTIONS

Geotechnical and Construction Materials Testing Laboratory

Project: TOS-25 North Hollywood Park Stormwater Capture
Project Number: 200-20043-20001-01(LA0590B)
Date: 4/10/20, 04/21/20 - 4/27/2020
Sample ID:
Sampled:

Date Tested: 5/13/2020 - 05/18/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM-ML) Silty Sand, Fine grained, Moist, Dark Brown	(SM) Silty Sand, Fine, Moist, Lt. Brown	(SM) Silty Sand, Fine, Moist, Dark Brown	(CL-ML) Silt, Dark Brown	(SM) Silty Sand, Fine, Moist, Lt Brown	(MH) Silt, Dark Brown	(MH) Silt, Fine, Moist, Lt Grayish Brown	(SC) Clayey Sand, Stiff, Moist, Dark Brown	(ML) Silt, Dark Brown
BORING #	NH-HSA-3	NH-HSA-3	NH-HSA-3	NH-HSA-3	NH-HSA-3	NH-HSA-3	NH-HSA-3	NH-HSA-3	NH-HSA-3
DEPTH (ft)	5-6.5	15-16.5	25.5-26	30-31.5	35-36.5	55-56.5	75-76.5	80.5-81	81-81.5
SAMPLE #	S-1	S-3	S-5A	S-6	S-7	S-11	S-15	S-16A	S-16B
HEIGHT OF SAMPLE	SPT	SPT	5	SPT	SPT	SPT	SPT	5	6
WEIGHT OF SAMPLE (g)	SPT	SPT	939.4	SPT	SPT	SPT	SPT	1022.6	1273.5
TARE (g)	99.1	98.2	106	---	79.3	---	83.9	196.2	66
TARE + SAMPLE WET (g)	518.7	360.8	393.2	---	379.3	---	329.3	473.3	445.8
TARE + SAMPLE DRY (g)	466.3	351.6	379.2	---	364.70	---	276.7	434.6	399.8
MOISTURE CONTENT (%)	14.3	3.6	5.1	---	5.1	---	27.3	16.2	13.8
DRY DENSITY (pcf)	NT	NT	113.3	---	NT	---	NT	114.3	122.4
PASSING #200 (%)	35	13	39	NT	36	NT	80	44	NT
PLASTIC INDEX (%)	NT	NT	NT	**4.7**	NT	**2.2**	NT	NT	**NP**
SAND EQUIVALENT	NT	NT	NT	NT	NT	NT	NT	NT	NT

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CALIFORNIA TESTING & INSPECTIONS

Geotechnical and Construction Materials Testing Laboratory

Project: TOS-25 North Hollywood Park Stormwater Capture
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Sample ID:
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Date Tested: 5/13/2020 - 05/18/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Lt. Grayish Brown	(ML) Sandy Silt, Fine, Moist, Dark Brown	(ML) Sandy Silt, Fine, Moist, Dark Brown	(ML) Sandy Silt, Fine, Moist, Dark Gray	(SM) Silty Sand at top (CL) Clay at bottom	(ML) Sandy Silt, Fine, Moist, Brown
BORING #	NH-HSA-4	NH-HSA-4	NH-HSA-4	NH-HSA-4	NH-HSA-4	NH-HSA-4	NH-HSA-5	NH-HSA-5	NH-HSA-5
DEPTH (ft)	1-5	5-6.5	10-11.5	20-21.5	26-26.5	30-31.5	5-6.5	15-16	30-31.5
SAMPLE #	B-1	S-1	S-2	S-4	S-5B	S-6	S-1	SH-1	S-5
HEIGHT OF SAMPLE	Bulk	SPT	SPT	SPT	SPT	SPT	SPT	10"	SPT
WEIGHT OF SAMPLE (g)	Bulk	SPT	SPT	SPT	SPT	SPT	SPT	2858.8	SPT
TARE (g)	---	119.3	82.9	87.5	83.8	100.7	88.9	65.7	87.6
TARE + SAMPLE WET (g)	---	432.3	651.6	424	322.3	398.5	571.1	279.5	412
TARE + SAMPLE DRY (g)	---	390.6	590.2	391.8	287.10	357.1	510.7	257	373.5
MOISTURE CONTENT (%)	---	15.4	12.1	10.6	17.3	16.1	14.3	11.8	13.5
DRY DENSITY (pcf)	---	NT	NT	NT	NT	NT	NT	106.3	NT
PASSING #200 (%)	NT	37	NT	40	59	64	54	NT	64
PLASTIC INDEX (%)	NT	NT	**NP**	NT	NT	NT	**NP**	NT	NT
SAND EQUIVALENT	34	NT	NT	NT	NT	NT	NT	NT	NT

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Sample ID:
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Date Tested: 5/13/2020 - 05/18/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM-SP) Silty Sand, Fine, Moist, Lt. Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM-ML) Sandy Silt, Fine, Moist, Brown	(SM-ML) Sandy Silt,Stiff, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Lt. Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM-ML) Sandy Silt, Dense, Moist, Brown	(SM) Silty Sand, Fine, Moist, Lt. Brown	
BORING #	NH-HSA-6	NH-HSA-6	NH-HSA-6	NH-HSA-6	NH-HSA-6	NH-HSA-7	NH-HSA-7	NH-HSA-7	
DEPTH (ft)	5-5.5	5.5-6	10-11.5	20-21	30-31.3	5-5.4	10-11	15-16.5	
SAMPLE #	S-1A	S-1B	S-2	SH-1	S-5A	S-1A	SH-1	S-2	
HEIGHT OF SAMPLE	SPT	SPT	SPT	SPT	SPT	SPT	9.5"	SPT	
WEIGHT OF SAMPLE (g)	SPT	SPT	SPT	SPT	SPT	SPT	2813.1	SPT	
TARE (g)	84.9	91.0	90.2	87.5	83.3	107.0	68.3	96.3	
TARE + SAMPLE WET (g)	312.1	316.7	324.2	424	312	314.6	268.9	337.6	
TARE + SAMPLE DRY (g)	297.4	290.2	288.4	391.8	308.50	296.8	242.8	325.5	
MOISTURE CONTENT (%)	6.9	13.3	18.1	10.6	1.6	9.4	15.0	5.3	
DRY DENSITY (pcf)	NT	NT	NT	110.1	NT	NT	106.4	NT	
PASSING #200 (%)	8.1	42	62	NT	3.8	34	NT	41	
PLASTIC INDEX (%)	NT	NT	NT	NT	NT	NT	NT	NT	
SAND EQUIVALENT	NT	NT	NT	NT	NT	NT	NT	NT	

NT: Not Tested | NP: Non Plastic

DRAFT - FOR DISCUSSION PURPOSES ONLY

CALIFORNIA TESTING & INSPECTIONS

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Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Fine, Moist, Brown	(SM-SP) Silty Sand, Medium granined, Moist, Brown	(MH) Silty w/Sand, Fine, Moits, Dark Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Dark Brown	(SM) Silty Sand, Fine, Moist, Dark Brown	(ML) Silt w/Sand, Fine, Moist, Dark Brown	(SM) Silty Sand, Fine, Moist, Dark Brown	(ML) Silt w/Sand, Fine, Moist, Dark Brown
BORING #	NH-HSA-8	NH-HSA-8	NH-HSA-8	NH-HSA-9	NH-HSA-9	NH-HSA-9	NH-HSA-9	NH-HSA-10	NH-HSA-10
DEPTH (ft)	1-5	5-5.3	10-11.5	1-5	5-6.5	10-11.5	30.7-31.5	5-6.5	10-11.5
SAMPLE #	B-1	S-1A	S-2	B-1	S-1	S-2	S-5B	S-1	S-2
HEIGHT OF SAMPLE	Bulk	SPT	SPT	Bulk	SPT	SPT	SPT	SPT	SPT
WEIGHT OF SAMPLE (g)	Bulk	SPT	SPT	Bulk	SPT	SPT	SPT	SPT	SPT
TARE (g)	----	91.9	82.4	----	88.0	84.6	88.0	92.2	86.5
TARE + SAMPLE WET (g)	----	266.4	474.4	----	465.5	289.2	294.9	316.4	299.8
TARE + SAMPLE DRY (g)	----	255.8	403.5	----	421.40	271.8	271.8	300.4	283.0
MOISTURE CONTENT (%)	----	6.5	22.1	----	13.2	9.3	12.6	7.7	8.5
DRY DENSITY (pcf)	NT	NT	NT	NT	NT	NT	NT	NT	NT
PASSING #200 (%)	NT	8.8	68	NT	42	48	53	14	52
PLASTIC INDEX (%)	NT	NT	**4.0**	NT	**NP**	NT	NT	NT	NT
SAND EQUIVALENT	32	NT	NT	23	NT	NT	NT	NT	NT

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CALIFORNIA TESTING & INSPECTIONS

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Date Tested: 5/13/2020 - 05/18/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Fine, Moist, Lt Brown	(ML) Sandy Silt, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM-ML) Sandy Silt, Fine, Moist, Dark Brown	(MH) Silt, Dark Brown	(ML) Sandy Silt, Fine, Moist, Few 3/8" gravel, Brown	(ML) Silt, Dark Brown	(SM) Silty Sand, Fine, Moist, Reddish Brown	
BORING #	NH-HSA-10	NH-HSA-10	NH-HSA-11	NH-HSA-11	NH-HSA-11	NH-HSA-11	NH-HSA-12A	NH-HSA-14	
DEPTH (ft)	25-26.5	30.5-31.5	1-5	10-11.5	15.5-16	30-31.5	10-11.5	5-6.5	
SAMPLE #	S-5	S-6B	B-1	S-2	S-3A	S-6	S-1	S-1	
HEIGHT OF SAMPLE	SPT	SPT	Bulk	SPT	SPT	SPT	SPT	SPT	
WEIGHT OF SAMPLE (g)	SPT	SPT	Bulk	SPT	SPT	SPT	SPT	SPT	
TARE (g)	81.6	79.7	----	85.3	----	125.1	----	99.2	
TARE + SAMPLE WET (g)	311.3	310.5	----	411.0	----	562.3	----	406.7	
TARE + SAMPLE DRY (g)	303.2	291.8	----	380.6	----	523.8	----	375.1	
MOISTURE CONTENT (%)	3.7	8.8	----	10.3	----	9.7	----	11.5	
DRY DENSITY (pcf)	NT	NT	NT	NT	NT	NT	NT	NT	
PASSING #200 (%)	41	60	NT	55	29	60	NT	37	
PLASTIC INDEX (%)	NT	NT	NT	NT	**4.0**	NT	**NP**	NT	
SAND EQUIVALENT	NT	NT	14	NT	NT	NT	NT	NT	

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Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Fine, Moist, Brown	(SM-ML) Sandy Silt, Fine, Moist, Brown	(SM-ML) Sandy Silt, Fine, Moist, Lt. Brown	(SM-ML) Sandy Silt, Fine, Moist, Dense, Lt Brown	(SM) Sity Sand, Fine, Moist, Brown	(SM) Silty Sand, Fine-medium coarse, Moist, Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Brown	(SM) Silty Sand, Medium Dense, Moist, Dark Brown
BORING #	NH-HSA-15	NH-HSA-15	NH-HSA-15	NH-HSA-15	NH-HSA-15	NH-HSA-16	NH-HSA-16	NH-HSA-16	NH-HSA-16
DEPTH (ft)	5-6.5	10-11.5	15-16.5	20.5-21	30-31.5	1-5	5-5.3	20-21.5	25-27.5
SAMPLE #	S-1	S-2	S-3	S-4A	S-6	B-1	S-1A	S-4	SH-1
HEIGHT OF SAMPLE	SPT	SPT	SPT	6	SPT	Bulk	SPT	SPT	26.5"
WEIGHT OF SAMPLE (g)	SPT	SPT	SPT	1035.4	SPT	Bulk	SPT	SPT	7155.8
TARE (g)	91.5	68.3	65.5	62.0	68.7	----	66.2	65.8	81.6
TARE + SAMPLE WET (g)	756.9	382.2	352.5	346.4	310.5	----	215.2	380.1	611.2
TARE + SAMPLE DRY (g)	701.4	354.8	333.0	327.2	294.7	----	203.5	344	559.2
MOISTURE CONTENT (%)	9.1	9.6	7.3	7.2	7.0	----	8.5	13.0	10.9
DRY DENSITY (pcf)	NT	NT	NT	99.3	NT	NT	NT	NT	101.4
PASSING #200 (%)	36	57	58	NT	37	NT	13	47	34
PLASTIC INDEX (%)	NT	NT	NT	NT	NT	NT	NT	NT	NT
SAND EQUIVALENT	18	NT	NT	NT	NT	27	NT	NT	NT

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Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Fine, Moist, Brown	(SM-SP) Fine Sand w/Silt, Moist, Lt Brown	(SM-SP) Fine Sand w/Silt, Moist, Lt Brown	(MH) Silt, Fine, Moist, Dark Brown	(MH) Silt, Fine, Moist, Dark Brown	(MH) Silt, Fine, Moist, Lt. Brown	(MH) Silt, Fine, Moist, Lt. Brown	(SM) Silty Sand, Fine, Moist, Brown	(MH) Sandy Silt, Fine, Moist, Grayish Brown
BORING #	NH-HSA-16	NH-HSA-16	NH-HSA-16	NH-HSA-17	NH-HSA-17	NH-HSA-17	NH-HSA-17	NH-HSA-18	NH-HSA-18
DEPTH (ft)	30.3-31.5	45-46.5	55.7-56.3	5.5-6.5	15-16.5	25-26.5	30.5-31.5	5-6.5	80-81.5
SAMPLE #	S-5B	S-8	S-10C	S-1B	S-3	S-5	S-6B	S-1	S-15
HEIGHT OF SAMPLE	SPT	SPT	SPT	SPT	SPT	SPT	SPT	SPT	SPT
WEIGHT OF SAMPLE (g)	SPT	SPT	SPT	SPT	SPT	SPT	SPT	SPT	SPT
TARE (g)	68.4	68.2	67.0	65.5	90.0	88.2	89.1	79.4	79.6
TARE + SAMPLE WET (g)	325.6	333	251.7	483.1	374.4	400.8	505.4	637	523.6
TARE + SAMPLE DRY (g)	299.6	306.5	238.5	402.2	346.5	372.9	467.1	602.7	433.2
MOISTURE CONTENT (%)	11.2	11.1	7.7	24.0	10.9	9.8	10.1	6.6	25.6
DRY DENSITY (pcf)	NT	NT	NT	NT	NT	NT	NT	NT	NT
PASSING #200 (%)	36	NT	NT	67	54	58	50	30	NT
PLASTIC INDEX (%)	NT	NT	NT	**4.1**	NT	NT	**1.5**	NT	**7.2**
SAND EQUIVALENT	NT	NT	NT	NT	NT	NT	NT	25	NT

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Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/19/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Fine, Moist, Brown	(SM) Silty Sand, Fine, Moist, Dark Brown	(SM) Silty Sand, Fine, Moist, Dark Brown	(SM-ML) Silt w/Sand, Fine, Moist, Dark Brown	(ML) Sandy Silt, Fine, Moist, Brown				
BORING #	NH-HSA-19	NH-HSA-19	NH-HSA-19	NH-HSA-19	NH-HSA-19				
DEPTH (ft)	1-5	5-5.3	10-11.5	25-26	30.7-31.5				
SAMPLE #	B-1	S-1A	S-2	SH-1	S-5B				
HEIGHT OF SAMPLE	Bulk	SPT	SPT	5"	SPT				
WEIGHT OF SAMPLE (g)	Bulk	SPT	SPT	1737.5	SPT				
TARE (g)	----	87.5	96.1	87.6	98.1				
TARE + SAMPLE WET (g)	----	329.3	389.2	305.7	321.4				
TARE + SAMPLE DRY (g)	----	304.1	366.1	285.5	295.4				
MOISTURE CONTENT (%)	----	11.6	8.6	10.2	13.2				
DRY DENSITY (pcf)	NT	NT	NT	95.8	NT				
PASSING #200 (%)	NT	34	44	NT	62				
PLASTIC INDEX (%)	NT	NT	NT	NT	NT				
SAND EQUIVALENT	19	NT	NT	NT	NT				

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Sample ID:
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Date Tested: 5/18/2020 - 05/22/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/27/2020
Remarks:

DESCRIPTION	(SM-ML) Fine Silt w/Sand, Medium Dense, Moist, Dark Brown		(sm) Silty Sand, Firm, Moist, fine to medium grained, Yellowish Brown	(ML) Silt w/Sand, Firm, Moist, Dark Brown	(SM-ML) Sand w/Silt, Fine, Moist, Medium Dense, Dark Brown	(SM-ML) Silt w/Sand, Fine, Firm, Moist, Yellowish Brown	(SM) Silty Sand, Medium coarse, Stiff, Sl. Moist, Lt. Brown	(SM) Silty Sand, Loose, Moist, Brown	
BORING #	NH-HSA-19		NH-HSA-2	NH-HSA-8	NH-HSA-9	NH-HSA-10	NH-HSA-11	NH-HSA-16	
DEPTH (ft)	25-26		35.5-36	31-31.5	15-16	20.5-21	16-16.5	35.5-36	
SAMPLE #	SH-1		S-7A	S-6D	SH-1	S-4A	S-3B	S-6A	
HEIGHT OF SAMPLE	5"		4	5	9.5"	5	2	4	
WEIGHT OF SAMPLE (g)	1737.5		838.83	990.8	2805.4	885.48	379.2	730.22	
TARE (g)	87.6		67.3	60.6	68.5	61.7	62.3	99.8	
TARE + SAMPLE WET (g)	305.7		380.7	362.2	208.8	308.6	360.2	342.25	
TARE + SAMPLE DRY (g)	285.7		249.2	308.2	191.8	291.7	344.6	329.2	
MOISTURE CONTENT (%)	10.1		72.3	21.8	13.8	7.4	5.5	5.7	
DRY DENSITY (pcf)	95.8		79.6	104.8	107.1	102.6	114.2	108.5	
PASSING #200 (%)	NT		NT	66	NT	NT	NT	NT	
PLASTIC INDEX (%)	NT		NT	6.0	NT	NT	NT	NT	
SAND EQUIVALENT	NT		NT	NT	NT	NT	NT	NT	

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Completion Date: 5/27/2020
Remarks:

DESCRIPTION	(SM) Silty Sand, Moist, Brown	(SM) Sand w/Silt, Moist, Dark Brown	(SM) Silt Sand, Dry, Reddish Brown	(SM) Silty Sand, Firm, Moist, Yellowish Brown	(ML) Silt w/Sand, Moist, Brown	(SM) Silty Sand, Moist, Brown			
BORING #	NH-HSA-11	NH-HSA-12	NH-HSA-12A	NH-HSA-15	NH-HSA-16	NH-HSA-16			
DEPTH (ft)	5-6.5	10-11.5	15-16	21-21.5	10-11.5	15-16.5			
SAMPLE #	S-1	S-2	S-2A	S-4B	S-2	S-3			
HEIGHT OF SAMPLE	SPT	SPT	SPT	2	SPT	SPT			
WEIGHT OF SAMPLE (g)	SPT	SPT	SPT	360	SPT	SPT			
TARE (g)	61.6	53.0	62.0	61.7	60.6	52.9			
TARE + SAMPLE WET (g)	229.1	272.9	175.1	309.8	330.8	323.2			
TARE + SAMPLE DRY (g)	218.8	248.9	163.4	300.6	290.1	292.8			
MOISTURE CONTENT (%)	6.6	12.2	11.6	3.8	17.7	12.7			
DRY DENSITY (pcf)	NT	NT	NT	108.4	NT	NT			
PASSING #200 (%)	27	42	26.0	36	69	42			
PLASTIC INDEX (%)	**NP**	NT	NT	**5.0**	**5.0**	**NP**			
SAND EQUIVALENT	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 North Hollywood Park Stormwater Capture**
Client: **Geosyntec Consultants**
Attention To: K. Viswanathan
Location: See Below
Date Sampled: 4/10/20, 4/21/20 -4/27/20
Date of Report : 5/22/20
Project No. : 200-20043-20001-01(LA0590B)
Reported By: F. Jaque-Diaz
Reviewed By: F. Jaque-Diaz

CT&I Sample Number :							
Sample Location :	NH-HSA-2 S-3A	NH-HSA-2 S-8	NH-HSA-3 S-10	NH-HSA-4 S-3			
Depth:	15-16	40-41.5	50-51.5	15-16.5			
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-			
1 ½"	-	100%	-	-			
1"	-	96%	-	-			
3/4"	-	95%	100%	-			
1/2"	100%	84%	98%	-			
3/8"	99%	79%	94%	-			
#4	98%	66%	86%	100%			
#10	96%	51%	77%	99%			
#30	94%	37%	63%	98%			
#40	89%	25%	42%	95%			
#50	79%	16%	20%	85%			
#100	61%	10%	9%	69%			
#200	40%	6.6%	4.5%	50%			
Moisture content (ASTM D 2216)	11%	2.2%	1.7%	12.4%			
Wash #200 (ASTM D 1140)	NT	NT	NT	NT			
Liquid Limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic Index (ASTM D 4318)	NT	NT	NT	NT			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Soil Clasification (ASTM D 2487)	Well Graded Sand w/Silt (SW-SM)	Well Graded Sand w/Gravel and SIlt (SW-SP)	Well Graded Sand w/Gravel and SIlt (SW-SP)	Sand w/Silt (SM-ML)			

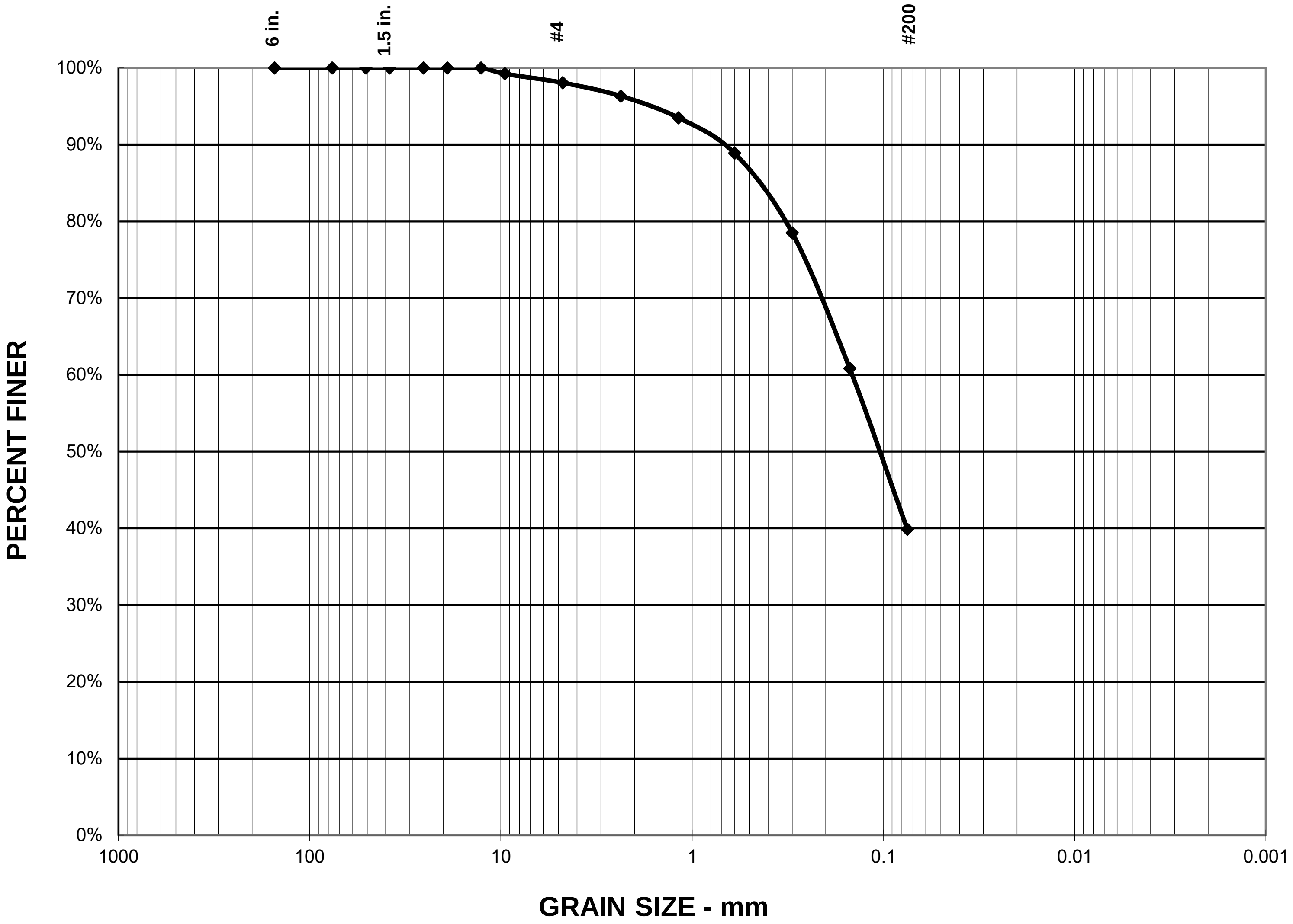
Comments: NP: Non-Plastic
NT: Not Tested

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

Signature
Fabiola Jaque-Diaz, P.E., Project Manager
Print Name/Title
5/22/2020
Date

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 2%

% SAND = 58%

% SILT & CLAY = 40%

Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-2 @15-16.5, S-3A
Soil Description: Well Graded Sand w/Silt (SW-SM)

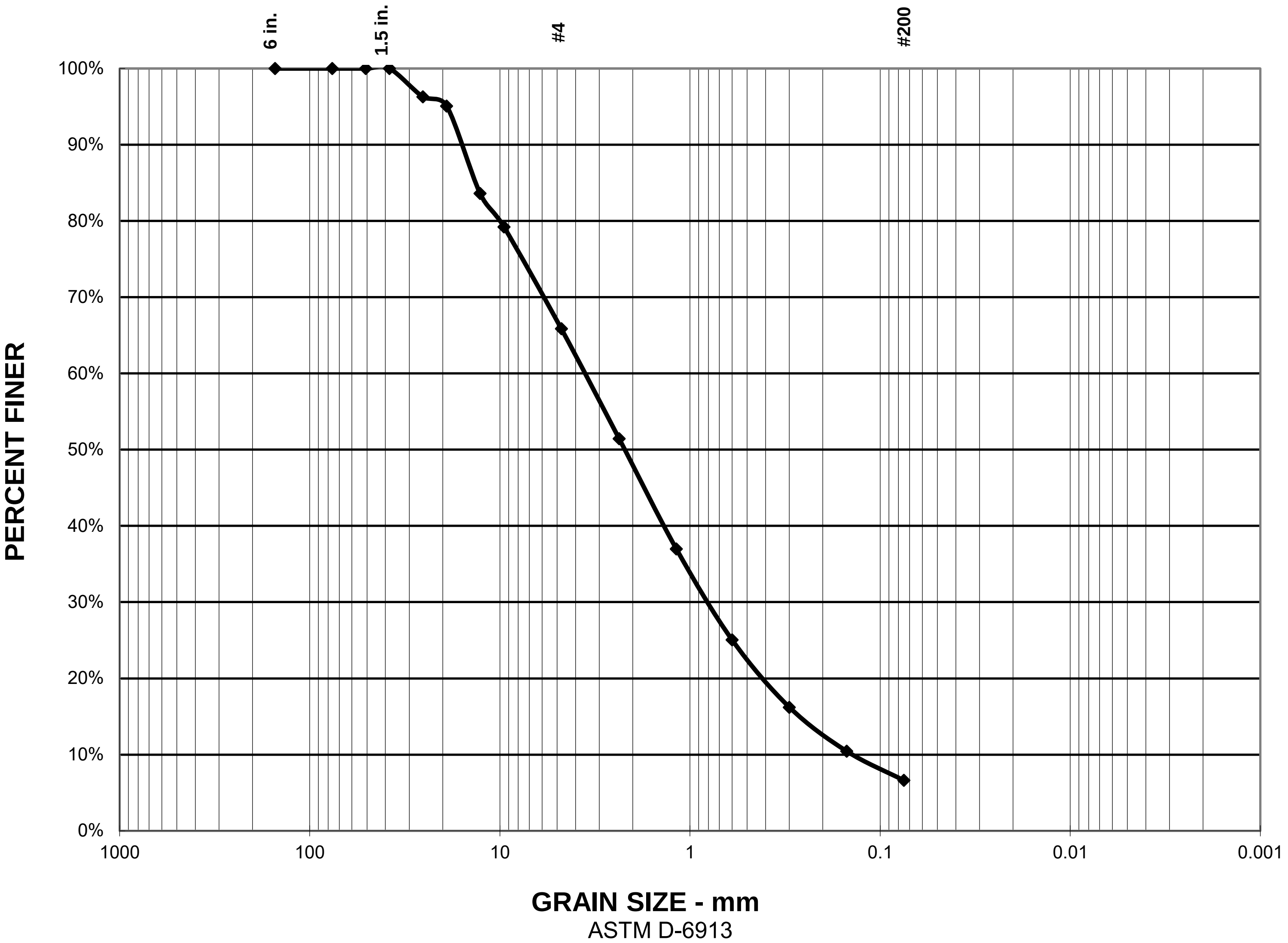
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-2 S-3A***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 34%

% SAND = 59%

% SILT & CLAY = 7%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-2 @40-41.5, S-8

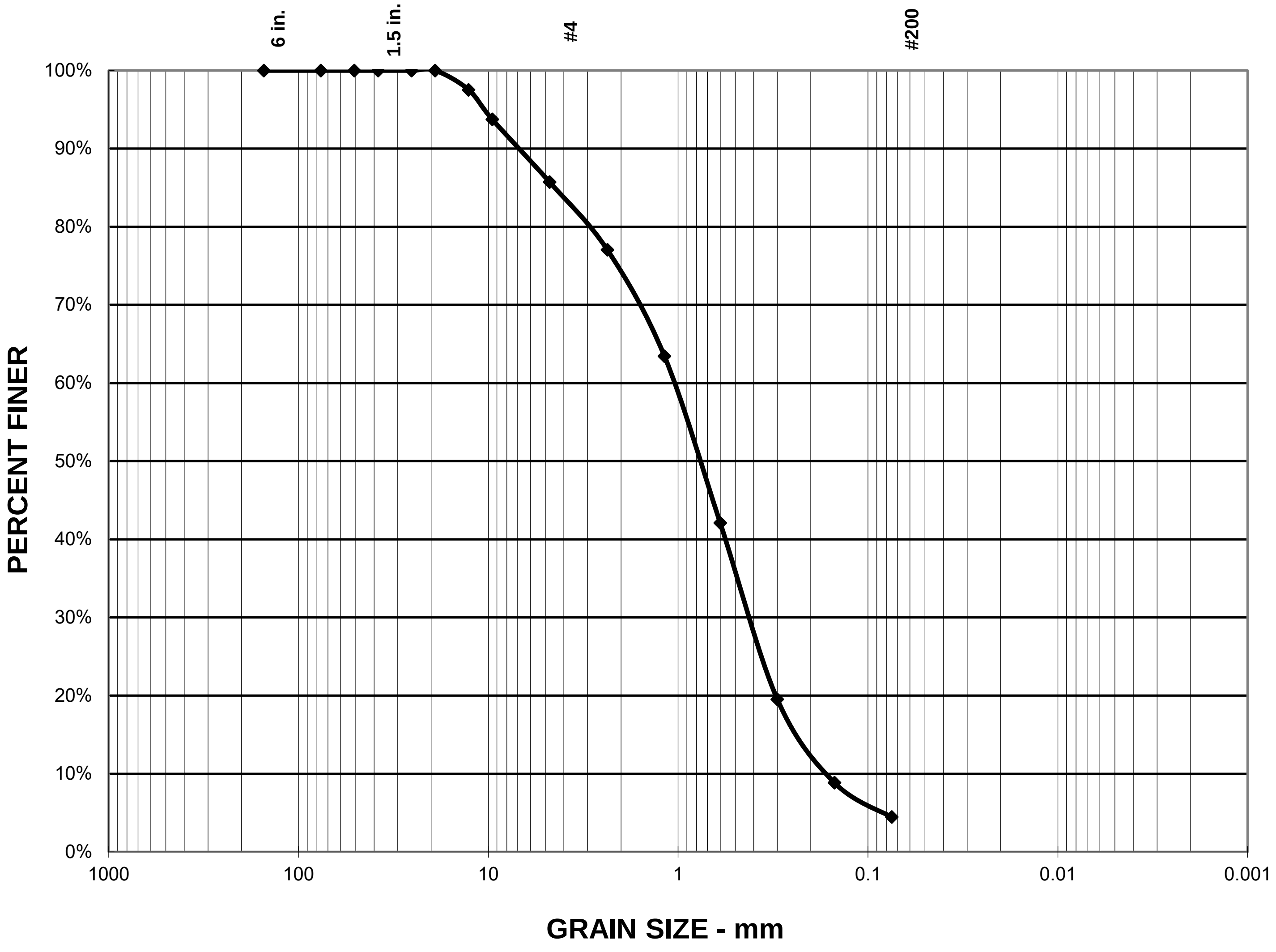
Soil Description: Well Graded Sand w/Gravel and Silt (SW-SP)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-2 S-8***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL =	14%
% SAND =	81%
% SILT & CLAY =	4%

Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-3 @50-51.5, S-10
Soil Description: Well Graded Sand w/Gravel and Silt (SW-SP)

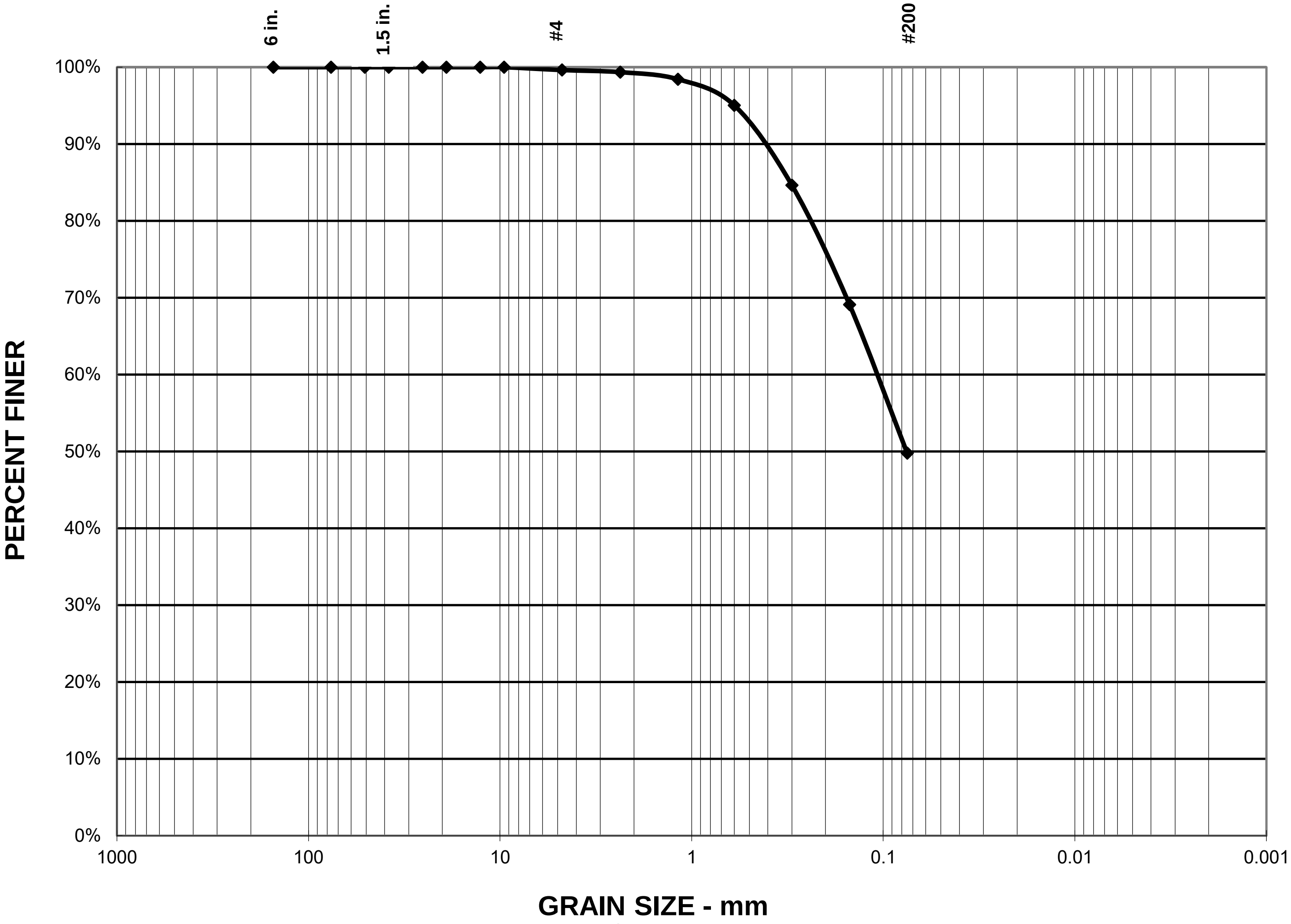
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-3 S-10***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL =	0%
% SAND =	50%
% SILT & CLAY =	50%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-2 @15-16.5, S-3A

Soil Description: Sand w/Silt (SM-ML)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-4 S-3***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 North Hollywood Park Stormwater Capture**

Date of Report : 5/22/20

Client: **Geosyntec Consultants**

Project No. : 200-20043-20001-01(LA0590B)

Attention To: K. Viswanathan

Reported By: F. Jaque-Diaz

Location: See Below

Date Sampled: 4/10/20, 4/21/20 -4/27/20

Reviewed By: F. Jaque-Diaz

CT&I Sample Number :							
Sample Location :	NH-HSA-5 S-2	NH-HSA-5 S-3	NH-HSA-6 S-4	NH-HSA-7 S-1B			
Depth:	10-11.5	20-21.5	25-26.5	5.4-6.5			
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-			
1 ½"	-	-	-	-			
1"	-	-	-	-			
3/4"	-	-	-	-			
1/2"	-	-	-	-			
3/8"	-	-	-	-			
#4	-	-	-	-			
#10	-	-	100	-			
#30	100%	100%	99%	100%			
#40	99%	98%	97%	99%			
#50	96%	88%	90%	96%			
#100	83%	68%	75%	88%			
#200	63%	46%	48%	73%			
Moisture content (ASTM D 2216)	14%	7.5%	10.4%	24%			
Wash #200 (ASTM D 1140)	NT	NT	NT	NT			
Liquid Limit (ASTM D 4318)	NT	NT	NT	30.0%			
Plastic limit (ASTM D 4318)	NT	NT	NT	25.9%			
Plastic Index (ASTM D 4318)	NT	NT	NT	4.1%			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Soil Clasification (ASTM D 2487)	Silt w/Sand (ML)	Sand w/Silt (SM)	Sand w/Silt (SM)	Silt w/Sand (ML)			

Comments: NP: Non-Plastic

NT: Not Tested

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

Signature

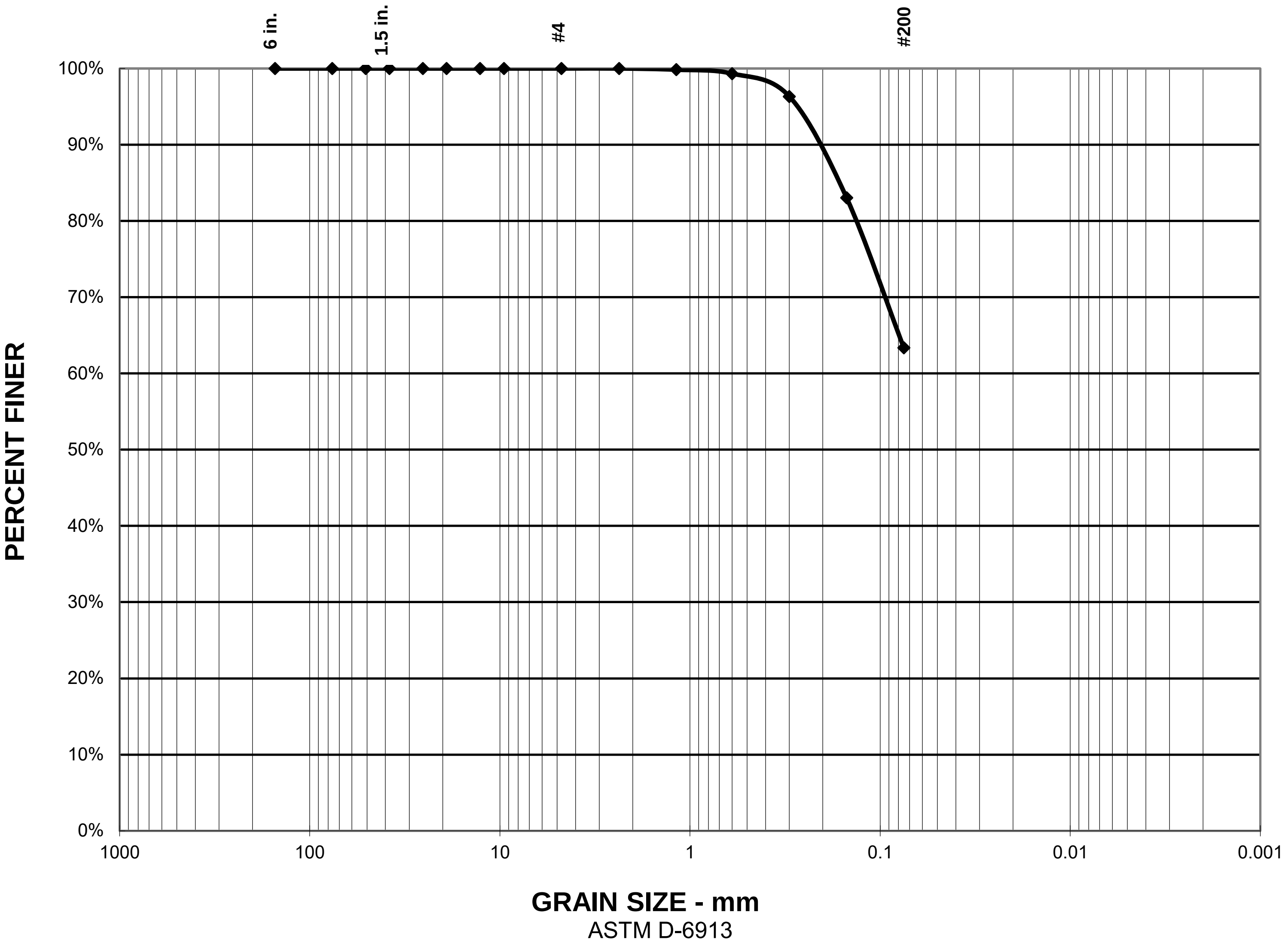
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/22/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY

% GRAVEL =	0%
% SAND =	37%
% SILT & CLAY =	63%

Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-5 @10-11.5, S-2
Soil Description: Silt w/ Sand (ML)

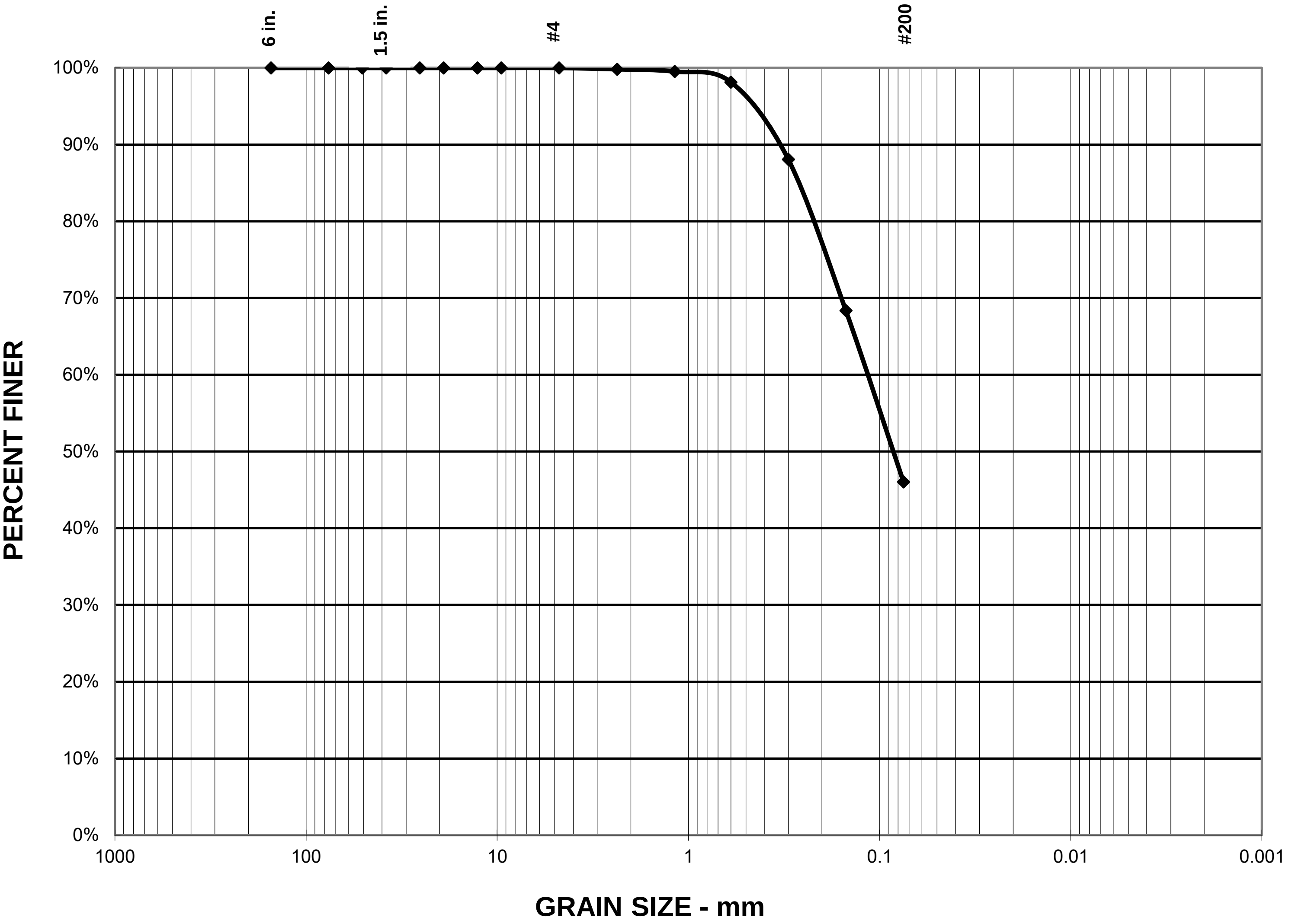
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-5 S-2***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 54%

% SILT & CLAY = 46%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-5 @20-21.5, S-3

Soil Description: Sand w/Silt (SM)

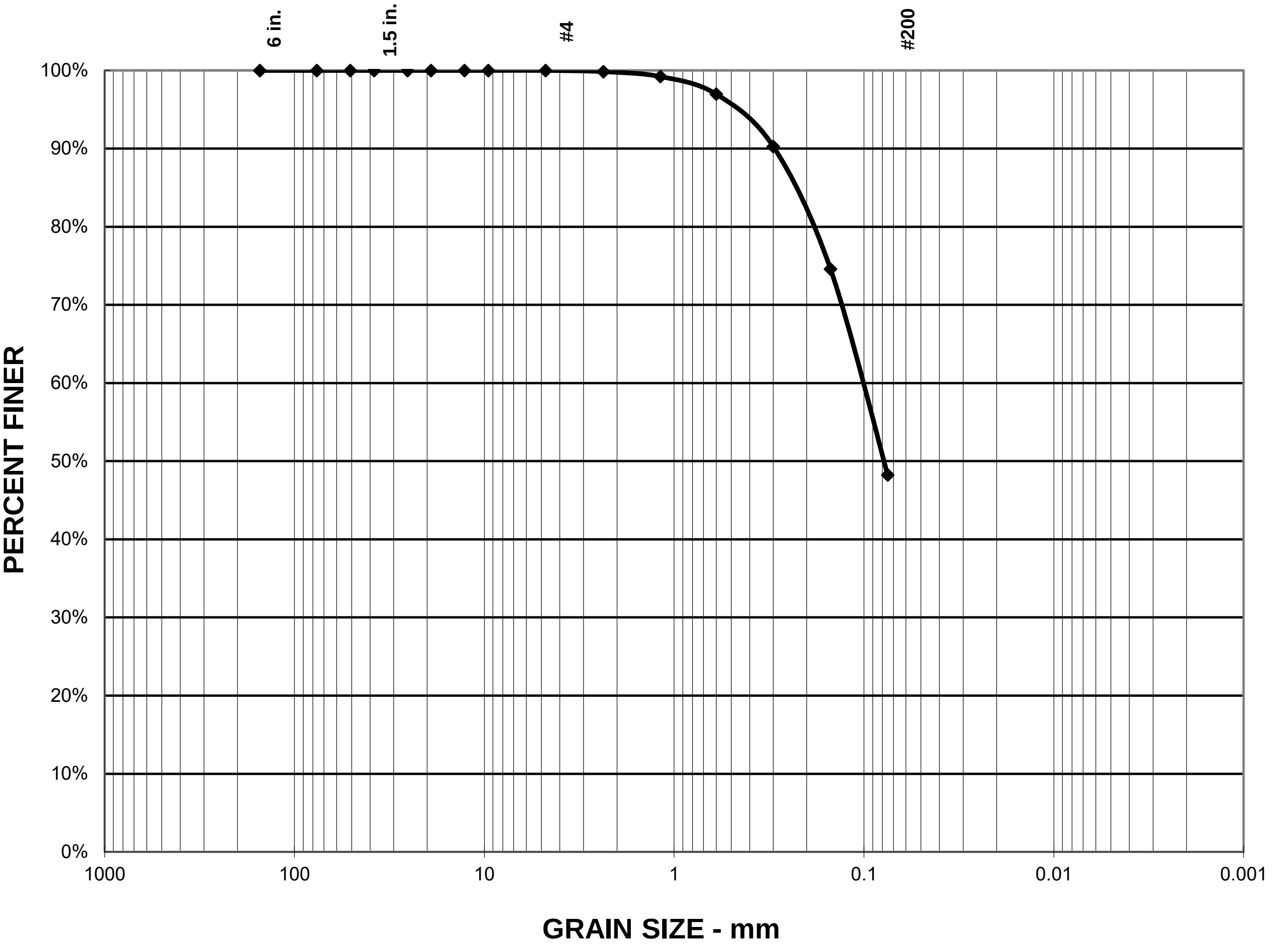
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-5 S-3***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 52%

% SILT & CLAY = 48%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-6 @25-26.5, S-4

Soil Description: Sand w/ Silt (SM)

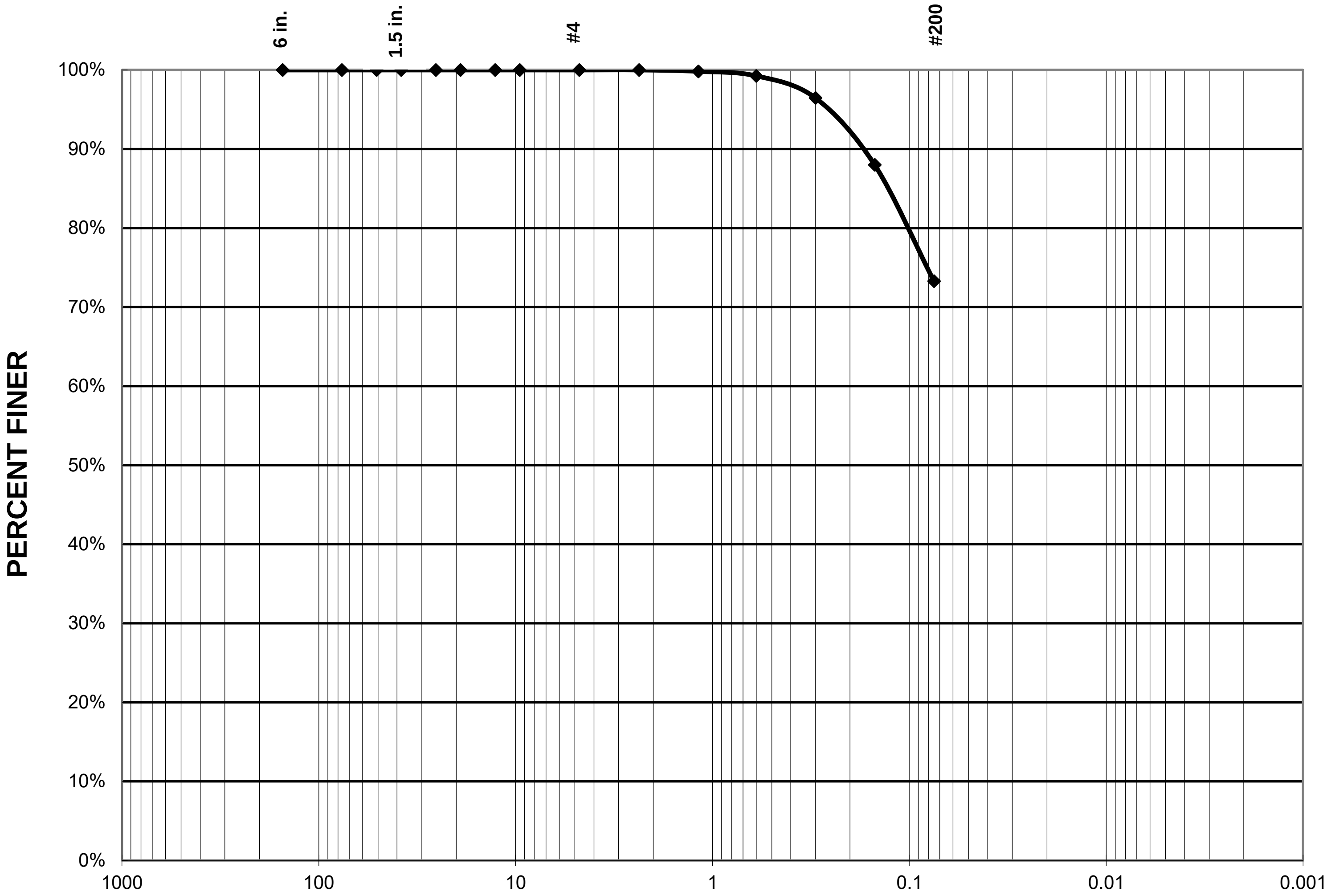
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. *NH-HSA-6 S-4*

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



GRAIN SIZE - mm
ASTM D6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 27%

% SILT & CLAY = 73%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-7 @5.4-6.5, S-1B

Soil Description: Silt w/Sand (ML)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-7 S-1B***

DRAFT - FOR DISCUSSION PURPOSES ONLY
California Testing Inspections
Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 North Hollywood Park Stormwater Capture**
Client: **Geosyntec Consultants**
Attention To: K. Viswanathan
Location: See Below
Date Sampled: 4/10/20, 4/21/20 -4/27/20
Date of Report : 5/22/20
Project No. : 200-20043-20001-01(LA0590B)
Reported By: F. Jaque-Diaz
Reviewed By: F. Jaque-Diaz

CT&I Sample Number :							
Sample Location :	NH-HSA-7 S-4	NH-HSA-8 S-4	NH-HSA-8 S-8	NH-HSA-8 S-10			
Depth:	30-31.5	20-21.5	40-41.5	50-51.5			
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-			
1 ½"	-	-	-	100%			
1"	-	-	-	87%			
3/4"	-	-	100%	78%			
1/2"	-	-	99%	75%			
3/8"	-	-	98%	71%			
#4	-	-	95%	63%			
#10	-	-	91%	55%			
#30	100%	100%	83%	45%			
#40	99%	98%	66%	36%			
#50	97%	87%	38%	28%			
#100	85%	69%	20%	23%			
#200	53%	52%	10%	17%			
Moisture content (ASTM D 2216)	8.0%	19%	3.7%	5.9%			
Wash #200 (ASTM D 1140)	NT	NT	NT	NT			
Liquid Limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic Index (ASTM D 4318)	NT	NT	NT	NT			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Soil Clasification (ASTM D 2487)	Silt w/Sand (ML)	Silt w/Sand (ML)	Well Graded Sand w/Silt (SW-SM)	Well Graded Sand w/Silt (SW-SM)			

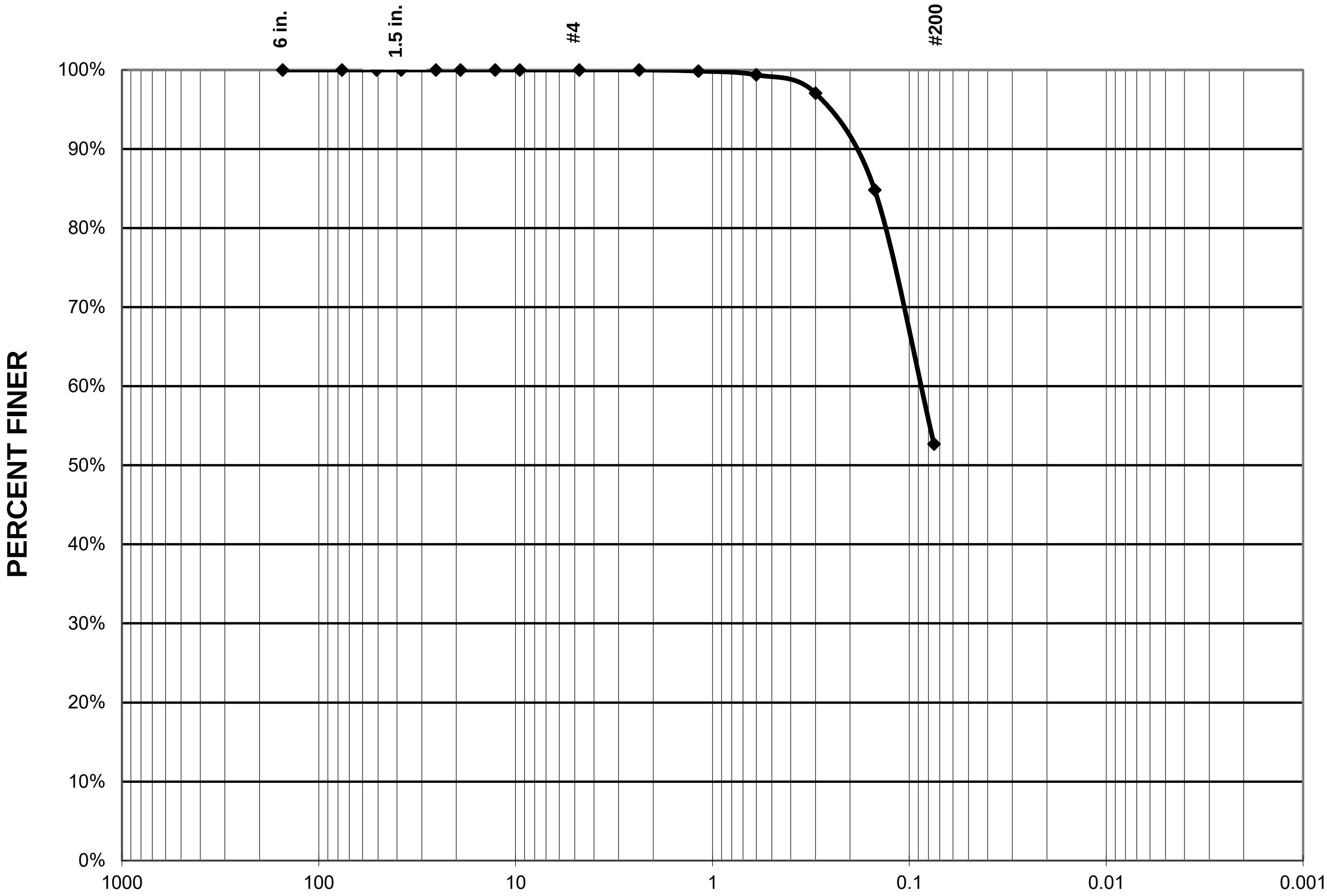
Comments: NP: Non-Plastic
NT: Not Tested

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

Signature
Fabiola Jaque-Diaz, P.E., Project Manager
Print Name/Title
5/22/2020
Date

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



GRAIN SIZE - mm

ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 47%

% SILT & CLAY = 53%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-7 @30-31.5, S-4

Soil Description: Silt w/Sand (ML)

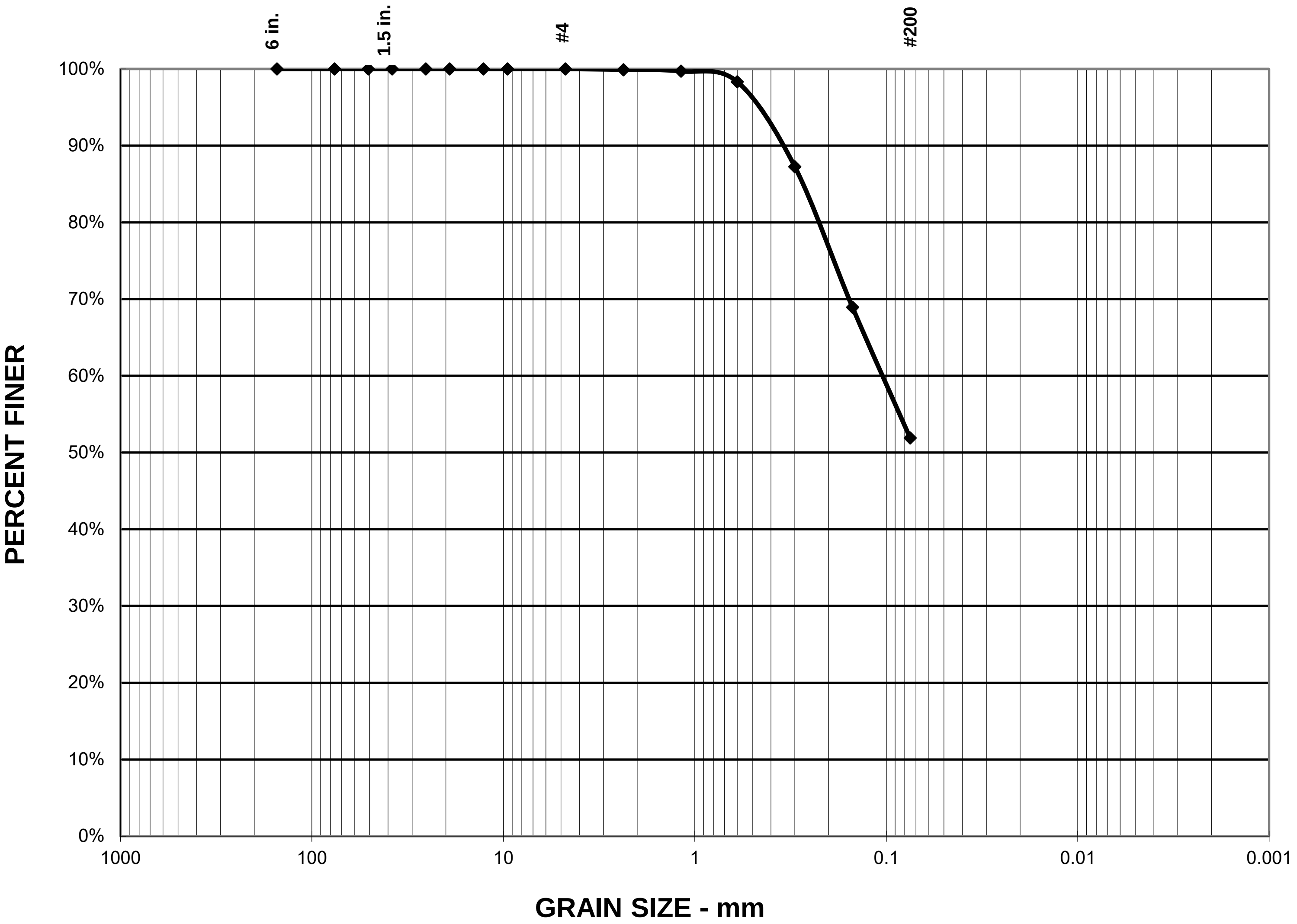
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

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

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 48%

% SILT & CLAY = 52%

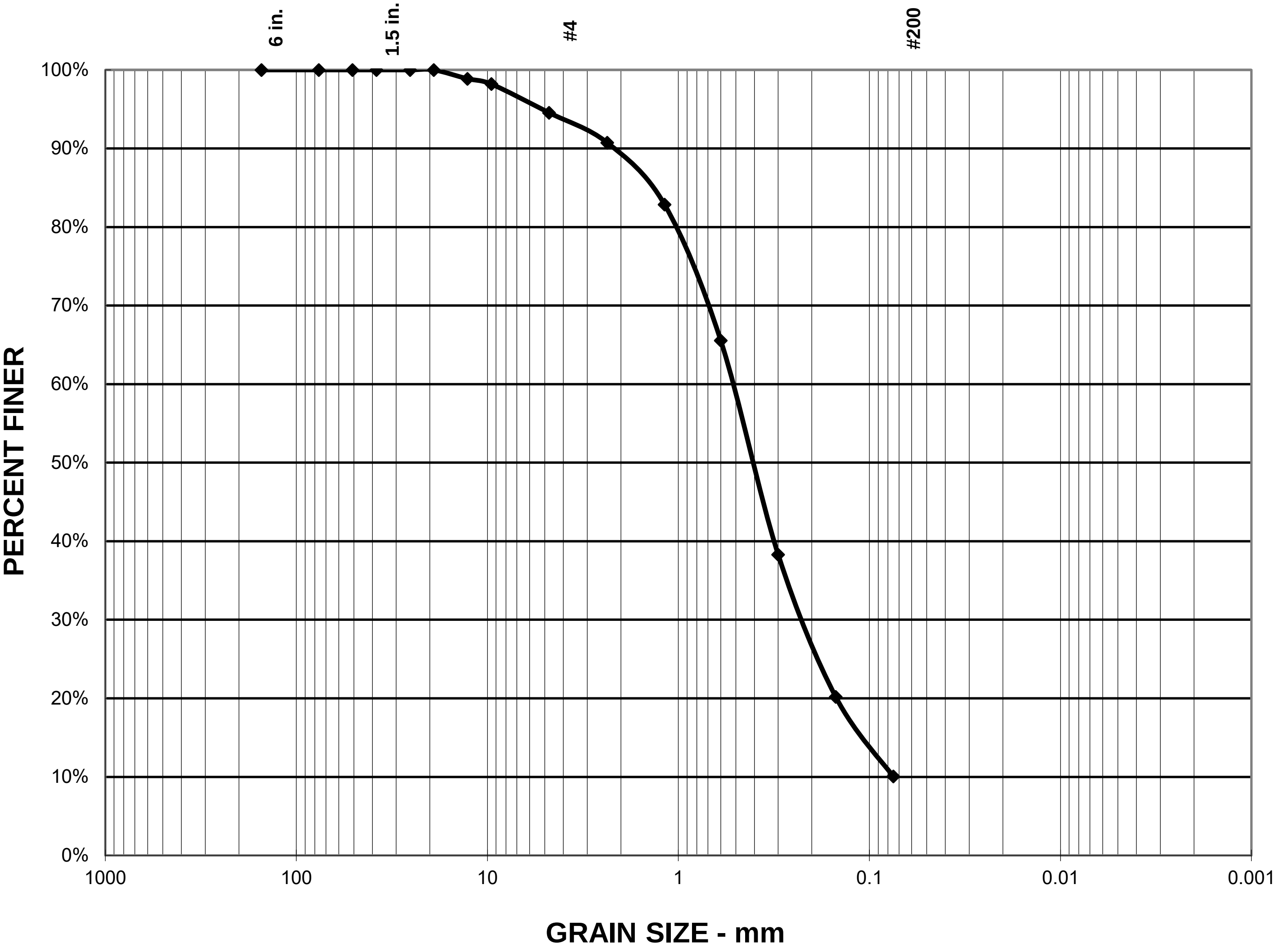
Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-8 @20-21.5, S-4
Soil Description: Silt w/ Sand (ML)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-8 S-4***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 5%

% SAND = 84%

% SILT & CLAY = 10%

Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-8 @40-41.5, S-8
Soil Description: Well Graded Sand w/ Silt (SW-SM)

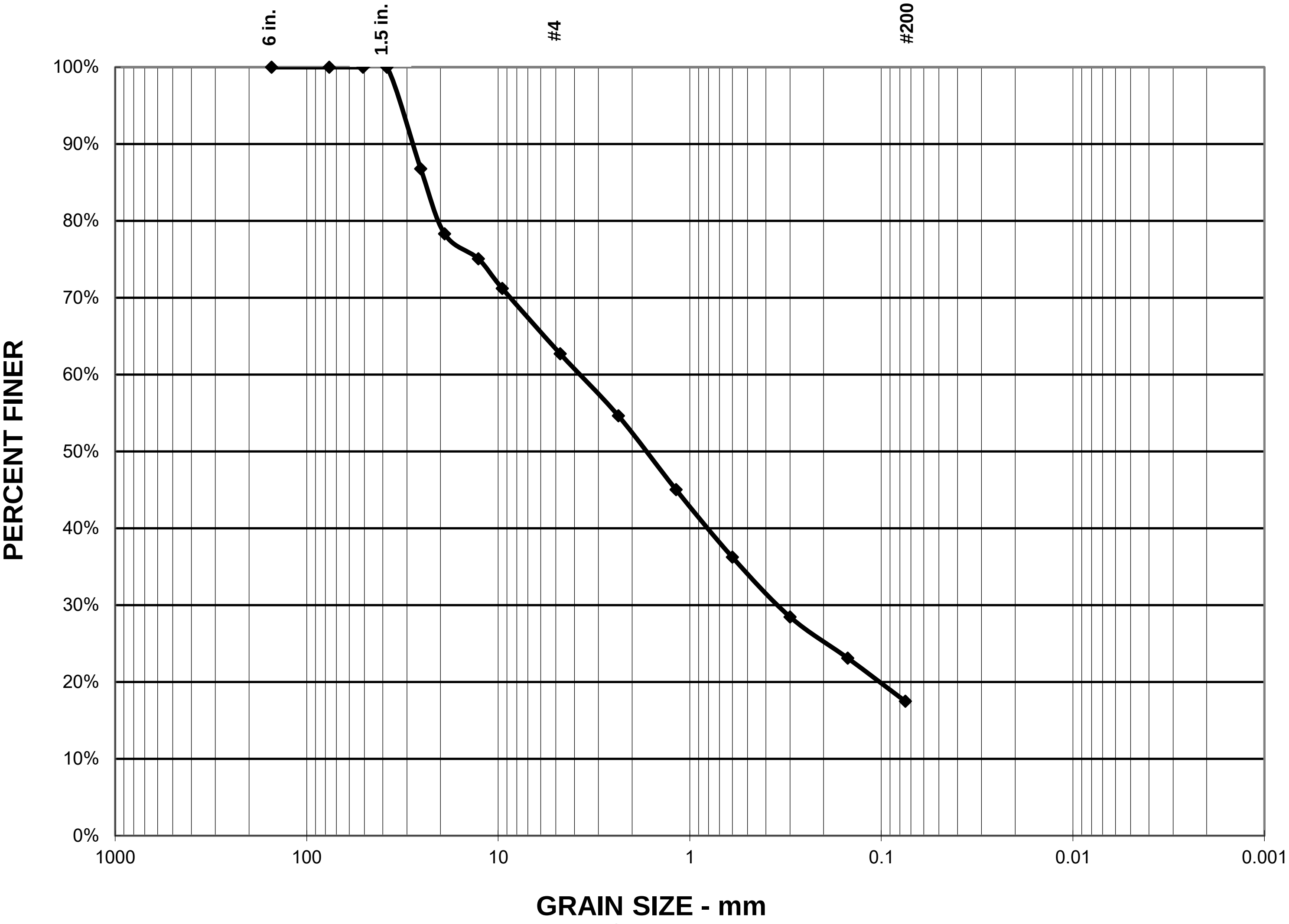
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-8 S-8***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 37%

% SAND = 45%

% SILT & CLAY = 17%

Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-8 @50-51.5, S-10
Soil Description: Well Graded Sand W/ Gravel and Silt (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-8 S-10***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 North Hollywood Park Stormwater Capture**

Date of Report : 5/22/20

Client: **Geosyntec Consultants**

Project No. : 200-20043-20001-01(LA0590B)

Attention To: K. Viswanathan

Reported By: F. Jaque-Diaz

Location: See Below

Date Sampled: 4/10/20, 4/21/20 -4/27/20

Reviewed By: F. Jaque-Diaz

CT&I Sample Number :							
Sample Location :	NH-HSA-12 S-1B	NH-HSA-12A S-3	NH-HSA-12A S-5	NH-HSA-13 S-1B			
Depth:	5.4-6.5	20-21.5	30-31.5	5.5-6.5			
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-			
1 ½"	-	-	-	-			
1"	-	-	100%	-			
3/4"	-	-	93%	100%			
1/2"	100%	-	90%	99%			
3/8"	98%	-	88%	97%			
#4	94%	100%	82%	97%			
#10	88%	99%	73%	96%			
#30	80%	99%	59%	91%			
#40	64%	97%	37%	73%			
#50	42%	86%	18%	34%			
#100	28%	59%	9.1%	10%			
#200	18%	33%	4.8%	3.3%			
Moisture content (ASTM D 2216)	7.0%	6.3%	1.6%	1.2%			
Wash #200 (ASTM D 1140)	NT	NT	NT	NT			
Liquid Limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic Index (ASTM D 4318)	NT	NT	NT	NT			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Soil Clasification (ASTM D 2487)	Well Graded Sand w/Gravel and Silt (SW-SM)	Well Graded Sand w/Silt (SM)	Well Graded Sand w/Gravel and Silt (SW-SM)	Well Graded Sand w/Silt (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

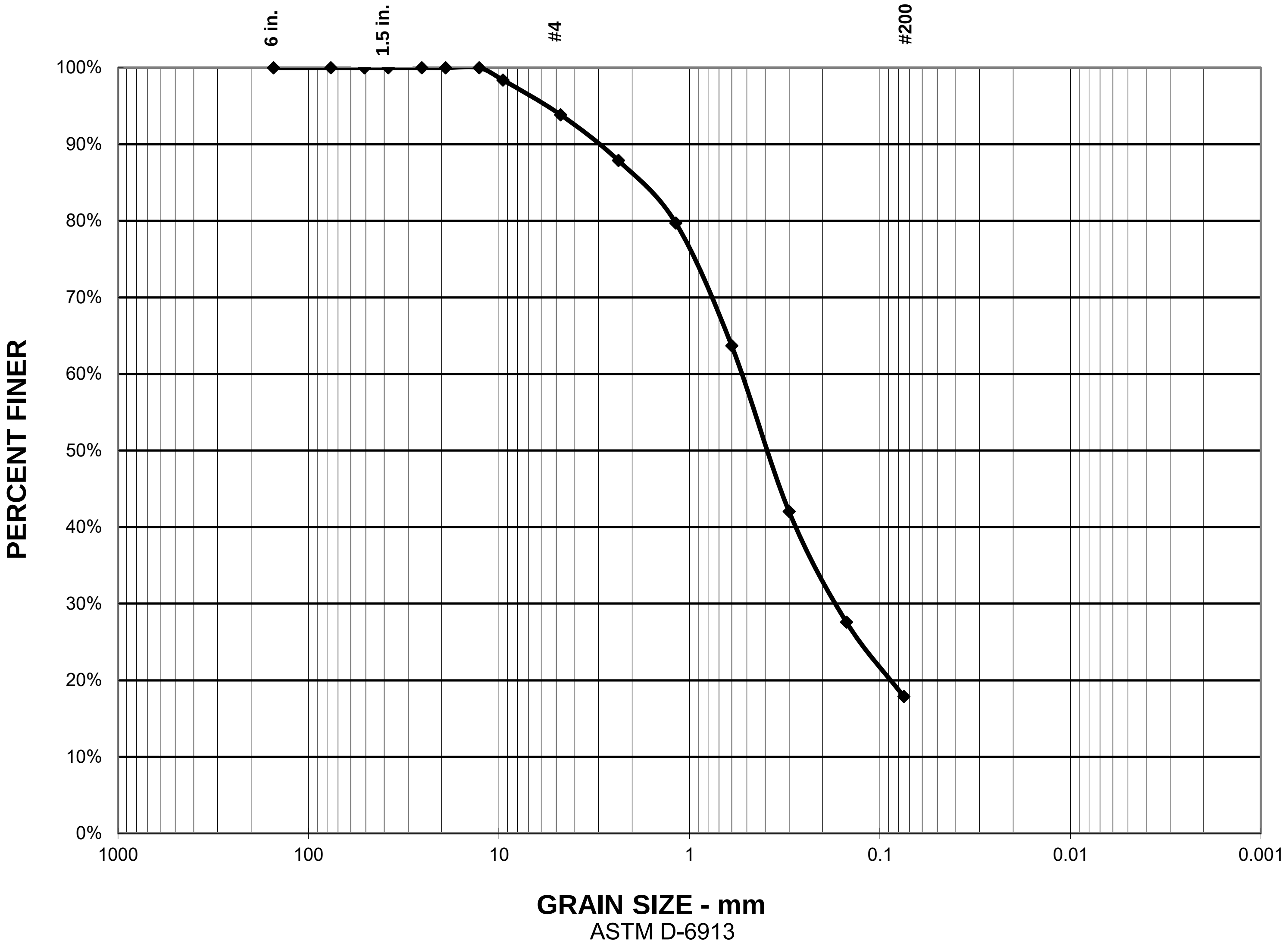
Print Name/Title

5/22/2020

Date

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 6%

% SAND = 76%

% SILT & CLAY = 18%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-12 @5.4-6.5, S-1B

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

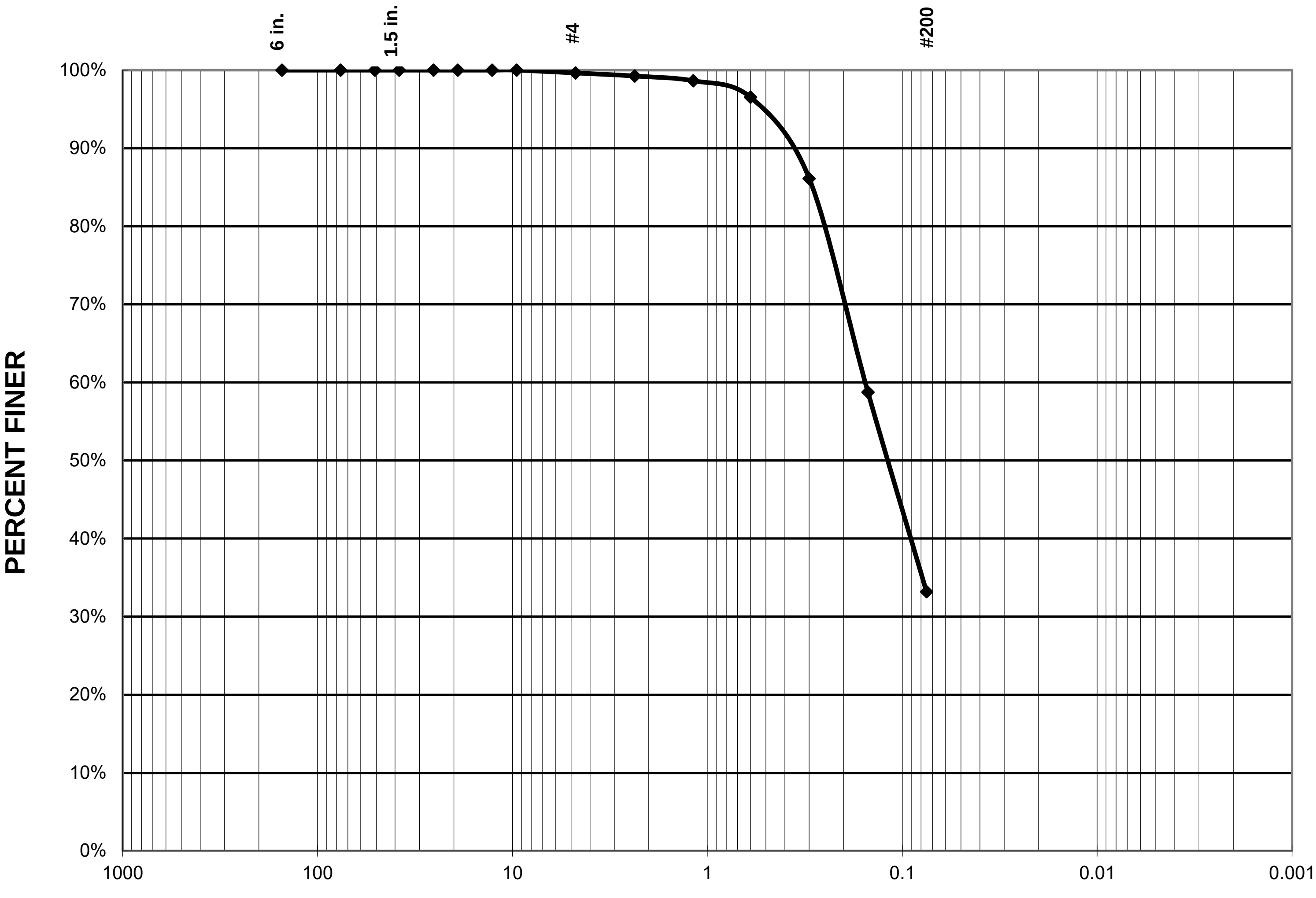
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-12 S-1B***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 66%

% SILT & CLAY = 33%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-12A @20-21.5, S-3

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

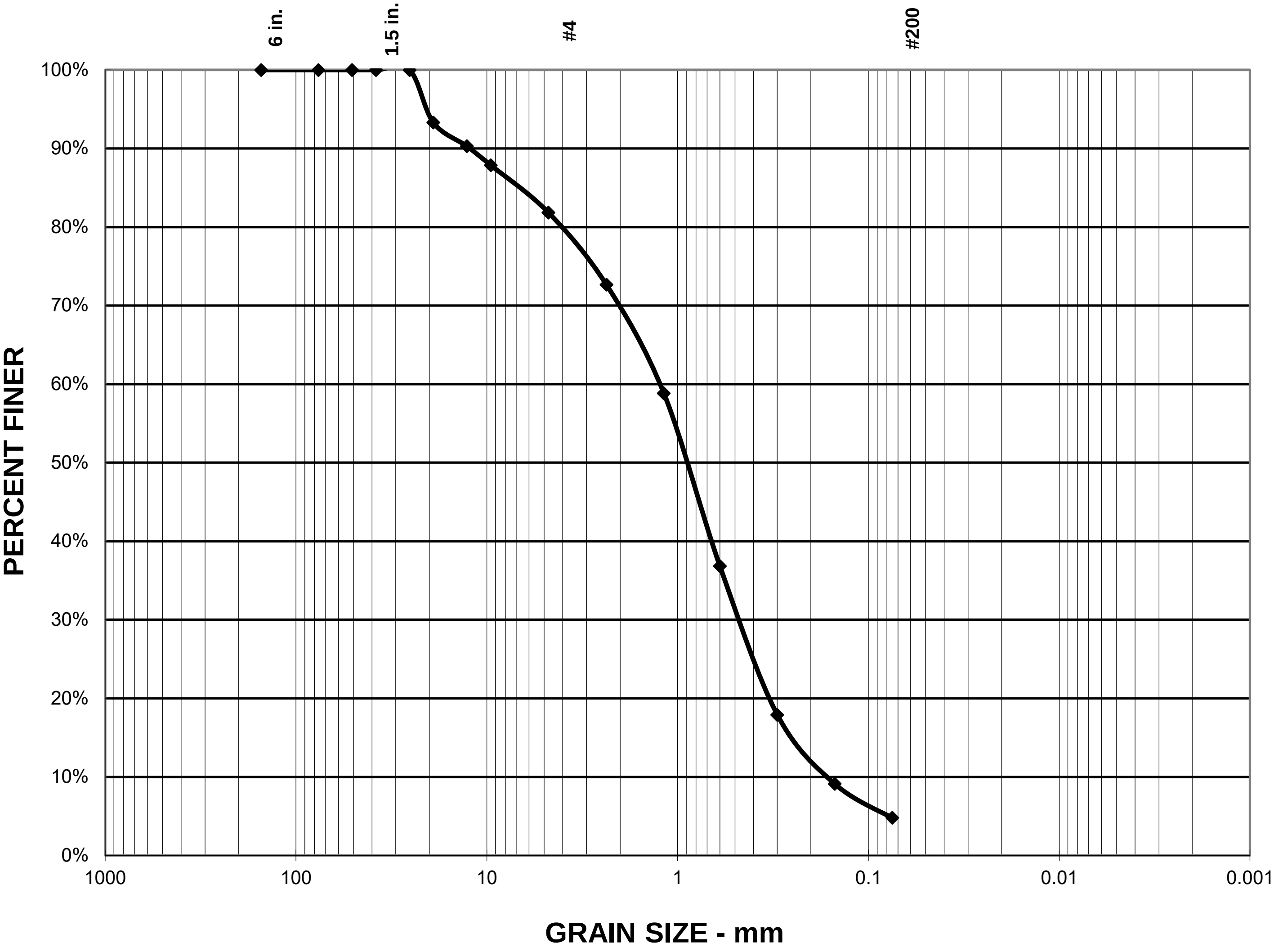
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-12A S-3***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 18%

% SAND = 77%

% SILT & CLAY = 5%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-12A @30-31.5, S-5

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

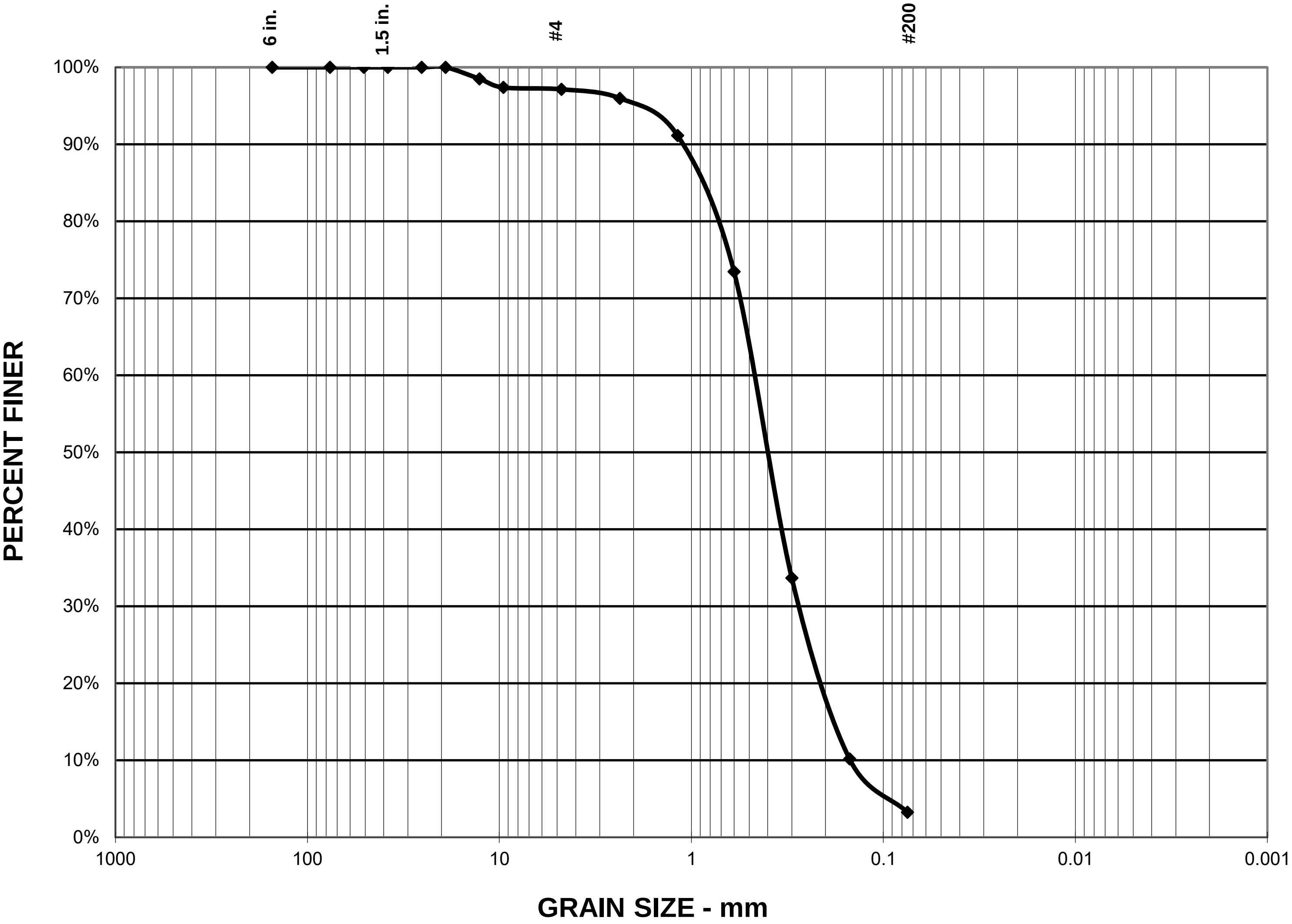
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-12A S-5***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 3%

% SAND = 94%

% SILT & CLAY = 3%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-13 @5.5-6.5, S-1B

Soil Description: Well Graded Sand W/ Gravel and Silt (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-13 S-1B***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 North Hollywood Park Stormwater Capture**
Date of Report : 5/22/20
Client: **Geosyntec Consultants**
Project No. : 200-20043-20001-01(LA0590B)
Attention To: K. Viswanathan
Reported By: F. Jaque-Diaz
Location: See Below
Date Sampled: 4/10/20, 4/21/20 -4/27/20
Reviewed By: F. Jaque-Diaz

CT&I Sample Number :							
Sample Location :	NH-HSA-13 S-3	NH-HSA-13 S-6	NH-HSA-14 S-3	NH-HSA-14 S-7			
Depth:	15-16.5	30-31.5	15-16.5	35-36.5			
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-			
1 ½"	-	-	-	-			
1"	-	-	100%	-			
3/4"	-	100%	91%	-			
1/2"	-	95%	87%	100%			
3/8"	-	95%	82%	99%			
#4	-	93%	77%	98%			
#10	100%	91%	69%	95%			
#30	99%	86%	56%	85%			
#40	98%	74%	38%	53%			
#50	91%	41%	22%	20%			
#100	75%	16%	12.0%	9%			
#200	51%	6.3%	7.1%	4.6%			
Moisture content (ASTM D 2216)	7.0%	1.6%	1.6%	1.5%			
Wash #200 (ASTM D 1140)	NT	NT	NT	NT			
Liquid Limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic Index (ASTM D 4318)	NT	NT	NT	NT			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Soil Clasification (ASTM D 2487)	Silt w/Sand (SM-ML)	Well Graded Sand w/Silt (SW-SM)	Well Graded Sand w/Gravel and Silt (SW-SM)	Well Graded Sand w/Gravel and Silt (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

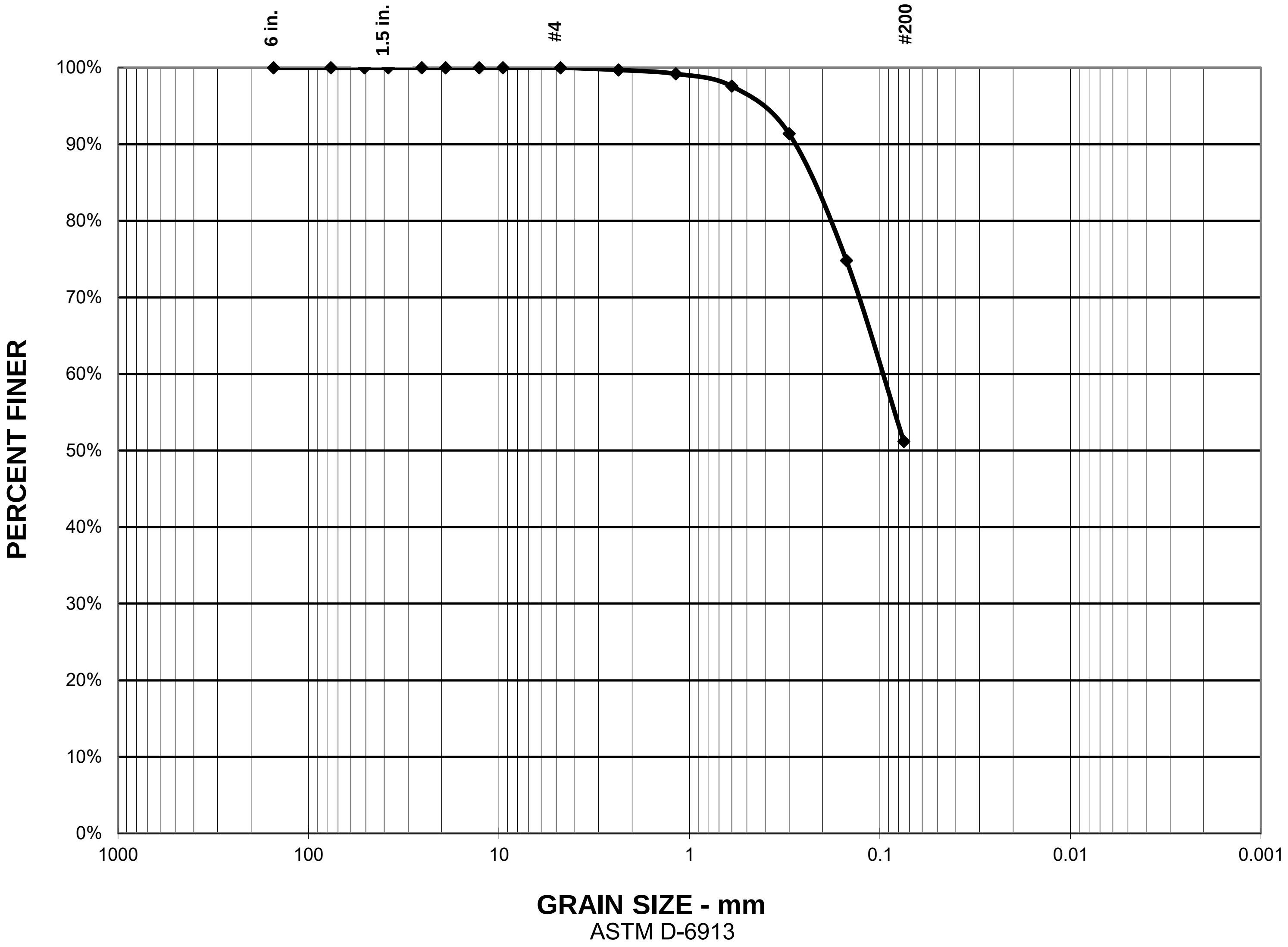
Print Name/Title

5/22/2020

Date

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 49%

% SILT & CLAY = 51%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-13 @15-16.5, S-3

Soil Description: Silt w/Sand (SM-ML)

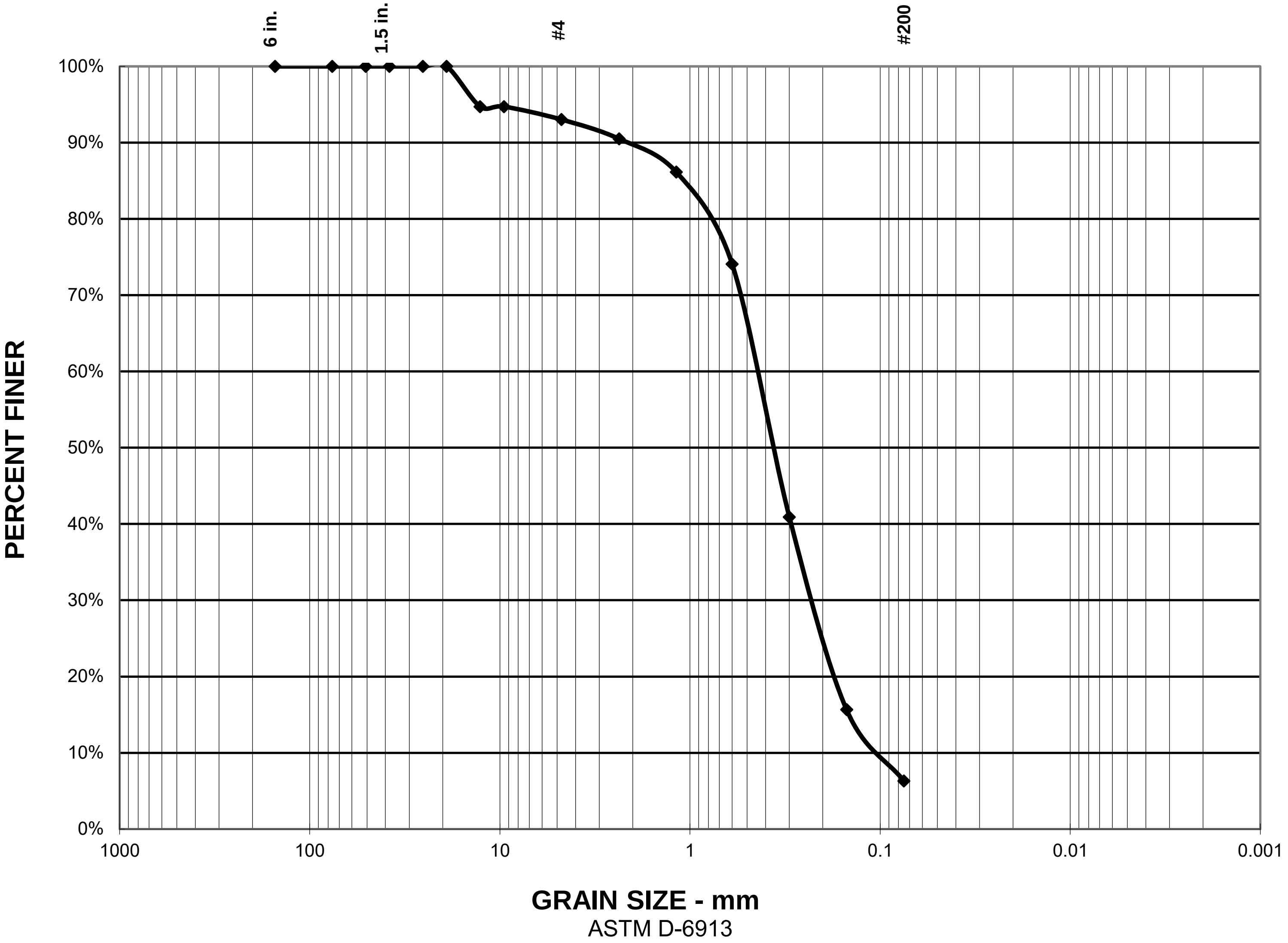
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-13 S-3***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL =	7%
% SAND =	87%
% SILT & CLAY =	6%

Project No.:	200-20043-20001-01(LA0590B)
Project Name:	TOS-25 North Hollywood Park Stormwater Capture
Date sampled:	4/10/20-4/27/20
Location:	NH-HSA-13 @30-31.5, S-6
Soil Description:	Well Graded Sand w/Silt (SW-SM)

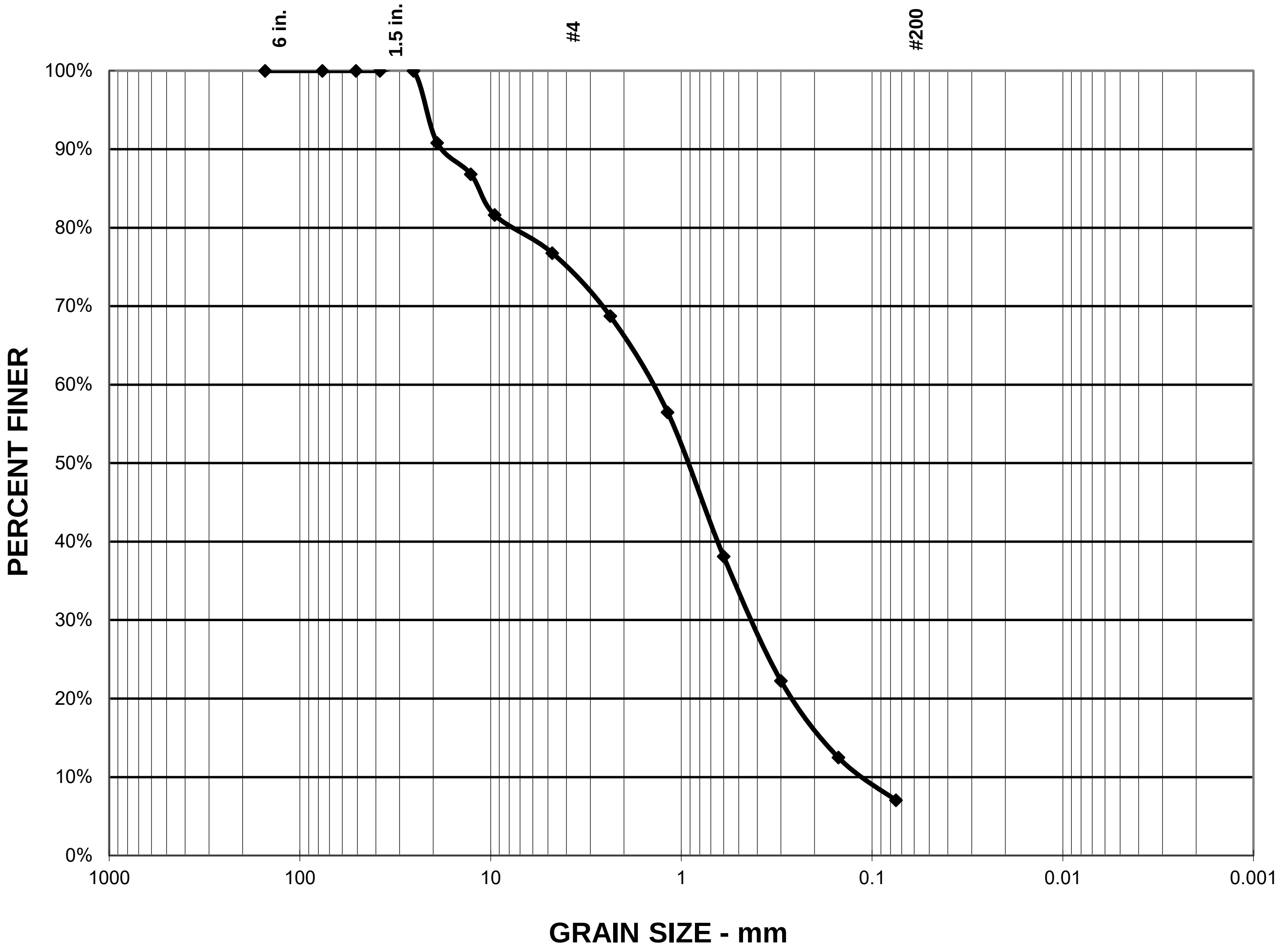
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-13 S-6***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL =	23%
% SAND =	70%
% SILT & CLAY =	7%

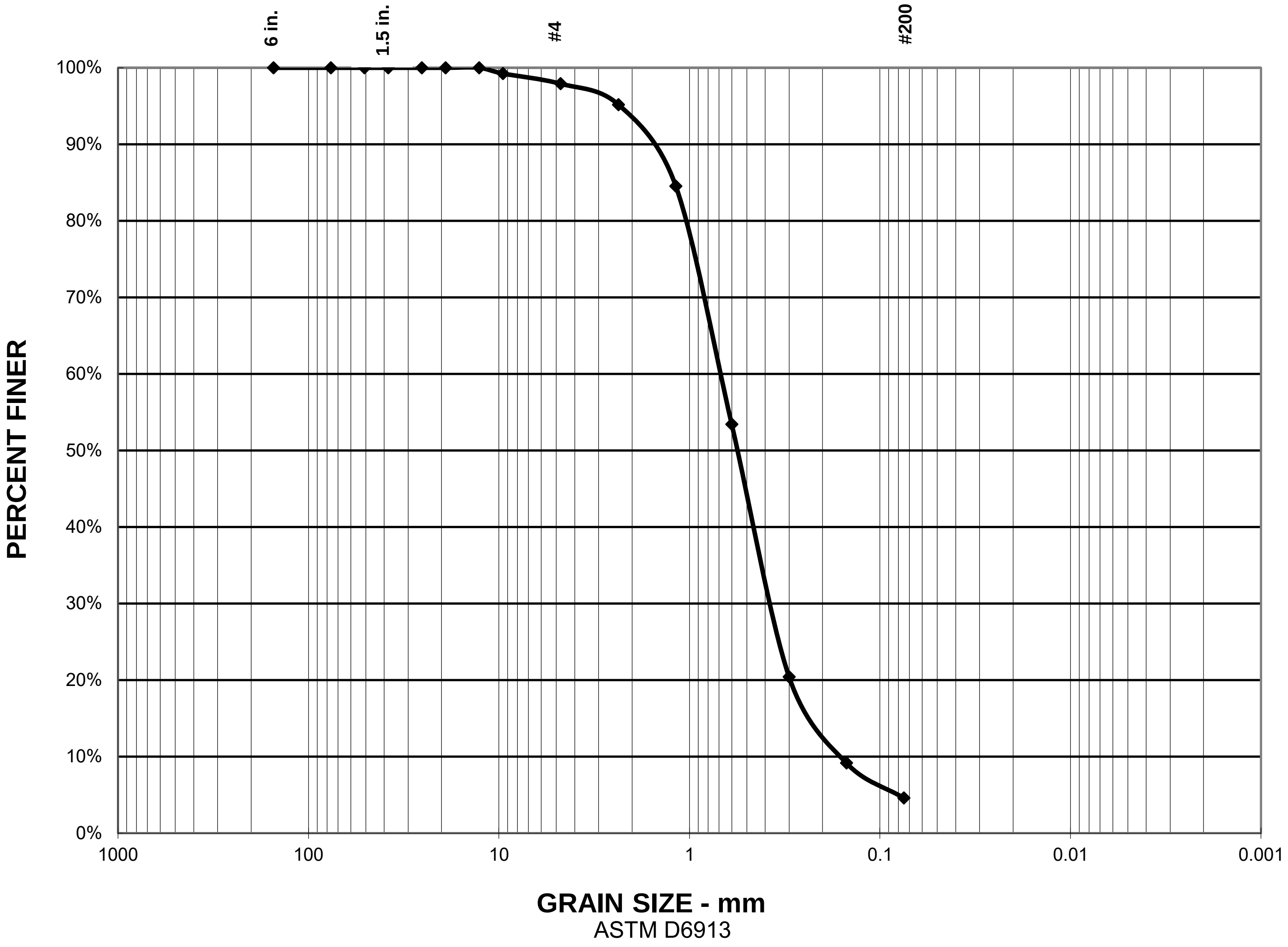
Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-14 @15-16.5, S-3
Soil Description: Well Graded Sand w/ Gravel and Silt (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-14 S-3***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 2%

% SAND = 93%

% SILT & CLAY = 5%

Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-14 @35-36.5, S-7
Soil Description: Well Graded Sand W/ Gravel and Silt (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-14 S-7***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 North Hollywood Park Stormwater Capture**

Date of Report : 5/22/20

Client: **Geosyntec Consultants**

Project No. : 200-20043-20001-01(LA0590B)

Attention To: K. Viswanathan

Reported By: F. Jaque-Diaz

Location: See Below

Date Sampled: 4/10/20, 4/21/20 -4/27/20

Reviewed By: F. Jaque-Diaz

CT&I Sample Number :							
Sample Location :	NH-HSA-14 S-9	NH-HSA-16 S-7	NH-HSA-16 S-12	NH-HSA-18 S-3			
Depth:	45-46.5	40-41.5	65-66.5	35-36.5			
Gradation (ASTM D6913)							
Percent Passing Sieve Size							
2"	-	-	-	-			
1 ½"	-	-	-	-			
1"	100%	100%	100%	-			
3/4"	92%	93%	89%	-			
1/2"	85%	93%	78%	-			
3/8"	83%	92%	74%	-			
#4	81%	90%	64%	-			
#10	77%	84%	55%	-			
#30	68%	69%	44%	100%			
#40	46%	40%	33%	98%			
#50	20%	15%	22%	92%			
#100	8%	7%	14%	69%			
#200	3.6%	3.8%	7.8%	28%			
Moisture content (ASTM D 2216)	1.8%	2.5%	3.8%	3.2%			
Wash #200 (ASTM D 1140)	NT	NT	NT	NT			
Liquid Limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic limit (ASTM D 4318)	NT	NT	NT	NT			
Plastic Index (ASTM D 4318)	NT	NT	NT	NT			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Soil Clasification (ASTM D 2487)	Well Graded Sand w/Gravel and Silt (SW-SM)	Well Graded Sand w/Gravel and Silt (SW-SM)	Well Graded Sand w/ Gravel and Silt (SW-SM)	Sand w/ Silt (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

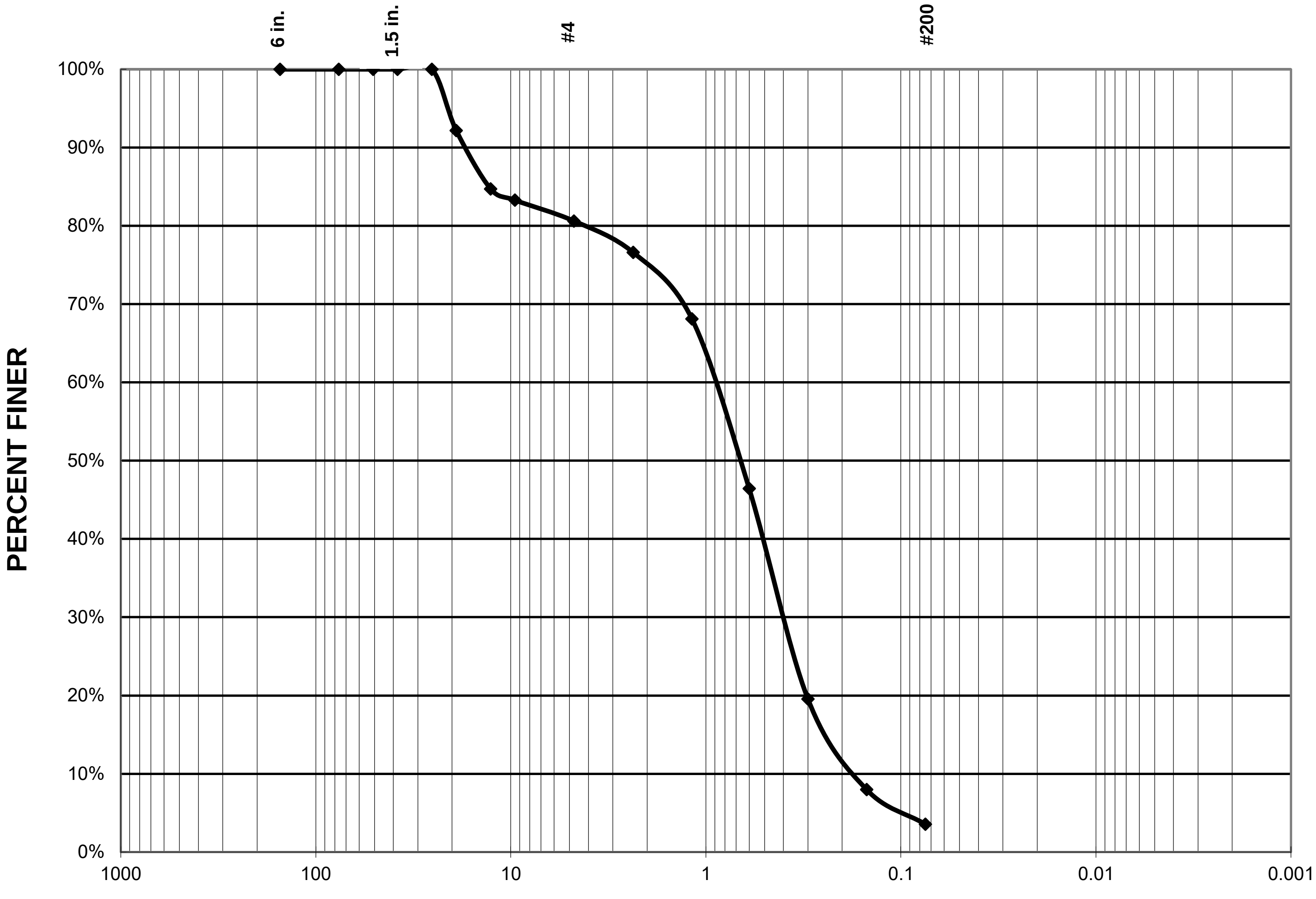
Print Name/Title

5/22/2020

Date

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



GRAIN SIZE - mm
ASTM D-6913

TEST SUMMARY

% GRAVEL = 19%

% SAND = 77%

% SILT & CLAY = 4%

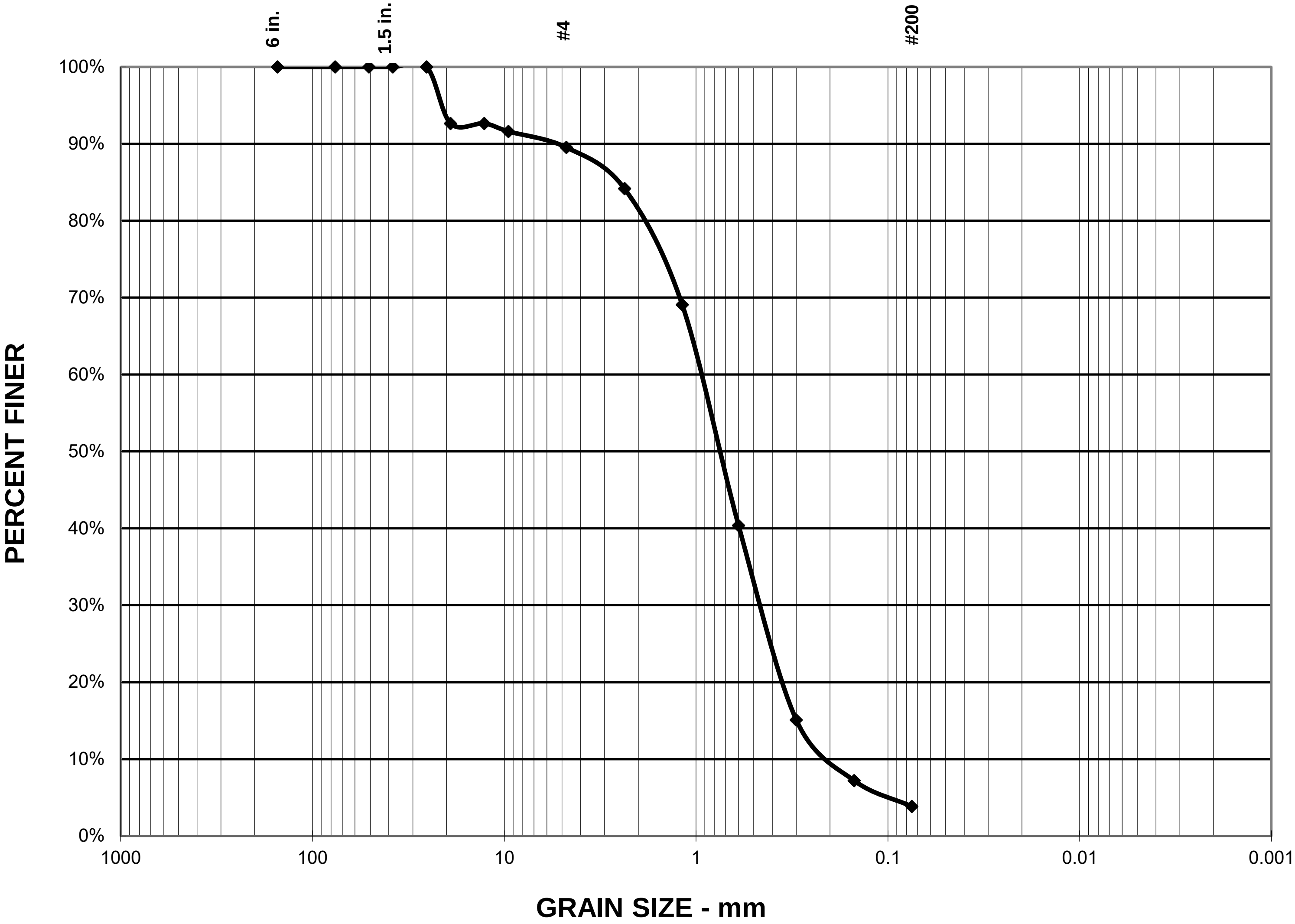
Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-14 @45-46.5, S-9
Soil Description: Well Graded Sand w/Gravel and Silt (SW-SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-14 S-9***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 10%

% SAND = 86%

% SILT & CLAY = 4%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-16 @40-41.5, S-7

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

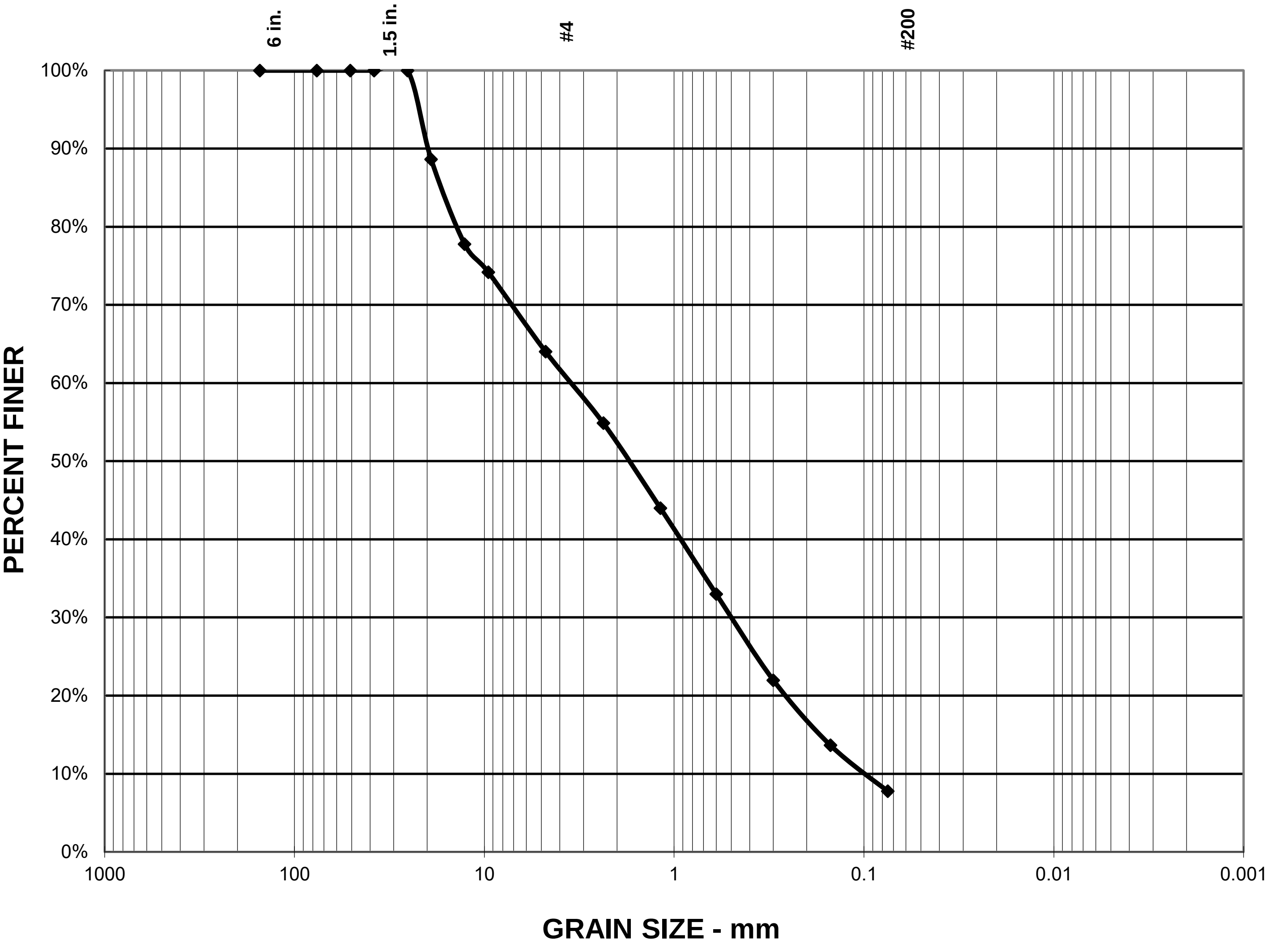
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-16 S-7***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL =	36%
% SAND =	56%
% SILT & CLAY =	8%

Project No.:	200-20043-20001-01(LA0590B)
Project Name:	TOS-25 North Hollywood Park Stormwater Capture
Date sampled:	4/10/20-4/27/20
Location:	NH-HSA-16 @65-66.5, S-12
Soil Description:	Well Graded Sand w/ Gravel and Silt (SW-SM)

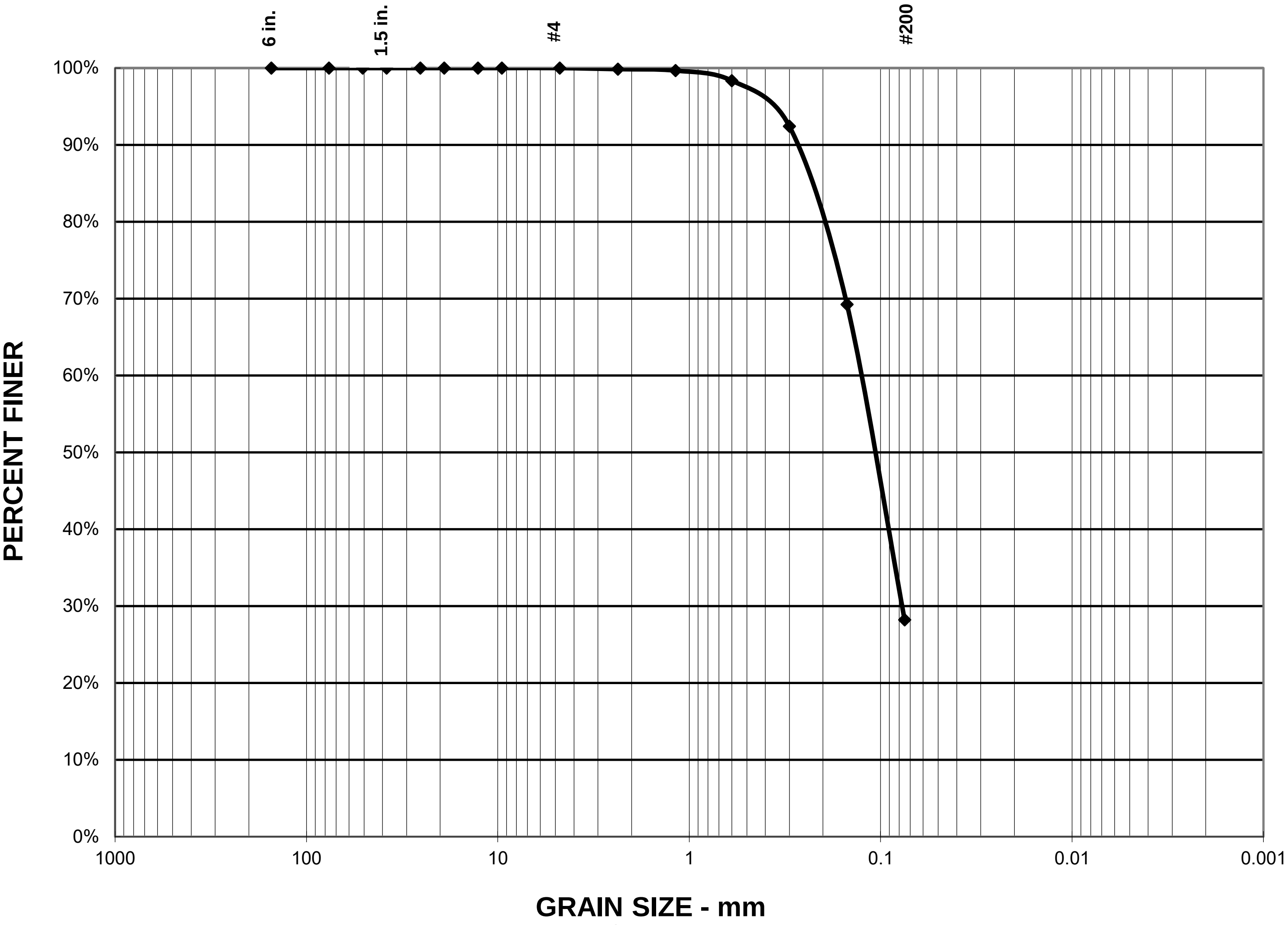
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-16 S-12***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 72%

% SILT & CLAY = 28%

Project No.: 200-20043-20001-01(LA0590B)
Project Name: TOS-25 North Hollywood Park Stormwater Capture
Date sampled: 4/10/20-4/27/20
Location: NH-HSA-18 @20-21.5, S-3
Soil Description: Sand w/ Silt (SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-18 S-3***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 North Hollywood Park Stormwater Capture**

Client: **Geosyntec Consultants**

Attention To: K. Viswanathan

Location: See Below

Date Sampled: 4/10/20, 4/21/20 -4/27/20

Date of Report : 5/22/20

Project No. : 200-20043-20001-01(LA0590B)

Reported By: F. Jaque-Diaz

Reviewed By: F. Jaque-Diaz

CT&I Sample Number :								
Sample Location :	NH-HSA-18 S-6	NH-HSA-18 S-7						
Depth:	35-36.5	40-41.5						
Gradation (ASTM D6913)								
Percent Passing Sieve Size								
2"	-	-						
1 ½"	-	-						
1"	-	-						
3/4"	-	100%						
1/2"	-	98%						
3/8"	-	97%						
#4	100%	92%						
#10	99%	88%						
#30	97%	81%						
#40	94%	71%						
#50	91%	50%						
#100	86%	28%						
#200	75%	13%						
Moisture content (ASTM D 2216)	17.1%	3.9%						
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)	NT	NT						
Soil Clasification (ASTM D 2487)	Silt w/Sand (ML)	Well Graded Sand w/Gravel and Silt (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

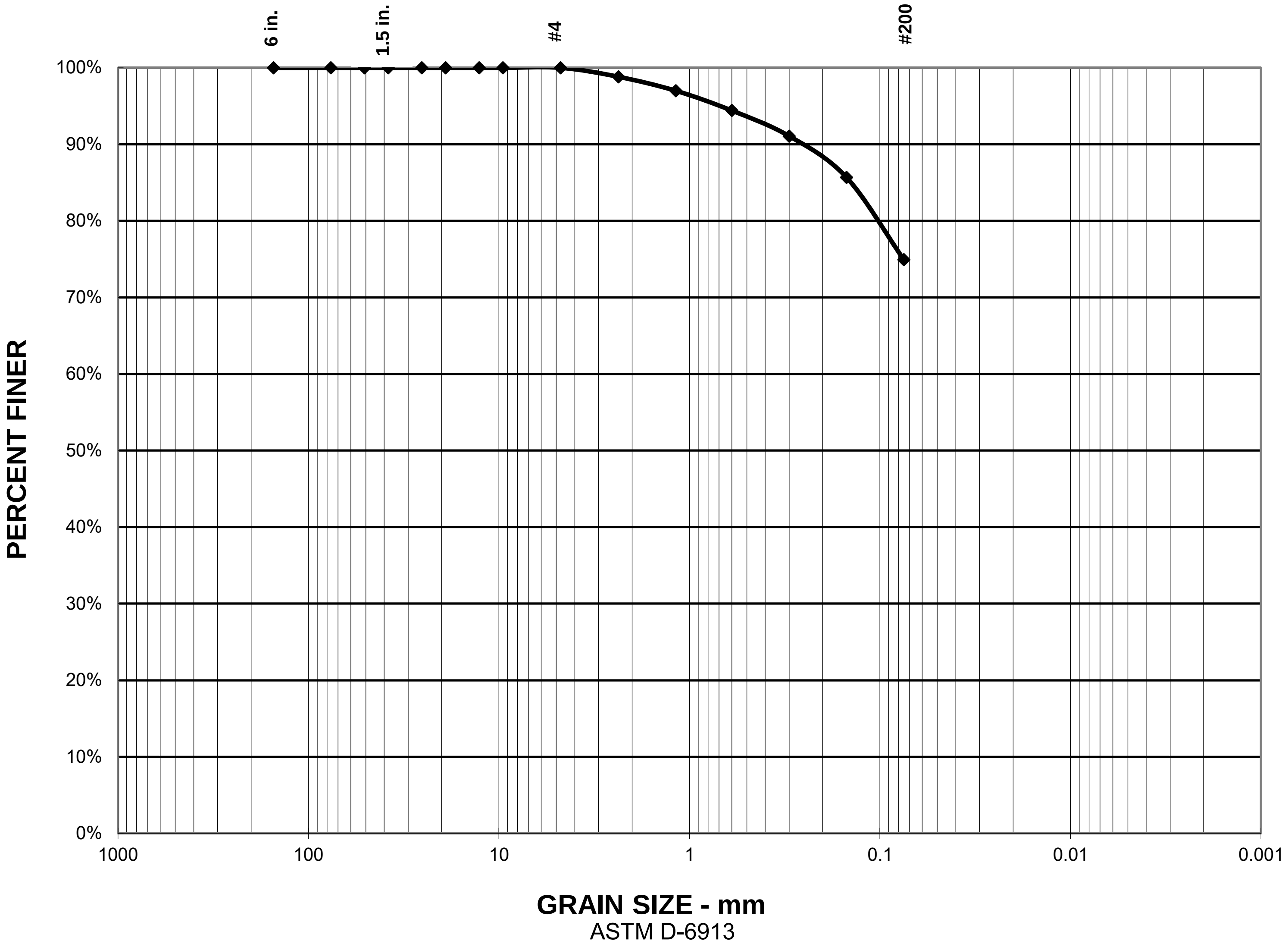
Print Name/Title

5/22/2020

Date

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



TEST SUMMARY

% GRAVEL = 0%

% SAND = 25%

% SILT & CLAY = 75%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-18 @35-36.5, S-6

Soil Description: Silt w/Sand (ML)

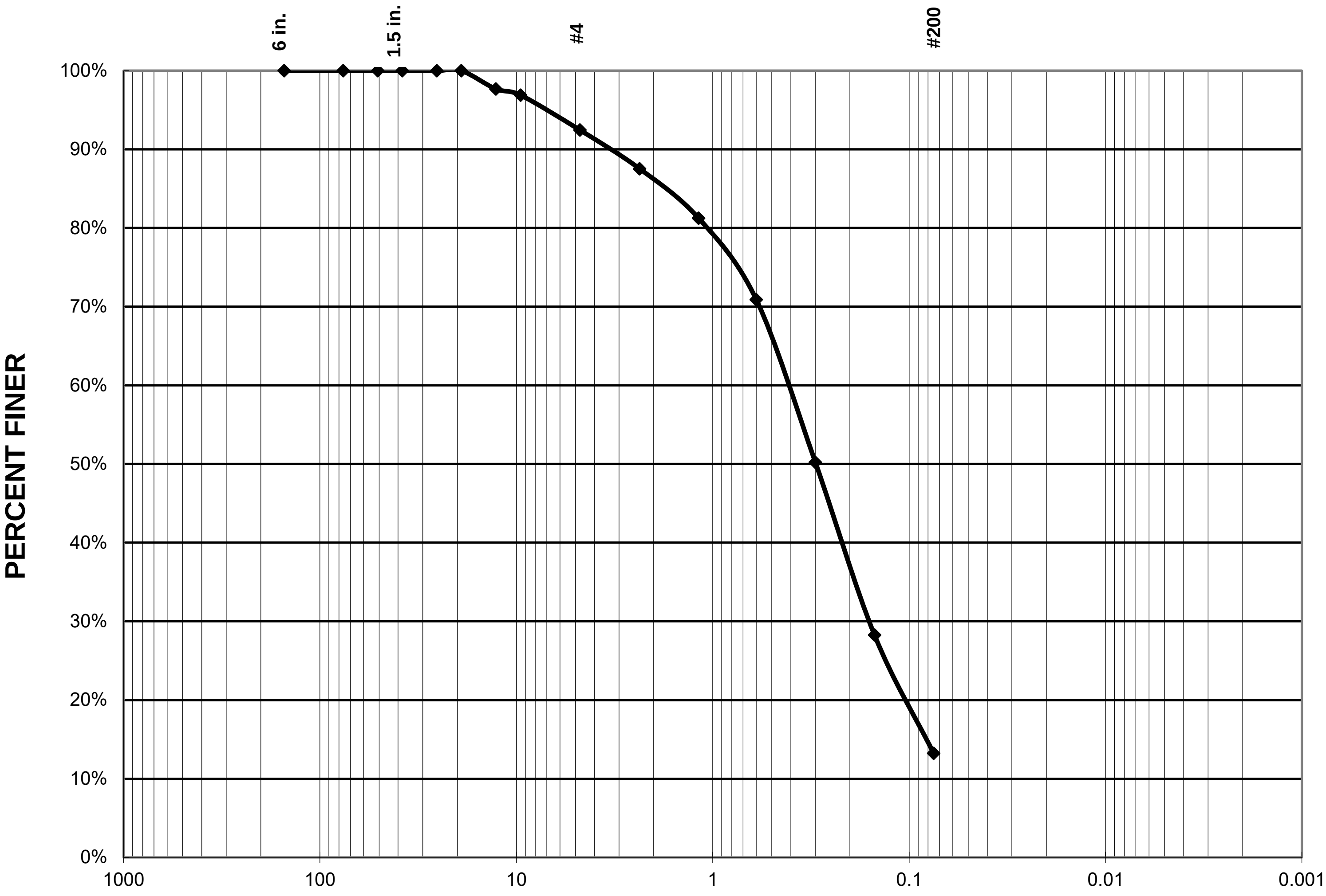
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-18 S-6***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



GRAIN SIZE - mm

ASTM D-6913

TEST SUMMARY

% GRAVEL =	8%
% SAND =	79%
% SILT & CLAY =	13%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-18 @40-41.5, S-7

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

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-18 S-7***

DRAFT - FOR DISCUSSION PURPOSES ONLY

California Testing Inspections

Material Testing Geotechnical Laboratory

SUMMARY OF LABORATORY TEST RESULTS

1

Project Name: **TOS-25 North Hollywood Park Stormwater Capture**

Date of Report : 5/27/20

Client: **Geosyntec Consultants**

Project No. : 200-20043-20001-01(LA0590B)

Attention To: K. Viswanathan

Reported By: F. Jaque-Diaz

Location: See Below

Date Sampled: 4/10/20, 4/21/20 -4/27/20

Reviewed By: F. Jaque-Diaz

CT&I Sample Number :							
Sample Location :	NH-HSA-9 S-4	NH-HSA-13 S-2	NH-HSA-16 S-14	NH-HSA-18 S-12			
Depth:	25-26.5	10-11.5	75-76.5	65-66.5			
Gradation (ASTM D6913) **Percent Passing Sieve Size**							
2"	-	-	-	-			
1 ½"	-	-	-	-			
1"	-	-	-	-			
3/4"	-	-	100%	100%			
1/2"	-	-	99%	99%			
3/8"	-	-	98%	97%			
#4	-	-	95%	96%			
#10	-	100%	92%	91%			
#30	100%	99%	84%	80%			
#40	98%	97%	70%	56%			
#50	89%	92%	55%	25%			
#100	73%	78%	43%	12%			
#200	51%	57%	34%	7.3%			
Moisture content (ASTM D 2216)	7.0%	8.5%	11.7%	2.1%			
Wash #200 (ASTM D 1140)	NT	NT	NT	NT			
Liquid Limit (ASTM D 4318)	NT	NT	23%	NT			
Plastic limit (ASTM D 4318)	NT	NT	19%	NT			
Plastic Index (ASTM D 4318)	NT	NT	4%	NT			
Proctor (ASTM D 1557)(pcf@%MC)	NT	NT	NT	NT			
Sand Equivalent (ASTM D2419)	NT	NT	NT	NT			
Soil Clasification (ASTM D 2487)	Sandy Silt, Yellowish Brown (ML)	Sandy Silt, Brown (ML)	Well Graded Sand w/SIlt, Brown (SM)	Well Graded Sand w/Silt and Gravel (SM)			

Comments: NP: Non-Plastic

NT: Not Tested

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

Signature

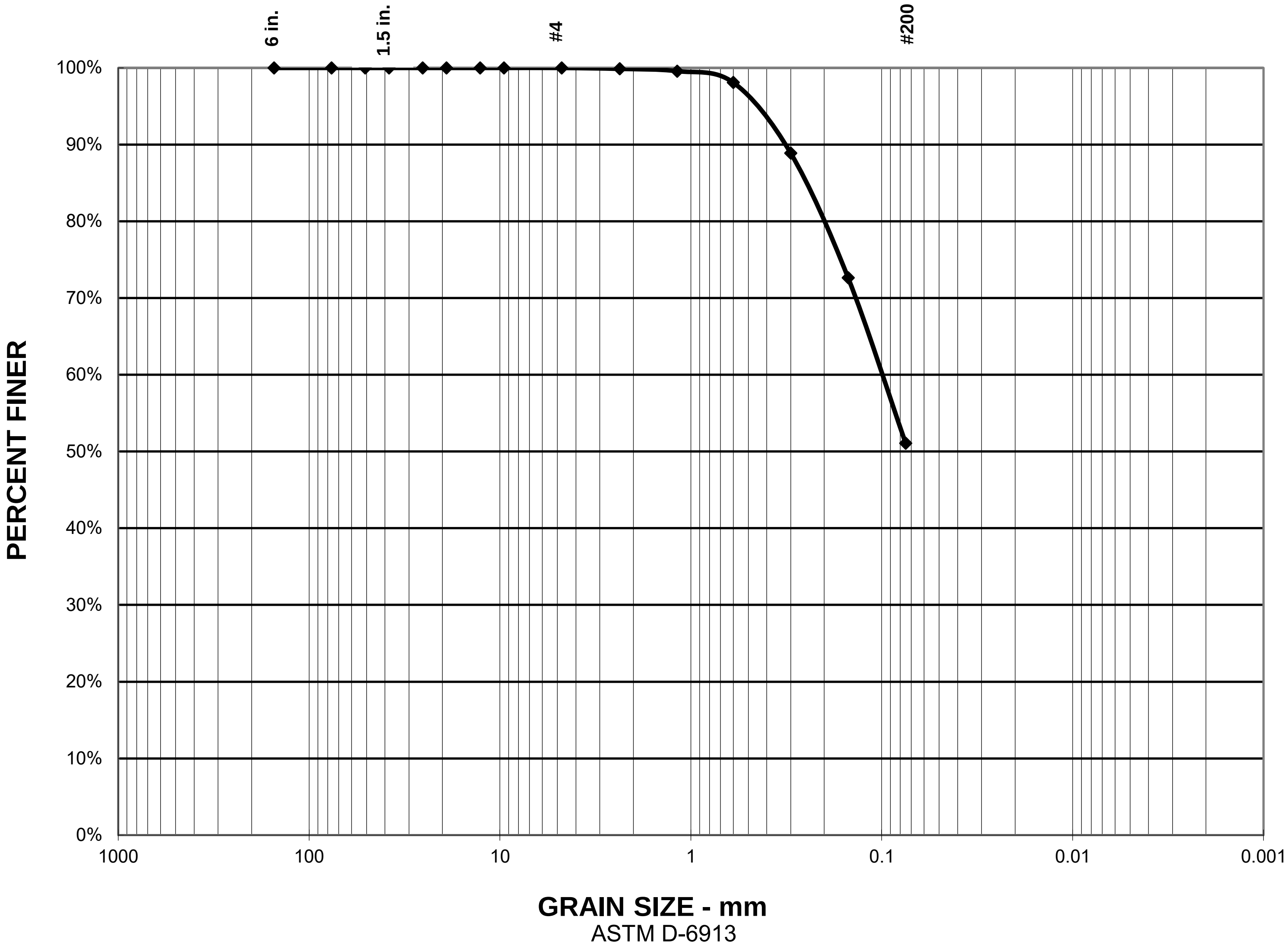
Fabiola Jaque-Diaz, P.E., Project Manager

Print Name/Title

5/27/2020

Date

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 49%

% SILT & CLAY = 51%

Project No.:	200-20043-20001-01(LA0590B)
Project Name:	TOS-25 North Hollywood Park Stormwater Capture
Date sampled:	4/10/20-4/27/20
Location:	NH-HSA-9 @25-26.5, S-4
Soil Description:	Sandy Silt, Yellowish Brown (ML)

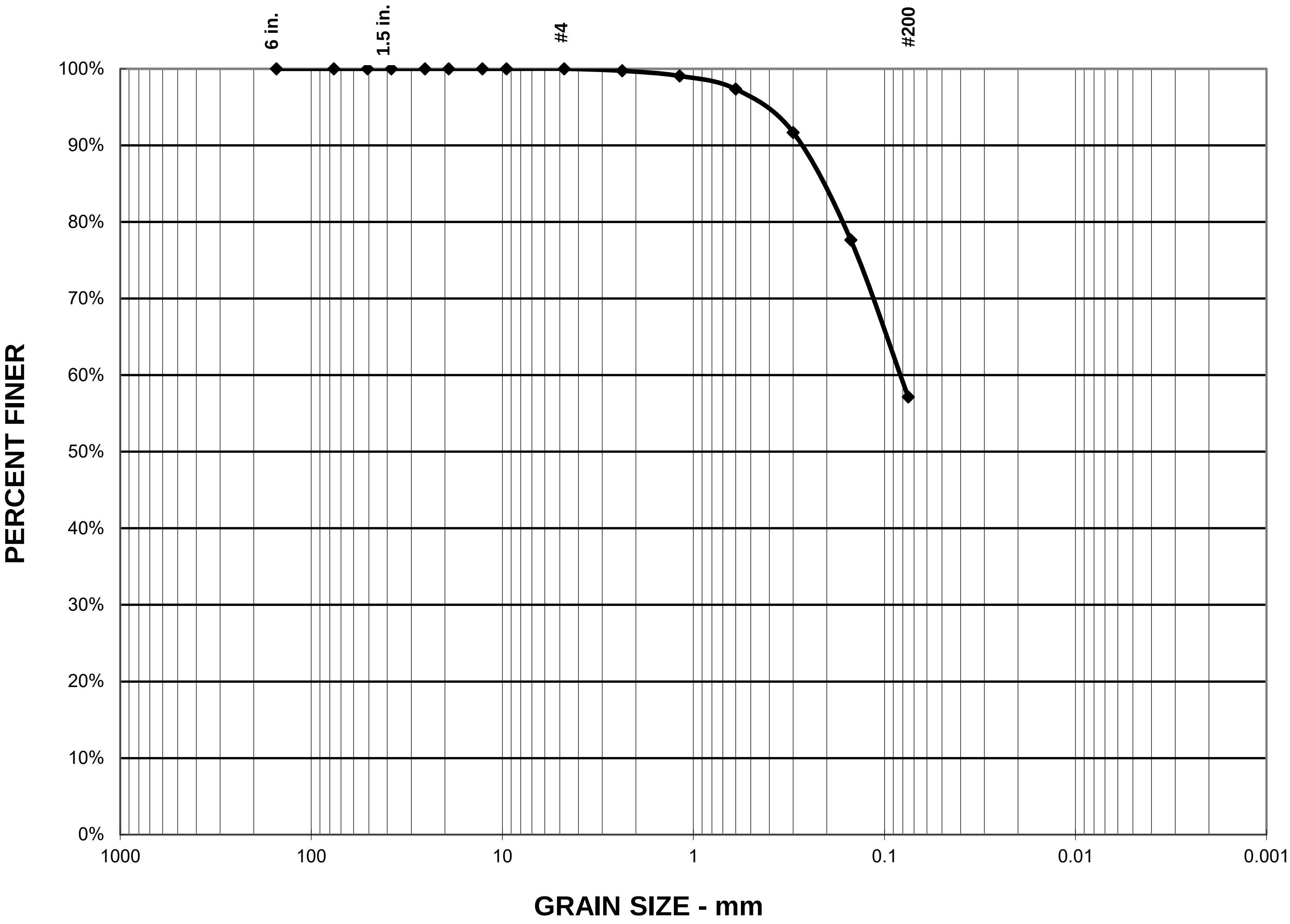
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-9 S-4***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D-6913

TEST SUMMARY

% GRAVEL = 0%

% SAND = 43%

% SILT & CLAY = 57%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-13 @10-11.5, S-2

Soil Description: Sandy Silt, Brown (ML)

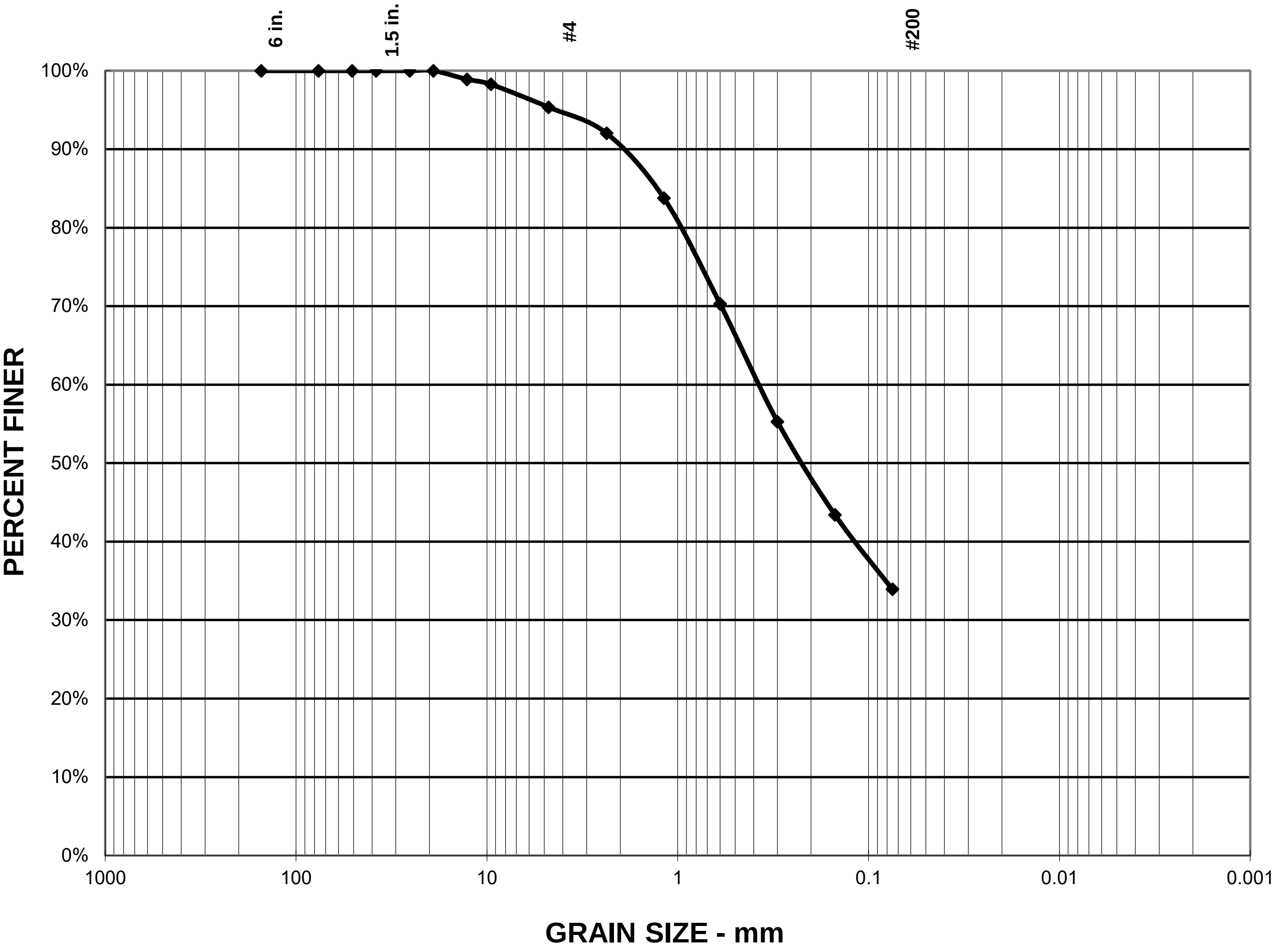
GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-13 S-2***

DRAFT - FOR DISCUSSION PURPOSES ONLY

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 5%

% SAND = 61%

% SILT & CLAY = 34%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-16 @75-76.5, S-14

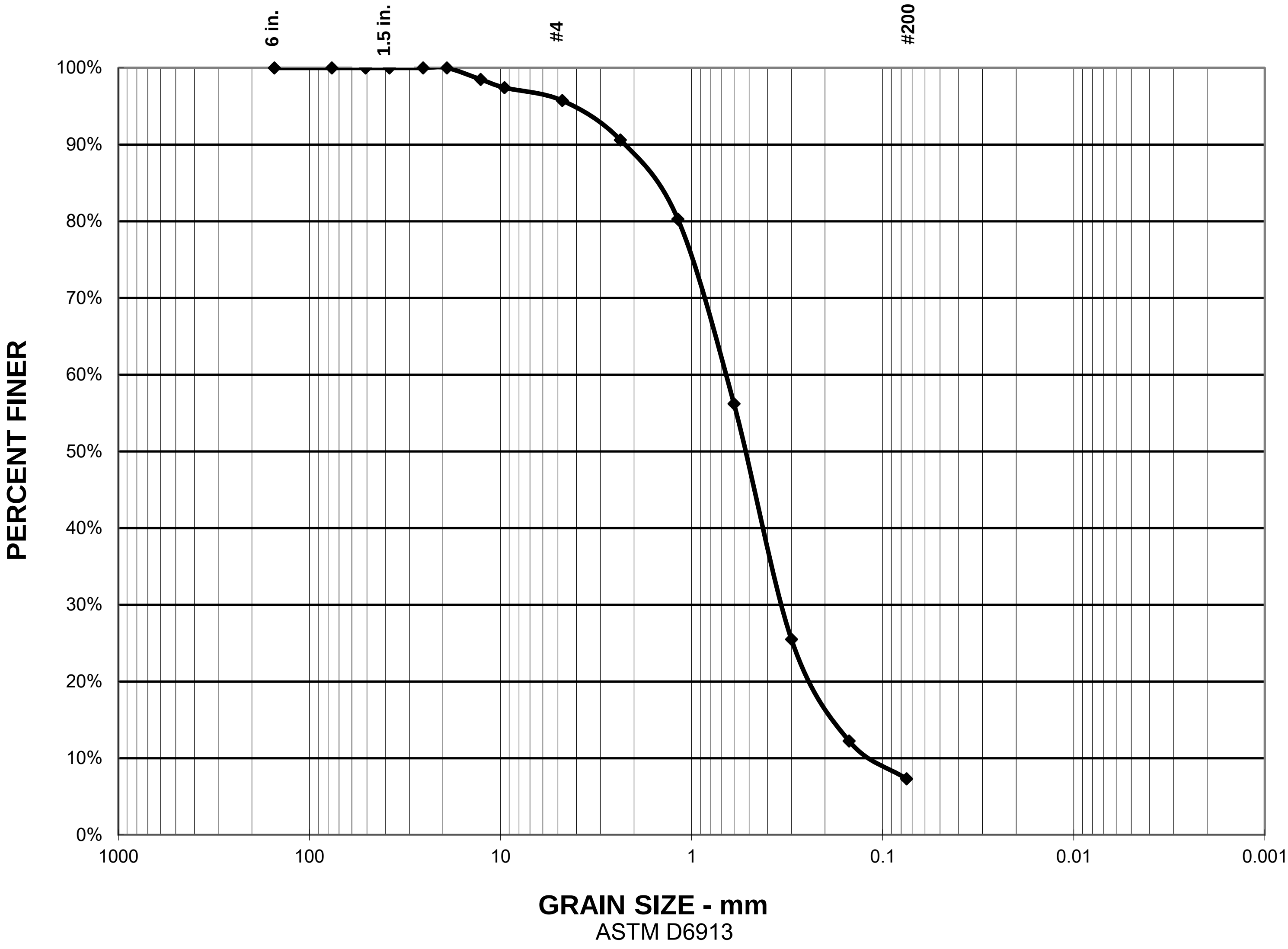
Soil Description: Well Graded Sand w/SIlt, Brown (SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-16 S-14***

GRAIN SIZE DISTRIBUTION GRAPH



ASTM D6913

TEST SUMMARY

% GRAVEL = 4%

% SAND = 88%

% SILT & CLAY = 7%

Project No.: 200-20043-20001-01(LA0590B)

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Date sampled: 4/10/20-4/27/20

Location: NH-HSA-18 @65-66.5, S-12

Soil Description: Well Graded Sand w/Silt and Gravel (SM)

GRAIN SIZE DISTRIBUTION TEST REPORT

California Testing & Inspections

Drawing No. ***NH-HSA-18 S-12***

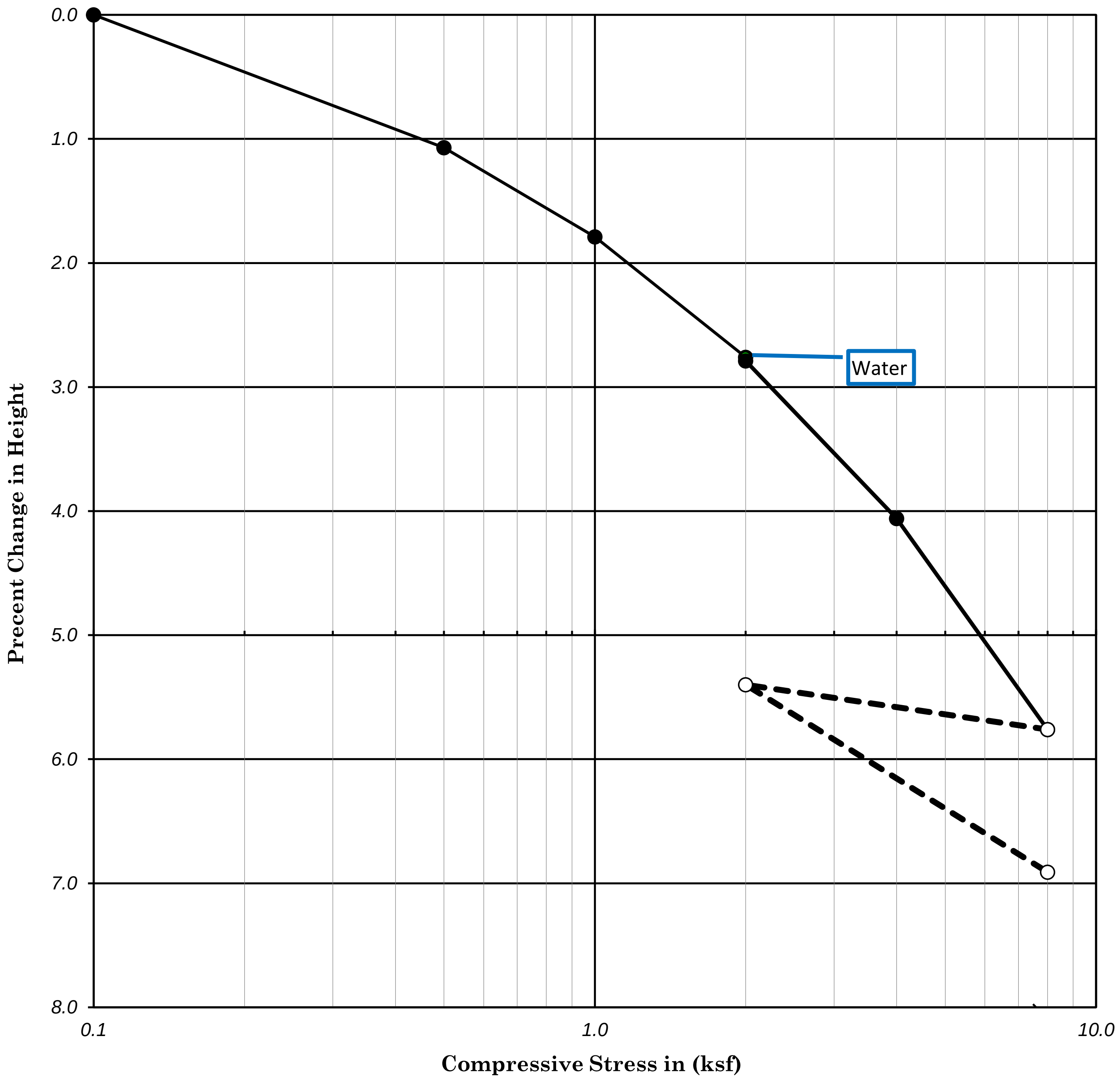
CALIFORNIA TESTING & INSPECTIONS
Geotechnical and Construction Materials Testing Laboratory

Project: TOS-25 North Hollywood Park Stormwater Capture
Project Number: 200-20043-20001-01(LA0590B)
Date: 4/10/20, 04/21/20 - 4/27/2020
Sample ID:
Sampled:

Date Tested: 5/13/2020 - 05/18/2020
Tested By: S. Rodriguez, L. Valle, D. Atkins
Completion Date: 5/26/2020
Remarks:

BORING #	SAMPLE #	DEPTH (ft)	LL	PL	PI
NH-HSA-1	S-1	5.0-6.5'	NP	NP	NP
NH-HSA-1	S-2	10.0-11.5'	NP	NP	NP
NH-HSA-1	S-6	30.0-31.5'	NP	NP	NP
NH-HSA-2	S-6	30.5-31.0'	26	23	3
NH-HSA-3	S-6	30.0-31.5'	25	20	5
NH-HSA-3	S-11	55.0-56.5'	23	21	2
NH-HSA-3	S-16B	81-81.5	NP	NP	NP
NH-HSA-4	S-2	10.0-11.5'	NP	NP	NP
NH-HSA-5	S-1	5.0-6.5'	NP	NP	NP
NH-HSA-8	S-2	10.0-11.5'	26	22	4
NH-HSA-8	S-6D	31-31.5'	26	20	6
NH-HSA-9	S-1	5.0-6.5'	NP	NP	NP
NH-HSA-11	S-1	5.0-6.5'	NP	NP	NP
NH-HSA-11	S-3A	15.5-16.0'	27	23	4
NH-HSA-12	S-2	10.0-11.5'	21	19	2
NH-HSA-12A	S-1	10.0-11.5'	NP	NP	NP
NH-HSA-15	S-4B	21.0-21.5'	23	18	5
NH-HSA-16	S-2	10.0-11.5'	24	19	5
NH-HSA-16	S-3	15.0-16.5'	NP	NP	NP
NH-HSA-16	S-14	75.0-76.5'	23	19	4
NH-HSA-17	S-1B	5.5-6.5'	30	26	4
NH-HSA-17	S-6B	30.5-31.5'	22	20	2
NH-HSA-18	S-15	80.0-81.5'	33	26	7

NP: Non Plastic



Boring No.	: *NH-HSA-8*	**Liquid Limit :**	*N.T.*		**Moisture Content (%)**	**Dry Density (pcf)**	**Percent Saturation**	**Void Ratio**
Sample No.	: *S-6C*	**Plastic Limit :**	*N.T.*					
Depth (ft)	: *30.5'-31'*	**Plastic Index :**	*N.T.*	**Initial**	*21.4*	*104.8*	*94.8*	*0.61*
		Specific Gravity :	*2.70*	**Final**	*21.1*	*112.6*	*100.00*	*0.50*

Description : *Silty Sand (SM)*

TOS-25 North Hollywood Park Stormwater Capture

Project No. : *200-20043-200001-01* **Date :** *05/19/20*

CONSOLIDATION TEST

(ASTM D-2435)

Drawing No. : HSA-8

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PERCENT PASSING NO. 200 SIEVE

ASTM D1140

Client: California Testing & Inspections, Inc.

AP Lab No.: 20-0526

Project Name: TOS-25 North Hollywood Park Stormwater Capture

Test Date: 05/18/20

Project Number: 200-20043-20001-01 (LA0590B)

Boring No.	Sample No.	Depth (ft)	Percent Fines (%)
NH-HSA-18	SH-1	15-17.5	22.5

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name: TOS-25 North Hollywood Park Stormwater Capture
Tested by: ST Date: 05-21-20
Project No.: 200-20043-20001-01 (LA0590B)
Input Data by: JP Date: 05-26-20
Boring No.: NH-HSA-18
Reviewed by: AP Date: 05-26-20
Sample No.: SH-1
Depth (feet): 15-17.5
Sample Type: Shelby Tube
Confining Pressure = 3.5 psi (See Remarks below)
Soil Description: Silty Sand

Diameter (in)	2.895	2.886	2.891	Avg. =	2.891
Height (in)	5.993	6.004	6.010	Avg. =	6.002

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	6.563	6.724
Moisture Content (%)	4.75	22.57
Wet Weight (gms)	127.73	1401.48
Dry Weight (gms)	124.21	1170.68
Container Weight (gms)	50.11	148.00
Density and Saturation		
Wet Weight (gms)	1077.32	
Container Weight (gms)	0.00	
Wet Density (pcf)	104.2	
Dry Density (pcf)	99.5	
Initial Void Ratio	0.694	
% Saturation	18.5	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 98

Consolidation

Cell Pressure (psi) =	53.5	Initial Burette Ht.(cm)=	61.1
Back Pressure(psi) =	50.0	Final Burette Ht.(cm)=	56.7
Eff. Consol. Stress (psi) =	3.5	Final Height (in)=	5.819
Induced OCR =	2.3	Initial Volume (cu.in)=	39.392
Change in Ht. of Specimen (in) =	0.1836	Final Volume (cu.in) =	39.123

Shear		At Failure	
Rate of Deformation (in/min)=	0.004	Max. Deviator Stress (ksf) =	0.90
Time to 50% primary Consolidation (min) =	15	Eff. Minor Principal stress (ksf) =	0.29
Failure Mode:	Bulging Failure	Eff. Major Principal stress (ksf) =	1.18
		Axial Strain (%) =	14.68

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

DRAFT - FOR DISCUSSION PURPOSES ONLY

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	TOS-25 North Hollywood Park Stormwater Capture	Tested by:	ST	Date:	05-21-20
Project No.:	200-20043-20001-01 (LA0590B)	Input Data by:	JP	Date:	05-26-20
Boring No.:	NH-HSA-18	Reviewed by:	AP	Date:	05-26-20
Sample No.:	SH-1				
Depth (feet):	15-17.5	Sample Type:	Shelby Tube	Confining Pressure = 15.0 psi	
Soil Description:	Silty Sand				

Diameter (in)	2.894	2.888	2.886	Avg. =	2.889
Height (in)	6.018	6.020	6.005	Avg. =	6.014

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	6.557	6.534
Moisture Content (%)	4.00	20.79
Wet Weight (gms)	136.24	1451.80
Dry Weight (gms)	132.92	1226.59
Container Weight (gms)	49.95	143.56
Density and Saturation		
Wet Weight (gms)	1130.33	
Container Weight (gms)	0.00	
Wet Density (pcf)	109.2	
Dry Density (pcf)	105.0	
Initial Void Ratio	0.605	
% Saturation	17.9	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 100

Consolidation

Cell Pressure (psi) =	65.0	Initial Burette Ht.(cm)=	52.0
Back Pressure(psi) =	50.0	Final Burette Ht.(cm)=	38.8
Eff. Consol. Stress (psi) =	15.0	Final Height (in)=	5.912
Induced OCR=	1.0	Initial Volume (cu.in)=	39.434
Change in Ht. of Specimen (in) =	0.1021	Final Volume (cu.in) =	38.629

Shear		At Failure	
Rate of Deformation (in/min)=	0.004	Max. Deviator Stress (ksf) =	2.23
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	0.81
Failure Mode:	Bulging Failure	Eff. Major Principal stress (ksf) =	3.04
		Axial Strain (%) =	15.22

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Test Procedure: ASTM D 4767

Project Name:	TOS-25 North Hollywood Park Stormwater Capture	Tested by:	ST	Date:	05-21-20
Project No.:	200-20043-20001-01 (LA0590B)	Input Data by:	JP	Date:	05-26-20
Boring No.:	NH-HSA-18	Reviewed by:	AP	Date:	05-26-20
Sample No.:	SH-1				

Depth (feet): 15-17.5 Sample Type: Shelby Tube Confining Pressure = 30.0 psi

Soil Description: Silty Sand

Diameter (in)	2.888	2.884	2.885	Avg. =	2.886
Height (in)	6.006	6.011	6.010	Avg. =	6.009

	BEFORE CONSOLIDATION	AFTER CONSOLIDATION
Area (in²)	6.540	6.491
Moisture Content (%)	3.03	18.20
Wet Weight (gms)	140.11	1511.12
Dry Weight (gms)	137.50	1299.42
Container Weight (gms)	51.31	136.06
Density and Saturation		
Wet Weight (gms)	1200.23	
Container Weight (gms)	0.00	
Wet Density (pcf)	116.3	
Dry Density (pcf)	112.9	
Initial Void Ratio	0.492	
% Saturation	16.6	

Assumed Specific Gravity = 2.70

Back Pressure Saturation

B Value (%) = 98

Consolidation

Cell Pressure (psi) =	80.0	Initial Burette Ht.(cm)=	63.8
Back Pressure(psi) =	50.0	Final Burette Ht.(cm)=	55.7
Eff. Consol. Stress (psi) =	30.0	Final Height (in)=	5.977
Induced OCR =	1.0	Initial Volume (cu.in)=	39.299
Change in Ht. of Specimen (in) =	0.0316	Final Volume (cu.in) =	38.802

Shear

		At Failure	
Rate of Deformation (in/min)=	0.004	Max. Deviator Stress (ksf) =	18.03
Time to 50% primary Consolidation =	15	Eff. Minor Principal stress (ksf) =	7.24
Failure Mode:	Bulging Failure	Eff. Major Principal stress (ksf) =	25.28
		Axial Strain (%) =	15.06

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	TOS-25 North Hollywood Park Stormwater Capture	Cell Pressure:	53.5	psi
Project No.:	200-20043-20001-01 (LA0590B)	Back Pressure :	50.0	psi
Boring No.:	NH-HSA-18	Consolidation Pressure :	3.5	psi
Sample No.:	SH-1	Initial Sample Height:	6.002	in
Depth (feet):	15-17.5	Initial Area of Sample:	6.563	sq. in.
Sample Type:	Shelby Tube	Final Sample Ht.* (L):	5.819	in
Soil Description:	Silty Sand	Final Sample Area (A)*:	6.724	sq. in.
		Induced OCR=	2.3	

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)
53.5	0	0.000	50.0	1.00	0.00	0.00	0.00	0.00	0.50
53.5	19	0.005	51.0	2.11	0.40	0.09	0.14	0.20	0.56
53.5	21	0.010	51.3	2.42	0.45	0.17	0.19	0.23	0.54
53.5	23	0.015	51.6	2.83	0.50	0.26	0.23	0.25	0.52
53.5	24	0.020	51.7	3.01	0.51	0.34	0.25	0.26	0.51
53.5	25	0.025	51.8	3.16	0.53	0.43	0.26	0.26	0.51
53.5	25	0.030	51.9	3.30	0.54	0.52	0.27	0.27	0.50
53.5	26	0.035	51.9	3.39	0.55	0.60	0.28	0.27	0.50
53.5	26	0.040	52.0	3.51	0.56	0.69	0.28	0.28	0.50
53.5	27	0.045	52.0	3.60	0.57	0.77	0.29	0.28	0.50
53.5	29	0.050	52.0	3.83	0.61	0.86	0.29	0.31	0.52
53.5	31	0.100	52.1	4.25	0.64	1.72	0.31	0.32	0.52
53.5	34	0.159	52.0	4.29	0.70	2.74	0.29	0.35	0.56
53.5	35	0.201	52.0	4.32	0.73	3.45	0.29	0.36	0.58
53.5	37	0.242	51.9	4.27	0.76	4.15	0.27	0.38	0.61
53.5	38	0.283	51.9	4.29	0.77	4.86	0.27	0.39	0.62
53.5	38	0.323	51.8	4.14	0.78	5.56	0.26	0.39	0.64
53.5	40	0.364	51.8	4.27	0.81	6.25	0.26	0.40	0.65
53.5	41	0.405	51.7	4.19	0.81	6.96	0.25	0.41	0.66
53.5	41	0.446	51.7	4.18	0.81	7.67	0.25	0.41	0.66
53.5	43	0.486	51.7	4.20	0.84	8.35	0.24	0.42	0.68
53.5	43	0.527	51.7	4.21	0.84	9.06	0.24	0.42	0.68
53.5	43	0.569	51.6	4.13	0.84	9.77	0.24	0.42	0.69
53.5	45	0.608	51.6	4.20	0.87	10.46	0.23	0.43	0.70
53.5	46	0.650	51.6	4.16	0.87	11.16	0.23	0.43	0.71
53.5	46	0.692	51.6	4.11	0.86	11.88	0.23	0.43	0.71
53.5	47	0.731	51.6	4.21	0.88	12.57	0.23	0.44	0.72
53.5	47	0.773	51.6	4.14	0.88	13.28	0.22	0.44	0.72
53.5	48	0.814	51.6	4.15	0.88	13.99	0.23	0.44	0.72
53.5	49	0.854	51.5	4.14	0.90	14.68	0.22	0.45	0.73
53.5	49	0.895	51.6	4.19	0.89	15.39	0.22	0.45	0.73
53.5	49	0.900	51.6	4.17	0.89	15.47	0.22	0.45	0.73

CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	TOS-25 North Hollywood Park Stormwater Capture	Cell Pressure:	65.0	psi
Project No.:	200-20043-20001-01 (LA0590B)	Back Pressure :	50.0	psi
Boring No.:	NH-HSA-18	Consolidation Pressure :	15.0	psi
Sample No.:	SH-1	Initial Sample Height:	6.014	in
Depth (feet):	15-17.5	Initial Area of Sample:	6.557	sq. in.
Sample Type:	Shelby Tube	Final Sample Ht.* (L):	5.912	in
Soil Description:	Silty Sand	Final Sample Area (A)*:	6.534	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)
65.0	0	0.000	50.0	1.00	0.00	0.00	0.00	0.00	2.16
65.0	34	0.005	52.3	1.41	0.75	0.08	0.33	0.38	2.21
65.0	44	0.010	53.7	1.59	0.96	0.17	0.54	0.48	2.10
65.0	52	0.015	55.3	1.81	1.13	0.25	0.76	0.57	1.97
65.0	55	0.020	56.2	1.95	1.21	0.34	0.89	0.61	1.88
65.0	58	0.025	56.9	2.09	1.27	0.42	1.00	0.64	1.80
65.0	60	0.030	57.5	2.21	1.31	0.51	1.08	0.65	1.74
65.0	61	0.035	58.0	2.33	1.34	0.59	1.15	0.67	1.68
65.0	62	0.040	58.4	2.42	1.36	0.68	1.20	0.68	1.64
65.0	63	0.045	58.7	2.52	1.38	0.76	1.25	0.69	1.60
65.0	64	0.050	58.9	2.60	1.39	0.85	1.29	0.70	1.57
65.0	66	0.075	59.8	2.91	1.44	1.27	1.40	0.72	1.48
65.0	69	0.100	60.2	3.14	1.49	1.69	1.46	0.75	1.44
65.0	73	0.157	60.5	3.40	1.57	2.66	1.51	0.78	1.44
65.0	76	0.198	60.6	3.51	1.61	3.36	1.52	0.80	1.44
65.0	78	0.237	60.5	3.57	1.66	4.01	1.51	0.83	1.47
65.0	81	0.278	60.5	3.62	1.69	4.70	1.51	0.85	1.49
65.0	83	0.318	60.5	3.64	1.73	5.38	1.50	0.87	1.52
65.0	86	0.356	60.4	3.68	1.78	6.03	1.50	0.89	1.55
65.0	89	0.398	60.3	3.71	1.82	6.72	1.49	0.91	1.58
65.0	91	0.438	60.2	3.70	1.85	7.40	1.47	0.92	1.61
65.0	94	0.477	60.2	3.74	1.90	8.06	1.47	0.95	1.64
65.0	96	0.519	60.1	3.73	1.93	8.78	1.45	0.96	1.67
65.0	98	0.560	60.0	3.74	1.96	9.47	1.45	0.98	1.69
65.0	102	0.598	59.9	3.76	2.01	10.12	1.43	1.01	1.73
65.0	104	0.641	59.9	3.77	2.04	10.84	1.42	1.02	1.76
65.0	106	0.681	59.8	3.74	2.06	11.52	1.41	1.03	1.78
65.0	109	0.720	59.7	3.77	2.11	12.18	1.40	1.06	1.82
65.0	111	0.762	59.6	3.76	2.14	12.89	1.39	1.07	1.84
65.0	113	0.802	59.5	3.74	2.15	13.57	1.37	1.08	1.86
65.0	117	0.842	59.5	3.77	2.20	14.25	1.36	1.10	1.90
65.0	119	0.884	59.4	3.74	2.22	14.95	1.35	1.11	1.92
65.0	119	0.900	59.4	3.74	2.23	15.22	1.35	1.12	1.93

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CONSOLIDATED UNDRAINED TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

Project Name:	TOS-25 North Hollywood Park Stormwater Capture	Cell Pressure:	80.0	psi
Project No.:	200-20043-20001-01 (LA0590B)	Back Pressure :	50.0	psi
Boring No.:	NH-HSA-18	Consolidation Pressure :	30.0	psi
Sample No.:	SH-1	Initial Sample Height:	6.009	in
Depth (feet):	15-17.5	Initial Area of Sample:	6.540	sq. in.
Sample Type:	Shelby Tube	Final Sample Ht.* (L):	5.977	in
Soil Description:	Silty Sand	Final Sample Area (A)*:	6.491	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)
80.0	0	0.000	50.0	1.00	0.00	0.00	0.00	0.00	4.32
80.0	81	0.005	55.3	1.51	1.80	0.08	0.76	0.90	4.46
80.0	104	0.010	57.6	1.71	2.30	0.17	1.10	1.15	4.37
80.0	124	0.015	59.7	1.94	2.74	0.25	1.40	1.37	4.29
80.0	140	0.020	61.3	2.15	3.10	0.33	1.63	1.55	4.24
80.0	151	0.025	62.2	2.30	3.34	0.42	1.75	1.67	4.24
80.0	162	0.030	63.0	2.47	3.58	0.50	1.88	1.79	4.24
80.0	171	0.035	63.5	2.59	3.78	0.59	1.95	1.89	4.26
80.0	179	0.040	63.9	2.70	3.94	0.67	2.00	1.97	4.29
80.0	186	0.045	64.2	2.79	4.09	0.75	2.04	2.04	4.32
80.0	193	0.050	64.4	2.89	4.26	0.84	2.07	2.13	4.38
80.0	225	0.075	64.6	3.22	4.93	1.25	2.10	2.47	4.69
80.0	258	0.100	63.9	3.43	5.64	1.67	2.00	2.82	5.14
80.0	315	0.152	61.9	3.61	6.81	2.54	1.71	3.40	6.02
80.0	354	0.191	60.1	3.66	7.61	3.19	1.45	3.81	6.67
80.0	397	0.228	58.2	3.69	8.47	3.82	1.17	4.24	7.38
80.0	436	0.267	56.3	3.71	9.24	4.47	0.91	4.62	8.03
80.0	475	0.306	54.3	3.70	10.00	5.11	0.61	5.00	8.70
80.0	515	0.343	52.4	3.71	10.77	5.74	0.34	5.38	9.36
80.0	551	0.383	50.4	3.69	11.45	6.41	0.06	5.72	9.99
80.0	589	0.421	48.6	3.68	12.14	7.05	-0.20	6.07	10.59
80.0	626	0.459	46.7	3.67	12.83	7.67	-0.48	6.41	11.21
80.0	659	0.497	44.9	3.65	13.41	8.32	-0.73	6.70	11.76
80.0	693	0.537	43.2	3.64	13.99	8.98	-0.99	6.99	12.30
80.0	727	0.574	41.5	3.63	14.57	9.60	-1.23	7.29	12.83
80.0	758	0.611	39.9	3.61	15.09	10.23	-1.46	7.54	13.32
80.0	786	0.651	38.2	3.58	15.55	10.88	-1.69	7.77	13.79
80.0	818	0.688	36.9	3.59	16.06	11.51	-1.88	8.03	14.23
80.0	846	0.726	35.4	3.57	16.49	12.14	-2.10	8.25	14.67
80.0	870	0.763	34.2	3.55	16.83	12.77	-2.28	8.42	15.02
80.0	898	0.802	32.8	3.54	17.26	13.41	-2.47	8.63	15.42
80.0	924	0.839	31.6	3.53	17.63	14.03	-2.65	8.81	15.78
80.0	943	0.876	30.4	3.50	17.86	14.66	-2.82	8.93	16.07
80.0	957	0.900	29.7	3.49	18.03	15.06	-2.92	9.02	16.26

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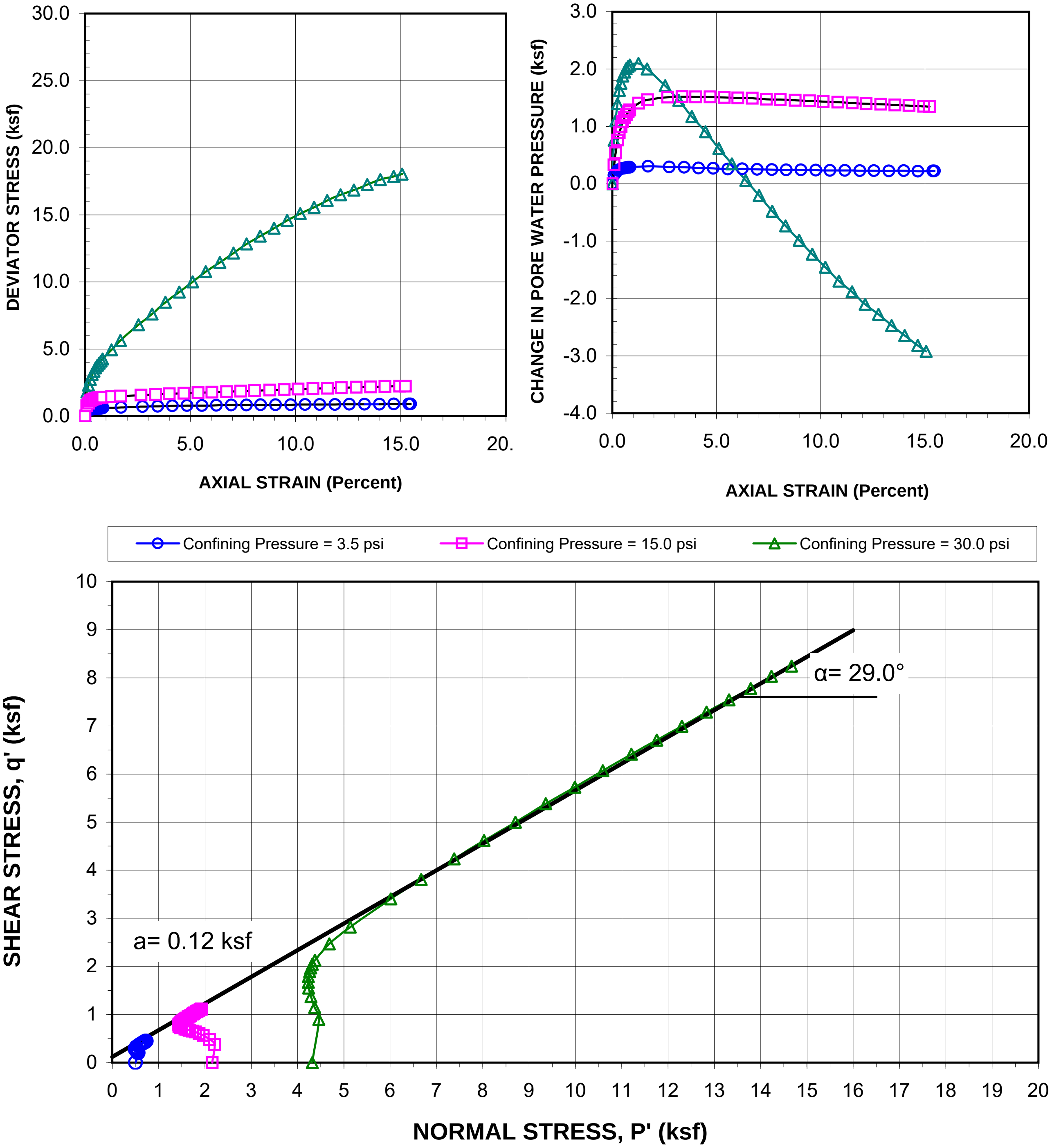
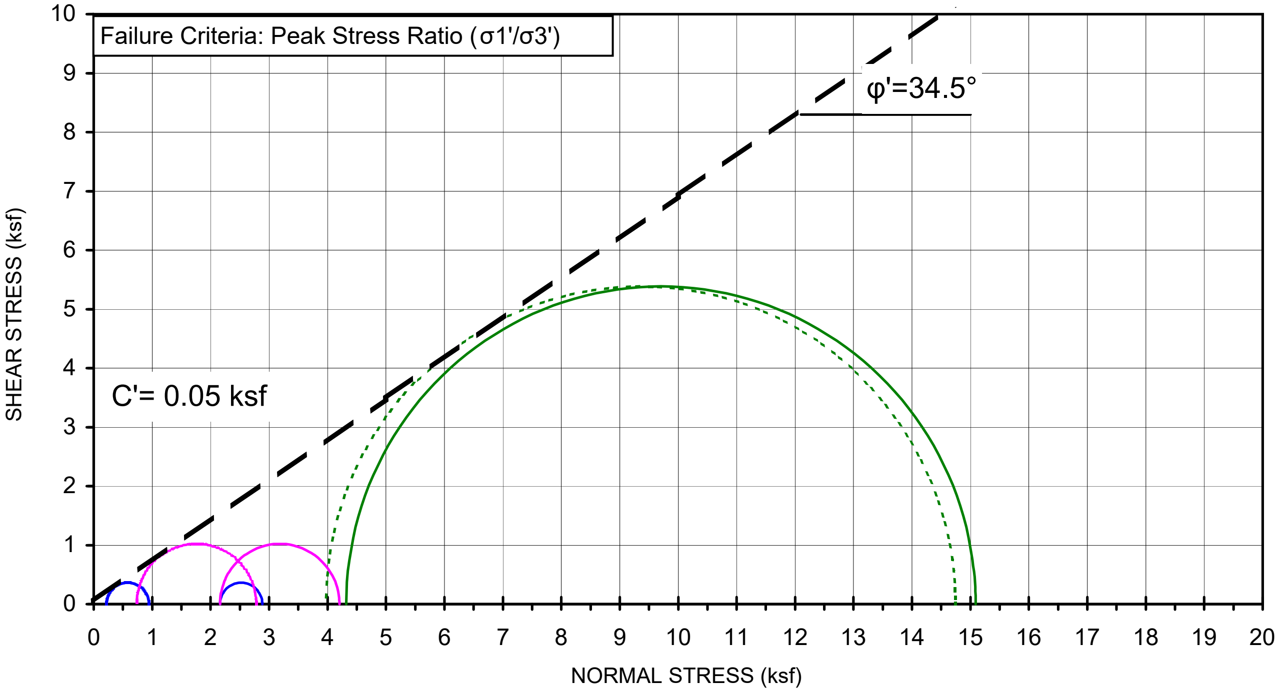


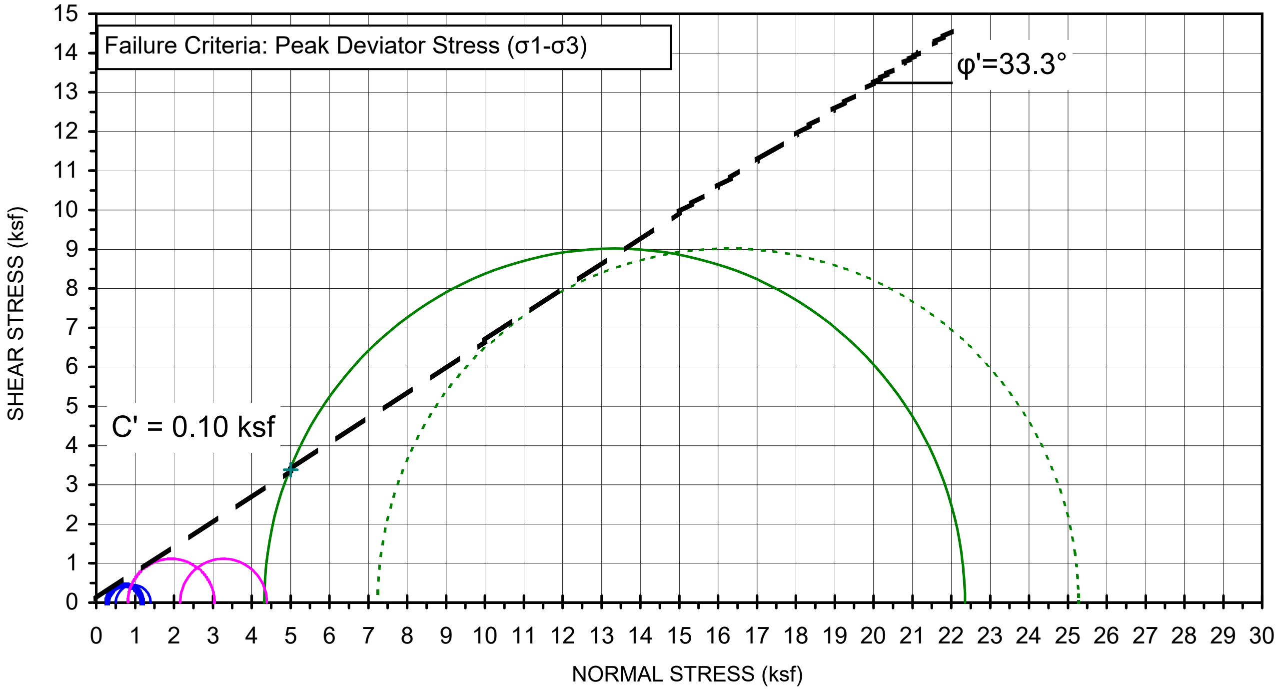
Project Name:	TOS-25 North Hollywood Park Stormwat	Sample Type:	Shelby Tube
Project No.:	200-20043-20001-01 (LA0590B)	Soil Description:	Silty Sand
Boring No.:	NH-HSA-18	Avg. Dry Unit Weight (pcf):	105.8
Sample No.:	SH-1	Avg. Initial Moisture Content (%):	3.9
Depth (feet):	15-17.5	Confining Pressures:	3.5, 15.0, 30.0 psi

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

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





Project Name:	TOS-25 North Hollywood Park Stormwater Cap	Sample Type:	Shelby Tube
Project No.:	200-20043-20001-01 (LA0590B)	Soil Description:	Silty Sand
Boring No.:	NH-HSA-18	Avg. Dry Unit Weight (pcf):	105.8
Sample No.:	SH-1	Avg. Initial Moisture Content (%):	3.9
Depth (feet):	15-17.5	Confining Pressure:	3.5, 15.0, 30.0 psi

CU TRIAXIAL TEST WITH PORE PRESSURE MEASUREMENT

ASTM D 4767

APPENDIX D

Soil Chemical Laboratory Testing Data

Results Only Soil Testing
for
City of LA TOS-25
North Hollywood Park
Storm Water Capture

May 7, 2020

Prepared for:
Karthik Viswanathan
Geosyntec Consultants, Inc.
2100 Main Street, Suite 105
Huntington Beach, CA 92648
kviswanathan@geosyntec.com

Project X Job#: S200504C
Client Job or PO#: LA0590B

Respectfully Submitted,

Eduardo Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

No. M37102

Soil Analysis Lab Results

Client: Geosyntec Consultants, Inc.
Job Name: City of LA TOS-25 North Hollywood Park Storm Water Capture
Client Job Number: LA0590B
Project X Job Number: S200504C
May 7, 2020

	Method	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
Bore# / Description	**Depth**	**Sulfates**		**Chlorides**		**Resistivity**		**pH**	**Redox**	**Sulfide**	**Nitrate**	**Ammonium**	**Lithium**	**Sodium**	**Potassium**	**Magnesium**	**Calcium**	**Flouride**	**Phosphate**	**Bicarbonate**
		SO_4^{2-}		Cl^-		As Rec'd	Minimum			S^{2-}	NO_3^-	NH_4^+	Li^+	Na^+	K^+	Mg^{2+}	Ca^{2+}	F_2^{--}	PO_4^{3-}	HCO_3^-
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(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)
NH-HSA-8-S1B	5.3-6.5	1.4	0.0001	0.7	0.0001	93,800	27,470	7.17	235	0.45	0.2	ND	ND	13.0	6.4	1.4	14.3	2.7	6.5	56.6

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract

APPENDIX E

Environmental Laboratory Testing Data

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ANALYTICAL REPORT

Eurofins Calscience LLC
7440 Lincoln Way
Garden Grove, CA 92841
Tel: (714)895-5494

Laboratory Job ID: 570-26752-1
Client Project/Site: City of LA TOS-25/ LA0590B

For:
Geosyntec Consultants, Inc.
2100 Main Street
Suite 150
Huntington Beach, California 92648

Attn: Karthik Viswanathan

Authorized for release by:
4/29/2020 12:37:37 PM

Stephen Nowak, Project Manager I
(714)895-5494
stephennowak@eurofinsus.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Definitions/Glossary

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
F1	MS and/or MSD recovery exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Job ID: 570-26752-1

Laboratory: Eurofins Calscience LLC

Narrative

Job Narrative
570-26752-1

Comments
No additional comments.

Receipt
The samples were received on 4/27/2020 10:15 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 20.7º C.

Receipt Exceptions

Received samples in high temperature,no ice.

VN-HSA-2-25 (570-26752-1), AX-HSA-5-S3 (570-26752-2), NH-HSA-10-S4 (570-26752-3), NH-HSA-9-S2 (570-26752-4), NH-HSA-18-S7 (570-26752-5) and NH-HSA-3-40 (570-26752-6)

GC/MS VOA
Method 8260B: The initial calibration curve analyzed in batch 570-65837 was outside method criteria for the following analyte(s): Bromomethane. As indicated in the reference method, sample analysis may proceed; however, any detection or non-detection for the affected analyte(s) is considered an estimated concentration.

Method 8260B: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 570-65826 and analytical batch 570-65837 were outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

VOA Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client Sample ID: VN-HSA-2-25 Lab Sample ID: 570-26752-1

No Detections.

Client Sample ID: AX-HSA-5-S3 Lab Sample ID: 570-26752-2

No Detections.

Client Sample ID: NH-HSA-10-S4 Lab Sample ID: 570-26752-3

No Detections.

Client Sample ID: NH-HSA-9-S2 Lab Sample ID: 570-26752-4

No Detections.

Client Sample ID: NH-HSA-18-S7 Lab Sample ID: 570-26752-5

No Detections.

Client Sample ID: NH-HSA-3-40 Lab Sample ID: 570-26752-6

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Geosyntec Consultants, Inc. Job ID: 570-26752-1
Project/Site: City of LA TOS-25/ LA0590B

Method: 8260B - Volatile Organic Compounds (GC/MS)

Client Sample ID: VN-HSA-2-25 **Lab Sample ID: 570-26752-1**
Date Collected: 04/16/20 08:10 **Matrix: Solid**
Date Received: 04/27/20 10:15

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,1,1-Trichloroethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,1,2,2-Tetrachloroethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,1,2-Trichloroethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,1-Dichloroethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,1-Dichloroethene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,1-Dichloropropene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2,3-Trichlorobenzene	ND		9.8		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2,3-Trichloropropane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2,4-Trichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2,4-Trimethylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2-Dibromo-3-Chloropropane	ND		9.8		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2-Dibromoethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2-Dichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2-Dichloroethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,2-Dichloropropane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,3,5-Trimethylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,3-Dichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,3-Dichloropropane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
1,4-Dichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
2,2-Dichloropropane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
2-Butanone	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
2-Chlorotoluene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
2-Hexanone	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
4-Chlorotoluene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
4-Methyl-2-pentanone	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Acetone	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Benzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Bromobenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Bromochloromethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Bromodichloromethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Bromoform	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Bromomethane	ND		25		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
cis-1,2-Dichloroethene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
cis-1,3-Dichloropropene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Carbon disulfide	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Carbon tetrachloride	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Chlorobenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Chloroethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Chloroform	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Chloromethane	ND		25		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Dibromochloromethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Dibromomethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Dichlorodifluoromethane	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Ethylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Isopropylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Methylene Chloride	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Methyl-t-Butyl Ether (MTBE)	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1

Client Sample Results

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Client Sample ID: VN-HSA-2-25
Lab Sample ID: 570-26752-1
Date Collected: 04/16/20 08:10
Matrix: Solid
Date Received: 04/27/20 10:15

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Naphthalene	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
n-Butylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
N-Propylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
o-Xylene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
m,p-Xylene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
p-Isopropyltoluene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
sec-Butylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Styrene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
trans-1,2-Dichloroethene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
trans-1,3-Dichloropropene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
tert-Butylbenzene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Tetrachloroethene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Toluene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Trichloroethene	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Trichlorofluoromethane	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Vinyl acetate	ND		49		ug/Kg		04/28/20 17:09	04/29/20 00:11	1
Vinyl chloride	ND		4.9		ug/Kg		04/28/20 17:09	04/29/20 00:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 155*	*04/28/20 17:09*	*04/29/20 00:11*	*1*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*	*04/28/20 17:09*	*04/29/20 00:11*	*1*
Dibromofluoromethane (Surr)	*96*		*79 - 133*	*04/28/20 17:09*	*04/29/20 00:11*	*1*
Toluene-d8 (Surr)	*100*		*80 - 120*	*04/28/20 17:09*	*04/29/20 00:11*	*1*

Client Sample ID: AX-HSA-5-S3
Lab Sample ID: 570-26752-2
Date Collected: 04/17/20 07:40
Matrix: Solid
Date Received: 04/27/20 10:15

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,1,1-Trichloroethane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,1,2,2-Tetrachloroethane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		51		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,1,2-Trichloroethane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,1-Dichloroethane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,1-Dichloroethene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,1-Dichloropropene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2,3-Trichlorobenzene	ND		10		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2,3-Trichloropropane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2,4-Trichlorobenzene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2,4-Trimethylbenzene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2-Dibromo-3-Chloropropane	ND		10		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2-Dibromoethane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2-Dichlorobenzene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2-Dichloroethane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,2-Dichloropropane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,3,5-Trimethylbenzene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,3-Dichlorobenzene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,3-Dichloropropane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
1,4-Dichlorobenzene	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1
2,2-Dichloropropane	ND		5.1		ug/Kg		04/28/20 17:09	04/29/20 00:36	1

QC Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590B

Job ID: 570-26752-1

Method: 8260B - Volatile Organic Compounds (GC/MS)

Lab Sample ID: MB 570-65826/3-A
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 65826

Analyte	MB Result	MB Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,1,1-Trichloroethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,1,2,2-Tetrachloroethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,1,2-Trichloroethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,1-Dichloroethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,1-Dichloroethene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,1-Dichloropropene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2,3-Trichlorobenzene	ND		9.8		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2,3-Trichloropropane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2,4-Trichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2,4-Trimethylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2-Dibromo-3-Chloropropane	ND		9.8		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2-Dibromoethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2-Dichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2-Dichloroethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,2-Dichloropropane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,3,5-Trimethylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,3-Dichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,3-Dichloropropane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
1,4-Dichlorobenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
2,2-Dichloropropane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
2-Butanone	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
2-Chlorotoluene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
2-Hexanone	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
4-Chlorotoluene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
4-Methyl-2-pentanone	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Acetone	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Benzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Bromobenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Bromochloromethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Bromodichloromethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Bromoform	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Bromomethane	ND		25		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
cis-1,2-Dichloroethene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
cis-1,3-Dichloropropene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Carbon disulfide	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Carbon tetrachloride	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Chlorobenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Chloroethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Chloroform	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Chloromethane	ND		25		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Dibromochloromethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Dibromomethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Dichlorodifluoromethane	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Ethylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Isopropylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Methylene Chloride	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1

QC Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590B

Job ID: 570-26752-1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 570-65826/3-A
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 65826

Analyte	MB Result	MB Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Methyl-t-Butyl Ether (MTBE)	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Naphthalene	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
n-Butylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
N-Propylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
o-Xylene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
m,p-Xylene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
p-Isopropyltoluene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
sec-Butylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Styrene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
trans-1,2-Dichloroethene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
trans-1,3-Dichloropropene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
tert-Butylbenzene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Tetrachloroethene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Toluene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Trichloroethene	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Trichlorofluoromethane	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Vinyl acetate	ND		49		ug/Kg		04/28/20 17:07	04/28/20 21:10	1
Vinyl chloride	ND		4.9		ug/Kg		04/28/20 17:07	04/28/20 21:10	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*101*		*71 - 155*	*04/28/20 17:07*	*04/28/20 21:10*	*1*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*	*04/28/20 17:07*	*04/28/20 21:10*	*1*
Dibromofluoromethane (Surr)	*99*		*79 - 133*	*04/28/20 17:07*	*04/28/20 21:10*	*1*
Toluene-d8 (Surr)	*99*		*80 - 120*	*04/28/20 17:07*	*04/28/20 21:10*	*1*

Lab Sample ID: LCS 570-65826/1-A
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,1,1,2-Tetrachloroethane	50.1	47.75		ug/Kg		95	70 - 130
1,1,1-Trichloroethane	50.1	48.58		ug/Kg		97	70 - 130
1,1,2,2-Tetrachloroethane	50.1	48.30		ug/Kg		96	70 - 130
1,1,2-Trichloro-1,2,2-trifluoroethane	50.1	45.09	J	ug/Kg		90	70 - 130
1,1,2-Trichloroethane	50.1	48.96		ug/Kg		98	70 - 130
1,1-Dichloroethane	50.1	45.50		ug/Kg		91	70 - 130
1,1-Dichloroethene	50.1	47.36		ug/Kg		95	74 - 122
1,1-Dichloropropene	50.1	46.83		ug/Kg		93	70 - 130
1,2,3-Trichlorobenzene	50.1	48.80		ug/Kg		97	70 - 130
1,2,3-Trichloropropane	50.1	46.53		ug/Kg		93	70 - 130
1,2,4-Trichlorobenzene	50.1	49.66		ug/Kg		99	70 - 130
1,2,4-Trimethylbenzene	50.1	45.35		ug/Kg		91	70 - 130
1,2-Dibromo-3-Chloropropane	50.1	45.90		ug/Kg		92	70 - 130
1,2-Dibromoethane	50.1	47.15		ug/Kg		94	70 - 130
1,2-Dichlorobenzene	50.1	47.63		ug/Kg		95	75 - 120
1,2-Dichloroethane	50.1	49.25		ug/Kg		98	70 - 130
1,2-Dichloropropane	50.1	46.50		ug/Kg		93	79 - 115
1,3,5-Trimethylbenzene	50.1	46.83		ug/Kg		93	70 - 130

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 570-65826/1-A
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,3-Dichlorobenzene	50.1	47.41		ug/Kg		95	70 - 130
1,3-Dichloropropane	50.1	46.03		ug/Kg		92	70 - 130
1,4-Dichlorobenzene	50.1	47.56		ug/Kg		95	70 - 130
2,2-Dichloropropane	50.1	49.03		ug/Kg		98	70 - 130
2-Butanone	50.1	46.49	J	ug/Kg		93	70 - 130
2-Chlorotoluene	50.1	45.96		ug/Kg		92	70 - 130
2-Hexanone	50.1	47.72	J	ug/Kg		95	70 - 130
4-Chlorotoluene	50.1	48.26		ug/Kg		96	70 - 130
4-Methyl-2-pentanone	50.1	45.79	J	ug/Kg		91	70 - 130
Acetone	50.1	48.16	J	ug/Kg		96	70 - 130
Benzene	50.1	44.21		ug/Kg		88	78 - 120
Bromobenzene	50.1	48.96		ug/Kg		98	70 - 130
Bromochloromethane	50.1	46.57		ug/Kg		93	70 - 130
Bromodichloromethane	50.1	48.90		ug/Kg		98	70 - 130
Bromoform	50.1	46.14		ug/Kg		92	70 - 130
Bromomethane	50.1	40.52		ug/Kg		81	70 - 130
cis-1,2-Dichloroethene	50.1	46.10		ug/Kg		92	70 - 130
cis-1,3-Dichloropropene	50.1	45.74		ug/Kg		91	70 - 130
Carbon disulfide	50.1	47.10	J	ug/Kg		94	70 - 130
Carbon tetrachloride	50.1	45.04		ug/Kg		90	49 - 139
Chlorobenzene	50.1	47.25		ug/Kg		94	79 - 120
Chloroethane	50.1	47.41		ug/Kg		95	70 - 130
Chloroform	50.1	44.21		ug/Kg		88	70 - 130
Chloromethane	50.1	42.53		ug/Kg		85	70 - 130
Dibromochloromethane	50.1	45.13		ug/Kg		90	70 - 130
Dibromomethane	50.1	48.47		ug/Kg		97	70 - 130
Dichlorodifluoromethane	50.1	43.01		ug/Kg		86	70 - 130
Ethylbenzene	50.1	46.26		ug/Kg		92	76 - 120
Isopropylbenzene	50.1	46.81		ug/Kg		93	70 - 130
Methylene Chloride	50.1	47.11	J	ug/Kg		94	70 - 130
Methyl-t-Butyl Ether (MTBE)	50.1	45.58		ug/Kg		91	70 - 124
Naphthalene	50.1	49.48	J	ug/Kg		99	70 - 130
n-Butylbenzene	50.1	46.80		ug/Kg		93	77 - 123
N-Propylbenzene	50.1	47.16		ug/Kg		94	70 - 130
o-Xylene	50.1	48.94		ug/Kg		98	70 - 130
m,p-Xylene	100	98.50		ug/Kg		98	70 - 130
p-Isopropyltoluene	50.1	46.61		ug/Kg		93	70 - 130
sec-Butylbenzene	50.1	46.15		ug/Kg		92	70 - 130
Styrene	50.1	47.45		ug/Kg		95	70 - 130
trans-1,2-Dichloroethene	50.1	44.98		ug/Kg		90	70 - 130
trans-1,3-Dichloropropene	50.1	46.75		ug/Kg		93	70 - 130
tert-Butylbenzene	50.1	45.27		ug/Kg		90	70 - 130
Tetrachloroethene	50.1	48.69		ug/Kg		97	70 - 130
Toluene	50.1	46.94		ug/Kg		94	77 - 120
Trichloroethene	50.1	48.29		ug/Kg		96	70 - 130
Trichlorofluoromethane	50.1	49.07	J	ug/Kg		98	70 - 130
Vinyl acetate	50.1	50.06		ug/Kg		100	70 - 130
Vinyl chloride	50.1	43.96		ug/Kg		88	68 - 122

QC Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590B

Job ID: 570-26752-1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 570-65826/1-A
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 65826

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*98*		*71 - 155*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*
Dibromofluoromethane (Surr)	*97*		*79 - 133*
Toluene-d8 (Surr)	*100*		*80 - 120*

Lab Sample ID: LCSD 570-65826/2-A
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	50.0	48.04		ug/Kg		96	70 - 130	1	20
1,1,1-Trichloroethane	50.0	49.08		ug/Kg		98	70 - 130	1	20
1,1,2,2-Tetrachloroethane	50.0	49.71		ug/Kg		99	70 - 130	3	20
1,1,2-Trichloro-1,2,2-trifluoroethane	50.0	45.17	J	ug/Kg		90	70 - 130	0	20
1,1,2-Trichloroethane	50.0	49.61		ug/Kg		99	70 - 130	1	20
1,1-Dichloroethane	50.0	45.79		ug/Kg		92	70 - 130	1	20
1,1-Dichloroethene	50.0	47.90		ug/Kg		96	74 - 122	1	20
1,1-Dichloropropene	50.0	47.23		ug/Kg		94	70 - 130	1	20
1,2,3-Trichlorobenzene	50.0	49.25		ug/Kg		98	70 - 130	1	20
1,2,3-Trichloropropane	50.0	47.32		ug/Kg		95	70 - 130	2	20
1,2,4-Trichlorobenzene	50.0	49.59		ug/Kg		99	70 - 130	0	20
1,2,4-Trimethylbenzene	50.0	46.15		ug/Kg		92	70 - 130	2	20
1,2-Dibromo-3-Chloropropane	50.0	48.20		ug/Kg		96	70 - 130	5	20
1,2-Dibromoethane	50.0	47.99		ug/Kg		96	70 - 130	2	20
1,2-Dichlorobenzene	50.0	48.69		ug/Kg		97	75 - 120	2	20
1,2-Dichloroethane	50.0	49.59		ug/Kg		99	70 - 130	1	20
1,2-Dichloropropane	50.0	46.13		ug/Kg		92	79 - 115	1	25
1,3,5-Trimethylbenzene	50.0	47.18		ug/Kg		94	70 - 130	1	20
1,3-Dichlorobenzene	50.0	48.26		ug/Kg		97	70 - 130	2	20
1,3-Dichloropropane	50.0	46.86		ug/Kg		94	70 - 130	2	20
1,4-Dichlorobenzene	50.0	48.92		ug/Kg		98	70 - 130	3	20
2,2-Dichloropropane	50.0	49.61		ug/Kg		99	70 - 130	1	20
2-Butanone	50.0	48.92	J	ug/Kg		98	70 - 130	5	20
2-Chlorotoluene	50.0	47.18		ug/Kg		94	70 - 130	3	20
2-Hexanone	50.0	50.15		ug/Kg		100	70 - 130	5	20
4-Chlorotoluene	50.0	50.11		ug/Kg		100	70 - 130	4	20
4-Methyl-2-pentanone	50.0	47.07	J	ug/Kg		94	70 - 130	3	20
Acetone	50.0	46.22	J	ug/Kg		92	70 - 130	4	20
Benzene	50.0	45.07		ug/Kg		90	78 - 120	2	20
Bromobenzene	50.0	49.18		ug/Kg		98	70 - 130	0	20
Bromochloromethane	50.0	47.36		ug/Kg		95	70 - 130	2	20
Bromodichloromethane	50.0	50.67		ug/Kg		101	70 - 130	4	20
Bromoform	50.0	48.53		ug/Kg		97	70 - 130	5	20
Bromomethane	50.0	40.45		ug/Kg		81	70 - 130	0	20
cis-1,2-Dichloroethene	50.0	45.94		ug/Kg		92	70 - 130	0	20
cis-1,3-Dichloropropene	50.0	45.58		ug/Kg		91	70 - 130	0	20
Carbon disulfide	50.0	48.79	J	ug/Kg		98	70 - 130	4	20
Carbon tetrachloride	50.0	46.27		ug/Kg		93	49 - 139	3	20

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 570-65826/2-A
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 65826

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chlorobenzene			50.0	47.40		ug/Kg		95	79 - 120	0	20
Chloroethane			50.0	48.15		ug/Kg		96	70 - 130	2	20
Chloroform			50.0	45.45		ug/Kg		91	70 - 130	3	20
Chloromethane			50.0	42.44		ug/Kg		85	70 - 130	0	20
Dibromochloromethane			50.0	46.47		ug/Kg		93	70 - 130	3	20
Dibromomethane			50.0	48.91		ug/Kg		98	70 - 130	1	20
Dichlorodifluoromethane			50.0	42.46		ug/Kg		85	70 - 130	1	20
Ethylbenzene			50.0	46.89		ug/Kg		94	76 - 120	1	20
Isopropylbenzene			50.0	47.93		ug/Kg		96	70 - 130	2	20
Methylene Chloride			50.0	47.45	J	ug/Kg		95	70 - 130	1	20
Methyl-t-Butyl Ether (MTBE)			50.0	46.30		ug/Kg		93	70 - 124	2	20
Naphthalene			50.0	50.18		ug/Kg		100	70 - 130	1	20
n-Butylbenzene			50.0	48.27		ug/Kg		97	77 - 123	3	25
N-Propylbenzene			50.0	47.66		ug/Kg		95	70 - 130	1	20
o-Xylene			50.0	49.15		ug/Kg		98	70 - 130	0	20
m,p-Xylene			100	99.93		ug/Kg		100	70 - 130	1	20
p-Isopropyltoluene			50.0	47.76		ug/Kg		96	70 - 130	2	20
sec-Butylbenzene			50.0	47.43		ug/Kg		95	70 - 130	3	20
Styrene			50.0	47.78		ug/Kg		96	70 - 130	1	20
trans-1,2-Dichloroethene			50.0	45.18		ug/Kg		90	70 - 130	0	20
trans-1,3-Dichloropropene			50.0	47.82		ug/Kg		96	70 - 130	2	20
tert-Butylbenzene			50.0	46.44		ug/Kg		93	70 - 130	3	20
Tetrachloroethene			50.0	48.92		ug/Kg		98	70 - 130	0	20
Toluene			50.0	47.41		ug/Kg		95	77 - 120	1	20
Trichloroethene			50.0	48.96		ug/Kg		98	70 - 130	1	20
Trichlorofluoromethane			50.0	50.33		ug/Kg		101	70 - 130	3	20
Vinyl acetate			50.0	50.40		ug/Kg		101	70 - 130	1	20
Vinyl chloride			50.0	44.35		ug/Kg		89	68 - 122	1	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*96*		*71 - 155*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*
Dibromofluoromethane (Surr)	*99*		*79 - 133*
Toluene-d8 (Surr)	*99*		*80 - 120*

Lab Sample ID: 570-26867-B-1-C MS
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
1,1,1,2-Tetrachloroethane	ND		50.6	40.02		ug/Kg		79	70 - 130		
1,1,1-Trichloroethane	ND		50.6	44.59		ug/Kg		88	70 - 130		
1,1,2,2-Tetrachloroethane	ND	F1	50.6	35.55		ug/Kg		70	70 - 130		
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		50.6	ND		ug/Kg		78	70 - 130		
1,1,2-Trichloroethane	ND		50.6	42.99		ug/Kg		85	70 - 130		
1,1-Dichloroethane	ND		50.6	42.56		ug/Kg		84	70 - 130		
1,1-Dichloroethene	ND		50.6	45.12		ug/Kg		89	47 - 143		
1,1-Dichloropropene	ND		50.6	41.76		ug/Kg		83	70 - 130		

QC Sample Results

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 570-26867-B-1-C MS
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2,3-Trichlorobenzene	ND	F1	50.6	23.46	F1	ug/Kg		46	70 - 130
1,2,3-Trichloropropane	ND	F1	50.6	35.03	F1	ug/Kg		69	70 - 130
1,2,4-Trichlorobenzene	ND	F1	50.6	24.97	F1	ug/Kg		49	70 - 130
1,2,4-Trimethylbenzene	ND	F1	50.6	32.09	F1	ug/Kg		63	70 - 130
1,2-Dibromo-3-Chloropropane	ND	F1	50.6	34.99	F1	ug/Kg		69	70 - 130
1,2-Dibromoethane	ND		50.6	40.66		ug/Kg		80	64 - 124
1,2-Dichlorobenzene	ND		50.6	32.63		ug/Kg		64	35 - 131
1,2-Dichloroethane	ND		50.6	44.16		ug/Kg		87	70 - 130
1,2-Dichloropropane	ND		50.6	42.43		ug/Kg		84	79 - 115
1,3,5-Trimethylbenzene	ND	F1	50.6	32.74	F1	ug/Kg		65	70 - 130
1,3-Dichlorobenzene	ND	F1	50.6	32.26	F1	ug/Kg		64	70 - 130
1,3-Dichloropropane	ND		50.6	40.61		ug/Kg		80	70 - 130
1,4-Dichlorobenzene	ND	F1	50.6	33.00	F1	ug/Kg		65	70 - 130
2,2-Dichloropropane	ND		50.6	43.21		ug/Kg		85	70 - 130
2-Butanone	ND		50.6	ND		ug/Kg		79	70 - 130
2-Chlorotoluene	ND	F1	50.6	34.24	F1	ug/Kg		68	70 - 130
2-Hexanone	ND		50.6	ND		ug/Kg		80	70 - 130
4-Chlorotoluene	ND	F1	50.6	35.64		ug/Kg		70	70 - 130
4-Methyl-2-pentanone	ND		50.6	ND		ug/Kg		78	70 - 130
Acetone	ND		50.6	55.02		ug/Kg		79	70 - 130
Benzene	ND		50.6	40.91		ug/Kg		80	61 - 127
Bromobenzene	ND		50.6	37.86		ug/Kg		75	70 - 130
Bromochloromethane	ND		50.6	42.39		ug/Kg		84	70 - 130
Bromodichloromethane	ND		50.6	42.71		ug/Kg		84	70 - 130
Bromoform	ND	F1	50.6	36.28		ug/Kg		72	70 - 130
Bromomethane	ND		50.6	40.26		ug/Kg		80	70 - 130
cis-1,2-Dichloroethene	ND		50.6	42.38		ug/Kg		84	70 - 130
cis-1,3-Dichloropropene	ND	F1	50.6	35.94		ug/Kg		71	70 - 130
Carbon disulfide	ND		50.6	ND		ug/Kg		86	70 - 130
Carbon tetrachloride	ND		50.6	36.72		ug/Kg		73	51 - 135
Chlorobenzene	ND		50.6	39.25		ug/Kg		78	57 - 123
Chloroethane	ND		50.6	45.13		ug/Kg		89	70 - 130
Chloroform	ND		50.6	41.73		ug/Kg		82	70 - 130
Chloromethane	ND		50.6	40.21		ug/Kg		79	70 - 130
Dibromochloromethane	ND		50.6	37.00		ug/Kg		73	70 - 130
Dibromomethane	ND		50.6	42.77		ug/Kg		85	70 - 130
Dichlorodifluoromethane	ND		50.6	40.61		ug/Kg		80	70 - 130
Ethylbenzene	ND		50.6	38.88		ug/Kg		73	57 - 129
Isopropylbenzene	ND	F1	50.6	35.77		ug/Kg		71	70 - 130
Methylene Chloride	ND		50.6	ND		ug/Kg		88	70 - 130
Methyl-t-Butyl Ether (MTBE)	ND		50.6	42.20		ug/Kg		83	57 - 123
Naphthalene	ND	F1	50.6	ND	F1	ug/Kg		57	70 - 130
n-Butylbenzene	ND	F1	50.6	28.34	F1	ug/Kg		55	77 - 123
N-Propylbenzene	ND	F1	50.6	33.84	F1	ug/Kg		67	70 - 130
o-Xylene	ND		50.6	39.25		ug/Kg		78	70 - 130
m,p-Xylene	ND		101	80.06		ug/Kg		78	70 - 130
p-Isopropyltoluene	ND	F1	50.6	30.23	F1	ug/Kg		60	70 - 130
sec-Butylbenzene	ND	F1	50.6	30.22	F1	ug/Kg		60	70 - 130
Styrene	ND		50.6	37.35		ug/Kg		74	70 - 130

QC Sample Results

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 570-26867-B-1-C MS
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
trans-1,2-Dichloroethene	ND		50.6	41.97		ug/Kg		83	70 - 130
trans-1,3-Dichloropropene	ND		50.6	37.52		ug/Kg		74	70 - 130
tert-Butylbenzene	ND	F1	50.6	31.67	F1	ug/Kg		63	70 - 130
Tetrachloroethene	ND		50.6	39.24		ug/Kg		78	70 - 130
Toluene	ND		50.6	40.91		ug/Kg		81	63 - 123
Trichloroethene	ND		50.6	46.68		ug/Kg		92	44 - 158
Trichlorofluoromethane	ND		50.6	ND		ug/Kg		93	70 - 130
Vinyl acetate	ND	F1	50.6	ND	F1	ug/Kg		19	70 - 130
Vinyl chloride	ND		50.6	42.72		ug/Kg		84	49 - 139

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 155*
4-Bromofluorobenzene (Surr)	*100*		*80 - 120*
Dibromofluoromethane (Surr)	*99*		*79 - 133*
Toluene-d8 (Surr)	*99*		*80 - 120*

Lab Sample ID: 570-26867-B-1-D MSD
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,1,1,2-Tetrachloroethane	ND		49.2	37.74		ug/Kg		77	70 - 130	6	20
1,1,1-Trichloroethane	ND		49.2	42.34		ug/Kg		86	70 - 130	5	20
1,1,2,2-Tetrachloroethane	ND	F1	49.2	33.33	F1	ug/Kg		68	70 - 130	6	20
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		49.2	ND		ug/Kg		74	70 - 130	8	20
1,1,2-Trichloroethane	ND		49.2	40.57		ug/Kg		82	70 - 130	6	20
1,1-Dichloroethane	ND		49.2	41.27		ug/Kg		84	70 - 130	3	20
1,1-Dichloroethene	ND		49.2	42.70		ug/Kg		87	47 - 143	6	25
1,1-Dichloropropene	ND		49.2	39.60		ug/Kg		80	70 - 130	5	20
1,2,3-Trichlorobenzene	ND	F1	49.2	20.83	F1	ug/Kg		42	70 - 130	12	20
1,2,3-Trichloropropane	ND	F1	49.2	32.88	F1	ug/Kg		67	70 - 130	6	20
1,2,4-Trichlorobenzene	ND	F1	49.2	21.83	F1	ug/Kg		44	70 - 130	13	20
1,2,4-Trimethylbenzene	ND	F1	49.2	28.35	F1	ug/Kg		58	70 - 130	12	20
1,2-Dibromo-3-Chloropropane	ND	F1	49.2	31.87	F1	ug/Kg		65	70 - 130	9	20
1,2-Dibromoethane	ND		49.2	38.53		ug/Kg		78	64 - 124	5	20
1,2-Dichlorobenzene	ND		49.2	29.22		ug/Kg		59	35 - 131	11	25
1,2-Dichloroethane	ND		49.2	42.35		ug/Kg		86	70 - 130	4	20
1,2-Dichloropropane	ND		49.2	39.33		ug/Kg		80	79 - 115	8	25
1,3,5-Trimethylbenzene	ND	F1	49.2	29.34	F1	ug/Kg		60	70 - 130	11	20
1,3-Dichlorobenzene	ND	F1	49.2	28.88	F1	ug/Kg		59	70 - 130	11	20
1,3-Dichloropropane	ND		49.2	38.39		ug/Kg		78	70 - 130	6	20
1,4-Dichlorobenzene	ND	F1	49.2	29.36	F1	ug/Kg		60	70 - 130	12	20
2,2-Dichloropropane	ND		49.2	40.76		ug/Kg		83	70 - 130	6	20
2-Butanone	ND		49.2	ND		ug/Kg		81	70 - 130	1	20
2-Chlorotoluene	ND	F1	49.2	31.21	F1	ug/Kg		63	70 - 130	9	20
2-Hexanone	ND		49.2	ND		ug/Kg		81	70 - 130	1	20
4-Chlorotoluene	ND	F1	49.2	32.47	F1	ug/Kg		66	70 - 130	9	20
4-Methyl-2-pentanone	ND		49.2	ND		ug/Kg		78	70 - 130	4	20

QC Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590B

Job ID: 570-26752-1

Method: 8260B - Volatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 570-26867-B-1-D MSD
Matrix: Solid
Analysis Batch: 65837

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 65826

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Acetone	ND		49.2	58.67		ug/Kg		89	70 - 130	6	20
Benzene	ND		49.2	38.62		ug/Kg		78	61 - 127	6	20
Bromobenzene	ND		49.2	34.51		ug/Kg		70	70 - 130	9	20
Bromochloromethane	ND		49.2	40.29		ug/Kg		82	70 - 130	5	20
Bromodichloromethane	ND		49.2	40.55		ug/Kg		82	70 - 130	5	20
Bromoform	ND	F1	49.2	34.08	F1	ug/Kg		69	70 - 130	6	20
Bromomethane	ND		49.2	35.19		ug/Kg		72	70 - 130	13	20
cis-1,2-Dichloroethene	ND		49.2	40.59		ug/Kg		82	70 - 130	4	20
cis-1,3-Dichloropropene	ND	F1	49.2	33.14	F1	ug/Kg		67	70 - 130	8	20
Carbon disulfide	ND		49.2	ND		ug/Kg		86	70 - 130	3	20
Carbon tetrachloride	ND		49.2	34.26		ug/Kg		70	51 - 135	7	29
Chlorobenzene	ND		49.2	36.72		ug/Kg		75	57 - 123	7	20
Chloroethane	ND		49.2	43.38		ug/Kg		88	70 - 130	4	20
Chloroform	ND		49.2	39.60		ug/Kg		80	70 - 130	5	20
Chloromethane	ND		49.2	38.62		ug/Kg		78	70 - 130	4	20
Dibromochloromethane	ND		49.2	34.77		ug/Kg		71	70 - 130	6	20
Dibromomethane	ND		49.2	40.53		ug/Kg		82	70 - 130	5	20
Dichlorodifluoromethane	ND		49.2	38.22		ug/Kg		78	70 - 130	6	20
Ethylbenzene	ND		49.2	36.62		ug/Kg		71	57 - 129	6	22
Isopropylbenzene	ND	F1	49.2	32.71	F1	ug/Kg		66	70 - 130	9	20
Methylene Chloride	ND		49.2	ND		ug/Kg		86	70 - 130	6	20
Methyl-t-Butyl Ether (MTBE)	ND		49.2	40.31		ug/Kg		82	57 - 123	5	21
Naphthalene	ND	F1	49.2	ND	F1	ug/Kg		52	70 - 130	11	20
n-Butylbenzene	ND	F1	49.2	25.14	F1	ug/Kg		50	77 - 123	12	21
N-Propylbenzene	ND	F1	49.2	30.39	F1	ug/Kg		62	70 - 130	11	20
o-Xylene	ND		49.2	36.39		ug/Kg		74	70 - 130	8	20
m,p-Xylene	ND		98.4	73.86		ug/Kg		74	70 - 130	8	20
p-Isopropyltoluene	ND	F1	49.2	27.02	F1	ug/Kg		55	70 - 130	11	20
sec-Butylbenzene	ND	F1	49.2	26.84	F1	ug/Kg		55	70 - 130	12	20
Styrene	ND		49.2	34.32		ug/Kg		70	70 - 130	8	20
trans-1,2-Dichloroethene	ND		49.2	40.11		ug/Kg		82	70 - 130	5	20
trans-1,3-Dichloropropene	ND		49.2	35.12		ug/Kg		71	70 - 130	7	20
tert-Butylbenzene	ND	F1	49.2	27.86	F1	ug/Kg		57	70 - 130	13	20
Tetrachloroethene	ND		49.2	36.42		ug/Kg		74	70 - 130	7	20
Toluene	ND		49.2	38.08		ug/Kg		77	63 - 123	7	20
Trichloroethene	ND		49.2	44.39		ug/Kg		90	44 - 158	5	20
Trichlorofluoromethane	ND		49.2	ND		ug/Kg		91	70 - 130	5	20
Vinyl acetate	ND	F1	49.2	ND	F1	ug/Kg		23	70 - 130	16	20
Vinyl chloride	ND		49.2	41.08		ug/Kg		83	49 - 139	4	47

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
1,2-Dichloroethane-d4 (Surr)	*99*		*71 - 155*
4-Bromofluorobenzene (Surr)	*99*		*80 - 120*
Dibromofluoromethane (Surr)	*99*		*79 - 133*
Toluene-d8 (Surr)	*100*		*80 - 120*

QC Association Summary

GC/MS VOA

Prep Batch: 65826

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-26752-1	VN-HSA-2-25	Total/NA	Solid	5030C	
570-26752-2	AX-HSA-5-S3	Total/NA	Solid	5030C	
570-26752-3	NH-HSA-10-S4	Total/NA	Solid	5030C	
570-26752-4	NH-HSA-9-S2	Total/NA	Solid	5030C	
570-26752-5	NH-HSA-18-S7	Total/NA	Solid	5030C	
570-26752-6	NH-HSA-3-40	Total/NA	Solid	5030C	
MB 570-65826/3-A	Method Blank	Total/NA	Solid	5030C	
LCS 570-65826/1-A	Lab Control Sample	Total/NA	Solid	5030C	
LCSD 570-65826/2-A	Lab Control Sample Dup	Total/NA	Solid	5030C	
570-26867-B-1-C MS	Matrix Spike	Total/NA	Solid	5030C	
570-26867-B-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	5030C	

Analysis Batch: 65837

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-26752-1	VN-HSA-2-25	Total/NA	Solid	8260B	65826
570-26752-2	AX-HSA-5-S3	Total/NA	Solid	8260B	65826
570-26752-3	NH-HSA-10-S4	Total/NA	Solid	8260B	65826
570-26752-4	NH-HSA-9-S2	Total/NA	Solid	8260B	65826
570-26752-5	NH-HSA-18-S7	Total/NA	Solid	8260B	65826
570-26752-6	NH-HSA-3-40	Total/NA	Solid	8260B	65826
MB 570-65826/3-A	Method Blank	Total/NA	Solid	8260B	65826
LCS 570-65826/1-A	Lab Control Sample	Total/NA	Solid	8260B	65826
LCSD 570-65826/2-A	Lab Control Sample Dup	Total/NA	Solid	8260B	65826
570-26867-B-1-C MS	Matrix Spike	Total/NA	Solid	8260B	65826
570-26867-B-1-D MSD	Matrix Spike Duplicate	Total/NA	Solid	8260B	65826

Lab Chronicle

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590B

Job ID: 570-26752-1

Client Sample ID: VN-HSA-2-25

Lab Sample ID: 570-26752-1
Date Collected: 04/16/20 08:10
Matrix: Solid
Date Received: 04/27/20 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030C			5.09 g	5 mL	65826	04/28/20 17:09	P4DI	ECL 2
Total/NA	Analysis	8260B		1	5 mL	5 mL	65837	04/29/20 00:11	BE5H	ECL 2

Instrument ID: GCMSLL

Client Sample ID: AX-HSA-5-S3

Lab Sample ID: 570-26752-2
Date Collected: 04/17/20 07:40
Matrix: Solid
Date Received: 04/27/20 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030C			4.95 g	5 mL	65826	04/28/20 17:09	P4DI	ECL 2
Total/NA	Analysis	8260B		1	5 mL	5 mL	65837	04/29/20 00:36	BE5H	ECL 2

Instrument ID: GCMSLL

Client Sample ID: NH-HSA-10-S4

Lab Sample ID: 570-26752-3
Date Collected: 04/21/20 07:40
Matrix: Solid
Date Received: 04/27/20 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030C			5.00 g	5 mL	65826	04/28/20 17:09	P4DI	ECL 2
Total/NA	Analysis	8260B		1	5 mL	5 mL	65837	04/29/20 01:02	BE5H	ECL 2

Instrument ID: GCMSLL

Client Sample ID: NH-HSA-9-S2

Lab Sample ID: 570-26752-4
Date Collected: 04/21/20 07:40
Matrix: Solid
Date Received: 04/27/20 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030C			4.91 g	5 mL	65826	04/28/20 17:09	P4DI	ECL 2
Total/NA	Analysis	8260B		1	5 mL	5 mL	65837	04/29/20 01:28	BE5H	ECL 2

Instrument ID: GCMSLL

Client Sample ID: NH-HSA-18-S7

Lab Sample ID: 570-26752-5
Date Collected: 04/22/20 11:03
Matrix: Solid
Date Received: 04/27/20 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030C			5.01 g	5 mL	65826	04/28/20 17:09	P4DI	ECL 2
Total/NA	Analysis	8260B		1	5 mL	5 mL	65837	04/29/20 01:54	BE5H	ECL 2

Instrument ID: GCMSLL

Lab Chronicle

Client Sample ID: NH-HSA-3-40

Lab Sample ID: 570-26752-6

Date Collected: 04/23/20 08:07

Matrix: Solid

Date Received: 04/27/20 10:15

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	5030C			5.18 g	5 mL	65826	04/28/20 17:09	P4DI	ECL 2
Total/NA	Analysis	8260B		1	5 mL	5 mL	65837	04/29/20 02:20	BE5H	ECL 2
	Instrument ID: GCMSLL									

Laboratory References:

ECL 2 = Eurofins Calscience LLC Lampson, 7445 Lampson Ave, Garden Grove, CA 92841, TEL (714)895-5494

Accreditation/Certification Summary

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590B

Job ID: 570-26752-1

Laboratory: Eurofins Calscience LLC

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	Los Angeles County Sanitation Districts	10109	09-29-20
California	SCAQMD LAP	17LA0919	11-30-20
California	State	2944	09-29-20
Guam	State	20-003R	10-31-20
Nevada	State	CA00111	07-31-20
Oregon	NELAP	CA300001	01-29-21
USDA	US Federal Programs	P330-20-00034	02-10-23
Washington	State	C916-18	10-11-20

Method Summary

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590B

Job ID: 570-26752-1

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	ECL 2
5030C	Purge and Trap	SW846	ECL 2

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

ECL 2 = Eurofins Calscience LLC Lampson, 7445 Lampson Ave, Garden Grove, CA 92841, TEL (714)895-5494 eurofins

Environment Testing
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ANALYTICAL REPORT

Eurofins Calscience LLC
7440 Lincoln Way
Garden Grove, CA 92841
Tel: (714)895-5494

Laboratory Job ID: 570-27609-1
Client Project/Site: City of LA TOS-25/ LA0590D

For:
Geosyntec Consultants, Inc.
2100 Main Street
Suite 150
Huntington Beach, California 92648

Attn: Karthik Viswanathan

Authorized for release by:
5/13/2020 4:59:04 PM

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Definitions/Glossary

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
*1	LCS/LCSD RPD exceeds control limits.
F1	MS and/or MSD recovery exceeds control limits.
F2	MS/MSD RPD exceeds control limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Job ID: 570-27609-1

Laboratory: Eurofins Calscience LLC

Narrative

Job Narrative
570-27609-1

Receipt
The sample was received on 5/7/2020 9:30 AM; the sample arrived in good condition, properly preserved, and where required, on ice. The temperature of the cooler at receipt time was 2.9°C

Department GC/MS Semi VOA
Method 8270C: The matrix spike / matrix spike duplicate / sample duplicate (MS/MSD/DUP) precision for preparation batch 570-67783 and analytical batch 570-67881 was outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample / laboratory control sample duplicate (LCS/LCSD) precision was within acceptance limit

Method 8270C: The RPD of the laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 570-67783 and analytical batch 570-67881 recovered outside control limits for the following analytes: Hexachlorobenzene

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Detection Summary

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590D

Job ID: 570-27609-1

Client Sample ID: NH-HSA-1-S1

Lab Sample ID: 570-27609-1

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590D

Job ID: 570-27609-1

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Client Sample ID: NH-HSA-1-S1
Date Collected: 04/24/20 07:30
Date Received: 05/07/20 09:30

Lab Sample ID: 570-27609-1
Matrix: Solid

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
1,2-Dichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
1,3-Dichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
1,4-Dichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
1-Methylnaphthalene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,4,5-Trichlorophenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,4,6-Trichlorophenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,4-Dichlorophenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,4-Dimethylphenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,4-Dinitrophenol	ND		2.0		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,4-Dinitrotoluene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,6-Dichlorophenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2,6-Dinitrotoluene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2-Chloronaphthalene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2-Chlorophenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2-Methylnaphthalene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2-Methylphenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2-Nitroaniline	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
2-Nitrophenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
3,3'-Dichlorobenzidine	ND		2.5		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
3 & 4 Methylphenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
3-Nitroaniline	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
4,6-Dinitro-2-methylphenol	ND		2.5		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
4-Bromophenyl phenyl ether	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
4-Chloro-3-methylphenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
4-Chloroaniline	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
4-Chlorophenyl phenyl ether	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
4-Nitroaniline	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
4-Nitrophenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Acenaphthene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Acenaphthylene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Aniline	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Anthracene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Azobenzene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzidine	ND		5.0		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzo[a]anthracene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzo[a]pyrene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzo[b]fluoranthene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzo[g,h,i]perylene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzo[k]fluoranthene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzoic acid	ND		2.5		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Benzyl alcohol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Bis(2-chloroethoxy)methane	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Bis(2-chloroethyl)ether	ND		2.5		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
bis (2-Chloroisopropyl) ether	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Bis(2-ethylhexyl) phthalate	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Butyl benzyl phthalate	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Chrysene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Dibenz(a,h)anthracene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1

Client Sample Results

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Client Sample ID: NH-HSA-1-S1
Lab Sample ID: 570-27609-1
Date Collected: 04/24/20 07:30
Matrix: Solid
Date Received: 05/07/20 09:30

Analyte	Result	Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Dibenzofuran	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Diethyl phthalate	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Dimethyl phthalate	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Di-n-butyl phthalate	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Di-n-octyl phthalate	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Fluoranthene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Fluorene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Hexachloro-1,3-butadiene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Hexachlorobenzene	ND	*1	0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Hexachlorocyclopentadiene	ND		1.5		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Hexachloroethane	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Indeno[1,2,3-cd]pyrene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Isophorone	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Naphthalene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Nitrobenzene	ND		2.0		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
N-Nitrosodimethylamine	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
N-Nitrosodi-n-propylamine	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
N-Nitrosodiphenylamine	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Pentachlorophenol	ND		2.5		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Phenanthrene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Phenol	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Pyrene	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1
Pyridine	ND		0.50		mg/Kg		05/08/20 07:32	05/08/20 18:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*71*		*18 - 138*	*05/08/20 07:32*	*05/08/20 18:44*	*1*
2-Fluorobiphenyl (Surr)	*57*		*27 - 120*	*05/08/20 07:32*	*05/08/20 18:44*	*1*
2-Fluorophenol (Surr)	*65*		*25 - 120*	*05/08/20 07:32*	*05/08/20 18:44*	*1*
Nitrobenzene-d5 (Surr)	*59*		*33 - 123*	*05/08/20 07:32*	*05/08/20 18:44*	*1*
p-Terphenyl-d14 (Surr)	*63*		*27 - 159*	*05/08/20 07:32*	*05/08/20 18:44*	*1*
Phenol-d6 (Surr)	*66*		*26 - 122*	*05/08/20 07:32*	*05/08/20 18:44*	*1*

Surrogate Summary

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid **Prep Type: Total/NA**

		Percent Surrogate Recovery (Acceptance Limits)					
		TBP	FBP	2FP	NBZ	TPHd14	PHL6
Lab Sample ID	Client Sample ID	(18-138)	(27-120)	(25-120)	(33-123)	(27-159)	(26-122)
570-27577-A-6-B MS	Matrix Spike	77	66	81	63	70	83
570-27577-A-6-C MSD	Matrix Spike Duplicate	93	74	89	80	83	97
570-27609-1	NH-HSA-1-S1	71	57	65	59	63	66
LCS 570-67783/2-A	Lab Control Sample	93	78	87	78	87	94
LCSD 570-67783/3-A	Lab Control Sample Dup	89	77	82	70	84	87
MB 570-67783/1-A	Method Blank	91	77	88	82	89	94

Surrogate Legend

TBP = 2,4,6-Tribromophenol (Surr)
FBP = 2-Fluorobiphenyl (Surr)
2FP = 2-Fluorophenol (Surr)
NBZ = Nitrobenzene-d5 (Surr)
TPHd14 = p-Terphenyl-d14 (Surr)
PHL6 = Phenol-d6 (Surr)

QC Sample Results

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590D

Job ID: 570-27609-1

Method: 8270C - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 570-67783/1-A
Matrix: Solid
Analysis Batch: 67881

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 67783

Analyte	MB Result	MB Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
1,2,4-Trichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
1,2-Dichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
1,3-Dichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
1,4-Dichlorobenzene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
1-Methylnaphthalene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,4,5-Trichlorophenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,4,6-Trichlorophenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,4-Dichlorophenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,4-Dimethylphenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,4-Dinitrophenol	ND		2.0		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,4-Dinitrotoluene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,6-Dichlorophenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2,6-Dinitrotoluene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2-Chloronaphthalene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2-Chlorophenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2-Methylnaphthalene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2-Methylphenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2-Nitroaniline	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
2-Nitrophenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
3,3'-Dichlorobenzidine	ND		2.5		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
3 & 4 Methylphenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
3-Nitroaniline	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
4,6-Dinitro-2-methylphenol	ND		2.5		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
4-Bromophenyl phenyl ether	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
4-Chloro-3-methylphenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
4-Chloroaniline	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
4-Chlorophenyl phenyl ether	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
4-Nitroaniline	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
4-Nitrophenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Acenaphthene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Acenaphthylene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Aniline	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Anthracene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Azobenzene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzidine	ND		5.0		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzo[a]anthracene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzo[a]pyrene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzo[b]fluoranthene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzo[g,h,i]perylene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzo[k]fluoranthene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzoic acid	ND		2.5		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Benzyl alcohol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Bis(2-chloroethoxy)methane	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Bis(2-chloroethyl)ether	ND		2.5		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
bis (2-Chloroisopropyl) ether	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Bis(2-ethylhexyl) phthalate	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Butyl benzyl phthalate	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Chrysene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1

QC Sample Results

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 570-67783/1-A
Matrix: Solid
Analysis Batch: 67881

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 67783

Analyte	MB Result	MB Qualifier	RL		Unit	D	Prepared	Analyzed	Dil Fac
Dibenz(a,h)anthracene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Dibenzofuran	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Diethyl phthalate	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Dimethyl phthalate	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Di-n-butyl phthalate	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Di-n-octyl phthalate	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Fluoranthene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Fluorene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Hexachloro-1,3-butadiene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Hexachlorobenzene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Hexachlorocyclopentadiene	ND		1.5		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Hexachloroethane	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Indeno[1,2,3-cd]pyrene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Isophorone	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Naphthalene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Nitrobenzene	ND		2.0		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
N-Nitrosodimethylamine	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
N-Nitrosodi-n-propylamine	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
N-Nitrosodiphenylamine	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Pentachlorophenol	ND		2.5		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Phenanthrene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Phenol	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Pyrene	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1
Pyridine	ND		0.50		mg/Kg		05/08/20 07:31	05/08/20 15:35	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol (Surr)	*91*		*18 - 138*	*05/08/20 07:31*	*05/08/20 15:35*	*1*
2-Fluorobiphenyl (Surr)	*77*		*27 - 120*	*05/08/20 07:31*	*05/08/20 15:35*	*1*
2-Fluorophenol (Surr)	*88*		*25 - 120*	*05/08/20 07:31*	*05/08/20 15:35*	*1*
Nitrobenzene-d5 (Surr)	*82*		*33 - 123*	*05/08/20 07:31*	*05/08/20 15:35*	*1*
p-Terphenyl-d14 (Surr)	*89*		*27 - 159*	*05/08/20 07:31*	*05/08/20 15:35*	*1*
Phenol-d6 (Surr)	*94*		*26 - 122*	*05/08/20 07:31*	*05/08/20 15:35*	*1*

Lab Sample ID: LCS 570-67783/2-A
Matrix: Solid
Analysis Batch: 67881

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 67783

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
1,2,4-Trichlorobenzene			5.00	4.093		mg/Kg		82	45 - 129		
1,2-Dichlorobenzene			5.00	3.749		mg/Kg		75	45 - 123		
1,3-Dichlorobenzene			5.00	3.661		mg/Kg		73	45 - 123		
1,4-Dichlorobenzene			5.00	3.526		mg/Kg		71	42 - 132		
1-Methylnaphthalene			5.00	4.018		mg/Kg		80	45 - 105		
2,4,5-Trichlorophenol			5.00	3.989		mg/Kg		80	43 - 127		
2,4,6-Trichlorophenol			5.00	4.053		mg/Kg		81	48 - 126		
2,4-Dichlorophenol			5.00	3.928		mg/Kg		79	49 - 127		
2,4-Dimethylphenol			5.00	3.944		mg/Kg		79	45 - 147		
2,4-Dinitrophenol			5.00	3.155		mg/Kg		63	18 - 138		

QC Sample Results

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 570-67783/2-A
Matrix: Solid
Analysis Batch: 67881

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 67783

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
2,4-Dinitrotoluene	5.00	4.327		mg/Kg		87	51 - 129
2,6-Dichlorophenol	5.00	3.882		mg/Kg		78	55 - 115
2,6-Dinitrotoluene	5.00	4.362		mg/Kg		87	44 - 140
2-Chloronaphthalene	5.00	4.137		mg/Kg		83	45 - 129
2-Chlorophenol	5.00	3.945		mg/Kg		79	58 - 124
2-Methylnaphthalene	5.00	4.027		mg/Kg		81	42 - 132
2-Methylphenol	5.00	4.180		mg/Kg		84	45 - 129
2-Nitroaniline	5.00	4.060		mg/Kg		81	35 - 150
2-Nitrophenol	5.00	3.946		mg/Kg		79	50 - 140
3,3'-Dichlorobenzidine	5.00	2.836		mg/Kg		57	20 - 150
3 & 4 Methylphenol	10.0	6.564		mg/Kg		66	37 - 127
3-Nitroaniline	5.00	3.440		mg/Kg		69	24 - 120
4,6-Dinitro-2-methylphenol	5.00	3.507		mg/Kg		70	36 - 138
4-Bromophenyl phenyl ether	5.00	4.176		mg/Kg		84	39 - 135
4-Chloro-3-methylphenol	5.00	4.154		mg/Kg		83	55 - 151
4-Chloroaniline	5.00	2.845		mg/Kg		57	16 - 124
4-Chlorophenyl phenyl ether	5.00	4.275		mg/Kg		85	45 - 135
4-Nitroaniline	5.00	3.771		mg/Kg		75	47 - 137
4-Nitrophenol	5.00	3.812		mg/Kg		76	24 - 126
Acenaphthene	5.00	4.136		mg/Kg		83	51 - 123
Acenaphthylene	5.00	4.681		mg/Kg		94	52 - 120
Aniline	5.00	2.766		mg/Kg		55	50 - 130
Anthracene	5.00	4.260		mg/Kg		85	41 - 125
Azobenzene	5.00	4.395		mg/Kg		88	60 - 140
Benzidine	5.00	1.973	J	mg/Kg		39	20 - 92
Benzo[a]anthracene	5.00	4.380		mg/Kg		88	45 - 117
Benzo[a]pyrene	5.00	3.744		mg/Kg		75	41 - 125
Benzo[b]fluoranthene	5.00	3.841		mg/Kg		77	41 - 137
Benzo[g,h,i]perylene	5.00	4.289		mg/Kg		86	16 - 124
Benzo[k]fluoranthene	5.00	4.116		mg/Kg		82	42 - 144
Benzoic acid	5.00	2.912		mg/Kg		58	18 - 150
Benzyl alcohol	5.00	3.972		mg/Kg		79	46 - 150
Bis(2-chloroethoxy)methane	5.00	4.281		mg/Kg		86	43 - 133
Bis(2-chloroethyl)ether	5.00	3.845		mg/Kg		77	46 - 124
bis (2-Chloroisopropyl) ether	5.00	5.105		mg/Kg		102	27 - 147
Bis(2-ethylhexyl) phthalate	5.00	4.129		mg/Kg		83	55 - 121
Butyl benzyl phthalate	5.00	4.330		mg/Kg		87	43 - 139
Chrysene	5.00	3.923		mg/Kg		78	45 - 117
Dibenz(a,h)anthracene	5.00	4.167		mg/Kg		83	21 - 129
Dibenzofuran	5.00	3.851		mg/Kg		77	46 - 130
Diethyl phthalate	5.00	4.302		mg/Kg		86	44 - 134
Dimethyl phthalate	5.00	4.351		mg/Kg		87	51 - 123
Di-n-butyl phthalate	5.00	4.399		mg/Kg		88	44 - 134
Di-n-octyl phthalate	5.00	3.956		mg/Kg		79	18 - 150
Fluoranthene	5.00	4.328		mg/Kg		87	39 - 129
Fluorene	5.00	4.483		mg/Kg		90	54 - 126
Hexachloro-1,3-butadiene	5.00	3.970		mg/Kg		79	40 - 136
Hexachlorobenzene	5.00	4.663		mg/Kg		93	40 - 136
Hexachlorocyclopentadiene	5.00	4.838		mg/Kg		97	31 - 115

QC Sample Results

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 570-67783/2-A
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 67881
Prep Batch: 67783

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Hexachloroethane	5.00	3.891		mg/Kg		78	40 - 124
Indeno[1,2,3-cd]pyrene	5.00	4.166		mg/Kg		83	70 - 130
Isophorone	5.00	4.305		mg/Kg		86	70 - 130
Naphthalene	5.00	3.888		mg/Kg		78	32 - 146
Nitrobenzene	5.00	3.926		mg/Kg		79	41 - 137
N-Nitrosodimethylamine	5.00	3.363		mg/Kg		67	45 - 129
N-Nitrosodi-n-propylamine	5.00	4.225		mg/Kg		85	40 - 136
N-Nitrosodiphenylamine	5.00	4.916		mg/Kg		98	51 - 150
Pentachlorophenol	5.00	3.141		mg/Kg		63	23 - 131
Phenanthrene	5.00	4.149		mg/Kg		83	38 - 140
Phenol	5.00	3.840		mg/Kg		77	40 - 130
Pyrene	5.00	4.123		mg/Kg		82	47 - 143
Pyridine	5.00	2.480		mg/Kg		50	46 - 88

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*93*		*18 - 138*
2-Fluorobiphenyl (Surr)	*78*		*27 - 120*
2-Fluorophenol (Surr)	*87*		*25 - 120*
Nitrobenzene-d5 (Surr)	*78*		*33 - 123*
p-Terphenyl-d14 (Surr)	*87*		*27 - 159*
Phenol-d6 (Surr)	*94*		*26 - 122*

Lab Sample ID: LCSD 570-67783/3-A
Client Sample ID: Lab Control Sample Dup
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 67881
Prep Batch: 67783

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2,4-Trichlorobenzene	5.00	3.825		mg/Kg		77	45 - 129	7	27
1,2-Dichlorobenzene	5.00	3.729		mg/Kg		75	45 - 123	1	14
1,3-Dichlorobenzene	5.00	3.583		mg/Kg		72	45 - 123	2	15
1,4-Dichlorobenzene	5.00	3.450		mg/Kg		69	42 - 132	2	30
1-Methylnaphthalene	5.00	3.874		mg/Kg		77	45 - 105	4	30
2,4,5-Trichlorophenol	5.00	3.850		mg/Kg		77	43 - 127	4	13
2,4,6-Trichlorophenol	5.00	3.886		mg/Kg		78	48 - 126	4	12
2,4-Dichlorophenol	5.00	3.772		mg/Kg		75	49 - 127	4	11
2,4-Dimethylphenol	5.00	3.587		mg/Kg		72	45 - 147	9	12
2,4-Dinitrophenol	5.00	3.098		mg/Kg		62	18 - 138	2	19
2,4-Dinitrotoluene	5.00	3.973		mg/Kg		79	51 - 129	9	28
2,6-Dichlorophenol	5.00	3.741		mg/Kg		75	55 - 115	4	20
2,6-Dinitrotoluene	5.00	4.118		mg/Kg		82	44 - 140	6	13
2-Chloronaphthalene	5.00	4.084		mg/Kg		82	45 - 129	1	13
2-Chlorophenol	5.00	3.604		mg/Kg		72	58 - 124	9	20
2-Methylnaphthalene	5.00	3.884		mg/Kg		78	42 - 132	4	13
2-Methylphenol	5.00	4.012		mg/Kg		80	45 - 129	4	13
2-Nitroaniline	5.00	3.974		mg/Kg		79	35 - 150	2	13
2-Nitrophenol	5.00	3.529		mg/Kg		71	50 - 140	11	13
3,3'-Dichlorobenzidine	5.00	2.924		mg/Kg		58	20 - 150	3	20
3 & 4 Methylphenol	10.0	6.074		mg/Kg		61	37 - 127	8	13

QC Sample Results

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 570-67783/3-A
Matrix: Solid
Analysis Batch: 67881

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 67783

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
3-Nitroaniline	5.00	3.433		mg/Kg		69	24 - 120	0	19
4,6-Dinitro-2-methylphenol	5.00	3.460		mg/Kg		69	36 - 138	1	17
4-Bromophenyl phenyl ether	5.00	3.922		mg/Kg		78	39 - 135	6	13
4-Chloro-3-methylphenol	5.00	3.905		mg/Kg		78	55 - 151	6	20
4-Chloroaniline	5.00	3.015		mg/Kg		60	16 - 124	6	29
4-Chlorophenyl phenyl ether	5.00	3.920		mg/Kg		78	45 - 135	9	13
4-Nitroaniline	5.00	3.529		mg/Kg		71	47 - 137	7	12
4-Nitrophenol	5.00	3.371		mg/Kg		67	24 - 126	12	27
Acenaphthene	5.00	3.865		mg/Kg		77	51 - 123	7	26
Acenaphthylene	5.00	4.358		mg/Kg		87	52 - 120	7	28
Aniline	5.00	2.681		mg/Kg		54	50 - 130	3	30
Anthracene	5.00	3.984		mg/Kg		80	41 - 125	7	11
Azobenzene	5.00	3.867		mg/Kg		77	60 - 140	13	30
Benzidine	5.00	2.090	J	mg/Kg		42	20 - 92	6	24
Benzo[a]anthracene	5.00	4.159		mg/Kg		83	45 - 117	5	12
Benzo[a]pyrene	5.00	3.495		mg/Kg		70	41 - 125	7	13
Benzo[b]fluoranthene	5.00	3.573		mg/Kg		71	41 - 137	7	15
Benzo[g,h,i]perylene	5.00	3.981		mg/Kg		80	16 - 124	7	18
Benzo[k]fluoranthene	5.00	4.068		mg/Kg		81	42 - 144	1	15
Benzoic acid	5.00	2.779		mg/Kg		56	18 - 150	5	16
Benzyl alcohol	5.00	3.967		mg/Kg		79	46 - 150	0	16
Bis(2-chloroethoxy)methane	5.00	4.106		mg/Kg		82	43 - 133	4	13
Bis(2-chloroethyl)ether	5.00	3.474		mg/Kg		69	46 - 124	10	21
bis (2-Chloroisopropyl) ether	5.00	4.931		mg/Kg		99	27 - 147	3	12
Bis(2-ethylhexyl) phthalate	5.00	3.919		mg/Kg		78	55 - 121	5	10
Butyl benzyl phthalate	5.00	4.012		mg/Kg		80	43 - 139	8	29
Chrysene	5.00	3.806		mg/Kg		76	45 - 117	3	12
Dibenz(a,h)anthracene	5.00	4.029		mg/Kg		81	21 - 129	3	15
Dibenzofuran	5.00	3.594		mg/Kg		72	46 - 130	7	14
Diethyl phthalate	5.00	4.112		mg/Kg		82	44 - 134	5	13
Dimethyl phthalate	5.00	4.020		mg/Kg		80	51 - 123	8	27
Di-n-butyl phthalate	5.00	4.421		mg/Kg		88	44 - 134	1	11
Di-n-octyl phthalate	5.00	3.807		mg/Kg		76	18 - 150	4	13
Fluoranthene	5.00	4.264		mg/Kg		85	39 - 129	1	12
Fluorene	5.00	4.073		mg/Kg		81	54 - 126	10	27
Hexachloro-1,3-butadiene	5.00	3.757		mg/Kg		75	40 - 136	6	15
Hexachlorobenzene	5.00	4.102	*1	mg/Kg		82	40 - 136	13	11
Hexachlorocyclopentadiene	5.00	4.613		mg/Kg		92	31 - 115	5	30
Hexachloroethane	5.00	3.511		mg/Kg		70	40 - 124	10	16
Indeno[1,2,3-cd]pyrene	5.00	3.953		mg/Kg		79	70 - 130	5	15
Isophorone	5.00	3.871		mg/Kg		77	70 - 130	11	12
Naphthalene	5.00	3.690		mg/Kg		74	32 - 146	5	20
Nitrobenzene	5.00	3.594		mg/Kg		72	41 - 137	9	13
N-Nitrosodimethylamine	5.00	3.209		mg/Kg		64	45 - 129	5	18
N-Nitrosodi-n-propylamine	5.00	3.914		mg/Kg		78	40 - 136	8	29
N-Nitrosodiphenylamine	5.00	4.586		mg/Kg		92	51 - 150	7	11
Pentachlorophenol	5.00	3.042		mg/Kg		61	23 - 131	3	22
Phenanthrene	5.00	3.974		mg/Kg		79	38 - 140	4	11
Phenol	5.00	3.591		mg/Kg		72	40 - 130	7	20

QC Sample Results

Client: Geosyntec Consultants, Inc. Job ID: 570-27609-1
Project/Site: City of LA TOS-25/ LA0590D

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCSD 570-67783/3-A **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 67881 **Prep Batch: 67783**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Pyrene			5.00	3.980		mg/Kg		80	47 - 143	4	20
Pyridine			5.00	2.353		mg/Kg		47	46 - 88	5	20

Surrogate	*LCSD %Recovery*	*LCSD Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*89*		*18 - 138*
2-Fluorobiphenyl (Surr)	*77*		*27 - 120*
2-Fluorophenol (Surr)	*82*		*25 - 120*
Nitrobenzene-d5 (Surr)	*70*		*33 - 123*
p-Terphenyl-d14 (Surr)	*84*		*27 - 159*
Phenol-d6 (Surr)	*87*		*26 - 122*

Lab Sample ID: 570-27577-A-6-B MS **Client Sample ID: Matrix Spike**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 67881 **Prep Batch: 67783**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2,4-Trichlorobenzene	ND		5.01	3.431		mg/Kg		69	56 - 120
1,2-Dichlorobenzene	ND	F2	5.01	3.091		mg/Kg		62	51 - 117
1,3-Dichlorobenzene	ND		5.01	3.121		mg/Kg		62	54 - 114
1,4-Dichlorobenzene	ND		5.01	3.006		mg/Kg		60	43 - 120
1-Methylnaphthalene	ND		5.01	3.350		mg/Kg		67	45 - 105
2,4,5-Trichlorophenol	ND		5.01	3.414		mg/Kg		68	48 - 120
2,4,6-Trichlorophenol	ND		5.01	3.429		mg/Kg		68	53 - 119
2,4-Dichlorophenol	ND		5.01	3.465		mg/Kg		69	55 - 121
2,4-Dimethylphenol	ND		5.01	3.522		mg/Kg		70	45 - 135
2,4-Dinitrophenol	ND		5.01	2.937		mg/Kg		59	15 - 99
2,4-Dinitrotoluene	ND		5.01	3.560		mg/Kg		71	28 - 120
2,6-Dichlorophenol	ND	F1	5.01	3.266	F1	mg/Kg		65	75 - 125
2,6-Dinitrotoluene	ND		5.01	3.635		mg/Kg		73	49 - 139
2-Chloronaphthalene	ND		5.01	3.583		mg/Kg		72	51 - 123
2-Chlorophenol	ND		5.01	3.419		mg/Kg		68	53 - 120
2-Methylnaphthalene	ND	F2	5.01	3.318		mg/Kg		66	51 - 123
2-Methylphenol	ND	F2	5.01	3.267		mg/Kg		65	52 - 124
2-Nitroaniline	ND		5.01	3.414		mg/Kg		68	43 - 157
2-Nitrophenol	ND		5.01	3.433		mg/Kg		69	55 - 139
3,3'-Dichlorobenzidine	ND		5.01	2.951		mg/Kg		59	15 - 225
3 & 4 Methylphenol	ND	F2	10.0	5.408		mg/Kg		54	33 - 129
3-Nitroaniline	ND		5.01	3.044		mg/Kg		61	30 - 144
4,6-Dinitro-2-methylphenol	ND		5.01	2.996		mg/Kg		60	26 - 146
4-Bromophenyl phenyl ether	ND		5.01	3.402		mg/Kg		68	45 - 129
4-Chloro-3-methylphenol	ND		5.01	3.456		mg/Kg		69	32 - 120
4-Chloroaniline	ND		5.01	2.621		mg/Kg		52	25 - 133
4-Chlorophenyl phenyl ether	ND		5.01	3.497		mg/Kg		70	47 - 131
4-Nitroaniline	ND	F2	5.01	3.156		mg/Kg		63	50 - 140
4-Nitrophenol	ND		5.01	3.075		mg/Kg		61	14 - 128
Acenaphthene	ND		5.01	3.513		mg/Kg		70	34 - 148
Acenaphthylene	ND		5.01	3.834		mg/Kg		77	53 - 120
Aniline	ND	F1	5.01	2.260	F1	mg/Kg		45	60 - 140

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 570-27577-A-6-B MS
Matrix: Solid
Analysis Batch: 67881

Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 67783

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Anthracene	ND		5.01	3.448		mg/Kg		69	45 - 123
Azobenzene	ND		5.01	3.451		mg/Kg		69	60 - 140
Benzidine	ND	F1	5.01	ND	F1	mg/Kg		0	0.1 - 78
Benzo[a]anthracene	ND		5.01	3.609		mg/Kg		72	44 - 122
Benzo[a]pyrene	ND		5.01	3.122		mg/Kg		62	50 - 116
Benzo[b]fluoranthene	ND		5.01	3.056		mg/Kg		61	56 - 122
Benzo[g,h,i]perylene	ND		5.01	3.593		mg/Kg		72	9 - 123
Benzo[k]fluoranthene	ND		5.01	3.387		mg/Kg		68	52 - 130
Benzoic acid	ND	F1	5.01	2.801	F1	mg/Kg		56	0.1 - 28
Benzyl alcohol	ND	F2	5.01	3.192		mg/Kg		64	54 - 150
Bis(2-chloroethoxy)methane	ND		5.01	3.617		mg/Kg		72	49 - 127
Bis(2-chloroethyl)ether	ND		5.01	3.348		mg/Kg		67	55 - 115
bis (2-Chloroisopropyl) ether	ND	F2	5.01	3.804		mg/Kg		76	33 - 153
Bis(2-ethylhexyl) phthalate	ND	F2	5.01	3.295		mg/Kg		66	55 - 121
Butyl benzyl phthalate	ND		5.01	3.516		mg/Kg		70	15 - 189
Chrysene	ND		5.01	3.259		mg/Kg		65	42 - 120
Dibenz(a,h)anthracene	ND		5.01	3.609		mg/Kg		72	19 - 127
Dibenzofuran	ND		5.01	3.233		mg/Kg		65	48 - 126
Diethyl phthalate	ND	F2	5.01	3.551		mg/Kg		71	52 - 124
Dimethyl phthalate	ND		5.01	3.438		mg/Kg		69	44 - 122
Di-n-butyl phthalate	ND		5.01	3.616		mg/Kg		72	49 - 127
Di-n-octyl phthalate	ND		5.01	3.218		mg/Kg		64	43 - 163
Fluoranthene	ND	F2	5.01	3.433		mg/Kg		69	45 - 123
Fluorene	ND		5.01	3.676		mg/Kg		73	12 - 186
Hexachloro-1,3-butadiene	ND	F2	5.01	3.272		mg/Kg		65	43 - 127
Hexachlorobenzene	ND	F2 *1	5.01	3.575		mg/Kg		71	43 - 133
Hexachlorocyclopentadiene	ND		5.01	3.854		mg/Kg		77	60 - 140
Hexachloroethane	ND	F2	5.01	3.108		mg/Kg		62	48 - 114
Indeno[1,2,3-cd]pyrene	ND		5.01	3.583		mg/Kg		72	70 - 130
Isophorone	ND		5.01	3.633		mg/Kg		73	51 - 117
Naphthalene	ND		5.01	3.319		mg/Kg		66	20 - 140
Nitrobenzene	ND	F2	5.01	3.231		mg/Kg		65	46 - 136
N-Nitrosodimethylamine	ND	F2	5.01	2.924		mg/Kg		58	53 - 119
N-Nitrosodi-n-propylamine	ND	F2	5.01	3.463		mg/Kg		69	38 - 140
N-Nitrosodiphenylamine	ND	F2	5.01	3.843		mg/Kg		77	57 - 159
Pentachlorophenol	ND		5.01	2.720		mg/Kg		54	10 - 124
Phenanthrene	ND		5.01	3.481		mg/Kg		70	46 - 130
Phenol	ND		5.01	3.420		mg/Kg		68	22 - 124
Pyrene	ND		5.01	3.468		mg/Kg		69	31 - 169
Pyridine	ND	F1 F2	5.01	2.254	F1	mg/Kg		45	50 - 130

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*77*		*18 - 138*
2-Fluorobiphenyl (Surr)	*66*		*27 - 120*
2-Fluorophenol (Surr)	*81*		*25 - 120*
Nitrobenzene-d5 (Surr)	*63*		*33 - 123*
p-Terphenyl-d14 (Surr)	*70*		*27 - 159*
Phenol-d6 (Surr)	*83*		*26 - 122*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 570-27577-A-6-C MSD **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid **Prep Type: Total/NA**
Analysis Batch: 67881 **Prep Batch: 67783**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2,4-Trichlorobenzene	ND		4.98	3.957		mg/Kg		79	56 - 120	14	20
1,2-Dichlorobenzene	ND	F2	4.98	4.070	F2	mg/Kg		82	51 - 117	27	18
1,3-Dichlorobenzene	ND		4.98	3.669		mg/Kg		74	54 - 114	16	18
1,4-Dichlorobenzene	ND		4.98	3.607		mg/Kg		72	43 - 120	18	26
1-Methylnaphthalene	ND		4.98	4.050		mg/Kg		81	45 - 105	19	30
2,4,5-Trichlorophenol	ND		4.98	4.006		mg/Kg		80	48 - 120	16	18
2,4,6-Trichlorophenol	ND		4.98	3.954		mg/Kg		79	53 - 119	14	18
2,4-Dichlorophenol	ND		4.98	3.926		mg/Kg		79	55 - 121	12	18
2,4-Dimethylphenol	ND		4.98	3.715		mg/Kg		75	45 - 135	5	22
2,4-Dinitrophenol	ND		4.98	3.357		mg/Kg		67	15 - 99	13	33
2,4-Dinitrotoluene	ND		4.98	4.062		mg/Kg		82	28 - 120	13	20
2,6-Dichlorophenol	ND	F1	4.98	3.870		mg/Kg		78	75 - 125	17	20
2,6-Dinitrotoluene	ND		4.98	4.140		mg/Kg		83	49 - 139	13	17
2-Chloronaphthalene	ND		4.98	4.140		mg/Kg		83	51 - 123	14	17
2-Chlorophenol	ND		4.98	3.893		mg/Kg		78	53 - 120	13	20
2-Methylnaphthalene	ND	F2	4.98	4.189	F2	mg/Kg		84	51 - 123	23	19
2-Methylphenol	ND	F2	4.98	4.330	F2	mg/Kg		87	52 - 124	28	19
2-Nitroaniline	ND		4.98	3.863		mg/Kg		78	43 - 157	12	17
2-Nitrophenol	ND		4.98	3.848		mg/Kg		77	55 - 139	11	17
3,3'-Dichlorobenzidine	ND		4.98	3.371		mg/Kg		68	15 - 225	13	22
3 & 4 Methylphenol	ND	F2	9.97	6.964	F2	mg/Kg		70	33 - 129	25	20
3-Nitroaniline	ND		4.98	3.591		mg/Kg		72	30 - 144	17	18
4,6-Dinitro-2-methylphenol	ND		4.98	3.519		mg/Kg		71	26 - 146	16	18
4-Bromophenyl phenyl ether	ND		4.98	4.001		mg/Kg		80	45 - 129	16	17
4-Chloro-3-methylphenol	ND		4.98	4.173		mg/Kg		84	32 - 120	19	20
4-Chloroaniline	ND		4.98	3.008		mg/Kg		60	25 - 133	14	22
4-Chlorophenyl phenyl ether	ND		4.98	4.184		mg/Kg		84	47 - 131	18	18
4-Nitroaniline	ND	F2	4.98	3.857	F2	mg/Kg		77	50 - 140	20	18
4-Nitrophenol	ND		4.98	3.466		mg/Kg		70	14 - 128	12	59
Acenaphthene	ND		4.98	3.999		mg/Kg		80	34 - 148	13	20
Acenaphthylene	ND		4.98	4.393		mg/Kg		88	53 - 120	14	20
Aniline	ND	F1	4.98	2.499	F1	mg/Kg		50	60 - 140	10	30
Anthracene	ND		4.98	3.961		mg/Kg		79	45 - 123	14	17
Azobenzene	ND		4.98	4.249		mg/Kg		85	60 - 140	21	30
Benzidine	ND	F1	4.98	ND	F1	mg/Kg		0	0.1 - 78	NC	54
Benzo[a]anthracene	ND		4.98	4.036		mg/Kg		81	44 - 122	11	14
Benzo[a]pyrene	ND		4.98	3.424		mg/Kg		69	50 - 116	9	17
Benzo[b]fluoranthene	ND		4.98	3.375		mg/Kg		68	56 - 122	10	20
Benzo[g,h,i]perylene	ND		4.98	4.071		mg/Kg		82	9 - 123	12	18
Benzo[k]fluoranthene	ND		4.98	3.757		mg/Kg		75	52 - 130	10	18
Benzoic acid	ND	F1	4.98	3.135	F1	mg/Kg		63	0.1 - 28	11	81
Benzyl alcohol	ND	F2	4.98	4.377	F2	mg/Kg		88	54 - 150	31	18
Bis(2-chloroethoxy)methane	ND		4.98	3.955		mg/Kg		79	49 - 127	9	16
Bis(2-chloroethyl)ether	ND		4.98	3.957		mg/Kg		79	55 - 115	17	18
bis (2-Chloroisopropyl) ether	ND	F2	4.98	5.154	F2	mg/Kg		103	33 - 153	30	18
Bis(2-ethylhexyl) phthalate	ND	F2	4.98	3.962	F2	mg/Kg		80	55 - 121	18	15
Butyl benzyl phthalate	ND		4.98	3.851		mg/Kg		77	15 - 189	9	20
Chrysene	ND		4.98	3.758		mg/Kg		75	42 - 120	14	16

QC Sample Results

Method: 8270C - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 570-27577-A-6-C MSD
Matrix: Solid
Analysis Batch: 67881

Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 67783

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Dibenz(a,h)anthracene	ND		4.98	4.021		mg/Kg		81	19 - 127	11	16
Dibenzofuran	ND		4.98	3.707		mg/Kg		74	48 - 126	14	18
Diethyl phthalate	ND	F2	4.98	4.270	F2	mg/Kg		86	52 - 124	18	16
Dimethyl phthalate	ND		4.98	3.975		mg/Kg		80	44 - 122	14	20
Di-n-butyl phthalate	ND		4.98	4.107		mg/Kg		82	49 - 127	13	17
Di-n-octyl phthalate	ND		4.98	3.635		mg/Kg		73	43 - 163	12	19
Fluoranthene	ND	F2	4.98	4.156	F2	mg/Kg		83	45 - 123	19	18
Fluorene	ND		4.98	4.338		mg/Kg		87	12 - 186	17	20
Hexachloro-1,3-butadiene	ND	F2	4.98	3.987	F2	mg/Kg		80	43 - 127	20	17
Hexachlorobenzene	ND	F2 *1	4.98	4.367	F2	mg/Kg		88	43 - 133	20	17
Hexachlorocyclopentadiene	ND		4.98	4.390		mg/Kg		88	60 - 140	13	30
Hexachloroethane	ND	F2	4.98	4.017	F2	mg/Kg		81	48 - 114	26	17
Indeno[1,2,3-cd]pyrene	ND		4.98	3.946		mg/Kg		79	70 - 130	10	16
Isophorone	ND		4.98	4.128		mg/Kg		83	51 - 117	13	16
Naphthalene	ND		4.98	3.849		mg/Kg		77	20 - 140	15	20
Nitrobenzene	ND	F2	4.98	4.127	F2	mg/Kg		83	46 - 136	24	17
N-Nitrosodimethylamine	ND	F2	4.98	3.680	F2	mg/Kg		74	53 - 119	23	18
N-Nitrosodi-n-propylamine	ND	F2	4.98	4.484	F2	mg/Kg		90	38 - 140	26	20
N-Nitrosodiphenylamine	ND	F2	4.98	4.740	F2	mg/Kg		95	57 - 159	21	20
Pentachlorophenol	ND		4.98	3.183		mg/Kg		64	10 - 124	16	20
Phenanthrene	ND		4.98	3.949		mg/Kg		79	46 - 130	13	17
Phenol	ND		4.98	4.027		mg/Kg		81	22 - 124	16	20
Pyrene	ND		4.98	4.017		mg/Kg		81	31 - 169	15	20
Pyridine	ND	F1 F2	4.98	2.813	F2	mg/Kg		56	50 - 130	22	20

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
2,4,6-Tribromophenol (Surr)	*93*		*18 - 138*
2-Fluorobiphenyl (Surr)	*74*		*27 - 120*
2-Fluorophenol (Surr)	*89*		*25 - 120*
Nitrobenzene-d5 (Surr)	*80*		*33 - 123*
p-Terphenyl-d14 (Surr)	*83*		*27 - 159*
Phenol-d6 (Surr)	*97*		*26 - 122*

QC Association Summary

GC/MS Semi VOA

Prep Batch: 67783

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-27609-1	NH-HSA-1-S1	Total/NA	Solid	3545	
MB 570-67783/1-A	Method Blank	Total/NA	Solid	3545	
LCS 570-67783/2-A	Lab Control Sample	Total/NA	Solid	3545	
LCSD 570-67783/3-A	Lab Control Sample Dup	Total/NA	Solid	3545	
570-27577-A-6-B MS	Matrix Spike	Total/NA	Solid	3545	
570-27577-A-6-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3545	

Analysis Batch: 67881

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
570-27609-1	NH-HSA-1-S1	Total/NA	Solid	8270C	67783
MB 570-67783/1-A	Method Blank	Total/NA	Solid	8270C	67783
LCS 570-67783/2-A	Lab Control Sample	Total/NA	Solid	8270C	67783
LCSD 570-67783/3-A	Lab Control Sample Dup	Total/NA	Solid	8270C	67783
570-27577-A-6-B MS	Matrix Spike	Total/NA	Solid	8270C	67783
570-27577-A-6-C MSD	Matrix Spike Duplicate	Total/NA	Solid	8270C	67783

Lab Chronicle

Client Sample ID: NH-HSA-1-S1

Lab Sample ID: 570-27609-1

Date Collected: 04/24/20 07:30

Matrix: Solid

Date Received: 05/07/20 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3545			20.08 g	2 mL	67783	05/08/20 07:32	F7UI	ECL 1
Total/NA	Analysis	8270C		1			67881	05/08/20 18:44	N8CZ	ECL 1
	Instrument ID:	GCMSTT								

Laboratory References:

ECL 1 = Eurofins Calscience LLC Lincoln, 7440 Lincoln Way, Garden Grove, CA 92841, TEL (714)895-5494

Accreditation/Certification Summary

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590D

Job ID: 570-27609-1

Laboratory: Eurofins Calscience LLC

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
California	Los Angeles County Sanitation Districts	10109	09-29-20
California	SCAQMD LAP	17LA0919	11-30-20
California	State	2944	09-29-20
Guam	State	20-003R	10-31-20
Nevada	State	CA00111	07-31-20
Oregon	NELAP	CA300001	01-29-21
USDA	US Federal Programs	P330-20-00034	02-10-23
Washington	State	C916-18	10-11-20

Method Summary

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590D

Job ID: 570-27609-1

Method	Method Description	Protocol	Laboratory
8270C	Semivolatile Organic Compounds (GC/MS)	SW846	ECL 1
3545	Pressurized Fluid Extraction	SW846	ECL 1

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

ECL 1 = Eurofins Calscience LLC Lincoln, 7440 Lincoln Way, Garden Grove, CA 92841, TEL (714)895-5494

Sample Summary

Client: Geosyntec Consultants, Inc.
Project/Site: City of LA TOS-25/ LA0590D

Job ID: 570-27609-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
570-27609-1	NH-HSA-1-S1	Solid	04/24/20 07:30	05/07/20 09:30	

eurofins Calscience

7440 Lincoln Way, Garden Grove, CA 92841-1427 • (714) 895-5494
For courier service / sample drop off information, contact us26_sales@eurofinsus.com or call us.

570-27609 Chain of Custody

CHAIN OF CUSTODY

Loc: 570
27609

DATE: 05/04/20
PAGE: 1 OF 1

LABORATORY CLIENT: Karthik Viswanathan, Geosyntec Consultants
ADDRESS: 2100 Main St., Ste. 150
CITY: Huntington Beach STATE: CA ZIP: 92648
TEL: 714-465-1250 E-MAIL: kviswanathan@geosyntec.com

CLIENT PROJECT NAME / NUMBER: City of LA TOS-25 / LA0590D
P.O. NO.: 100015480
PROJECT CONTACT: Karthik Viswanathan
SAMPLER(S): (PRINT) Karthik Viswanathan

TURNAROUND TIME (Rush surcharges may apply to any TAT not "STANDARD"):
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☒ STANDARD

☐ COELT EDF
GLOBAL ID:
LOG CODE:

SPECIAL INSTRUCTIONS:

REQUESTED ANALYSES

Please check box or fill in blank as needed.

LAB USE ONLY	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	Unpreserved	Preserved	Field Filtered	8270C - Semivolatile Organic Compounds (SVOCs)
	NH-HSA-1-S1	4/24/2020	7:30	Solid	1		No	No	X

Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
05/04/20 16:18	Geosyntec	05/06/20	1330
05/06/20 1330		5/7/2020	0930

06/02/14 Revision

3 8 12 6 8 S4

DRAFT - FOR DISCUSSION PURPOSES ONLY

Login Sample Receipt Checklist

Client: Geosyntec Consultants, Inc.

Job Number: 570-27609-1

Login Number: 27609
List Number: 1
Creator: Liao, Gineyau

List Source: Eurofins Calscience

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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APPENDIX F

Liquefaction and Dry Settlement Evaluation Results

Geosyntec
consultants

COMPUTATION COVER SHEET

Client: TetraTech **Project:** TOS No. 25 North Hollywood Park, LA, CA **Project No.:** LA0590B

Task No.:

Title of Computations: **SOIL LIQUEFACTION EVALUATION AND SEISMICALLY INDUCED DEFORMATION CALCULATIONS FOR NORTH HOLLYWOOD PARK**

Computations by:

Signature DRAFT

Printed Name Sneha Upadhyaya

Title Senior Staff Professional

05/29/2020
Date

Assumptions and Procedures Checked by: (peer reviewer)

Signature

Printed Name

Title

Date

Computations Checked by:

Signature

Printed Name

Title

Date

Computations back checked by: (originator)

Signature

Printed Name Sneha Upadhyaya

Title Senior Staff Professional

Date

Approved by: (pm or designate)

Signature

Printed Name

Title

Date

Approval notes:

Revisions (number and initial all revisions)

No.	Sheet	Date	By	Checked by	Approval

SOIL LIQUEFACTION EVALUATION AND SEISMICALLY INDUCED DEFORMATION CALCULATIONS

1. PURPOSE AND SCOPE

The purpose of this calculation package is to document the site-specific liquefaction evaluation and seismically induced deformation analyses relating to the Storm Water Capture Parks Program – North Hollywood Park, Los Angeles, CA.

The scope of this document consists of the following tasks:

1. Summarize the seismic input parameters.
2. Summarize the design groundwater level.
3. Perform liquefaction triggering analyses and induced deformation calculations.
4. Estimate seismically induced dry sand settlement.

2. SEISMIC INPUT PARAMETERS

The seismic design input parameters for soil liquefaction evaluation and seismically induced deformation calculations at the Site were estimated for 2/3 PGA_M analysis for Site Class D. The 2/3 PGA_M was estimated as 0.63 g and the associated representative magnitude was estimated as M 6.77. The seismic site classification and development of the seismic input parameters are described in detail in the supporting Seismic Design Parameters Calculation Package of the main report.

3. DESIGN GROUND WATER LEVEL

Per Geosyntec's investigation, the existing groundwater levels are on the order of 107 ft bgs and the historic groundwater level (as extracted from the 1998 CGS report) is approximately 10 ft bgs in the vicinity of the Site. However, this historic high groundwater level at the Site is higher than the anticipated foundation level of 17 ft bgs for the infiltration galleries. Thus, in lieu of the historic high groundwater level, the anticipated foundation level of 17 ft bgs was used to perform the liquefaction analyses presented herein.

4. LIQUEFACTION EVALUATION AND DEFORMATION CALCULATIONS

The liquefaction assessment was performed based on the Cone Penetration Test (CPT) data from Geosyntec's investigations including CPT-1, CPT-1A, CPT-2, CPT-3, CPT-3A, CPT-4, CPT-5, CPT-5A, CPT-6, CPT-7, CPT-8, CPT-8A, CPT-9, CPT-9A, CPT-10, CPT-11 and CPT-12, for the 2/3 PGA_M analysis.

4.1 Methodology

Liquefaction triggering evaluations were performed at each CPT sounding location following Boulanger and Idriss (2014) methodology as implemented in the computer program CLiq v. 2.1 (GeoLogismiki 2007).

The liquefaction assessment input parameters to CLiq v.2.1 are summarized in Table 1. Soil layers with CPT Soil Behavior Type Index (I_c) greater than 2.6 were considered non-liquefiable (i.e., clay-like or too plastic to liquefy) (Robertson and Wride 1998). Laboratory based Fines Content (FC) data from samples from nearby borings was used to obtain the equivalent CPT tip resistance for clean sands. The FC versus depth profiles are included in Attachment 1.

Liquefaction-induced vertical settlements were estimated using Zhang et al. (2002) methodology implemented in CLiq. Dry sand settlement above the ground water level was estimated using the Robertson and Shao (2010) methodology implemented in CLiq. The total seismically induced vertical settlement was computed as the sum of the liquefaction-induced settlement and the dry sand settlement.

Lateral spreading deformations were estimated using the Zhang et al. (2004) methodology also implemented in CLiq for level ground with free face conditions, based on the height of the slope (free face) (H) and the horizontal distance from the CPT to the toe of the slope (free face) (L). The height of the free face was assumed to be approximately 20 ft, representative of the conditions at the flood control channel along the western edge of the Site. Lateral displacements below 2H (i.e., 40 ft bgs) were ignored.

Table 1. Liquefaction assessment and seismic deformation input parameters

Assessment Parameters	**Parameters**	
General Parameters	Calculation Method	B&I (2014)
	Max acceleration	0.63 g
	Earthquake Magnitude	6.77
	G.W.T. (in-situ)	107 ft
	G.W.T. (earthquake)	17 ft
Advanced parameters	Average Results Interval	1
	Apply Kσ correction	Yes
	Auto transition layer detection	No
	Limit analysis depth	Yes, limit selected at 60 ft
	Auto unit weight calculation	Yes
	Ic cut-off value	2.6
	Calculate dry sand settlements	Yes
	Use factor of 2 in dry settlement	Yes
	User FS	1.0
	Weighting factor for ev	No
I&B 2008	I&B Clay-like behavior (also applies to BI14)	No
	Settlement according to Zhang et al	Yes
B&I 2014	Fines Content	User defined FC
Site Conditions	Final site conditions	Same as initial
Lateral Displacement	Level ground with free face	1<L/H<50 (L=horizontal distance from CPT to the toe of slope; H = height of the slope = 20 ft)
	Ignore displacements below 2H	Yes

4.2 Results

Detailed results from the liquefaction evaluation and seismically induced vertical and lateral deformations (i.e., CLiq output) are presented in Attachment 1.

Liquefaction is predicted to trigger when Factor of Safety against liquefaction (FS_{liq}) is equal or less than 1, which corresponds to a condition when the seismic demand (cyclic stress ratio, CSR) is equal or exceeds the soil liquefaction capacity (cyclic resistance ratio, CRR).

The FS_{liq} versus depth profiles for the CPT soundings analyzed herein indicate the potential for liquefaction and induced settlements at the site for the design ground motions and design groundwater conditions. Additionally, the results from lateral spreading analyses also indicate the potential for significant lateral displacements at the Site.

Table 2 summarizes the seismically induced total and differential settlements at the ground surface as well as at the anticipated foundation level of approximately 17 ft bgs for 2/3 PGA_M analysis. The estimated total settlements at the ground surface ranged from 1 in to 7.5 in. Differential settlements at the ground surface ranged from 0.5 in to 4 in. The estimated total settlements at 17 ft bgs ranged from 0.5 in to 3 in. Differential settlements at 17 ft bgs ranged from 0 to 1.5 in.

Table 3 summarizes the lateral displacements at each CPT location for the 2/3 PGA_M analysis. The ranges of estimated lateral displacements at the site were grouped into different bins based on the distances from the free face as shown in Table 3.

Table 2. Estimated seismically induced settlements at the CPT locations for 2/3 PGA_M analysis

CPT Sounding	Sounding Depth (ft)	Settlement at the Ground Surface (inches)				Settlement at 17 ft bgs (inches)			
		Dry sand	Liquefaction induced	Total	Differential	Dry sand	Liquefaction induced	Total	Differential
CPT-1	23.8	0.2	0.5	0.7	0.3	0.0	0.5	0.5	0.2
CPT-1A	43.0	0.2	1.3	1.4	0.7	0.0	1.3	1.3	0.6
CPT-2	38.1	2.5	0.9	3.4	1.7	0.0	0.9	0.9	0.5
CPT-3	41.6	3.6	1.8	5.5	2.7	0.0	1.8	1.8	0.9
CPT-3A	41.3	5.4	1.8	7.2	3.6	0.0	1.8	1.8	0.9
CPT-4	39.8	2.3	2.6	4.9	2.4	0.0	2.6	2.6	1.3
CPT-5	46.3	2.2	1.1	3.3	1.7	0.0	1.1	1.1	0.5
CPT-5A	46.4	1.0	1.6	2.6	1.3	0.0	1.6	1.6	0.8
CPT-6	44.5	0.3	2.0	2.2	1.1	0.0	2.0	2.0	1.0
CPT-7	46.7	0.0	1.9	2.0	1.0	0.0	1.9	1.9	1.0
CPT-8	46.5	0.1	2.9	3.0	1.5	0.0	2.9	2.9	1.5
CPT-8A	37.4	0.1	1.1	1.2	0.6	0.0	1.1	1.1	0.5
CPT-9	51.3	0.9	2.6	3.5	1.8	0.0	2.6	2.6	1.3
CPT-9A	52.8	0.4	1.6	2.0	1.0	0.0	1.6	1.6	0.8
CPT-10	49.8	1.2	2.3	3.5	1.7	0.0	2.3	2.3	1.2
CPT-11	46.1	0.3	2.7	3.0	1.5	0.0	2.7	2.7	1.3
CPT-12	40.6	0.5	0.2	0.7	0.4	0.0	0.2	0.2	0.1

Table 3. Estimated seismically induced lateral displacements at the CPT locations for 2/3 PGA_M analysis

CPT ID	Refusal depth (ft)	Distance from Free face (L) ft	L/H	Lateral displacement (inches)	Distance range (ft)	L/H range	Lateral Displacement range (inches)
CPT-2	38.1	75	3.75	40.7	75 to 125	3.75 to 6.25	30 to 55
CPT-7	46.7	85	4.25	54.6			
CPT-12	40.6	85	4.25	7.1			
CPT-1	23.8	96	4.80	16.4			
CPT-1A	43.0	100	5.00	29.9			
CPT-11	46.1	125	6.25	46.8			
CPT-4	39.8	300	15.00	27.6	300 to 600	15 to 30	10 to 30
CPT-3A	41.3	350	17.50	14.3			
CPT-3	41.6	355	17.75	15.6			
CPT-6	44.5	435	21.75	15.0			
CPT-8	46.5	450	22.50	13.4			
CPT-8A	37.4	460	23.00	9.7			
CPT-10	49.8	570	28.50	13.4			
CPT-5A	46.4	635	31.75	9.6	600 to 800	30 to 40	6 to 10
CPT-5	46.3	640	32.00	6.0			
CPT-9A	52.8	800	40.00	6.6			
CPT-9	51.3	807	40.35	10.0			

5. REFERENCES

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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.

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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.

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.

Zhang, G., Robertson, P.K., and Brachman, R.W.I. (2004). "Estimating Liquefaction-Induced Lateral Displacements Using the Standard Penetration Test or Cone Penetration Test." *Journal of Geotechnical and Geoenvironmental Engineering*, 130(8): 861-871.

Written by: **Sneha Upadhyaya** Date: **05/29/20** Reviewed by: Date:
Client: **TetraTech** Project: **TOS No. 25 North Hollywood Park** Project No.: **LA0590B** Task No.:

ATTACHMENT 1

LIQUEFACTION EVALUATION AND SEISMIC DEFORMATION CALCULATIONS (CLIQ OUTPUT) FOR 2/3 PGA$_M$ ANALYSIS

EXAMPLE CALCULATIONS PROVIDED FOR CPT-1 ONLY

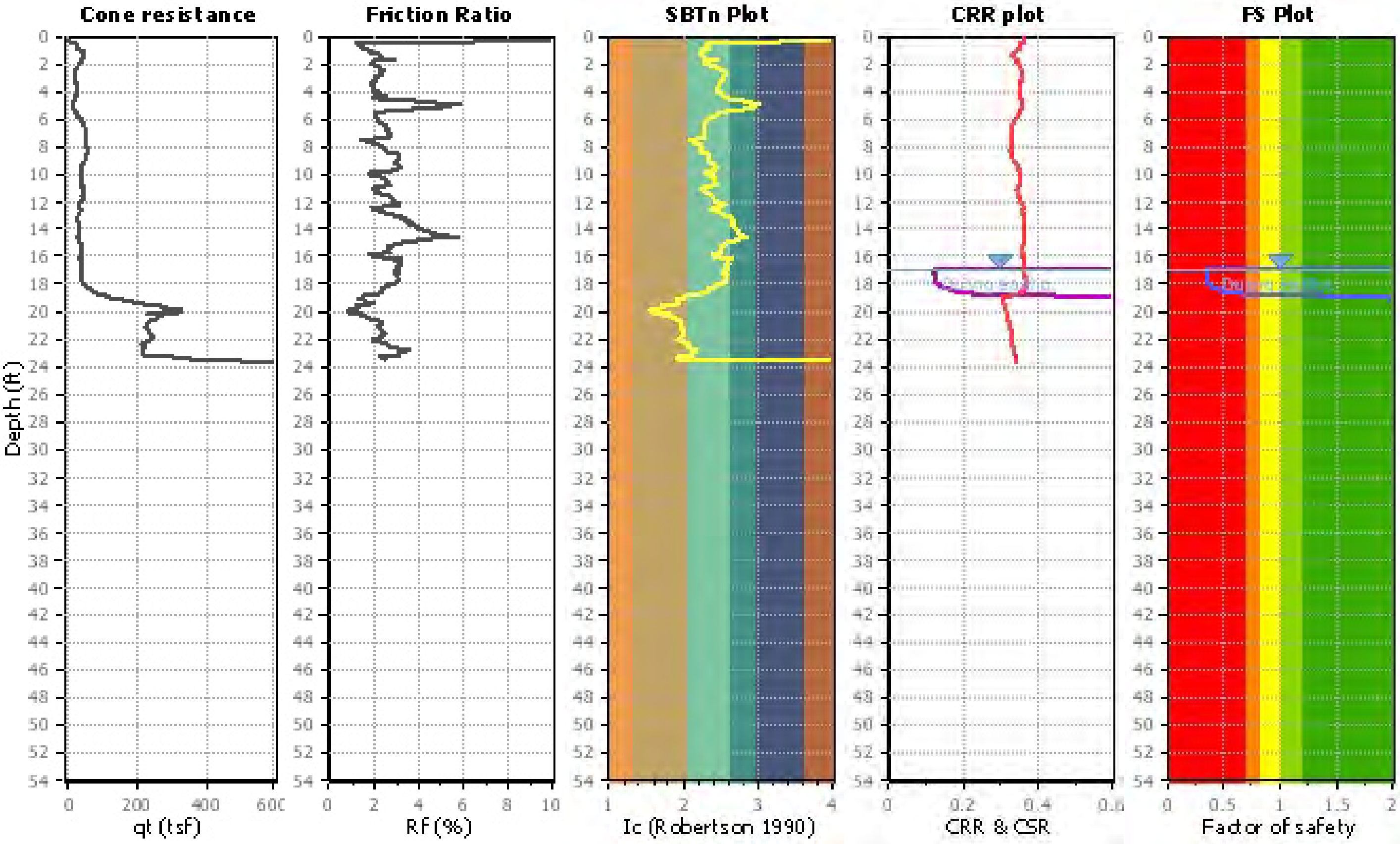
LIQUEFACTION ANALYSIS REPORT

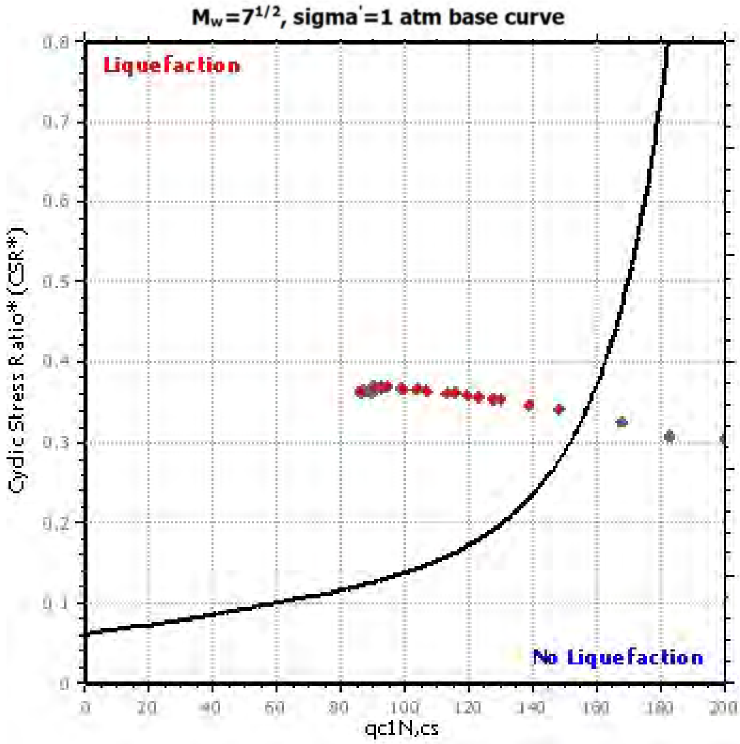
Project title : TOS-25 North Hollywood Park **Location :**

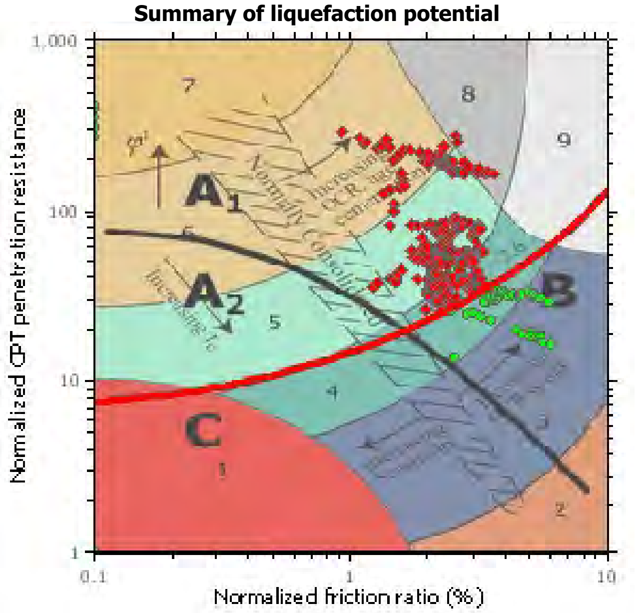
CPT file : NH-CPT-1

Input parameters and analysis data

Analysis method:	B&I (2014)	G.W.T. (in-situ):	107.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	6.77	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.63	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

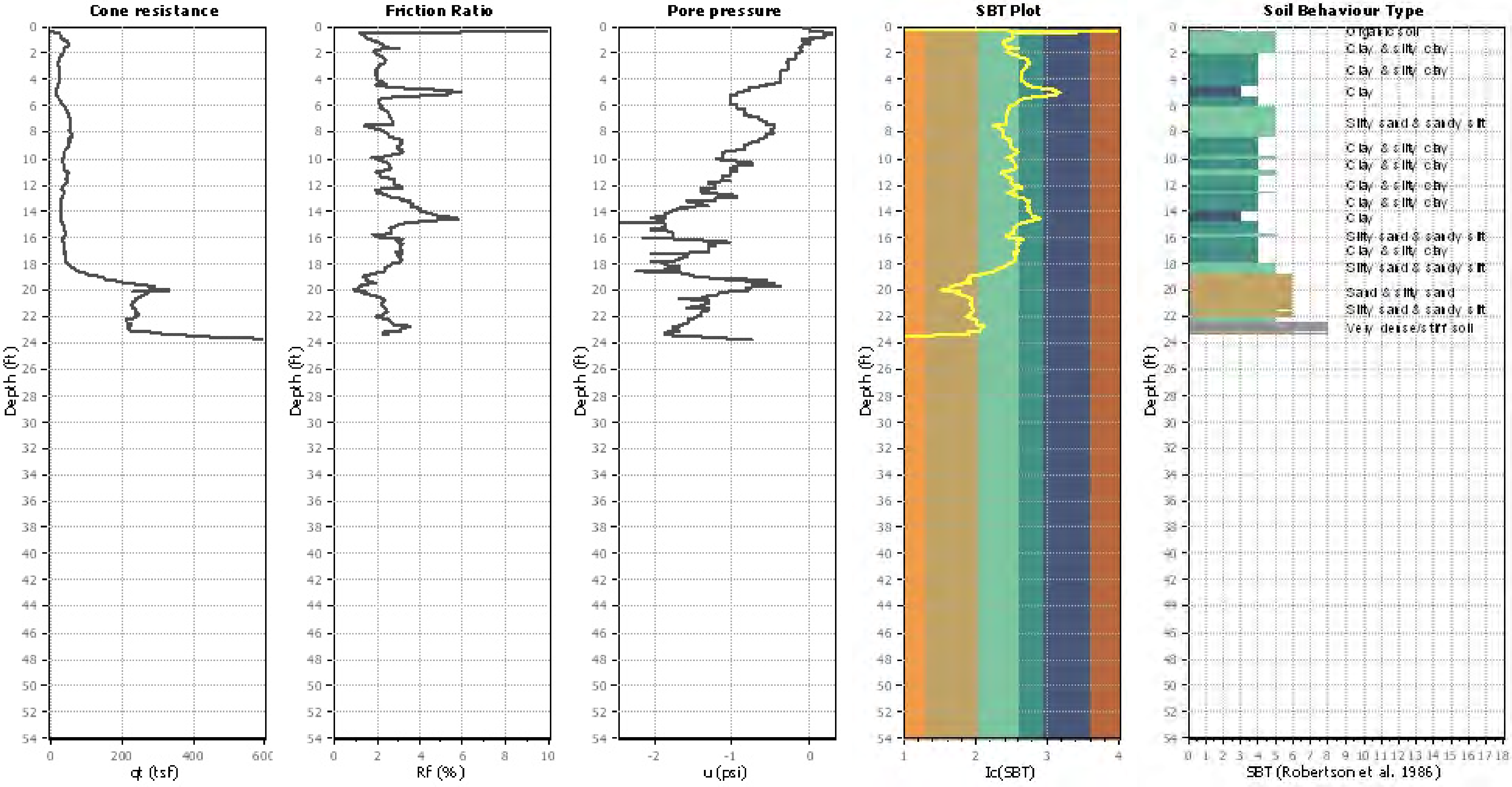






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plo



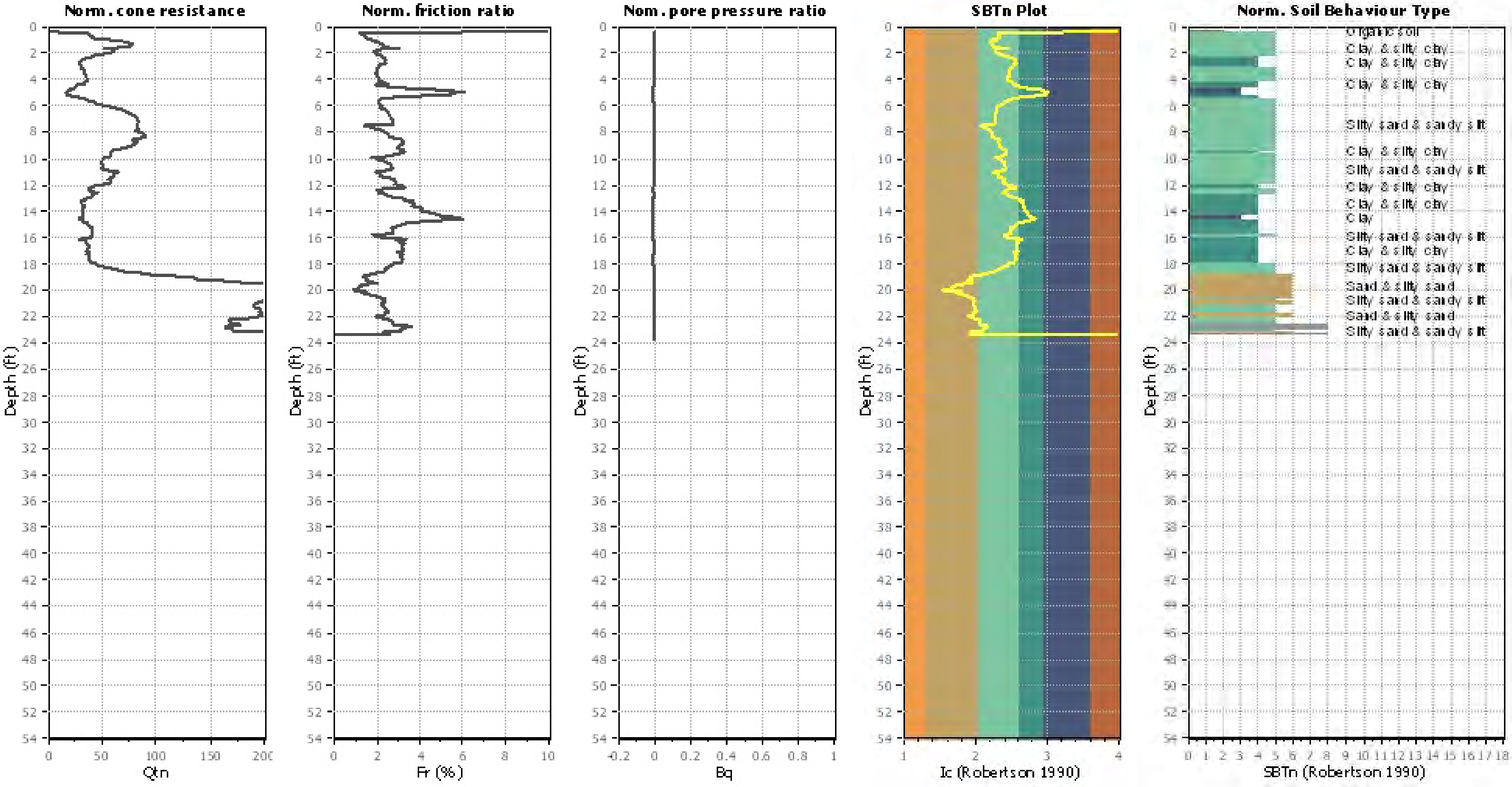
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	17.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.77	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	107.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normaliz



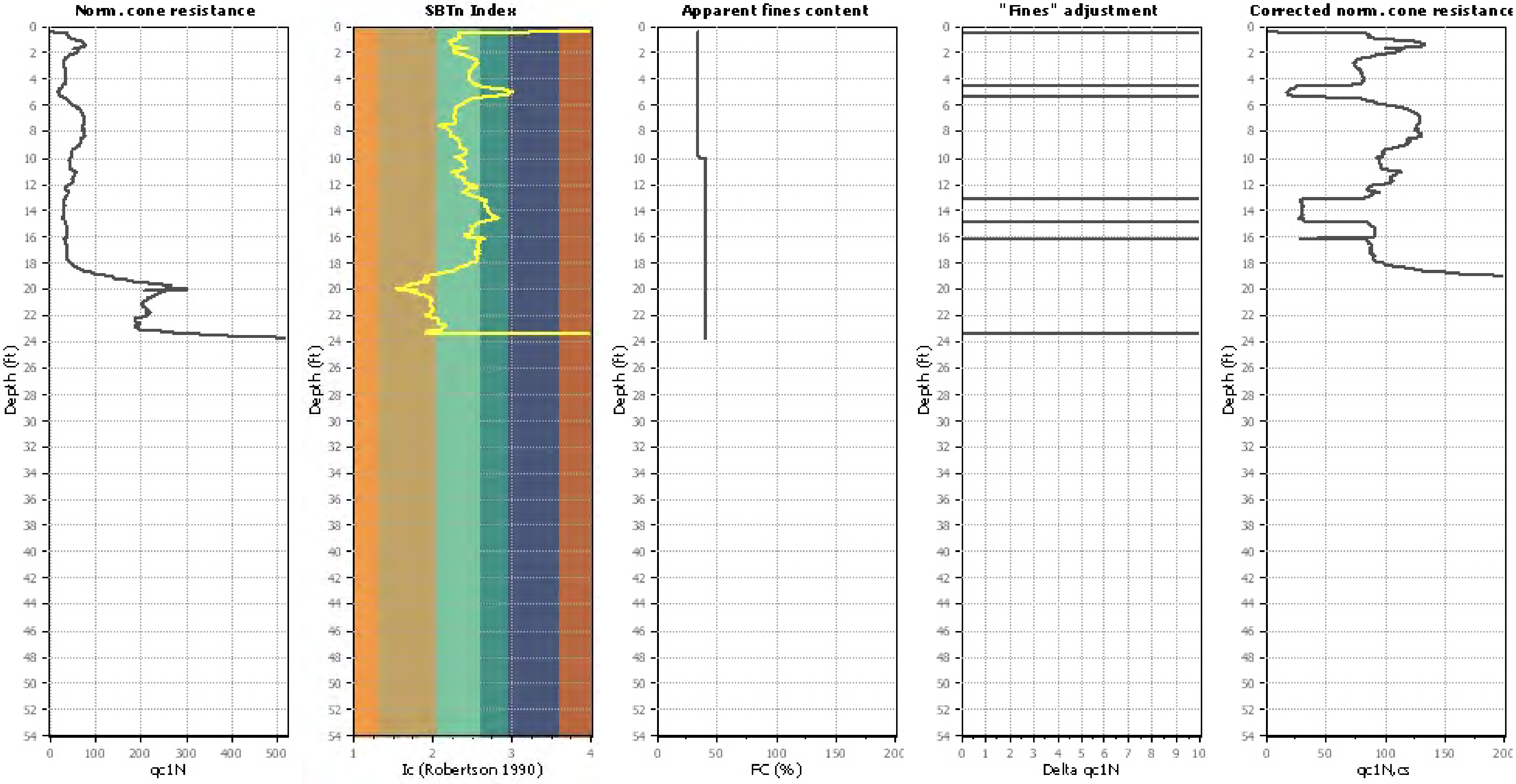
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	17.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.77	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	107.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬜ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

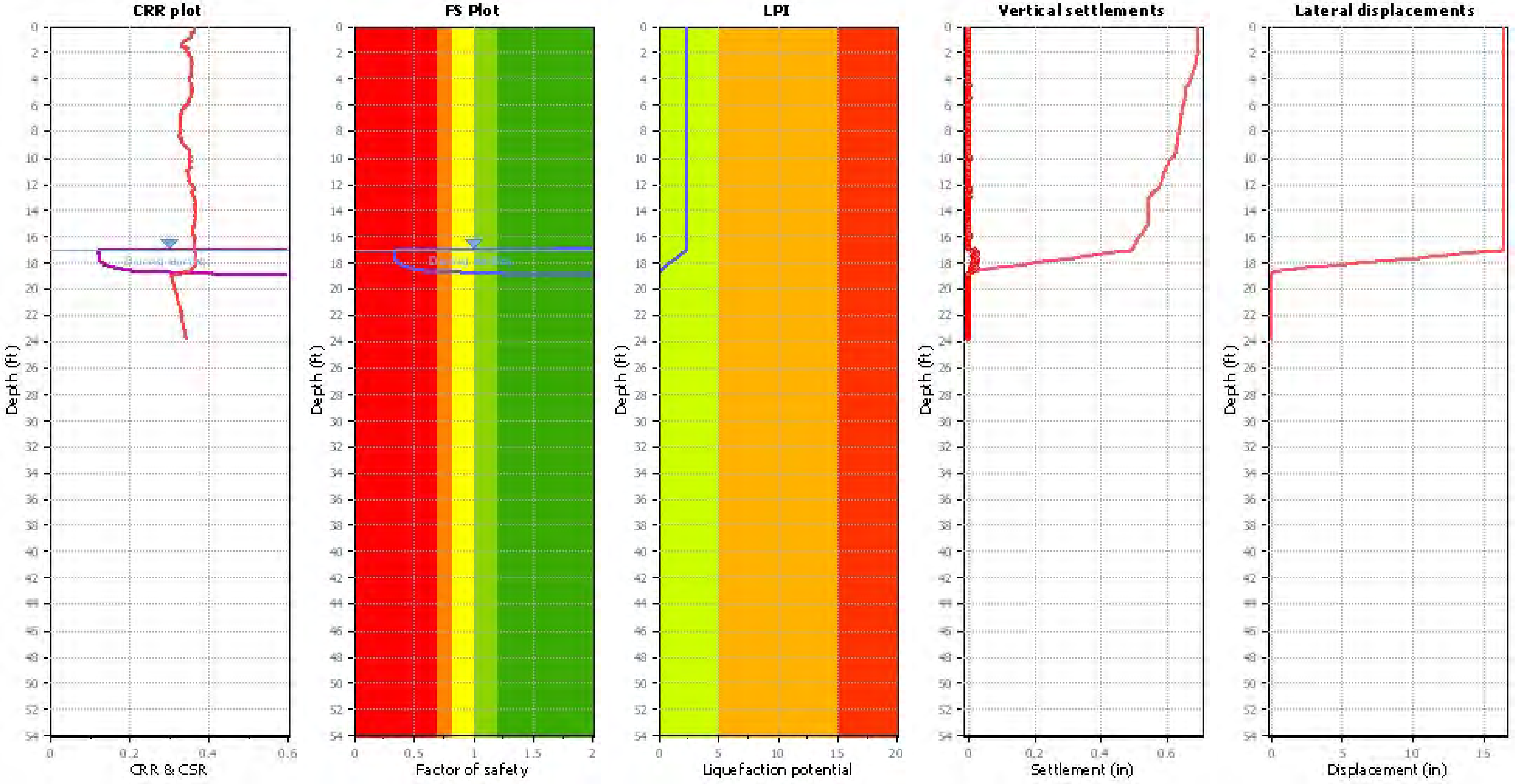
Liquefaction analysis overall plots (intermediate resu



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	17.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.77	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	107.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	17.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.77	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	107.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

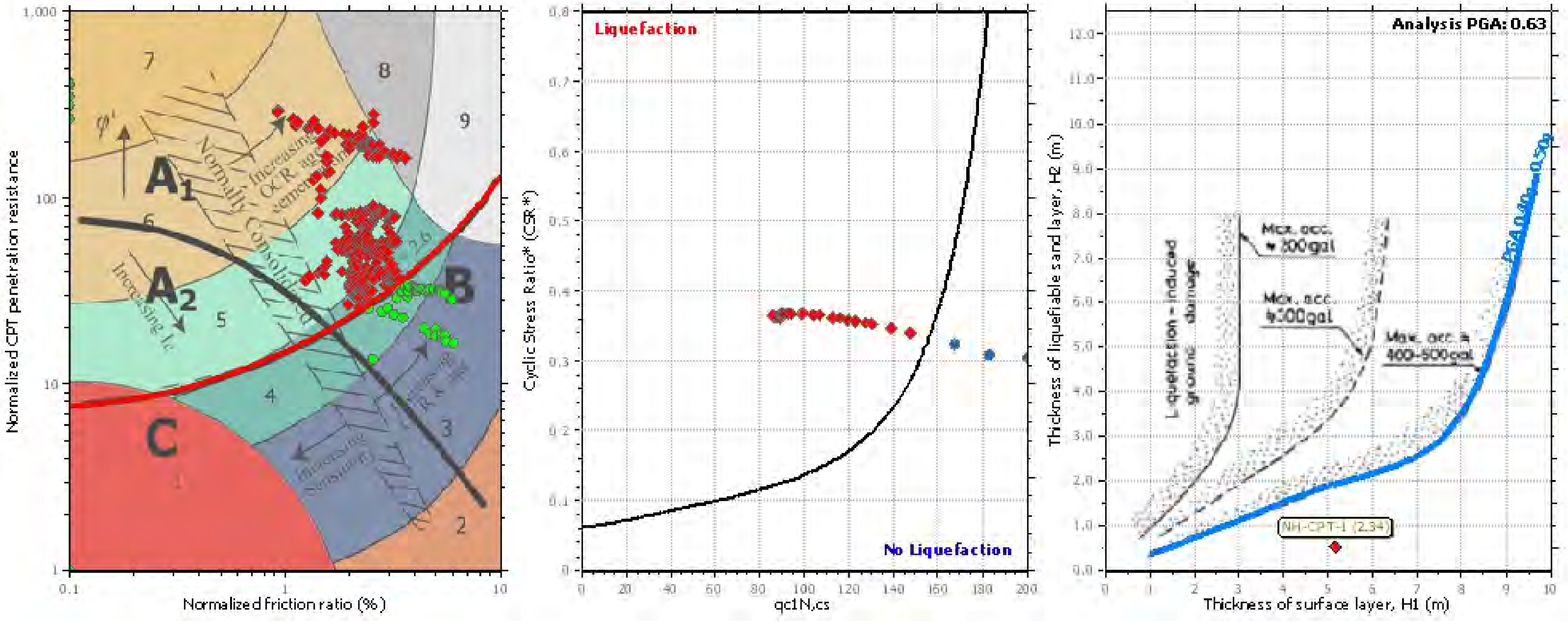
F.S. color scheme

- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

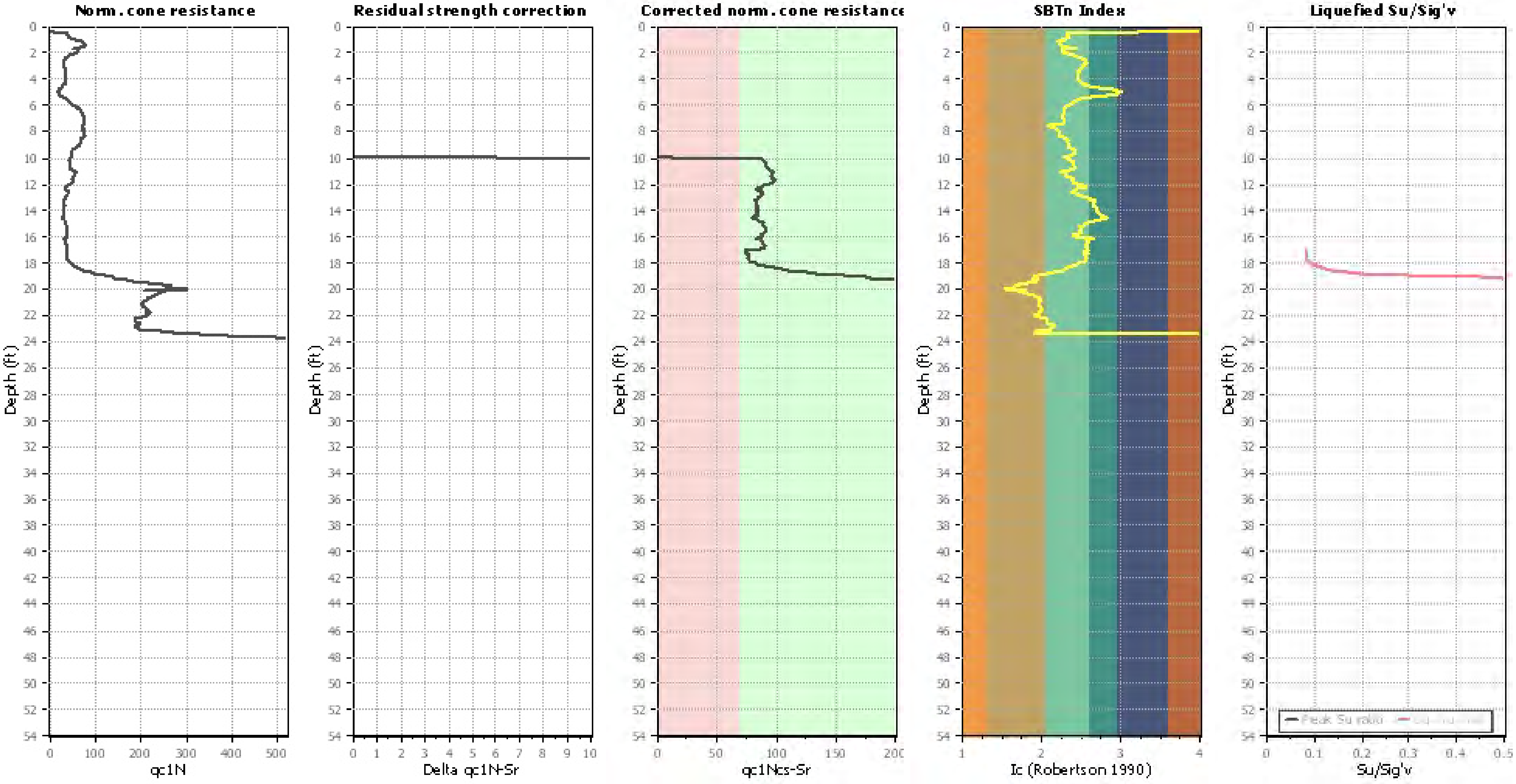
Liquefaction analysis summary plo



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	17.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.77	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	107.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

Check for strength loss plots (Idriss & Boulanger (2008))



Norm. cone resistance

Residual strength correction

Corrected norm. cone resistance

SBTn Index

Liquefied Su/Sig'v

Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	17.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	1	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.77	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	107.00 ft	Fill height:	N/A	Limit depth:	60.00 ft

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data ::

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
1	0.08	0.01	0.00	0.01	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
2	0.16	0.01	0.00	0.01	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
3	0.20	0.01	0.00	0.01	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
4	0.30	0.02	0.00	0.02	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
5	0.35	0.02	0.00	0.02	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
6	0.40	0.02	0.00	0.02	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
7	0.49	0.03	0.00	0.03	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
8	0.53	0.03	0.00	0.03	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
9	0.64	0.04	0.00	0.04	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
10	0.69	0.04	0.00	0.04	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
11	0.73	0.04	0.00	0.04	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
12	0.80	0.05	0.00	0.05	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
13	0.88	0.05	0.00	0.05	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
14	0.93	0.05	0.00	0.05	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
15	1.02	0.06	0.00	0.06	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
16	1.06	0.06	0.00	0.06	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
17	1.13	0.06	0.00	0.06	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
18	1.19	0.07	0.00	0.07	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
19	1.28	0.07	0.00	0.07	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
20	1.33	0.08	0.00	0.08	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
21	1.39	0.08	0.00	0.08	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
22	1.50	0.09	0.00	0.09	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
23	1.54	0.09	0.00	0.09	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
24	1.59	0.09	0.00	0.09	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
25	1.65	0.10	0.00	0.10	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
26	1.71	0.10	0.00	0.10	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
27	1.79	0.10	0.00	0.10	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
28	1.85	0.11	0.00	0.11	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
29	1.94	0.11	0.00	0.11	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
30	2.01	0.12	0.00	0.12	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
31	2.05	0.12	0.00	0.12	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
32	2.14	0.12	0.00	0.12	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
33	2.18	0.13	0.00	0.13	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
34	2.27	0.13	0.00	0.13	1.00	0.410	1.21	0.338	1.10	1.00	2.000	No
35	2.32	0.13	0.00	0.13	1.00	0.409	1.21	0.338	1.10	1.00	2.000	No
36	2.42	0.14	0.00	0.14	1.00	0.409	1.21	0.338	1.10	1.00	2.000	No
37	2.46	0.14	0.00	0.14	1.00	0.409	1.21	0.338	1.10	1.00	2.000	No
38	2.54	0.15	0.00	0.15	1.00	0.409	1.21	0.338	1.10	1.00	2.000	No
39	2.57	0.15	0.00	0.15	1.00	0.409	1.21	0.338	1.10	1.00	2.000	No
40	2.64	0.15	0.00	0.15	1.00	0.409	1.21	0.337	1.10	1.00	2.000	No
41	2.71	0.16	0.00	0.16	1.00	0.409	1.21	0.337	1.10	1.00	2.000	No
42	2.76	0.16	0.00	0.16	1.00	0.409	1.21	0.337	1.10	1.00	2.000	No
43	2.85	0.16	0.00	0.16	1.00	0.409	1.21	0.337	1.10	1.00	2.000	No
44	2.89	0.17	0.00	0.17	1.00	0.409	1.21	0.337	1.10	1.00	2.000	No
45	2.98	0.17	0.00	0.17	1.00	0.409	1.21	0.337	1.10	1.00	2.000	No
46	3.02	0.17	0.00	0.17	1.00	0.408	1.21	0.337	1.10	1.00	2.000	No
47	3.10	0.18	0.00	0.18	1.00	0.408	1.21	0.337	1.10	1.00	2.000	No
48	3.20	0.18	0.00	0.18	1.00	0.408	1.21	0.337	1.10	1.00	2.000	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
49	3.25	0.19	0.00	0.19	1.00	0.408	1.21	0.337	1.10	1.00	2.000	No
50	3.32	0.19	0.00	0.19	1.00	0.408	1.21	0.337	1.10	1.00	2.000	No
51	3.36	0.19	0.00	0.19	1.00	0.408	1.21	0.337	1.10	1.00	2.000	No
52	3.46	0.20	0.00	0.20	1.00	0.408	1.21	0.337	1.10	1.00	2.000	No
53	3.49	0.20	0.00	0.20	1.00	0.408	1.21	0.336	1.10	1.00	2.000	No
54	3.59	0.20	0.00	0.20	1.00	0.408	1.21	0.336	1.10	1.00	2.000	No
55	3.64	0.21	0.00	0.21	1.00	0.408	1.21	0.336	1.10	1.00	2.000	No
56	3.68	0.21	0.00	0.21	1.00	0.408	1.21	0.336	1.10	1.00	2.000	No
57	3.76	0.21	0.00	0.21	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
58	3.81	0.22	0.00	0.22	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
59	3.91	0.22	0.00	0.22	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
60	3.96	0.22	0.00	0.22	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
61	4.04	0.23	0.00	0.23	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
62	4.09	0.23	0.00	0.23	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
63	4.20	0.24	0.00	0.24	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
64	4.26	0.24	0.00	0.24	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
65	4.31	0.24	0.00	0.24	0.99	0.407	1.21	0.336	1.10	1.00	2.000	No
66	4.36	0.25	0.00	0.25	0.99	0.407	1.21	0.335	1.10	1.00	2.000	No
67	4.45	0.25	0.00	0.25	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
68	4.51	0.26	0.00	0.26	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
69	4.57	0.26	0.00	0.26	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
70	4.62	0.26	0.00	0.26	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
71	4.66	0.26	0.00	0.26	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
72	4.74	0.27	0.00	0.27	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
73	4.83	0.27	0.00	0.27	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
74	4.88	0.28	0.00	0.28	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
75	4.93	0.28	0.00	0.28	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
76	5.01	0.28	0.00	0.28	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
77	5.05	0.29	0.00	0.29	0.99	0.406	1.21	0.335	1.10	1.00	2.000	No
78	5.14	0.29	0.00	0.29	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
79	5.19	0.29	0.00	0.29	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
80	5.26	0.30	0.00	0.30	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
81	5.32	0.30	0.00	0.30	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
82	5.41	0.31	0.00	0.31	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
83	5.45	0.31	0.00	0.31	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
84	5.53	0.31	0.00	0.31	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
85	5.58	0.32	0.00	0.32	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
86	5.67	0.32	0.00	0.32	0.99	0.405	1.21	0.334	1.10	1.00	2.000	No
87	5.72	0.32	0.00	0.32	0.99	0.404	1.21	0.334	1.10	1.00	2.000	No
88	5.81	0.33	0.00	0.33	0.99	0.404	1.21	0.334	1.10	1.00	2.000	No
89	5.85	0.33	0.00	0.33	0.99	0.404	1.21	0.334	1.10	1.00	2.000	No
90	5.94	0.34	0.00	0.34	0.99	0.404	1.21	0.333	1.10	1.00	2.000	No
91	5.99	0.34	0.00	0.34	0.99	0.404	1.21	0.333	1.10	1.00	2.000	No
92	6.08	0.34	0.00	0.34	0.99	0.404	1.21	0.333	1.10	1.00	2.000	No
93	6.12	0.35	0.00	0.35	0.99	0.404	1.21	0.333	1.10	1.00	2.000	No
94	6.19	0.35	0.00	0.35	0.99	0.404	1.21	0.333	1.10	1.00	2.000	No
95	6.26	0.36	0.00	0.36	0.99	0.404	1.21	0.333	1.10	1.00	2.000	No
96	6.34	0.36	0.00	0.36	0.99	0.404	1.21	0.333	1.10	1.00	2.000	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
97	6.38	0.36	0.00	0.36	0.99	0.403	1.21	0.333	1.10	1.00	2.000	No
98	6.44	0.37	0.00	0.37	0.98	0.403	1.21	0.333	1.10	1.00	2.000	No
99	6.52	0.37	0.00	0.37	0.98	0.403	1.21	0.333	1.10	1.00	2.000	No
100	6.60	0.38	0.00	0.38	0.98	0.403	1.21	0.333	1.10	1.00	2.000	No
101	6.69	0.38	0.00	0.38	0.98	0.403	1.21	0.332	1.10	1.00	2.000	No
102	6.74	0.38	0.00	0.38	0.98	0.403	1.21	0.332	1.10	1.00	2.000	No
103	6.77	0.39	0.00	0.39	0.98	0.403	1.21	0.332	1.10	1.00	2.000	No
104	6.83	0.39	0.00	0.39	0.98	0.403	1.21	0.332	1.10	1.00	2.000	No
105	6.91	0.39	0.00	0.39	0.98	0.403	1.21	0.332	1.10	1.00	2.000	No
106	6.97	0.40	0.00	0.40	0.98	0.402	1.21	0.332	1.10	1.00	2.000	No
107	7.06	0.40	0.00	0.40	0.98	0.402	1.21	0.332	1.10	1.00	2.000	No
108	7.10	0.41	0.00	0.41	0.98	0.402	1.21	0.332	1.10	1.00	2.000	No
109	7.19	0.41	0.00	0.41	0.98	0.402	1.21	0.332	1.10	1.00	2.000	No
110	7.24	0.41	0.00	0.41	0.98	0.402	1.21	0.332	1.10	1.00	2.000	No
111	7.29	0.42	0.00	0.42	0.98	0.402	1.21	0.332	1.10	1.00	2.000	No
112	7.35	0.42	0.00	0.42	0.98	0.402	1.21	0.332	1.10	1.00	2.000	No
113	7.45	0.43	0.00	0.43	0.98	0.402	1.21	0.331	1.10	1.00	2.000	No
114	7.49	0.43	0.00	0.43	0.98	0.402	1.21	0.331	1.10	1.00	2.000	No
115	7.59	0.44	0.00	0.44	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
116	7.64	0.44	0.00	0.44	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
117	7.71	0.44	0.00	0.44	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
118	7.75	0.45	0.00	0.45	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
119	7.82	0.45	0.00	0.45	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
120	7.88	0.45	0.00	0.45	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
121	7.95	0.46	0.00	0.46	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
122	8.04	0.46	0.00	0.46	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
123	8.07	0.46	0.00	0.46	0.98	0.401	1.21	0.331	1.10	1.00	2.000	No
124	8.18	0.47	0.00	0.47	0.98	0.400	1.21	0.330	1.10	1.00	2.000	No
125	8.20	0.47	0.00	0.47	0.98	0.400	1.21	0.330	1.10	1.00	2.000	No
126	8.28	0.48	0.00	0.48	0.98	0.400	1.21	0.330	1.10	1.00	2.000	No
127	8.35	0.48	0.00	0.48	0.98	0.400	1.21	0.330	1.10	1.00	2.000	No
128	8.41	0.49	0.00	0.49	0.98	0.400	1.21	0.330	1.10	1.00	2.000	No
129	8.48	0.49	0.00	0.49	0.98	0.400	1.21	0.330	1.10	1.00	2.000	No
130	8.54	0.49	0.00	0.49	0.98	0.400	1.21	0.330	1.09	1.00	2.000	No
131	8.62	0.50	0.00	0.50	0.98	0.400	1.21	0.330	1.09	1.00	2.000	No
132	8.67	0.50	0.00	0.50	0.98	0.400	1.21	0.330	1.09	1.00	2.000	No
133	8.74	0.51	0.00	0.51	0.98	0.400	1.21	0.330	1.09	1.00	2.000	No
134	8.83	0.51	0.00	0.51	0.98	0.399	1.21	0.330	1.09	1.00	2.000	No
135	8.89	0.51	0.00	0.51	0.98	0.399	1.21	0.329	1.09	1.00	2.000	No
136	8.93	0.52	0.00	0.52	0.97	0.399	1.21	0.329	1.09	1.00	2.000	No
137	9.02	0.52	0.00	0.52	0.97	0.399	1.21	0.329	1.08	1.00	2.000	No
138	9.06	0.53	0.00	0.53	0.97	0.399	1.21	0.329	1.08	1.00	2.000	No
139	9.15	0.53	0.00	0.53	0.97	0.399	1.21	0.329	1.08	1.00	2.000	No
140	9.19	0.53	0.00	0.53	0.97	0.399	1.21	0.329	1.08	1.00	2.000	No
141	9.26	0.54	0.00	0.54	0.97	0.399	1.21	0.329	1.07	1.00	2.000	No
142	9.33	0.54	0.00	0.54	0.97	0.398	1.21	0.329	1.07	1.00	2.000	No
143	9.46	0.55	0.00	0.55	0.97	0.398	1.21	0.329	1.07	1.00	2.000	No
144	9.50	0.55	0.00	0.55	0.97	0.398	1.21	0.329	1.07	1.00	2.000	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
145	9.55	0.55	0.00	0.55	0.97	0.398	1.21	0.328	1.07	1.00	2.000	No
146	9.63	0.56	0.00	0.56	0.97	0.398	1.21	0.328	1.07	1.00	2.000	No
147	9.65	0.56	0.00	0.56	0.97	0.398	1.21	0.328	1.07	1.00	2.000	No
148	9.75	0.57	0.00	0.57	0.97	0.398	1.21	0.328	1.07	1.00	2.000	No
149	9.79	0.57	0.00	0.57	0.97	0.398	1.21	0.328	1.06	1.00	2.000	No
150	9.89	0.58	0.00	0.58	0.97	0.397	1.21	0.328	1.06	1.00	2.000	No
151	9.94	0.58	0.00	0.58	0.97	0.397	1.21	0.328	1.06	1.00	2.000	No
152	9.99	0.58	0.00	0.58	0.97	0.397	1.21	0.328	1.06	1.00	2.000	No
153	10.07	0.59	0.00	0.59	0.97	0.397	1.21	0.328	1.06	1.00	2.000	No
154	10.12	0.59	0.00	0.59	0.97	0.397	1.21	0.328	1.06	1.00	2.000	No
155	10.21	0.59	0.00	0.59	0.97	0.397	1.21	0.327	1.06	1.00	2.000	No
156	10.26	0.60	0.00	0.60	0.97	0.397	1.21	0.327	1.06	1.00	2.000	No
157	10.30	0.60	0.00	0.60	0.97	0.397	1.21	0.327	1.06	1.00	2.000	No
158	10.39	0.60	0.00	0.60	0.97	0.397	1.21	0.327	1.06	1.00	2.000	No
159	10.46	0.61	0.00	0.61	0.97	0.396	1.21	0.327	1.06	1.00	2.000	No
160	10.53	0.61	0.00	0.61	0.97	0.396	1.21	0.327	1.06	1.00	2.000	No
161	10.57	0.61	0.00	0.61	0.97	0.396	1.21	0.327	1.06	1.00	2.000	No
162	10.66	0.62	0.00	0.62	0.97	0.396	1.21	0.327	1.06	1.00	2.000	No
163	10.71	0.62	0.00	0.62	0.97	0.396	1.21	0.327	1.05	1.00	2.000	No
164	10.79	0.63	0.00	0.63	0.97	0.396	1.21	0.327	1.05	1.00	2.000	No
165	10.83	0.63	0.00	0.63	0.97	0.396	1.21	0.327	1.05	1.00	2.000	No
166	10.90	0.63	0.00	0.63	0.97	0.396	1.21	0.326	1.06	1.00	2.000	No
167	10.97	0.64	0.00	0.64	0.97	0.396	1.21	0.326	1.06	1.00	2.000	No
168	11.06	0.64	0.00	0.64	0.97	0.395	1.21	0.326	1.06	1.00	2.000	No
169	11.10	0.65	0.00	0.65	0.97	0.395	1.21	0.326	1.06	1.00	2.000	No
170	11.19	0.65	0.00	0.65	0.96	0.395	1.21	0.326	1.05	1.00	2.000	No
171	11.23	0.65	0.00	0.65	0.96	0.395	1.21	0.326	1.05	1.00	2.000	No
172	11.30	0.66	0.00	0.66	0.96	0.395	1.21	0.326	1.05	1.00	2.000	No
173	11.37	0.66	0.00	0.66	0.96	0.395	1.21	0.326	1.05	1.00	2.000	No
174	11.46	0.67	0.00	0.67	0.96	0.395	1.21	0.326	1.05	1.00	2.000	No
175	11.49	0.67	0.00	0.67	0.96	0.395	1.21	0.326	1.05	1.00	2.000	No
176	11.59	0.68	0.00	0.68	0.96	0.394	1.21	0.325	1.05	1.00	2.000	No
177	11.63	0.68	0.00	0.68	0.96	0.394	1.21	0.325	1.05	1.00	2.000	No
178	11.68	0.68	0.00	0.68	0.96	0.394	1.21	0.325	1.05	1.00	2.000	No
179	11.75	0.69	0.00	0.69	0.96	0.394	1.21	0.325	1.05	1.00	2.000	No
180	11.81	0.69	0.00	0.69	0.96	0.394	1.21	0.325	1.05	1.00	2.000	No
181	11.90	0.69	0.00	0.69	0.96	0.394	1.21	0.325	1.05	1.00	2.000	No
182	11.95	0.70	0.00	0.70	0.96	0.394	1.21	0.325	1.04	1.00	2.000	No
183	12.03	0.70	0.00	0.70	0.96	0.394	1.21	0.325	1.04	1.00	2.000	No
184	12.07	0.70	0.00	0.70	0.96	0.393	1.21	0.325	1.04	1.00	2.000	No
185	12.14	0.71	0.00	0.71	0.96	0.393	1.21	0.325	1.04	1.00	2.000	No
186	12.21	0.71	0.00	0.71	0.96	0.393	1.21	0.324	1.04	1.00	2.000	No
187	12.29	0.72	0.00	0.72	0.96	0.393	1.21	0.324	1.04	1.00	2.000	No
188	12.37	0.72	0.00	0.72	0.96	0.393	1.21	0.324	1.04	1.00	2.000	No
189	12.43	0.73	0.00	0.73	0.96	0.393	1.21	0.324	1.04	1.00	2.000	No
190	12.48	0.73	0.00	0.73	0.96	0.393	1.21	0.324	1.04	1.00	2.000	No
191	12.56	0.73	0.00	0.73	0.96	0.393	1.21	0.324	1.04	1.00	2.000	No
192	12.61	0.74	0.00	0.74	0.96	0.392	1.21	0.324	1.04	1.00	2.000	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
193	12.67	0.74	0.00	0.74	0.96	0.392	1.21	0.324	1.03	1.00	2.000	No
194	12.74	0.74	0.00	0.74	0.96	0.392	1.21	0.324	1.03	1.00	2.000	No
195	12.80	0.75	0.00	0.75	0.96	0.392	1.21	0.324	1.03	1.00	2.000	No
196	12.89	0.75	0.00	0.75	0.96	0.392	1.21	0.323	1.03	1.00	2.000	No
197	12.93	0.76	0.00	0.76	0.96	0.392	1.21	0.323	1.03	1.00	2.000	No
198	13.02	0.76	0.00	0.76	0.96	0.392	1.21	0.323	1.03	1.00	2.000	No
199	13.07	0.76	0.00	0.76	0.96	0.392	1.21	0.323	1.03	1.00	2.000	No
200	13.13	0.77	0.00	0.77	0.96	0.391	1.21	0.323	1.03	1.00	2.000	No
201	13.20	0.77	0.00	0.77	0.96	0.391	1.21	0.323	1.03	1.00	2.000	No
202	13.29	0.78	0.00	0.78	0.96	0.391	1.21	0.323	1.03	1.00	2.000	No
203	13.34	0.78	0.00	0.78	0.95	0.391	1.21	0.323	1.03	1.00	2.000	No
204	13.40	0.78	0.00	0.78	0.95	0.391	1.21	0.323	1.03	1.00	2.000	No
205	13.46	0.79	0.00	0.79	0.95	0.391	1.21	0.322	1.03	1.00	2.000	No
206	13.54	0.79	0.00	0.79	0.95	0.391	1.21	0.322	1.03	1.00	2.000	No
207	13.60	0.79	0.00	0.79	0.95	0.391	1.21	0.322	1.03	1.00	2.000	No
208	13.68	0.80	0.00	0.80	0.95	0.390	1.21	0.322	1.03	1.00	2.000	No
209	13.73	0.80	0.00	0.80	0.95	0.390	1.21	0.322	1.02	1.00	2.000	No
210	13.82	0.81	0.00	0.81	0.95	0.390	1.21	0.322	1.02	1.00	2.000	No
211	13.85	0.81	0.00	0.81	0.95	0.390	1.21	0.322	1.02	1.00	2.000	No
212	13.95	0.82	0.00	0.82	0.95	0.390	1.21	0.322	1.02	1.00	2.000	No
213	13.99	0.82	0.00	0.82	0.95	0.390	1.21	0.322	1.02	1.00	2.000	No
214	14.07	0.82	0.00	0.82	0.95	0.390	1.21	0.321	1.02	1.00	2.000	No
215	14.13	0.83	0.00	0.83	0.95	0.390	1.21	0.321	1.02	1.00	2.000	No
216	14.18	0.83	0.00	0.83	0.95	0.389	1.21	0.321	1.02	1.00	2.000	No
217	14.30	0.84	0.00	0.84	0.95	0.389	1.21	0.321	1.02	1.00	2.000	No
218	14.35	0.84	0.00	0.84	0.95	0.389	1.21	0.321	1.02	1.00	2.000	No
219	14.39	0.84	0.00	0.84	0.95	0.389	1.21	0.321	1.02	1.00	2.000	No
220	14.44	0.84	0.00	0.84	0.95	0.389	1.21	0.321	1.02	1.00	2.000	No
221	14.52	0.85	0.00	0.85	0.95	0.389	1.21	0.321	1.02	1.00	2.000	No
222	14.57	0.85	0.00	0.85	0.95	0.389	1.21	0.321	1.02	1.00	2.000	No
223	14.66	0.86	0.00	0.86	0.95	0.388	1.21	0.321	1.02	1.00	2.000	No
224	14.70	0.86	0.00	0.86	0.95	0.388	1.21	0.320	1.02	1.00	2.000	No
225	14.79	0.87	0.00	0.87	0.95	0.388	1.21	0.320	1.02	1.00	2.000	No
226	14.84	0.87	0.00	0.87	0.95	0.388	1.21	0.320	1.02	1.00	2.000	No
227	14.92	0.87	0.00	0.87	0.95	0.388	1.21	0.320	1.02	1.00	2.000	No
228	14.96	0.88	0.00	0.88	0.95	0.388	1.21	0.320	1.02	1.00	2.000	No
229	15.06	0.88	0.00	0.88	0.95	0.388	1.21	0.320	1.02	1.00	2.000	No
230	15.10	0.88	0.00	0.88	0.95	0.388	1.21	0.320	1.02	1.00	2.000	No
231	15.19	0.89	0.00	0.89	0.95	0.387	1.21	0.320	1.02	1.00	2.000	No
232	15.24	0.89	0.00	0.89	0.95	0.387	1.21	0.320	1.02	1.00	2.000	No
233	15.32	0.90	0.00	0.90	0.95	0.387	1.21	0.319	1.02	1.00	2.000	No
234	15.36	0.90	0.00	0.90	0.95	0.387	1.21	0.319	1.02	1.00	2.000	No
235	15.43	0.90	0.00	0.90	0.94	0.387	1.21	0.319	1.02	1.00	2.000	No
236	15.50	0.91	0.00	0.91	0.94	0.387	1.21	0.319	1.02	1.00	2.000	No
237	15.59	0.91	0.00	0.91	0.94	0.387	1.21	0.319	1.01	1.00	2.000	No
238	15.64	0.92	0.00	0.92	0.94	0.386	1.21	0.319	1.01	1.00	2.000	No
239	15.76	0.92	0.00	0.92	0.94	0.386	1.21	0.319	1.01	1.00	2.000	No
240	15.82	0.93	0.00	0.93	0.94	0.386	1.21	0.319	1.01	1.00	2.000	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
241	15.86	0.93	0.00	0.93	0.94	0.386	1.21	0.318	1.01	1.00	2.000	No
242	15.91	0.93	0.00	0.93	0.94	0.386	1.21	0.318	1.01	1.00	2.000	No
243	15.97	0.94	0.00	0.94	0.94	0.386	1.21	0.318	1.01	1.00	2.000	No
244	16.05	0.94	0.00	0.94	0.94	0.386	1.21	0.318	1.01	1.00	2.000	No
245	16.08	0.94	0.00	0.94	0.94	0.386	1.21	0.318	1.01	1.00	2.000	No
246	16.15	0.95	0.00	0.95	0.94	0.385	1.21	0.318	1.01	1.00	2.000	No
247	16.22	0.95	0.00	0.95	0.94	0.385	1.21	0.318	1.01	1.00	2.000	No
248	16.29	0.95	0.00	0.95	0.94	0.385	1.21	0.318	1.01	1.00	2.000	No
249	16.34	0.96	0.00	0.96	0.94	0.385	1.21	0.318	1.01	1.00	2.000	No
250	16.43	0.96	0.00	0.96	0.94	0.385	1.21	0.318	1.01	1.00	2.000	No
251	16.47	0.97	0.00	0.97	0.94	0.385	1.21	0.317	1.01	1.00	2.000	No
252	16.56	0.97	0.00	0.97	0.94	0.385	1.21	0.317	1.01	1.00	2.000	No
253	16.62	0.97	0.00	0.97	0.94	0.384	1.21	0.317	1.01	1.00	2.000	No
254	16.68	0.98	0.00	0.98	0.94	0.384	1.21	0.317	1.01	1.00	2.000	No
255	16.75	0.98	0.00	0.98	0.94	0.384	1.21	0.317	1.01	1.00	2.000	No
256	16.81	0.99	0.00	0.99	0.94	0.384	1.21	0.317	1.01	1.00	2.000	No
257	16.87	0.99	0.00	0.99	0.94	0.384	1.21	0.317	1.01	1.00	2.000	No
258	16.93	0.99	0.00	0.99	0.94	0.384	1.21	0.317	1.01	1.00	2.000	No
259	17.00	1.00	0.00	1.00	0.94	0.384	1.21	0.317	1.01	1.00	0.362	No
260	17.09	1.00	0.00	1.00	0.94	0.385	1.21	0.317	1.01	1.00	0.363	No
261	17.13	1.01	0.00	1.00	0.94	0.385	1.21	0.318	1.01	1.00	0.362	No
262	17.20	1.01	0.01	1.00	0.94	0.386	1.21	0.318	1.01	1.00	0.364	No
263	17.27	1.01	0.01	1.01	0.94	0.386	1.21	0.319	1.00	1.00	0.365	No
264	17.36	1.02	0.01	1.01	0.94	0.387	1.21	0.319	1.00	1.00	0.365	No
265	17.40	1.02	0.01	1.01	0.93	0.388	1.21	0.320	1.00	1.00	0.365	No
266	17.46	1.02	0.01	1.01	0.93	0.388	1.21	0.320	1.00	1.00	0.365	No
267	17.53	1.03	0.02	1.01	0.93	0.389	1.21	0.321	1.00	1.00	0.366	No
268	17.62	1.03	0.02	1.02	0.93	0.390	1.21	0.321	1.00	1.00	0.367	No
269	17.67	1.04	0.02	1.02	0.93	0.390	1.21	0.322	1.00	1.00	0.368	No
270	17.75	1.04	0.02	1.02	0.93	0.391	1.21	0.322	1.00	1.00	0.368	No
271	17.81	1.05	0.03	1.02	0.93	0.391	1.21	0.323	1.00	1.00	0.369	No
272	17.85	1.05	0.03	1.02	0.93	0.392	1.21	0.323	1.00	1.00	0.368	No
273	17.93	1.05	0.03	1.02	0.93	0.393	1.21	0.324	1.00	1.00	0.368	No
274	17.99	1.06	0.03	1.03	0.93	0.393	1.21	0.324	1.00	1.00	0.367	No
275	18.06	1.06	0.03	1.03	0.93	0.394	1.21	0.325	1.00	1.00	0.367	No
276	18.11	1.06	0.03	1.03	0.93	0.394	1.21	0.325	1.00	1.00	0.366	No
277	18.18	1.07	0.04	1.03	0.93	0.395	1.21	0.326	1.00	1.00	0.365	No
278	18.29	1.08	0.04	1.04	0.93	0.396	1.21	0.326	1.00	1.00	0.362	No
279	18.33	1.08	0.04	1.04	0.93	0.396	1.21	0.327	1.00	1.00	0.361	No
280	18.40	1.08	0.04	1.04	0.93	0.397	1.21	0.327	1.00	1.00	0.359	No
281	18.46	1.09	0.05	1.04	0.93	0.397	1.21	0.328	1.00	1.00	0.358	No
282	18.54	1.09	0.05	1.04	0.93	0.398	1.21	0.328	1.00	1.00	0.355	No
283	18.57	1.09	0.05	1.04	0.93	0.398	1.21	0.329	1.00	1.00	0.354	No
284	18.64	1.10	0.05	1.05	0.93	0.399	1.21	0.329	1.00	1.00	0.347	No
285	18.72	1.10	0.05	1.05	0.93	0.399	1.21	0.330	1.00	1.00	0.341	No
286	18.85	1.11	0.06	1.05	0.93	0.401	1.21	0.330	1.00	1.00	0.323	No
287	18.92	1.11	0.06	1.05	0.93	0.401	1.21	0.331	1.00	1.00	0.307	No
288	18.99	1.12	0.06	1.06	0.93	0.402	1.21	0.331	1.00	1.00	0.305	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
289	19.04	1.12	0.06	1.06	0.93	0.402	1.21	0.332	1.00	1.00	0.305	No
290	19.13	1.13	0.07	1.06	0.93	0.403	1.21	0.332	1.00	1.00	0.306	No
291	19.16	1.13	0.07	1.06	0.93	0.403	1.21	0.333	1.00	1.00	0.306	No
292	19.25	1.14	0.07	1.07	0.93	0.404	1.21	0.333	1.00	1.00	0.307	No
293	19.29	1.14	0.07	1.07	0.92	0.404	1.21	0.333	1.00	1.00	0.307	No
294	19.38	1.14	0.07	1.07	0.92	0.405	1.21	0.334	1.00	1.00	0.308	No
295	19.42	1.15	0.08	1.07	0.92	0.405	1.21	0.334	1.00	1.00	0.309	No
296	19.52	1.15	0.08	1.08	0.92	0.406	1.21	0.335	1.00	1.00	0.309	No
297	19.60	1.16	0.08	1.08	0.92	0.407	1.21	0.335	0.99	1.00	0.310	No
298	19.64	1.16	0.08	1.08	0.92	0.407	1.21	0.336	0.99	1.00	0.310	No
299	19.69	1.17	0.08	1.08	0.92	0.407	1.21	0.336	0.99	1.00	0.311	No
300	19.75	1.17	0.09	1.08	0.92	0.408	1.21	0.336	0.99	1.00	0.311	No
301	19.82	1.17	0.09	1.09	0.92	0.408	1.21	0.337	0.99	1.00	0.312	No
302	19.89	1.18	0.09	1.09	0.92	0.409	1.21	0.337	0.99	1.00	0.313	No
303	19.95	1.18	0.09	1.09	0.92	0.409	1.21	0.338	0.99	1.00	0.313	No
304	20.04	1.19	0.09	1.09	0.92	0.410	1.21	0.338	0.99	1.00	0.314	No
305	20.08	1.19	0.10	1.10	0.92	0.410	1.21	0.338	0.99	1.00	0.314	No
306	20.15	1.20	0.10	1.10	0.92	0.411	1.21	0.339	0.99	1.00	0.315	No
307	20.21	1.20	0.10	1.10	0.92	0.411	1.21	0.339	0.99	1.00	0.315	No
308	20.30	1.21	0.10	1.10	0.92	0.412	1.21	0.340	0.99	1.00	0.316	No
309	20.34	1.21	0.10	1.10	0.92	0.412	1.21	0.340	0.99	1.00	0.317	No
310	20.42	1.21	0.11	1.11	0.92	0.413	1.21	0.340	0.99	1.00	0.317	No
311	20.48	1.22	0.11	1.11	0.92	0.413	1.21	0.341	0.99	1.00	0.318	No
312	20.57	1.22	0.11	1.11	0.92	0.414	1.21	0.341	0.98	1.00	0.318	No
313	20.61	1.23	0.11	1.11	0.92	0.414	1.21	0.341	0.98	1.00	0.319	No
314	20.69	1.23	0.12	1.12	0.92	0.414	1.21	0.342	0.98	1.00	0.320	No
315	20.74	1.24	0.12	1.12	0.92	0.415	1.21	0.342	0.98	1.00	0.320	No
316	20.82	1.24	0.12	1.12	0.92	0.415	1.21	0.343	0.98	1.00	0.321	No
317	20.88	1.24	0.12	1.12	0.92	0.416	1.21	0.343	0.98	1.00	0.321	No
318	20.94	1.25	0.12	1.13	0.92	0.416	1.21	0.343	0.98	1.00	0.322	No
319	21.00	1.25	0.12	1.13	0.92	0.416	1.21	0.344	0.98	1.00	0.322	No
320	21.09	1.26	0.13	1.13	0.92	0.417	1.21	0.344	0.98	1.00	0.323	No
321	21.14	1.26	0.13	1.13	0.91	0.417	1.21	0.344	0.98	1.00	0.323	No
322	21.20	1.27	0.13	1.14	0.91	0.418	1.21	0.345	0.98	1.00	0.324	No
323	21.27	1.27	0.13	1.14	0.91	0.418	1.21	0.345	0.98	1.00	0.324	No
324	21.34	1.28	0.14	1.14	0.91	0.419	1.21	0.345	0.98	1.00	0.325	No
325	21.41	1.28	0.14	1.14	0.91	0.419	1.21	0.346	0.98	1.00	0.325	No
326	21.49	1.29	0.14	1.15	0.91	0.420	1.21	0.346	0.98	1.00	0.326	No
327	21.54	1.29	0.14	1.15	0.91	0.420	1.21	0.346	0.98	1.00	0.327	No
328	21.60	1.29	0.14	1.15	0.91	0.420	1.21	0.347	0.97	1.00	0.327	No
329	21.67	1.30	0.15	1.15	0.91	0.421	1.21	0.347	0.97	1.00	0.328	No
330	21.74	1.30	0.15	1.16	0.91	0.421	1.21	0.347	0.97	1.00	0.328	No
331	21.80	1.31	0.15	1.16	0.91	0.421	1.21	0.348	0.97	1.00	0.329	No
332	21.86	1.31	0.15	1.16	0.91	0.422	1.21	0.348	0.97	1.00	0.329	No
333	21.94	1.32	0.15	1.16	0.91	0.422	1.21	0.348	0.97	1.00	0.330	No
334	22.01	1.32	0.16	1.17	0.91	0.423	1.21	0.349	0.97	1.00	0.330	No
335	22.05	1.32	0.16	1.17	0.91	0.423	1.21	0.349	0.97	1.00	0.331	No
336	22.12	1.33	0.16	1.17	0.91	0.423	1.21	0.349	0.97	1.00	0.331	No

:: Cyclic Stress Ratio fully adjusted (CSR*) calculation data :: (continued)

Point ID	Depth (ft)	σ_v (tsf)	u_0 (tsf)	σ_v' (tsf)	r_d	CSR	MSF	CSR_{eq}	K_σ	User FS	CSR^*	Belongs to transition
337	22.19	1.33	0.16	1.17	0.91	0.424	1.21	0.350	0.97	1.00	0.332	No
338	22.25	1.34	0.16	1.17	0.91	0.424	1.21	0.350	0.97	1.00	0.332	No
339	22.34	1.34	0.17	1.18	0.91	0.425	1.21	0.350	0.97	1.00	0.333	No
340	22.39	1.35	0.17	1.18	0.91	0.425	1.21	0.351	0.97	1.00	0.333	No
341	22.48	1.35	0.17	1.18	0.91	0.425	1.21	0.351	0.97	1.00	0.334	No
342	22.52	1.36	0.17	1.18	0.91	0.426	1.21	0.351	0.97	1.00	0.334	No
343	22.60	1.36	0.17	1.19	0.91	0.426	1.21	0.352	0.97	1.00	0.335	No
344	22.66	1.37	0.18	1.19	0.91	0.426	1.21	0.352	0.96	1.00	0.335	No
345	22.74	1.37	0.18	1.19	0.91	0.427	1.21	0.352	0.96	1.00	0.336	No
346	22.77	1.37	0.18	1.19	0.91	0.427	1.21	0.352	0.96	1.00	0.336	No
347	22.85	1.38	0.18	1.20	0.91	0.427	1.21	0.353	0.96	1.00	0.337	No
348	22.92	1.38	0.18	1.20	0.91	0.428	1.21	0.353	0.96	1.00	0.337	No
349	23.01	1.39	0.19	1.20	0.90	0.428	1.21	0.353	0.96	1.00	0.338	No
350	23.05	1.39	0.19	1.20	0.90	0.428	1.21	0.353	0.96	1.00	0.338	No
351	23.10	1.40	0.19	1.21	0.90	0.429	1.21	0.354	0.96	1.00	0.338	No
352	23.17	1.40	0.19	1.21	0.90	0.429	1.21	0.354	0.96	1.00	0.339	No
353	23.25	1.41	0.20	1.21	0.90	0.429	1.21	0.354	0.96	1.00	0.340	No
354	23.32	1.41	0.20	1.21	0.90	0.430	1.21	0.355	0.96	1.00	0.340	No
355	23.40	1.42	0.20	1.22	0.90	0.430	1.21	0.355	0.96	1.00	0.341	No
356	23.43	1.42	0.20	1.22	0.90	0.430	1.21	0.355	0.96	1.00	0.341	No
357	23.52	1.42	0.20	1.22	0.90	0.431	1.21	0.356	0.96	1.00	0.341	No
358	23.58	1.42	0.21	1.22	0.90	0.431	1.21	0.356	0.96	1.00	0.342	No
359	23.63	1.43	0.21	1.22	0.90	0.432	1.21	0.356	0.96	1.00	0.342	No
360	23.69	1.43	0.21	1.22	0.90	0.432	1.21	0.356	0.96	1.00	0.342	No
361	23.76	1.43	0.21	1.22	0.90	0.432	1.21	0.357	0.96	1.00	0.343	No

Abbreviations

Depth:	Depth from free surface, at which CPT was performed (ft)
σ_v:	Total overburden pressure at test point (tsf)
u_0:	Water pressure at test point (tsf)
σ_v':	Effective overburden pressure based on GWT during earthquake (tsf)
r_d:	Nonlinear shear mass factor
CSR:	Cyclic Stress Ratio
MSF:	Magnitude Scaling Factor
CSR_{eq}:	CSR adjusted for M=7.5
K_σ:	Effective overburden stress factor
CSR^*:	CSR fully adjusted

:: Cyclic Resistance Ratio (CRR) calculation data ::

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
1	0.08	-0.09	34.00	4.06	0.69	1.70	-0.14	0.00	-0.14	4.000	No	Yes	2.00
2	0.16	-0.09	34.00	4.06	0.69	1.70	-0.14	0.00	-0.14	4.000	No	Yes	2.00
3	0.20	-0.09	34.00	4.06	0.69	1.70	-0.14	0.00	-0.14	4.000	No	Yes	2.00
4	0.30	-0.09	34.00	4.06	0.69	1.70	-0.14	0.00	-0.14	4.000	No	Yes	2.00
5	0.35	1.75	34.00	3.78	0.67	1.70	2.81	0.00	2.81	4.000	No	Yes	2.00
6	0.40	8.45	34.00	2.85	0.62	1.70	13.58	0.00	13.58	4.000	No	Yes	2.00
7	0.49	22.32	34.00	2.32	0.54	1.70	35.86	46.27	82.13	4.000	No	No	2.00
8	0.53	23.51	34.00	2.31	0.53	1.70	37.77	46.69	84.47	4.000	No	No	2.00
9	0.64	24.52	34.00	2.32	0.53	1.70	39.39	47.05	86.45	4.000	No	No	2.00
10	0.69	24.89	34.00	2.32	0.53	1.70	39.99	47.18	87.17	4.000	No	No	2.00
11	0.73	24.06	34.00	2.35	0.53	1.70	38.66	46.89	85.55	4.000	No	No	2.00
12	0.80	24.80	34.00	2.33	0.53	1.70	39.84	47.15	87.00	4.000	No	No	2.00
13	0.88	26.82	34.00	2.31	0.52	1.70	43.09	47.87	90.96	4.000	No	No	2.00
14	0.93	28.56	34.00	2.30	0.51	1.70	45.89	48.49	94.37	4.000	No	No	2.00
15	1.02	35.73	34.00	2.25	0.48	1.70	57.41	51.03	108.43	4.000	No	No	2.00
16	1.06	35.73	34.00	2.28	0.48	1.70	57.41	51.03	108.43	4.000	No	No	2.00
17	1.13	43.81	34.00	2.21	0.45	1.70	70.39	53.89	124.28	4.000	No	No	2.00
18	1.19	46.38	34.00	2.23	0.44	1.70	74.52	54.81	129.32	4.000	No	No	2.00
19	1.28	48.22	34.00	2.23	0.43	1.70	77.47	55.46	132.93	4.000	No	No	2.00
20	1.33	48.12	34.00	2.23	0.43	1.70	77.31	55.42	132.73	4.000	No	No	2.00
21	1.39	47.76	34.00	2.24	0.43	1.70	76.73	55.30	132.03	4.000	No	No	2.00
22	1.50	45.65	34.00	2.26	0.44	1.70	73.34	54.55	127.89	4.000	No	No	2.00
23	1.54	43.99	34.00	2.28	0.45	1.70	70.68	53.96	124.63	4.000	No	No	2.00
24	1.59	42.80	34.00	2.28	0.45	1.70	68.76	53.54	122.30	4.000	No	No	2.00
25	1.65	31.69	34.00	2.45	0.50	1.70	50.91	49.60	100.51	4.000	No	No	2.00
26	1.71	38.48	34.00	2.30	0.47	1.70	61.82	52.00	113.83	4.000	No	No	2.00
27	1.79	37.93	34.00	2.27	0.47	1.70	60.94	51.81	112.75	4.000	No	No	2.00
28	1.85	37.29	34.00	2.26	0.47	1.70	59.91	51.58	111.49	4.000	No	No	2.00
29	1.94	34.44	34.00	2.30	0.49	1.70	55.33	50.57	105.90	4.000	No	No	2.00
30	2.01	32.97	34.00	2.31	0.49	1.70	52.97	50.05	103.02	4.000	No	No	2.00
31	2.05	30.86	34.00	2.34	0.50	1.70	49.58	49.30	98.88	4.000	No	No	2.00
32	2.14	27.74	34.00	2.39	0.51	1.70	44.57	48.19	92.76	4.000	No	No	2.00
33	2.18	26.17	34.00	2.42	0.52	1.70	42.05	47.64	89.68	4.000	No	No	2.00
34	2.27	23.70	34.00	2.46	0.53	1.70	38.08	46.76	84.84	4.000	No	No	2.00
35	2.32	22.68	34.00	2.48	0.54	1.70	36.44	46.40	82.84	4.000	No	No	2.00
36	2.42	20.39	34.00	2.53	0.55	1.70	32.76	45.59	78.35	4.000	No	No	2.00
37	2.46	19.65	34.00	2.55	0.55	1.70	31.57	45.33	76.90	4.000	No	No	2.00
38	2.54	19.01	34.00	2.56	0.56	1.70	30.54	45.10	75.64	4.000	No	No	2.00
39	2.57	18.74	34.00	2.56	0.56	1.70	30.11	45.00	75.11	4.000	No	No	2.00
40	2.64	18.74	34.00	2.55	0.56	1.70	30.11	45.00	75.11	4.000	No	No	2.00
41	2.71	17.73	34.00	2.58	0.56	1.70	28.49	44.64	73.13	4.000	No	No	2.00
42	2.76	17.91	34.00	2.56	0.56	1.70	28.77	44.71	73.48	4.000	No	No	2.00
43	2.85	18.37	34.00	2.54	0.56	1.70	29.51	44.87	74.39	4.000	No	No	2.00
44	2.89	18.37	34.00	2.54	0.56	1.70	29.51	44.87	74.39	4.000	No	No	2.00
45	2.98	18.37	34.00	2.53	0.56	1.70	29.51	44.87	74.39	4.000	No	No	2.00
46	3.02	18.64	34.00	2.52	0.56	1.70	29.95	44.97	74.91	4.000	No	No	2.00
47	3.10	18.83	34.00	2.52	0.56	1.70	30.25	45.03	75.29	4.000	No	No	2.00
48	3.20	19.75	34.00	2.49	0.55	1.70	31.73	45.36	77.09	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
49	3.25	20.11	34.00	2.49	0.55	1.70	32.31	45.49	77.80	4.000	No	No	2.00
50	3.32	20.47	34.00	2.48	0.55	1.70	32.90	45.62	78.52	4.000	No	No	2.00
51	3.36	20.75	34.00	2.47	0.55	1.70	33.35	45.72	79.07	4.000	No	No	2.00
52	3.46	20.84	34.00	2.47	0.55	1.70	33.50	45.75	79.25	4.000	No	No	2.00
53	3.49	21.11	34.00	2.47	0.55	1.70	33.93	45.85	79.78	4.000	No	No	2.00
54	3.59	21.30	34.00	2.46	0.55	1.70	34.24	45.91	80.15	4.000	No	No	2.00
55	3.64	21.21	34.00	2.47	0.55	1.70	34.09	45.88	79.98	4.000	No	No	2.00
56	3.68	21.57	34.00	2.46	0.54	1.70	34.67	46.01	80.68	4.000	No	No	2.00
57	3.76	21.76	34.00	2.46	0.54	1.70	34.98	46.08	81.05	4.000	No	No	2.00
58	3.81	21.76	34.00	2.46	0.54	1.70	34.98	46.08	81.05	4.000	No	No	2.00
59	3.91	22.22	34.00	2.46	0.54	1.70	35.72	46.24	81.96	4.000	No	No	2.00
60	3.96	22.40	34.00	2.46	0.54	1.70	36.00	46.30	82.31	4.000	No	No	2.00
61	4.04	22.40	34.00	2.46	0.54	1.70	36.00	46.30	82.31	4.000	No	No	2.00
62	4.09	21.76	34.00	2.48	0.54	1.70	34.98	46.08	81.05	4.000	No	No	2.00
63	4.20	21.48	34.00	2.50	0.54	1.70	34.53	45.98	80.50	4.000	No	No	2.00
64	4.26	20.75	34.00	2.52	0.55	1.70	33.35	45.72	79.07	4.000	No	No	2.00
65	4.31	19.83	34.00	2.56	0.55	1.70	31.88	45.39	77.27	4.000	No	No	2.00
66	4.36	18.54	34.00	2.53	0.56	1.70	29.80	44.94	74.74	4.000	No	No	2.00
67	4.45	16.98	34.00	2.54	0.57	1.70	27.30	44.38	71.68	4.000	No	No	2.00
68	4.51	16.43	34.00	2.58	0.57	1.70	26.41	44.19	70.60	4.000	No	No	2.00
69	4.57	16.15	34.00	2.62	0.57	1.70	25.96	0.00	25.96	4.000	No	Yes	2.00
70	4.62	15.42	34.00	2.67	0.58	1.70	24.79	0.00	24.79	4.000	No	Yes	2.00
71	4.66	14.96	34.00	2.72	0.58	1.70	24.05	0.00	24.05	4.000	No	Yes	2.00
72	4.74	11.84	34.00	2.90	0.60	1.70	19.04	0.00	19.04	4.000	No	Yes	2.00
73	4.83	12.39	34.00	2.91	0.60	1.70	19.92	0.00	19.92	4.000	No	Yes	2.00
74	4.88	11.56	34.00	2.96	0.60	1.70	18.59	0.00	18.59	4.000	No	Yes	2.00
75	4.93	10.55	34.00	3.01	0.61	1.70	16.97	0.00	16.97	4.000	No	Yes	2.00
76	5.01	11.56	34.00	2.95	0.60	1.70	18.59	0.00	18.59	4.000	No	Yes	2.00
77	5.05	10.83	34.00	2.98	0.61	1.70	17.42	0.00	17.42	4.000	No	Yes	2.00
78	5.14	11.56	34.00	2.93	0.60	1.70	18.59	0.00	18.59	4.000	No	Yes	2.00
79	5.19	12.66	34.00	2.86	0.59	1.70	20.36	0.00	20.36	4.000	No	Yes	2.00
80	5.26	14.41	34.00	2.76	0.58	1.70	23.17	0.00	23.17	4.000	No	Yes	2.00
81	5.32	16.15	34.00	2.67	0.57	1.70	25.96	0.00	25.96	4.000	No	Yes	2.00
82	5.41	19.37	34.00	2.55	0.56	1.70	31.14	45.23	76.37	4.000	No	No	2.00
83	5.45	20.01	34.00	2.53	0.55	1.70	32.16	45.46	77.62	4.000	No	No	2.00
84	5.53	22.40	34.00	2.47	0.54	1.70	36.00	46.30	82.31	4.000	No	No	2.00
85	5.58	23.69	34.00	2.44	0.53	1.70	38.08	46.76	84.84	4.000	No	No	2.00
86	5.67	25.52	34.00	2.42	0.52	1.70	41.02	47.41	88.43	4.000	No	No	2.00
87	5.72	26.72	34.00	2.40	0.52	1.70	42.95	47.84	90.78	4.000	No	No	2.00
88	5.81	28.19	34.00	2.39	0.51	1.70	45.31	48.36	93.67	4.000	No	No	2.00
89	5.85	29.84	34.00	2.37	0.51	1.70	47.96	48.94	96.90	4.000	No	No	2.00
90	5.94	32.41	34.00	2.35	0.49	1.70	52.09	49.85	101.94	4.000	No	No	2.00
91	5.99	33.05	34.00	2.35	0.49	1.70	53.12	50.08	103.20	4.000	No	No	2.00
92	6.08	36.54	34.00	2.31	0.48	1.70	58.72	51.32	110.04	4.000	No	No	2.00
93	6.12	37.19	34.00	2.31	0.47	1.70	59.69	51.53	111.22	4.000	No	No	2.00
94	6.19	39.21	34.00	2.29	0.47	1.68	62.18	52.08	114.26	4.000	No	No	2.00
95	6.26	41.14	34.00	2.29	0.46	1.66	64.49	52.59	117.09	4.000	No	No	2.00
96	6.34	42.70	34.00	2.29	0.46	1.64	66.25	52.98	119.23	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
97	6.38	43.52	34.00	2.29	0.46	1.63	67.15	53.18	120.33	4.000	No	No	2.00
98	6.44	44.81	34.00	2.29	0.45	1.62	68.63	53.51	122.14	4.000	No	No	2.00
99	6.52	46.65	34.00	2.28	0.45	1.60	70.55	53.93	124.49	4.000	No	No	2.00
100	6.60	47.93	34.00	2.28	0.44	1.59	71.83	54.21	126.05	4.000	No	No	2.00
101	6.69	49.31	34.00	2.27	0.44	1.57	73.19	54.51	127.70	4.000	No	No	2.00
102	6.74	49.77	34.00	2.27	0.44	1.56	73.57	54.60	128.17	4.000	No	No	2.00
103	6.77	49.95	34.00	2.27	0.44	1.56	73.64	54.61	128.26	4.000	No	No	2.00
104	6.83	50.32	34.00	2.27	0.44	1.55	73.87	54.66	128.53	4.000	No	No	2.00
105	6.91	51.05	34.00	2.27	0.44	1.54	74.41	54.78	129.20	4.000	No	No	2.00
106	6.97	51.05	34.00	2.27	0.44	1.54	74.16	54.73	128.89	4.000	No	No	2.00
107	7.06	51.24	34.00	2.27	0.44	1.53	74.03	54.70	128.73	4.000	No	No	2.00
108	7.10	51.42	34.00	2.27	0.44	1.52	74.07	54.71	128.77	4.000	No	No	2.00
109	7.19	51.88	34.00	2.27	0.44	1.51	74.25	54.75	129.00	4.000	No	No	2.00
110	7.24	51.88	34.00	2.27	0.44	1.51	74.05	54.70	128.76	4.000	No	No	2.00
111	7.29	51.97	34.00	2.27	0.44	1.51	73.96	54.68	128.64	4.000	No	No	2.00
112	7.35	51.70	34.00	2.28	0.44	1.50	73.37	54.55	127.92	4.000	No	No	2.00
113	7.45	51.70	34.00	2.13	0.44	1.49	72.99	54.47	127.46	4.000	No	No	2.00
114	7.49	51.60	34.00	2.08	0.44	1.49	72.81	54.43	127.24	4.000	No	No	2.00
115	7.59	51.15	34.00	2.13	0.45	1.49	71.86	54.22	126.07	4.000	No	No	2.00
116	7.64	51.15	34.00	2.15	0.45	1.48	71.65	54.17	125.83	4.000	No	No	2.00
117	7.71	51.15	34.00	2.17	0.45	1.48	71.41	54.12	125.53	4.000	No	No	2.00
118	7.75	52.25	34.00	2.17	0.44	1.47	72.57	54.38	126.95	4.000	No	No	2.00
119	7.82	50.87	34.00	2.21	0.45	1.47	70.63	53.95	124.58	4.000	No	No	2.00
120	7.88	52.39	34.00	2.21	0.45	1.46	72.26	54.31	126.57	4.000	No	No	2.00
121	7.95	52.52	34.00	2.22	0.45	1.45	72.15	54.28	126.44	4.000	No	No	2.00
122	8.04	53.99	34.00	2.22	0.44	1.44	73.58	54.60	128.18	4.000	No	No	2.00
123	8.07	54.36	34.00	2.23	0.44	1.44	73.90	54.67	128.57	4.000	No	No	2.00
124	8.18	55.55	34.00	2.23	0.44	1.43	74.93	54.90	129.83	4.000	No	No	2.00
125	8.20	55.74	34.00	2.23	0.44	1.42	75.05	54.92	129.98	4.000	No	No	2.00
126	8.28	56.66	34.00	2.22	0.44	1.42	75.85	55.10	130.95	4.000	No	No	2.00
127	8.35	56.20	34.00	2.23	0.44	1.41	75.05	54.92	129.97	4.000	No	No	2.00
128	8.41	54.45	34.00	2.26	0.44	1.41	72.76	54.42	127.17	4.000	No	No	2.00
129	8.48	52.43	34.00	2.28	0.45	1.41	70.09	53.83	123.92	4.000	No	No	2.00
130	8.54	49.95	34.00	2.32	0.46	1.42	66.92	53.13	120.05	4.000	No	No	2.00
131	8.62	49.13	34.00	2.34	0.46	1.41	65.67	52.85	118.53	4.000	No	No	2.00
132	8.67	49.86	34.00	2.33	0.46	1.41	66.37	53.01	119.37	4.000	No	No	2.00
133	8.74	51.15	34.00	2.32	0.46	1.40	67.66	53.29	120.95	4.000	No	No	2.00
134	8.83	50.41	34.00	2.33	0.46	1.40	66.49	53.04	119.53	4.000	No	No	2.00
135	8.89	50.04	34.00	2.33	0.46	1.39	65.87	52.90	118.77	4.000	No	No	2.00
136	8.93	49.77	34.00	2.33	0.46	1.39	65.41	52.80	118.21	4.000	No	No	2.00
137	9.02	47.93	34.00	2.33	0.47	1.39	62.95	52.25	115.20	4.000	No	No	2.00
138	9.06	47.01	34.00	2.33	0.47	1.39	61.73	51.98	113.71	4.000	No	No	2.00
139	9.15	44.44	34.00	2.34	0.48	1.39	58.41	51.25	109.66	4.000	No	No	2.00
140	9.19	43.34	34.00	2.35	0.48	1.39	56.96	50.93	107.90	4.000	No	No	2.00
141	9.26	41.32	34.00	2.38	0.49	1.39	54.37	50.36	104.73	4.000	No	No	2.00
142	9.33	38.93	34.00	2.41	0.50	1.39	51.29	49.68	100.97	4.000	No	No	2.00
143	9.46	36.81	34.00	2.43	0.50	1.39	48.43	49.05	97.48	4.000	No	No	2.00
144	9.50	36.72	34.00	2.43	0.50	1.39	48.22	49.00	97.21	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
145	9.55	37.08	34.00	2.42	0.50	1.38	48.54	49.07	97.61	4.000	No	No	2.00
146	9.63	37.18	34.00	2.42	0.50	1.38	48.46	49.05	97.51	4.000	No	No	2.00
147	9.65	37.82	34.00	2.41	0.50	1.37	49.16	49.21	98.37	4.000	No	No	2.00
148	9.75	37.82	34.00	2.38	0.50	1.37	48.94	49.16	98.10	4.000	No	No	2.00
149	9.79	37.73	34.00	2.35	0.50	1.37	48.72	49.11	97.84	4.000	No	No	2.00
150	9.89	36.26	34.00	2.28	0.51	1.36	46.76	48.68	95.44	4.000	No	No	2.00
151	9.94	35.52	34.00	2.30	0.51	1.36	45.75	48.46	94.21	4.000	No	No	2.00
152	9.99	34.60	34.00	2.32	0.51	1.36	44.54	48.19	92.73	4.000	No	No	2.00
153	10.07	33.87	40.00	2.34	0.51	1.35	43.26	52.36	95.62	4.000	No	No	2.00
154	10.12	33.79	40.00	2.35	0.51	1.35	43.07	52.32	95.38	4.000	No	No	2.00
155	10.21	33.65	40.00	2.38	0.51	1.34	42.69	52.23	94.92	4.000	No	No	2.00
156	10.26	33.14	40.00	2.40	0.51	1.34	41.99	52.06	94.05	4.000	No	No	2.00
157	10.30	33.51	40.00	2.40	0.51	1.34	42.35	52.14	94.49	4.000	No	No	2.00
158	10.39	34.34	40.00	2.41	0.51	1.33	43.18	52.34	95.52	4.000	No	No	2.00
159	10.46	34.89	40.00	2.41	0.51	1.32	43.68	52.46	96.14	4.000	No	No	2.00
160	10.53	35.26	40.00	2.41	0.51	1.32	43.97	52.53	96.50	4.000	No	No	2.00
161	10.57	35.35	40.00	2.41	0.51	1.32	44.00	52.54	96.54	4.000	No	No	2.00
162	10.66	35.17	40.00	2.42	0.51	1.31	43.60	52.44	96.04	4.000	No	No	2.00
163	10.71	34.43	40.00	2.44	0.51	1.31	42.64	52.21	94.85	4.000	No	No	2.00
164	10.79	36.08	40.00	2.41	0.51	1.30	44.39	52.63	97.02	4.000	No	No	2.00
165	10.83	36.91	40.00	2.40	0.50	1.30	45.26	52.84	98.10	4.000	No	No	2.00
166	10.90	40.68	40.00	2.34	0.49	1.28	49.40	53.85	103.25	4.000	No	No	2.00
167	10.97	44.63	40.00	2.29	0.48	1.27	53.75	54.89	108.65	4.000	No	No	2.00
168	11.06	48.21	40.00	2.25	0.47	1.26	57.55	55.81	113.36	4.000	No	No	2.00
169	11.10	48.57	40.00	2.24	0.47	1.26	57.86	55.89	113.75	4.000	No	No	2.00
170	11.19	44.63	40.00	2.30	0.48	1.26	53.26	54.77	108.03	4.000	No	No	2.00
171	11.23	45.08	40.00	2.30	0.48	1.26	53.67	54.87	108.54	4.000	No	No	2.00
172	11.30	44.89	40.00	2.30	0.48	1.26	53.31	54.79	108.10	4.000	No	No	2.00
173	11.37	43.88	40.00	2.32	0.48	1.25	52.04	54.48	106.52	4.000	No	No	2.00
174	11.46	42.59	40.00	2.36	0.49	1.25	50.42	54.09	104.51	4.000	No	No	2.00
175	11.49	42.23	40.00	2.38	0.49	1.25	49.95	53.98	103.93	4.000	No	No	2.00
176	11.59	41.86	40.00	2.40	0.49	1.25	49.32	53.83	103.15	4.000	No	No	2.00
177	11.63	42.41	40.00	2.40	0.49	1.24	49.87	53.96	103.82	4.000	No	No	2.00
178	11.68	43.61	40.00	2.39	0.49	1.24	51.08	54.25	105.32	4.000	No	No	2.00
179	11.75	44.43	40.00	2.39	0.48	1.23	51.84	54.43	106.27	4.000	No	No	2.00
180	11.81	43.60	40.00	2.40	0.49	1.23	50.80	54.18	104.98	4.000	No	No	2.00
181	11.90	41.77	40.00	2.41	0.49	1.23	48.60	53.65	102.26	4.000	No	No	2.00
182	11.95	40.76	40.00	2.42	0.50	1.23	47.40	53.36	100.76	4.000	No	No	2.00
183	12.03	35.98	40.00	2.47	0.51	1.23	41.96	52.05	94.01	4.000	No	No	2.00
184	12.07	33.87	40.00	2.50	0.52	1.23	39.54	51.46	91.00	4.000	No	No	2.00
185	12.14	30.75	40.00	2.55	0.53	1.24	35.95	50.60	86.54	4.000	No	No	2.00
186	12.21	29.64	40.00	2.56	0.53	1.23	34.61	50.28	84.89	4.000	No	No	2.00
187	12.29	29.69	40.00	2.49	0.53	1.23	34.55	50.26	84.81	4.000	No	No	2.00
188	12.37	29.74	40.00	2.43	0.53	1.23	34.49	50.25	84.73	4.000	No	No	2.00
189	12.43	30.65	40.00	2.43	0.53	1.22	35.42	50.47	85.89	4.000	No	No	2.00
190	12.48	32.40	40.00	2.41	0.53	1.22	37.28	50.92	88.20	4.000	No	No	2.00
191	12.56	36.17	40.00	2.38	0.51	1.21	41.29	51.89	93.17	4.000	No	No	2.00
192	12.61	37.45	40.00	2.37	0.51	1.20	42.61	52.21	94.81	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
193	12.67	32.68	40.00	2.46	0.53	1.21	37.31	50.93	88.23	4.000	No	No	2.00
194	12.74	34.51	40.00	2.44	0.52	1.20	39.20	51.38	90.59	4.000	No	No	2.00
195	12.80	33.14	40.00	2.47	0.52	1.20	37.60	51.00	88.60	4.000	No	No	2.00
196	12.89	31.58	40.00	2.51	0.53	1.20	35.77	50.56	86.33	4.000	No	No	2.00
197	12.93	29.37	40.00	2.56	0.54	1.20	33.30	49.96	83.26	4.000	No	No	2.00
198	13.02	27.99	40.00	2.59	0.54	1.20	31.68	49.57	81.25	4.000	No	No	2.00
199	13.07	27.16	40.00	2.61	0.55	1.20	30.71	0.00	30.71	4.000	No	Yes	2.00
200	13.13	27.26	40.00	2.61	0.55	1.19	30.74	0.00	30.74	4.000	No	Yes	2.00
201	13.20	25.60	40.00	2.65	0.55	1.19	28.85	0.00	28.85	4.000	No	Yes	2.00
202	13.29	24.41	40.00	2.68	0.56	1.19	27.44	0.00	27.44	4.000	No	Yes	2.00
203	13.34	25.79	40.00	2.65	0.55	1.18	28.89	0.00	28.89	4.000	No	Yes	2.00
204	13.40	25.97	40.00	2.66	0.55	1.18	29.02	0.00	29.02	4.000	No	Yes	2.00
205	13.46	26.25	40.00	2.67	0.55	1.18	29.25	0.00	29.25	4.000	No	Yes	2.00
206	13.54	27.72	40.00	2.64	0.55	1.17	30.73	0.00	30.73	4.000	No	Yes	2.00
207	13.60	28.08	40.00	2.64	0.54	1.17	31.05	0.00	31.05	4.000	No	Yes	2.00
208	13.68	27.53	40.00	2.66	0.55	1.17	30.36	0.00	30.36	4.000	No	Yes	2.00
209	13.73	26.89	40.00	2.68	0.55	1.16	29.62	0.00	29.62	4.000	No	Yes	2.00
210	13.82	27.62	40.00	2.68	0.55	1.16	30.30	0.00	30.30	4.000	No	Yes	2.00
211	13.85	26.98	40.00	2.69	0.55	1.16	29.57	0.00	29.57	4.000	No	Yes	2.00
212	13.95	27.61	40.00	2.68	0.55	1.15	30.14	0.00	30.14	4.000	No	Yes	2.00
213	13.99	27.16	40.00	2.70	0.55	1.15	29.61	0.00	29.61	4.000	No	Yes	2.00
214	14.07	27.61	40.00	2.70	0.55	1.15	29.99	0.00	29.99	4.000	No	Yes	2.00
215	14.13	27.34	40.00	2.72	0.55	1.15	29.64	0.00	29.64	4.000	No	Yes	2.00
216	14.18	27.52	40.00	2.73	0.55	1.14	29.78	0.00	29.78	4.000	No	Yes	2.00
217	14.30	28.44	40.00	2.74	0.55	1.14	30.60	0.00	30.60	4.000	No	Yes	2.00
218	14.35	27.71	40.00	2.76	0.55	1.14	29.78	0.00	29.78	4.000	No	Yes	2.00
219	14.39	27.06	40.00	2.78	0.55	1.13	29.05	0.00	29.05	4.000	No	Yes	2.00
220	14.44	26.79	40.00	2.79	0.55	1.13	28.71	0.00	28.71	4.000	No	Yes	2.00
221	14.52	25.13	40.00	2.84	0.56	1.13	26.88	0.00	26.88	4.000	No	Yes	2.00
222	14.57	28.26	40.00	2.77	0.55	1.13	30.10	0.00	30.10	4.000	No	Yes	2.00
223	14.66	28.53	40.00	2.74	0.55	1.12	30.28	0.00	30.28	4.000	No	Yes	2.00
224	14.70	28.90	40.00	2.73	0.55	1.12	30.62	0.00	30.62	4.000	No	Yes	2.00
225	14.79	29.36	40.00	2.70	0.55	1.12	30.99	0.00	30.99	4.000	No	Yes	2.00
226	14.84	29.91	40.00	2.67	0.54	1.11	31.50	0.00	31.50	4.000	No	Yes	2.00
227	14.92	31.01	40.00	2.64	0.54	1.11	32.53	0.00	32.53	4.000	No	Yes	2.00
228	14.96	33.86	40.00	2.58	0.53	1.11	35.41	50.47	85.88	4.000	No	No	2.00
229	15.06	34.13	40.00	2.56	0.53	1.10	35.57	50.51	86.07	4.000	No	No	2.00
230	15.10	35.05	40.00	2.54	0.53	1.10	36.45	50.72	87.17	4.000	No	No	2.00
231	15.19	37.44	40.00	2.50	0.52	1.09	38.77	51.28	90.05	4.000	No	No	2.00
232	15.24	37.81	40.00	2.49	0.52	1.09	39.08	51.35	90.43	4.000	No	No	2.00
233	15.32	37.81	40.00	2.49	0.52	1.09	38.97	51.33	90.30	4.000	No	No	2.00
234	15.36	37.53	40.00	2.50	0.52	1.09	38.63	51.24	89.87	4.000	No	No	2.00
235	15.43	37.90	40.00	2.50	0.52	1.09	38.91	51.31	90.22	4.000	No	No	2.00
236	15.50	38.36	40.00	2.49	0.52	1.08	39.28	51.40	90.69	4.000	No	No	2.00
237	15.59	38.82	40.00	2.49	0.52	1.08	39.63	51.49	91.12	4.000	No	No	2.00
238	15.64	38.45	40.00	2.50	0.52	1.08	39.19	51.38	90.58	4.000	No	No	2.00
239	15.76	39.00	40.00	2.43	0.52	1.07	39.58	51.47	91.05	4.000	No	No	2.00
240	15.82	39.19	40.00	2.38	0.52	1.07	39.70	51.50	91.20	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
241	15.86	38.27	40.00	2.42	0.52	1.07	38.73	51.27	90.00	4.000	No	No	2.00
242	15.91	38.73	40.00	2.42	0.52	1.07	39.13	51.36	90.49	4.000	No	No	2.00
243	15.97	38.45	40.00	2.45	0.52	1.07	38.77	51.28	90.05	4.000	No	No	2.00
244	16.05	35.79	40.00	2.51	0.53	1.06	36.04	50.62	86.65	4.000	No	No	2.00
245	16.08	28.36	40.00	2.66	0.55	1.07	28.60	0.00	28.60	4.000	No	Yes	2.00
246	16.15	33.87	40.00	2.56	0.54	1.06	34.01	50.13	84.14	4.000	No	No	2.00
247	16.22	34.05	40.00	2.57	0.54	1.06	34.10	50.15	84.25	4.000	No	No	2.00
248	16.29	34.61	40.00	2.58	0.53	1.06	34.57	50.26	84.83	4.000	No	No	2.00
249	16.34	34.88	40.00	2.58	0.53	1.05	34.78	50.32	85.10	4.000	No	No	2.00
250	16.43	34.83	40.00	2.59	0.53	1.05	34.64	50.28	84.92	4.000	No	No	2.00
251	16.47	34.79	40.00	2.60	0.53	1.05	34.55	50.26	84.81	4.000	No	No	2.00
252	16.56	36.90	40.00	2.57	0.53	1.05	36.52	50.74	87.25	4.000	No	No	2.00
253	16.62	37.63	40.00	2.56	0.53	1.04	37.15	50.89	88.04	4.000	No	No	2.00
254	16.68	37.59	40.00	2.57	0.53	1.04	37.05	50.86	87.91	4.000	No	No	2.00
255	16.75	37.82	40.00	2.56	0.53	1.04	37.19	50.90	88.08	4.000	No	No	2.00
256	16.81	37.54	40.00	2.57	0.53	1.04	36.84	50.81	87.65	4.000	No	No	2.00
257	16.87	36.99	40.00	2.58	0.53	1.04	36.24	50.67	86.91	4.000	No	No	2.00
258	16.93	37.63	40.00	2.57	0.53	1.03	36.79	50.80	87.59	4.000	No	No	2.00
259	17.00	36.72	40.00	2.58	0.53	1.03	35.83	50.57	86.40	0.122	No	No	0.34
260	17.09	37.82	40.00	2.56	0.53	1.03	36.79	50.80	87.60	0.123	No	No	0.34
261	17.13	39.47	40.00	2.54	0.52	1.03	38.33	51.17	89.51	0.125	No	No	0.35
262	17.20	36.89	40.00	2.58	0.53	1.03	35.78	50.56	86.33	0.122	No	No	0.33
263	17.27	36.90	40.00	2.59	0.53	1.02	35.70	50.54	86.24	0.122	No	No	0.33
264	17.36	40.11	40.00	2.54	0.52	1.02	38.68	51.26	89.94	0.126	No	No	0.34
265	17.40	40.21	40.00	2.55	0.52	1.02	38.73	51.27	90.00	0.126	No	No	0.34
266	17.46	40.30	40.00	2.55	0.52	1.02	38.75	51.27	90.02	0.126	No	No	0.34
267	17.53	40.39	40.00	2.55	0.52	1.01	38.75	51.27	90.02	0.126	No	No	0.34
268	17.62	39.75	40.00	2.57	0.52	1.01	38.03	51.10	89.13	0.125	No	No	0.34
269	17.67	40.67	40.00	2.55	0.52	1.01	38.85	51.30	90.15	0.126	No	No	0.34
270	17.75	40.75	40.00	2.55	0.52	1.01	38.84	51.30	90.14	0.126	No	No	0.34
271	17.81	41.02	40.00	2.56	0.52	1.01	39.03	51.34	90.37	0.126	No	No	0.34
272	17.85	42.77	40.00	2.53	0.52	1.00	40.64	51.73	92.37	0.128	No	No	0.35
273	17.93	44.33	40.00	2.51	0.51	1.00	42.02	52.06	94.08	0.130	No	No	0.35
274	17.99	48.19	40.00	2.45	0.50	1.00	45.59	52.93	98.52	0.136	No	No	0.37
275	18.06	49.11	40.00	2.45	0.50	1.00	46.37	53.11	99.48	0.137	No	No	0.37
276	18.11	52.79	40.00	2.42	0.49	1.00	49.76	53.93	103.70	0.142	No	No	0.39
277	18.18	55.36	40.00	2.40	0.48	1.00	52.08	54.49	106.57	0.147	No	No	0.40
278	18.29	60.96	40.00	2.35	0.47	0.99	57.20	55.73	112.93	0.157	No	No	0.43
279	18.33	63.53	40.00	2.34	0.46	0.99	59.55	56.29	115.84	0.163	No	No	0.45
280	18.40	66.93	40.00	2.32	0.46	0.99	62.63	57.04	119.66	0.171	No	No	0.48
281	18.46	69.95	40.00	2.31	0.45	0.99	65.36	57.70	123.05	0.179	No	No	0.50
282	18.54	74.19	40.00	2.29	0.44	0.99	69.19	58.62	127.81	0.191	No	No	0.54
283	18.57	76.01	40.00	2.28	0.44	0.99	70.85	59.02	129.87	0.197	No	No	0.56
284	18.64	84.01	40.00	2.22	0.42	0.98	78.21	60.80	139.01	0.230	No	No	0.66
285	18.72	91.82	40.00	2.19	0.41	0.98	85.37	62.52	147.89	0.276	No	No	0.81
286	18.85	109.45	40.00	2.02	0.37	0.98	101.60	66.44	168.04	0.473	No	No	1.46
287	18.92	122.77	40.00	1.99	0.35	0.98	113.93	69.42	183.35	0.834	No	No	2.00
288	18.99	138.02	40.00	1.93	0.33	0.98	128.07	72.83	200.89	1.990	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
289	19.04	146.37	40.00	1.92	0.32	0.98	135.80	74.69	210.50	3.605	No	No	2.00
290	19.13	151.61	40.00	1.94	0.31	0.98	140.50	75.83	216.32	4.000	No	No	2.00
291	19.16	154.28	40.00	1.95	0.30	0.98	142.91	76.41	219.32	4.000	No	No	2.00
292	19.25	175.30	40.00	1.90	0.28	0.98	162.49	81.13	243.62	4.000	No	No	2.00
293	19.29	185.97	40.00	1.89	0.26	0.98	172.38	83.52	254.00	4.000	No	No	2.00
294	19.38	204.80	40.00	1.94	0.26	0.98	189.58	87.67	254.00	4.000	No	No	2.00
295	19.42	219.31	40.00	1.92	0.26	0.98	202.88	90.88	254.00	4.000	No	No	2.00
296	19.52	242.63	40.00	1.81	0.26	0.98	224.14	96.01	254.00	4.000	No	No	2.00
297	19.60	262.93	40.00	1.72	0.26	0.98	242.59	100.46	254.00	4.000	No	No	2.00
298	19.64	270.74	40.00	1.73	0.26	0.98	249.65	102.16	254.00	4.000	No	No	2.00
299	19.69	289.38	40.00	1.72	0.26	0.97	266.61	106.26	254.00	4.000	No	No	2.00
300	19.75	287.45	40.00	1.66	0.26	0.97	264.58	105.77	254.00	4.000	No	No	2.00
301	19.82	277.72	40.00	1.67	0.26	0.97	255.36	103.54	254.00	4.000	No	No	2.00
302	19.89	324.92	40.00	1.56	0.26	0.97	298.48	113.95	254.00	4.000	No	No	2.00
303	19.95	329.61	40.00	1.55	0.26	0.97	302.51	114.92	254.00	4.000	No	No	2.00
304	20.04	299.48	40.00	1.63	0.26	0.97	274.48	108.16	254.00	4.000	No	No	2.00
305	20.08	229.21	40.00	1.81	0.26	0.97	209.97	92.59	254.00	4.000	No	No	2.00
306	20.15	275.59	40.00	1.72	0.26	0.97	252.21	102.78	254.00	4.000	No	No	2.00
307	20.21	268.61	40.00	1.76	0.26	0.97	245.58	101.18	254.00	4.000	No	No	2.00
308	20.30	260.35	40.00	1.81	0.26	0.97	237.73	99.29	254.00	4.000	No	No	2.00
309	20.34	259.98	40.00	1.83	0.26	0.97	237.24	99.17	254.00	4.000	No	No	2.00
310	20.42	255.94	40.00	1.87	0.26	0.96	233.29	98.22	254.00	4.000	No	No	2.00
311	20.48	251.81	40.00	1.89	0.26	0.96	229.33	97.26	254.00	4.000	No	No	2.00
312	20.57	246.21	40.00	1.93	0.26	0.96	223.94	95.96	254.00	4.000	No	No	2.00
313	20.61	242.44	40.00	1.94	0.26	0.96	220.37	95.10	254.00	4.000	No	No	2.00
314	20.69	237.11	40.00	1.97	0.26	0.96	215.26	93.87	254.00	4.000	No	No	2.00
315	20.74	235.64	40.00	1.98	0.26	0.96	213.77	93.51	254.00	4.000	No	No	2.00
316	20.82	231.51	40.00	1.98	0.26	0.96	209.78	92.54	254.00	4.000	No	No	2.00
317	20.88	229.95	40.00	1.98	0.26	0.96	208.21	92.16	254.00	4.000	No	No	2.00
318	20.94	228.02	40.00	1.97	0.26	0.96	206.27	91.70	254.00	4.000	No	No	2.00
319	21.00	227.38	40.00	1.97	0.26	0.96	205.52	91.52	254.00	4.000	No	No	2.00
320	21.09	227.93	40.00	1.97	0.26	0.96	205.74	91.57	254.00	4.000	No	No	2.00
321	21.14	225.63	40.00	1.98	0.26	0.95	203.53	91.04	254.00	4.000	No	No	2.00
322	21.20	227.84	40.00	1.98	0.26	0.95	205.34	91.47	254.00	4.000	No	No	2.00
323	21.27	229.12	40.00	1.99	0.26	0.95	206.29	91.70	254.00	4.000	No	No	2.00
324	21.34	232.89	40.00	1.99	0.26	0.95	209.48	92.47	254.00	4.000	No	No	2.00
325	21.41	237.20	40.00	1.99	0.26	0.95	213.16	93.36	254.00	4.000	No	No	2.00
326	21.49	237.57	40.00	2.00	0.26	0.95	213.24	93.38	254.00	4.000	No	No	2.00
327	21.54	237.76	40.00	2.00	0.26	0.95	213.26	93.38	254.00	4.000	No	No	2.00
328	21.60	237.48	40.00	2.01	0.26	0.95	212.85	93.28	254.00	4.000	No	No	2.00
329	21.67	239.96	40.00	2.00	0.26	0.95	214.85	93.77	254.00	4.000	No	No	2.00
330	21.74	243.63	40.00	1.99	0.26	0.95	217.93	94.51	254.00	4.000	No	No	2.00
331	21.80	246.21	40.00	1.97	0.26	0.95	220.06	95.03	254.00	4.000	No	No	2.00
332	21.86	244.09	40.00	1.97	0.26	0.94	217.98	94.52	254.00	4.000	No	No	2.00
333	21.94	242.35	40.00	1.94	0.26	0.94	216.19	94.09	254.00	4.000	No	No	2.00
334	22.01	237.94	40.00	1.91	0.26	0.94	212.06	93.09	254.00	4.000	No	No	2.00
335	22.05	237.11	40.00	1.93	0.26	0.94	211.19	92.88	254.00	4.000	No	No	2.00
336	22.12	234.82	40.00	1.97	0.26	0.94	208.96	92.35	254.00	4.000	No	No	2.00

:: Cyclic Resistance Ratio (CRR) calculation data :: (continued)

Point ID	Depth (ft)	q_t (tsf)	FC (%)	Ic	m	C_N	q_{c1N}	Δq_{c1N}	$q_{c1N,cs}$	$CRR_{7.5}$	Belongs to trans. layer	Clay-like behaviour	FS
337	22.19	212.22	40.00	2.03	0.26	0.94	188.66	87.45	254.00	4.000	No	No	2.00
338	22.25	209.93	40.00	2.05	0.26	0.94	186.48	86.92	254.00	4.000	No	No	2.00
339	22.34	211.63	40.00	2.06	0.26	0.94	187.78	87.23	254.00	4.000	No	No	2.00
340	22.39	211.03	40.00	2.07	0.26	0.94	187.12	87.08	254.00	4.000	No	No	2.00
341	22.48	216.72	40.00	2.06	0.26	0.94	191.94	88.24	254.00	4.000	No	No	2.00
342	22.52	223.43	40.00	2.05	0.26	0.94	197.76	89.64	254.00	4.000	No	No	2.00
343	22.60	225.36	40.00	2.08	0.26	0.94	199.26	90.00	254.00	4.000	No	No	2.00
344	22.66	220.31	40.00	2.12	0.26	0.93	194.65	88.89	254.00	4.000	No	No	2.00
345	22.74	211.86	40.00	2.18	0.26	0.93	186.98	87.04	254.00	4.000	No	No	2.00
346	22.77	220.43	40.00	2.15	0.26	0.93	194.47	88.85	254.00	4.000	No	No	2.00
347	22.85	212.67	40.00	2.15	0.26	0.93	187.43	87.15	254.00	4.000	No	No	2.00
348	22.92	220.57	40.00	2.11	0.26	0.93	194.22	88.79	254.00	4.000	No	No	2.00
349	23.01	220.80	40.00	2.11	0.26	0.93	194.20	88.78	254.00	4.000	No	No	2.00
350	23.05	221.04	40.00	2.12	0.26	0.93	194.28	88.80	254.00	4.000	No	No	2.00
351	23.10	248.96	40.00	2.04	0.26	0.93	218.69	94.69	254.00	4.000	No	No	2.00
352	23.17	283.67	40.00	1.93	0.26	0.93	248.95	102.00	254.00	4.000	No	No	2.00
353	23.25	310.76	40.00	1.92	0.26	0.93	272.43	107.66	254.00	4.000	No	No	2.00
354	23.32	329.68	40.00	1.95	0.26	0.93	288.78	111.61	254.00	4.000	No	No	2.00
355	23.40	356.68	40.00	1.92	0.26	0.93	312.12	117.24	254.00	4.000	No	No	2.00
356	23.43	378.35	40.00	4.06	0.26	0.93	330.98	0.00	330.98	4.000	No	Yes	2.00
357	23.52	442.84	40.00	4.06	0.26	0.92	387.10	0.00	387.10	4.000	No	Yes	2.00
358	23.58	499.41	40.00	4.06	0.26	0.92	436.35	0.00	436.35	4.000	No	Yes	2.00
359	23.63	565.17	40.00	4.06	0.26	0.92	493.60	0.00	493.60	4.000	No	Yes	2.00
360	23.69	592.09	40.00	4.06	0.26	0.92	516.84	0.00	516.84	4.000	No	Yes	2.00
361	23.76	584.92	40.00	4.06	0.26	0.92	510.32	0.00	510.32	4.000	No	Yes	2.00

Abbreviations

Depth:	Depth from free surface, at which CPT was performed (ft)
q_t:	Total cone resistance
FC:	Fines content (%)
I_c:	Soil behavior type index
m:	Stress exponent
C_N:	Overburden correction factor
q_{c1N}:	Normalized and adjusted cone resistance
Δq_{c1N}:	Cone resistance correction factor due to fines
$q_{c1N,cs}$:	Normalized and adjusted cone resistance
$CRR_{7.5}$:	Cyclic resistance ratio for M_w=7.5
FS:	Factor of safety against soil liquefaction

:: Liquefaction Potential Index calculation data ::

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
0.08	2.00	0.00	9.99	0.07	0.00	0.16	2.00	0.00	9.98	0.07	0.00
0.20	2.00	0.00	9.97	0.05	0.00	0.30	2.00	0.00	9.95	0.09	0.00
0.35	2.00	0.00	9.95	0.06	0.00	0.40	2.00	0.00	9.94	0.05	0.00
0.49	2.00	0.00	9.93	0.09	0.00	0.53	2.00	0.00	9.92	0.04	0.00
0.64	2.00	0.00	9.90	0.11	0.00	0.69	2.00	0.00	9.90	0.05	0.00
0.73	2.00	0.00	9.89	0.04	0.00	0.80	2.00	0.00	9.88	0.07	0.00
0.88	2.00	0.00	9.87	0.09	0.00	0.93	2.00	0.00	9.86	0.05	0.00
1.02	2.00	0.00	9.84	0.10	0.00	1.06	2.00	0.00	9.84	0.04	0.00
1.13	2.00	0.00	9.83	0.07	0.00	1.19	2.00	0.00	9.82	0.07	0.00
1.28	2.00	0.00	9.80	0.09	0.00	1.33	2.00	0.00	9.80	0.05	0.00
1.39	2.00	0.00	9.79	0.06	0.00	1.50	2.00	0.00	9.77	0.11	0.00
1.54	2.00	0.00	9.76	0.04	0.00	1.59	2.00	0.00	9.76	0.05	0.00
1.65	2.00	0.00	9.75	0.06	0.00	1.71	2.00	0.00	9.74	0.05	0.00
1.79	2.00	0.00	9.73	0.08	0.00	1.85	2.00	0.00	9.72	0.06	0.00
1.94	2.00	0.00	9.70	0.09	0.00	2.01	2.00	0.00	9.69	0.07	0.00
2.05	2.00	0.00	9.69	0.04	0.00	2.14	2.00	0.00	9.67	0.09	0.00
2.18	2.00	0.00	9.67	0.04	0.00	2.27	2.00	0.00	9.65	0.09	0.00
2.32	2.00	0.00	9.65	0.04	0.00	2.42	2.00	0.00	9.63	0.11	0.00
2.46	2.00	0.00	9.63	0.03	0.00	2.54	2.00	0.00	9.61	0.08	0.00
2.57	2.00	0.00	9.61	0.03	0.00	2.64	2.00	0.00	9.60	0.07	0.00
2.71	2.00	0.00	9.59	0.07	0.00	2.76	2.00	0.00	9.58	0.05	0.00
2.85	2.00	0.00	9.57	0.09	0.00	2.89	2.00	0.00	9.56	0.04	0.00
2.98	2.00	0.00	9.55	0.09	0.00	3.02	2.00	0.00	9.54	0.04	0.00
3.10	2.00	0.00	9.53	0.08	0.00	3.20	2.00	0.00	9.51	0.11	0.00
3.25	2.00	0.00	9.51	0.05	0.00	3.32	2.00	0.00	9.49	0.07	0.00
3.36	2.00	0.00	9.49	0.04	0.00	3.46	2.00	0.00	9.47	0.10	0.00
3.49	2.00	0.00	9.47	0.04	0.00	3.59	2.00	0.00	9.45	0.09	0.00
3.64	2.00	0.00	9.45	0.05	0.00	3.68	2.00	0.00	9.44	0.04	0.00
3.76	2.00	0.00	9.43	0.08	0.00	3.81	2.00	0.00	9.42	0.05	0.00
3.91	2.00	0.00	9.40	0.10	0.00	3.96	2.00	0.00	9.40	0.04	0.00
4.04	2.00	0.00	9.38	0.09	0.00	4.09	2.00	0.00	9.38	0.05	0.00
4.20	2.00	0.00	9.36	0.11	0.00	4.26	2.00	0.00	9.35	0.06	0.00
4.31	2.00	0.00	9.34	0.04	0.00	4.36	2.00	0.00	9.34	0.05	0.00
4.45	2.00	0.00	9.32	0.10	0.00	4.51	2.00	0.00	9.31	0.06	0.00
4.57	2.00	0.00	9.30	0.05	0.00	4.62	2.00	0.00	9.30	0.05	0.00
4.66	2.00	0.00	9.29	0.05	0.00	4.74	2.00	0.00	9.28	0.08	0.00
4.83	2.00	0.00	9.26	0.09	0.00	4.88	2.00	0.00	9.26	0.05	0.00
4.93	2.00	0.00	9.25	0.05	0.00	5.01	2.00	0.00	9.24	0.09	0.00
5.05	2.00	0.00	9.23	0.04	0.00	5.14	2.00	0.00	9.22	0.09	0.00
5.19	2.00	0.00	9.21	0.05	0.00	5.26	2.00	0.00	9.20	0.07	0.00
5.32	2.00	0.00	9.19	0.06	0.00	5.41	2.00	0.00	9.18	0.09	0.00
5.45	2.00	0.00	9.17	0.04	0.00	5.53	2.00	0.00	9.16	0.08	0.00
5.58	2.00	0.00	9.15	0.05	0.00	5.67	2.00	0.00	9.14	0.09	0.00
5.72	2.00	0.00	9.13	0.05	0.00	5.81	2.00	0.00	9.12	0.08	0.00
5.85	2.00	0.00	9.11	0.04	0.00	5.94	2.00	0.00	9.10	0.09	0.00
5.99	2.00	0.00	9.09	0.05	0.00	6.08	2.00	0.00	9.07	0.09	0.00
6.12	2.00	0.00	9.07	0.04	0.00	6.19	2.00	0.00	9.06	0.07	0.00
6.26	2.00	0.00	9.05	0.07	0.00	6.34	2.00	0.00	9.03	0.08	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
6.38	2.00	0.00	9.03	0.04	0.00	6.44	2.00	0.00	9.02	0.05	0.00
6.52	2.00	0.00	9.01	0.08	0.00	6.60	2.00	0.00	8.99	0.08	0.00
6.69	2.00	0.00	8.98	0.09	0.00	6.74	2.00	0.00	8.97	0.04	0.00
6.77	2.00	0.00	8.97	0.03	0.00	6.83	2.00	0.00	8.96	0.06	0.00
6.91	2.00	0.00	8.95	0.09	0.00	6.97	2.00	0.00	8.94	0.06	0.00
7.06	2.00	0.00	8.92	0.09	0.00	7.10	2.00	0.00	8.92	0.04	0.00
7.19	2.00	0.00	8.90	0.09	0.00	7.24	2.00	0.00	8.90	0.05	0.00
7.29	2.00	0.00	8.89	0.05	0.00	7.35	2.00	0.00	8.88	0.06	0.00
7.45	2.00	0.00	8.86	0.10	0.00	7.49	2.00	0.00	8.86	0.04	0.00
7.59	2.00	0.00	8.84	0.10	0.00	7.64	2.00	0.00	8.84	0.05	0.00
7.71	2.00	0.00	8.83	0.06	0.00	7.75	2.00	0.00	8.82	0.05	0.00
7.82	2.00	0.00	8.81	0.07	0.00	7.88	2.00	0.00	8.80	0.06	0.00
7.95	2.00	0.00	8.79	0.07	0.00	8.04	2.00	0.00	8.77	0.09	0.00
8.07	2.00	0.00	8.77	0.03	0.00	8.18	2.00	0.00	8.75	0.10	0.00
8.20	2.00	0.00	8.75	0.03	0.00	8.28	2.00	0.00	8.74	0.08	0.00
8.35	2.00	0.00	8.73	0.07	0.00	8.41	2.00	0.00	8.72	0.06	0.00
8.48	2.00	0.00	8.71	0.07	0.00	8.54	2.00	0.00	8.70	0.06	0.00
8.62	2.00	0.00	8.69	0.08	0.00	8.67	2.00	0.00	8.68	0.05	0.00
8.74	2.00	0.00	8.67	0.07	0.00	8.83	2.00	0.00	8.65	0.09	0.00
8.89	2.00	0.00	8.65	0.05	0.00	8.93	2.00	0.00	8.64	0.04	0.00
9.02	2.00	0.00	8.63	0.09	0.00	9.06	2.00	0.00	8.62	0.04	0.00
9.15	2.00	0.00	8.61	0.09	0.00	9.19	2.00	0.00	8.60	0.05	0.00
9.26	2.00	0.00	8.59	0.06	0.00	9.33	2.00	0.00	8.58	0.07	0.00
9.46	2.00	0.00	8.56	0.13	0.00	9.50	2.00	0.00	8.55	0.04	0.00
9.55	2.00	0.00	8.55	0.04	0.00	9.63	2.00	0.00	8.53	0.08	0.00
9.65	2.00	0.00	8.53	0.03	0.00	9.75	2.00	0.00	8.51	0.09	0.00
9.79	2.00	0.00	8.51	0.05	0.00	9.89	2.00	0.00	8.49	0.10	0.00
9.94	2.00	0.00	8.49	0.05	0.00	9.99	2.00	0.00	8.48	0.05	0.00
10.07	2.00	0.00	8.46	0.08	0.00	10.12	2.00	0.00	8.46	0.04	0.00
10.21	2.00	0.00	8.44	0.10	0.00	10.26	2.00	0.00	8.44	0.05	0.00
10.30	2.00	0.00	8.43	0.04	0.00	10.39	2.00	0.00	8.42	0.08	0.00
10.46	2.00	0.00	8.41	0.07	0.00	10.53	2.00	0.00	8.40	0.07	0.00
10.57	2.00	0.00	8.39	0.04	0.00	10.66	2.00	0.00	8.38	0.10	0.00
10.71	2.00	0.00	8.37	0.04	0.00	10.79	2.00	0.00	8.36	0.09	0.00
10.83	2.00	0.00	8.35	0.04	0.00	10.90	2.00	0.00	8.34	0.07	0.00
10.97	2.00	0.00	8.33	0.06	0.00	11.06	2.00	0.00	8.31	0.09	0.00
11.10	2.00	0.00	8.31	0.04	0.00	11.19	2.00	0.00	8.29	0.09	0.00
11.23	2.00	0.00	8.29	0.04	0.00	11.30	2.00	0.00	8.28	0.07	0.00
11.37	2.00	0.00	8.27	0.07	0.00	11.46	2.00	0.00	8.25	0.09	0.00
11.49	2.00	0.00	8.25	0.03	0.00	11.59	2.00	0.00	8.23	0.10	0.00
11.63	2.00	0.00	8.23	0.04	0.00	11.68	2.00	0.00	8.22	0.05	0.00
11.75	2.00	0.00	8.21	0.07	0.00	11.81	2.00	0.00	8.20	0.06	0.00
11.90	2.00	0.00	8.19	0.09	0.00	11.95	2.00	0.00	8.18	0.05	0.00
12.03	2.00	0.00	8.17	0.09	0.00	12.07	2.00	0.00	8.16	0.04	0.00
12.14	2.00	0.00	8.15	0.07	0.00	12.21	2.00	0.00	8.14	0.06	0.00
12.29	2.00	0.00	8.13	0.08	0.00	12.37	2.00	0.00	8.11	0.09	0.00
12.43	2.00	0.00	8.11	0.06	0.00	12.48	2.00	0.00	8.10	0.05	0.00
12.56	2.00	0.00	8.09	0.09	0.00	12.61	2.00	0.00	8.08	0.05	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
12.67	2.00	0.00	8.07	0.06	0.00	12.74	2.00	0.00	8.06	0.07	0.00
12.80	2.00	0.00	8.05	0.06	0.00	12.89	2.00	0.00	8.04	0.09	0.00
12.93	2.00	0.00	8.03	0.05	0.00	13.02	2.00	0.00	8.02	0.08	0.00
13.07	2.00	0.00	8.01	0.05	0.00	13.13	2.00	0.00	8.00	0.06	0.00
13.20	2.00	0.00	7.99	0.06	0.00	13.29	2.00	0.00	7.98	0.09	0.00
13.34	2.00	0.00	7.97	0.05	0.00	13.40	2.00	0.00	7.96	0.06	0.00
13.46	2.00	0.00	7.95	0.06	0.00	13.54	2.00	0.00	7.94	0.08	0.00
13.60	2.00	0.00	7.93	0.06	0.00	13.68	2.00	0.00	7.91	0.08	0.00
13.73	2.00	0.00	7.91	0.04	0.00	13.82	2.00	0.00	7.89	0.09	0.00
13.85	2.00	0.00	7.89	0.03	0.00	13.95	2.00	0.00	7.87	0.10	0.00
13.99	2.00	0.00	7.87	0.04	0.00	14.07	2.00	0.00	7.86	0.08	0.00
14.13	2.00	0.00	7.85	0.05	0.00	14.18	2.00	0.00	7.84	0.05	0.00
14.30	2.00	0.00	7.82	0.13	0.00	14.35	2.00	0.00	7.81	0.04	0.00
14.39	2.00	0.00	7.81	0.04	0.00	14.44	2.00	0.00	7.80	0.05	0.00
14.52	2.00	0.00	7.79	0.09	0.00	14.57	2.00	0.00	7.78	0.05	0.00
14.66	2.00	0.00	7.77	0.09	0.00	14.70	2.00	0.00	7.76	0.04	0.00
14.79	2.00	0.00	7.75	0.09	0.00	14.84	2.00	0.00	7.74	0.05	0.00
14.92	2.00	0.00	7.73	0.09	0.00	14.96	2.00	0.00	7.72	0.04	0.00
15.06	2.00	0.00	7.71	0.10	0.00	15.10	2.00	0.00	7.70	0.04	0.00
15.19	2.00	0.00	7.69	0.09	0.00	15.24	2.00	0.00	7.68	0.05	0.00
15.32	2.00	0.00	7.67	0.08	0.00	15.36	2.00	0.00	7.66	0.05	0.00
15.43	2.00	0.00	7.65	0.07	0.00	15.50	2.00	0.00	7.64	0.07	0.00
15.59	2.00	0.00	7.62	0.09	0.00	15.64	2.00	0.00	7.62	0.05	0.00
15.76	2.00	0.00	7.60	0.13	0.00	15.82	2.00	0.00	7.59	0.06	0.00
15.86	2.00	0.00	7.58	0.04	0.00	15.91	2.00	0.00	7.58	0.05	0.00
15.97	2.00	0.00	7.57	0.06	0.00	16.05	2.00	0.00	7.55	0.08	0.00
16.08	2.00	0.00	7.55	0.03	0.00	16.15	2.00	0.00	7.54	0.07	0.00
16.22	2.00	0.00	7.53	0.07	0.00	16.29	2.00	0.00	7.52	0.07	0.00
16.34	2.00	0.00	7.51	0.05	0.00	16.43	2.00	0.00	7.50	0.09	0.00
16.47	2.00	0.00	7.49	0.04	0.00	16.56	2.00	0.00	7.48	0.09	0.00
16.62	2.00	0.00	7.47	0.07	0.00	16.68	2.00	0.00	7.46	0.06	0.00
16.75	2.00	0.00	7.45	0.07	0.00	16.81	2.00	0.00	7.44	0.06	0.00
16.87	2.00	0.00	7.43	0.05	0.00	16.93	2.00	0.00	7.42	0.06	0.00
17.00	0.34	0.66	7.41	0.07	0.10	17.09	0.34	0.66	7.40	0.08	0.13
17.13	0.35	0.65	7.39	0.05	0.07	17.20	0.33	0.67	7.38	0.07	0.10
17.27	0.33	0.67	7.37	0.07	0.10	17.36	0.34	0.66	7.35	0.09	0.13
17.40	0.34	0.66	7.35	0.04	0.06	17.46	0.34	0.66	7.34	0.06	0.08
17.53	0.34	0.66	7.33	0.07	0.10	17.62	0.34	0.66	7.32	0.09	0.13
17.67	0.34	0.66	7.31	0.05	0.07	17.75	0.34	0.66	7.30	0.08	0.12
17.81	0.34	0.66	7.29	0.06	0.08	17.85	0.35	0.65	7.28	0.04	0.06
17.93	0.35	0.65	7.27	0.08	0.12	17.99	0.37	0.63	7.26	0.06	0.08
18.06	0.37	0.63	7.25	0.07	0.10	18.11	0.39	0.61	7.24	0.05	0.07
18.18	0.40	0.60	7.23	0.07	0.10	18.29	0.43	0.57	7.21	0.10	0.13
18.33	0.45	0.55	7.21	0.04	0.05	18.40	0.48	0.52	7.20	0.07	0.08
18.46	0.50	0.50	7.19	0.06	0.07	18.54	0.54	0.46	7.17	0.08	0.08
18.57	0.56	0.44	7.17	0.03	0.03	18.64	0.66	0.34	7.16	0.07	0.05
18.72	0.81	0.19	7.15	0.08	0.03	18.85	1.46	0.00	7.13	0.14	0.00
18.92	2.00	0.00	7.12	0.07	0.00	18.99	2.00	0.00	7.11	0.07	0.00

:: Liquefaction Potential Index calculation data :: (continued)

Depth (ft)	FS	F_L	w_z	d_z	LPI	Depth (ft)	FS	F_L	w_z	d_z	LPI
19.04	2.00	0.00	7.10	0.04	0.00	19.13	2.00	0.00	7.08	0.09	0.00
19.16	2.00	0.00	7.08	0.04	0.00	19.25	2.00	0.00	7.07	0.08	0.00
19.29	2.00	0.00	7.06	0.05	0.00	19.38	2.00	0.00	7.05	0.09	0.00
19.42	2.00	0.00	7.04	0.04	0.00	19.52	2.00	0.00	7.03	0.09	0.00
19.60	2.00	0.00	7.01	0.08	0.00	19.64	2.00	0.00	7.01	0.04	0.00
19.69	2.00	0.00	7.00	0.06	0.00	19.75	2.00	0.00	6.99	0.06	0.00
19.82	2.00	0.00	6.98	0.07	0.00	19.89	2.00	0.00	6.97	0.07	0.00
19.95	2.00	0.00	6.96	0.06	0.00	20.04	2.00	0.00	6.95	0.09	0.00
20.08	2.00	0.00	6.94	0.04	0.00	20.15	2.00	0.00	6.93	0.06	0.00
20.21	2.00	0.00	6.92	0.07	0.00	20.30	2.00	0.00	6.91	0.09	0.00
20.34	2.00	0.00	6.90	0.04	0.00	20.42	2.00	0.00	6.89	0.08	0.00
20.48	2.00	0.00	6.88	0.06	0.00	20.57	2.00	0.00	6.87	0.09	0.00
20.61	2.00	0.00	6.86	0.04	0.00	20.69	2.00	0.00	6.85	0.09	0.00
20.74	2.00	0.00	6.84	0.05	0.00	20.82	2.00	0.00	6.83	0.08	0.00
20.88	2.00	0.00	6.82	0.05	0.00	20.94	2.00	0.00	6.81	0.06	0.00
21.00	2.00	0.00	6.80	0.06	0.00	21.09	2.00	0.00	6.79	0.09	0.00
21.14	2.00	0.00	6.78	0.05	0.00	21.20	2.00	0.00	6.77	0.06	0.00
21.27	2.00	0.00	6.76	0.07	0.00	21.34	2.00	0.00	6.75	0.07	0.00
21.41	2.00	0.00	6.74	0.07	0.00	21.49	2.00	0.00	6.72	0.09	0.00
21.54	2.00	0.00	6.72	0.05	0.00	21.60	2.00	0.00	6.71	0.06	0.00
21.67	2.00	0.00	6.70	0.07	0.00	21.74	2.00	0.00	6.69	0.07	0.00
21.80	2.00	0.00	6.68	0.06	0.00	21.86	2.00	0.00	6.67	0.06	0.00
21.94	2.00	0.00	6.66	0.08	0.00	22.01	2.00	0.00	6.65	0.07	0.00
22.05	2.00	0.00	6.64	0.05	0.00	22.12	2.00	0.00	6.63	0.06	0.00
22.19	2.00	0.00	6.62	0.08	0.00	22.25	2.00	0.00	6.61	0.06	0.00
22.34	2.00	0.00	6.60	0.09	0.00	22.39	2.00	0.00	6.59	0.05	0.00
22.48	2.00	0.00	6.57	0.09	0.00	22.52	2.00	0.00	6.57	0.04	0.00
22.60	2.00	0.00	6.56	0.08	0.00	22.66	2.00	0.00	6.55	0.05	0.00
22.74	2.00	0.00	6.53	0.08	0.00	22.77	2.00	0.00	6.53	0.03	0.00
22.85	2.00	0.00	6.52	0.08	0.00	22.92	2.00	0.00	6.51	0.07	0.00
23.01	2.00	0.00	6.49	0.09	0.00	23.05	2.00	0.00	6.49	0.05	0.00
23.10	2.00	0.00	6.48	0.04	0.00	23.17	2.00	0.00	6.47	0.07	0.00
23.25	2.00	0.00	6.46	0.08	0.00	23.32	2.00	0.00	6.45	0.06	0.00
23.40	2.00	0.00	6.43	0.08	0.00	23.43	2.00	0.00	6.43	0.04	0.00
23.52	2.00	0.00	6.42	0.09	0.00	23.58	2.00	0.00	6.41	0.06	0.00
23.63	2.00	0.00	6.40	0.05	0.00	23.69	2.00	0.00	6.39	0.06	0.00
23.76	2.00	0.00	6.38	0.06	0.00						

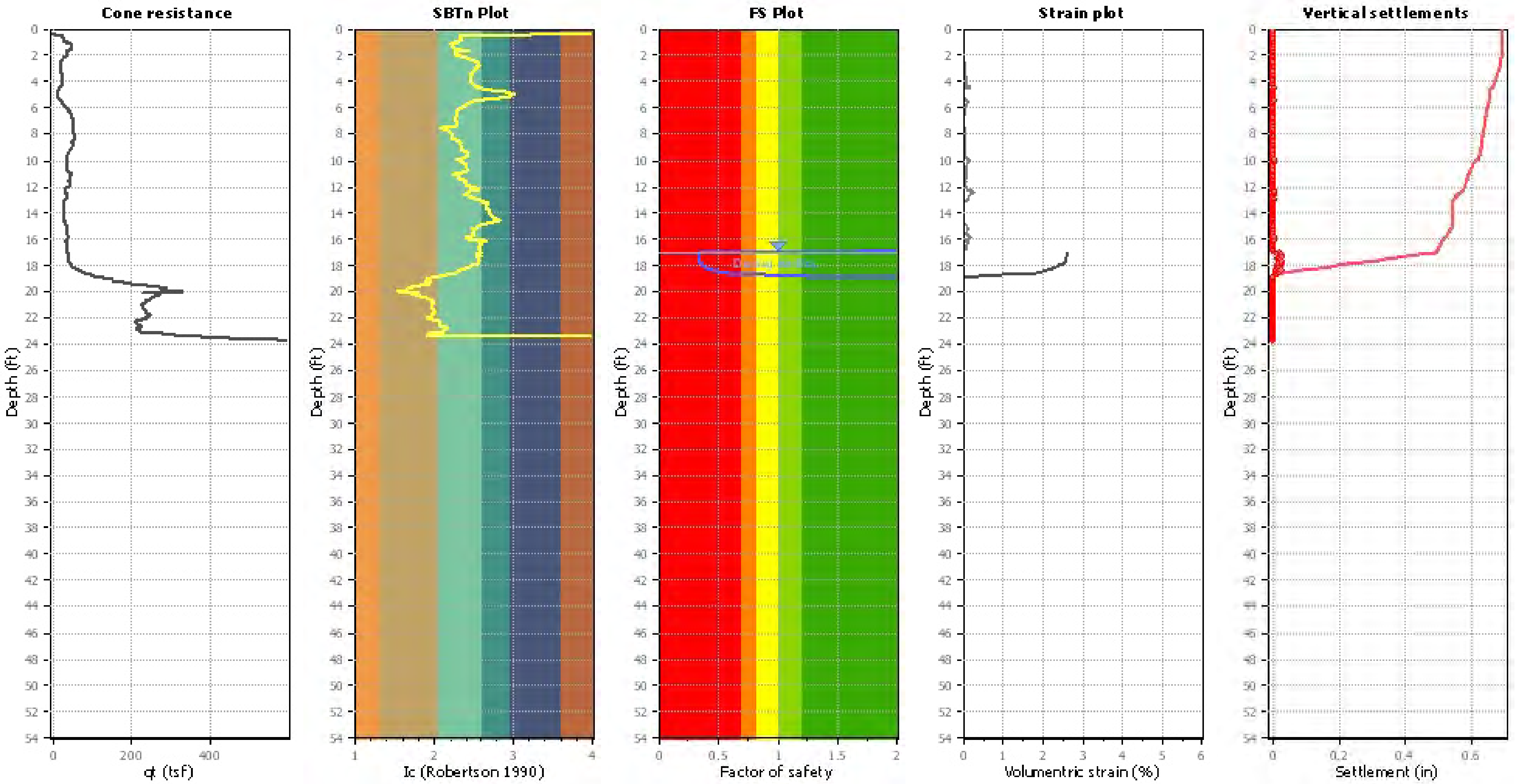
Overall liquefaction potential: 2.34

LPI = 0.00 - Liquefaction risk very low
LPI between 0.00 and 5.00 - Liquefaction risk low
LPI between 5.00 and 15.00 - Liquefaction risk high
LPI > 15.00 - Liquefaction risk very high

Abbreviations

FS:	Calculated factor of safety for test point
F_L:	1 - FS
w_z:	Function value of the extend of soil liquefaction according to depth
d_z:	Layer thickness (ft)
LPI:	Liquefaction potential index value for test point

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Q_{tn}	K_c	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
0.08	4.06	-1.00	26.61	-26.61	0	0	0.36	0.000	0.00	0.00	0.00	0.000
0.16	4.06	-1.00	26.61	-26.61	0	0	0.36	0.000	0.00	0.00	0.00	0.000
0.20	4.06	-1.00	26.61	-26.61	0	0	0.36	0.000	0.00	0.00	0.00	0.000
0.30	4.06	-1.00	26.61	-26.61	0	0	0.36	0.000	0.00	0.00	0.00	0.000
0.35	3.78	2.78	19.73	54.82	0	0	0.36	0.000	0.00	0.00	0.00	0.000
0.40	2.85	13.55	5.22	70.65	0	0	0.36	0.000	0.00	0.00	0.00	0.000
0.49	2.32	35.82	2.02	72.19	17	379	0.35	0.005	0.01	9.12	0.00	0.000
0.53	2.31	37.73	1.99	75.11	18	395	0.35	0.005	0.01	9.12	0.00	0.000
0.64	2.32	39.34	2.02	79.64	19	418	0.35	0.005	0.01	9.12	0.00	0.000
0.69	2.32	39.93	2.03	80.94	19	424	0.35	0.006	0.01	9.12	0.00	0.000
0.73	2.35	38.59	2.10	81.23	20	422	0.35	0.006	0.01	9.12	0.01	0.000
0.80	2.33	39.77	2.06	81.79	20	427	0.35	0.007	0.01	9.12	0.01	0.000
0.88	2.31	43.01	1.99	85.47	20	450	0.35	0.007	0.01	9.12	0.01	0.000
0.93	2.30	45.80	1.94	88.94	21	471	0.35	0.007	0.01	9.12	0.01	0.000
1.02	2.25	57.31	1.79	102.72	24	553	0.34	0.006	0.01	9.12	0.00	0.000
1.06	2.28	57.31	1.88	107.90	25	575	0.34	0.006	0.00	9.12	0.00	0.000
1.13	2.21	70.28	1.68	118.35	27	644	0.34	0.005	0.00	9.12	0.00	0.000
1.19	2.23	74.41	1.74	129.12	29	699	0.33	0.005	0.00	9.12	0.00	0.000
1.28	2.23	77.35	1.74	134.93	31	730	0.33	0.005	0.00	9.12	0.00	0.000
1.33	2.23	77.19	1.75	134.91	31	730	0.33	0.006	0.00	9.12	0.00	0.000
1.39	2.24	76.60	1.76	134.86	31	729	0.33	0.006	0.00	9.12	0.00	0.000
1.50	2.26	73.20	1.84	134.55	31	721	0.33	0.007	0.00	9.12	0.00	0.000
1.54	2.28	70.53	1.88	132.31	31	706	0.33	0.007	0.00	9.12	0.00	0.000
1.59	2.28	68.61	1.89	129.75	30	691	0.34	0.008	0.00	9.12	0.00	0.000
1.65	2.45	50.76	2.52	128.08	32	632	0.35	0.009	0.01	9.12	0.00	0.000
1.71	2.30	61.66	1.96	120.69	28	638	0.34	0.009	0.01	9.12	0.00	0.000
1.79	2.27	60.77	1.85	112.44	26	602	0.34	0.011	0.01	9.12	0.01	0.000
1.85	2.26	59.74	1.83	109.44	25	587	0.34	0.012	0.01	9.12	0.01	0.000
1.94	2.30	55.15	1.95	107.35	25	568	0.35	0.014	0.01	9.12	0.01	0.000
2.01	2.31	52.78	2.00	105.32	25	554	0.35	0.015	0.01	9.12	0.01	0.000
2.05	2.34	49.39	2.10	103.78	25	539	0.35	0.017	0.01	9.12	0.01	0.000
2.14	2.39	44.37	2.27	100.85	25	513	0.35	0.020	0.02	9.12	0.01	0.000
2.18	2.42	41.84	2.39	100.01	25	501	0.35	0.022	0.02	9.12	0.01	0.000
2.27	2.46	37.86	2.58	97.75	25	479	0.35	0.026	0.02	9.12	0.02	0.000
2.32	2.48	36.22	2.67	96.88	25	470	0.35	0.028	0.02	9.12	0.02	0.000
2.42	2.53	32.53	2.91	94.67	25	447	0.36	0.034	0.03	9.12	0.02	0.001
2.46	2.55	31.34	3.01	94.33	25	441	0.36	0.037	0.03	9.12	0.02	0.000
2.54	2.56	30.30	3.06	92.83	25	432	0.36	0.041	0.03	9.12	0.03	0.001
2.57	2.56	29.86	3.09	92.33	24	428	0.36	0.043	0.03	9.12	0.03	0.000
2.64	2.55	29.86	3.04	90.65	24	423	0.36	0.047	0.04	9.12	0.03	0.000
2.71	2.58	28.23	3.18	89.77	24	413	0.36	0.054	0.04	9.12	0.03	0.001
2.76	2.56	28.51	3.12	88.87	24	411	0.36	0.056	0.05	9.12	0.04	0.000
2.85	2.54	29.25	2.97	86.88	23	408	0.36	0.061	0.05	9.12	0.04	0.001
2.89	2.54	29.24	2.96	86.47	23	406	0.36	0.064	0.06	9.12	0.04	0.000
2.98	2.53	29.23	2.94	86.05	23	405	0.36	0.069	0.06	9.12	0.05	0.001
3.02	2.52	29.66	2.90	85.90	22	406	0.36	0.069	0.06	9.12	0.05	0.000
3.10	2.52	29.96	2.86	85.80	22	407	0.36	0.072	0.06	9.12	0.05	0.001
3.20	2.49	31.43	2.74	86.09	22	414	0.36	0.073	0.06	9.12	0.05	0.001

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	K_c	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
3.25	2.49	32.01	2.70	86.31	22	417	0.35	0.073	0.06	9.12	0.05	0.001
3.32	2.48	32.59	2.66	86.81	22	421	0.35	0.074	0.07	9.12	0.05	0.001
3.36	2.47	33.04	2.63	86.95	22	424	0.35	0.074	0.07	9.12	0.05	0.000
3.46	2.47	33.17	2.64	87.44	22	426	0.35	0.077	0.07	9.12	0.05	0.001
3.49	2.47	33.60	2.60	87.39	22	427	0.35	0.077	0.07	9.12	0.05	0.000
3.59	2.46	33.90	2.58	87.56	22	429	0.35	0.080	0.07	9.12	0.06	0.001
3.64	2.47	33.75	2.61	88.07	22	430	0.35	0.082	0.07	9.12	0.06	0.001
3.68	2.46	34.33	2.57	88.35	22	433	0.35	0.081	0.07	9.12	0.06	0.001
3.76	2.46	34.62	2.57	88.88	22	436	0.35	0.083	0.07	9.12	0.06	0.001
3.81	2.46	34.62	2.59	89.56	23	439	0.35	0.084	0.07	9.12	0.06	0.001
3.91	2.46	35.35	2.57	90.71	23	445	0.35	0.084	0.07	9.12	0.06	0.001
3.96	2.46	35.63	2.56	91.21	23	448	0.35	0.084	0.07	9.12	0.06	0.001
4.04	2.46	35.63	2.59	92.19	23	451	0.35	0.085	0.07	9.12	0.06	0.001
4.09	2.48	34.59	2.69	93.07	24	450	0.35	0.088	0.07	9.12	0.06	0.001
4.20	2.50	34.13	2.77	94.61	24	454	0.35	0.090	0.07	9.12	0.06	0.002
4.26	2.52	32.95	2.89	95.38	25	451	0.35	0.095	0.07	9.12	0.06	0.001
4.31	2.56	31.47	3.06	96.41	26	448	0.35	0.099	0.07	9.12	0.06	0.001
4.36	2.53	29.39	2.92	85.77	22	405	0.35	0.153	0.13	9.12	0.11	0.001
4.45	2.54	26.88	2.98	80.20	21	376	0.36	0.223	0.21	9.12	0.17	0.004
4.51	2.58	25.99	3.22	83.67	22	383	0.36	0.212	0.18	9.12	0.15	0.002
4.57	2.62	25.53	3.43	87.52	0	0	0.36	0.000	0.00	0.00	0.00	0.000
4.62	2.67	24.36	3.80	92.59	0	0	0.36	0.000	0.00	0.00	0.00	0.000
4.66	2.72	23.61	4.13	97.60	0	0	0.36	0.000	0.00	0.00	0.00	0.000
4.74	2.90	18.59	5.73	106.43	0	0	0.36	0.000	0.00	0.00	0.00	0.000
4.83	2.91	19.46	5.77	112.25	0	0	0.36	0.000	0.00	0.00	0.00	0.000
4.88	2.96	18.13	6.26	113.41	0	0	0.36	0.000	0.00	0.00	0.00	0.000
4.93	3.01	16.50	6.90	113.79	0	0	0.36	0.000	0.00	0.00	0.00	0.000
5.01	2.95	18.11	6.18	111.91	0	0	0.36	0.000	0.00	0.00	0.00	0.000
5.05	2.98	16.93	6.56	111.13	0	0	0.36	0.000	0.00	0.00	0.00	0.000
5.14	2.93	18.10	6.02	108.98	0	0	0.36	0.000	0.00	0.00	0.00	0.000
5.19	2.86	19.86	5.35	106.32	0	0	0.36	0.000	0.00	0.00	0.00	0.000
5.26	2.76	22.67	4.44	100.73	0	0	0.36	0.000	0.00	0.00	0.00	0.000
5.32	2.67	25.46	3.81	97.10	0	0	0.35	0.000	0.00	0.00	0.00	0.000
5.41	2.55	30.62	3.02	92.38	24	432	0.35	0.189	0.15	9.12	0.12	0.002
5.45	2.53	31.65	2.91	92.02	24	435	0.35	0.186	0.15	9.12	0.12	0.001
5.53	2.47	35.48	2.60	92.19	23	451	0.35	0.165	0.14	9.12	0.11	0.002
5.58	2.44	37.55	2.50	93.96	24	465	0.35	0.149	0.12	9.12	0.10	0.001
5.67	2.42	40.48	2.38	96.44	24	484	0.35	0.131	0.11	9.12	0.08	0.002
5.72	2.40	42.40	2.32	98.44	24	498	0.35	0.120	0.10	9.12	0.08	0.001
5.81	2.39	44.76	2.28	101.95	25	518	0.35	0.107	0.08	9.12	0.07	0.001
5.85	2.37	47.40	2.20	104.22	25	535	0.35	0.097	0.07	9.12	0.06	0.001
5.94	2.35	51.53	2.11	108.68	26	564	0.34	0.083	0.06	9.12	0.05	0.001
5.99	2.35	52.55	2.11	110.78	27	575	0.34	0.080	0.06	9.12	0.05	0.001
6.08	2.31	58.15	1.98	115.22	27	607	0.34	0.069	0.05	9.12	0.04	0.001
6.12	2.31	59.19	1.98	117.18	28	618	0.34	0.066	0.04	9.12	0.04	0.000
6.19	2.29	62.43	1.93	120.48	28	639	0.34	0.061	0.04	9.12	0.03	0.001
6.26	2.29	65.52	1.90	124.59	29	663	0.33	0.056	0.04	9.12	0.03	0.001
6.34	2.29	68.02	1.91	130.09	30	691	0.33	0.052	0.03	9.12	0.02	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	K_c	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
6.38	2.29	69.34	1.91	132.34	31	703	0.33	0.050	0.03	9.12	0.02	0.000
6.44	2.29	71.40	1.90	136.00	32	723	0.33	0.047	0.03	9.12	0.02	0.000
6.52	2.28	74.35	1.88	140.09	33	747	0.33	0.044	0.02	9.12	0.02	0.000
6.60	2.28	76.40	1.87	143.09	33	764	0.33	0.043	0.02	9.12	0.02	0.000
6.69	2.27	78.61	1.86	146.15	34	781	0.33	0.042	0.02	9.12	0.02	0.000
6.74	2.27	79.34	1.85	146.56	34	784	0.33	0.042	0.02	9.12	0.02	0.000
6.77	2.27	79.63	1.85	147.06	34	787	0.33	0.042	0.02	9.12	0.02	0.000
6.83	2.27	80.22	1.85	148.21	34	793	0.33	0.041	0.02	9.12	0.02	0.000
6.91	2.27	81.39	1.84	150.12	35	804	0.33	0.041	0.02	9.12	0.02	0.000
6.97	2.27	81.38	1.85	150.89	35	807	0.33	0.041	0.02	9.12	0.02	0.000
7.06	2.27	81.68	1.86	152.09	35	813	0.33	0.041	0.02	9.12	0.02	0.000
7.10	2.27	81.96	1.86	152.80	36	816	0.33	0.041	0.02	9.12	0.02	0.000
7.19	2.27	82.69	1.86	153.99	36	823	0.33	0.041	0.02	9.12	0.02	0.000
7.24	2.27	82.69	1.87	154.40	36	825	0.33	0.042	0.02	9.12	0.02	0.000
7.29	2.27	82.83	1.86	154.31	36	825	0.33	0.042	0.02	9.12	0.02	0.000
7.35	2.28	82.39	1.88	154.51	36	824	0.33	0.043	0.02	9.12	0.02	0.000
7.45	2.13	82.38	1.51	124.69	27	686	0.33	0.070	0.05	9.12	0.04	0.001
7.49	2.08	82.22	1.41	116.14	25	638	0.33	0.089	0.07	9.12	0.05	0.001
7.59	2.13	81.48	1.52	123.68	27	680	0.33	0.075	0.05	9.12	0.04	0.001
7.64	2.15	81.48	1.56	126.77	28	696	0.33	0.071	0.05	9.12	0.04	0.000
7.71	2.17	81.47	1.60	130.26	29	713	0.33	0.067	0.04	9.12	0.03	0.001
7.75	2.17	83.24	1.60	133.48	30	731	0.33	0.063	0.04	9.12	0.03	0.000
7.82	2.21	81.01	1.69	136.94	31	745	0.33	0.061	0.04	9.12	0.03	0.000
7.88	2.21	83.45	1.68	140.26	32	763	0.33	0.058	0.03	9.12	0.03	0.000
7.95	2.22	83.65	1.72	143.89	33	780	0.33	0.055	0.03	9.12	0.02	0.000
8.04	2.22	86.00	1.73	148.72	34	806	0.33	0.052	0.03	9.12	0.02	0.000
8.07	2.23	86.60	1.73	149.95	34	812	0.33	0.051	0.03	9.12	0.02	0.000
8.18	2.23	88.50	1.73	153.22	35	830	0.32	0.050	0.03	9.12	0.02	0.001
8.20	2.23	88.80	1.73	154.03	35	834	0.32	0.050	0.03	9.12	0.02	0.000
8.28	2.22	90.27	1.72	155.71	35	844	0.32	0.049	0.02	9.12	0.02	0.000
8.35	2.23	89.52	1.75	156.74	36	848	0.32	0.049	0.02	9.12	0.02	0.000
8.41	2.26	86.70	1.82	157.39	36	845	0.33	0.050	0.02	9.12	0.02	0.000
8.48	2.28	83.45	1.90	158.51	37	843	0.33	0.051	0.02	9.12	0.02	0.000
8.54	2.32	79.46	2.01	160.01	38	840	0.33	0.052	0.02	9.12	0.02	0.000
8.62	2.34	78.13	2.07	161.89	39	844	0.33	0.052	0.02	9.12	0.02	0.000
8.67	2.33	79.30	2.05	162.92	39	851	0.33	0.052	0.02	9.12	0.02	0.000
8.74	2.32	81.37	2.01	163.28	39	858	0.33	0.051	0.02	9.12	0.02	0.000
8.83	2.33	80.17	2.05	163.97	39	857	0.33	0.052	0.02	9.12	0.02	0.000
8.89	2.33	79.57	2.05	163.23	39	853	0.33	0.054	0.02	9.12	0.02	0.000
8.93	2.33	79.13	2.04	161.39	38	845	0.33	0.055	0.03	9.12	0.02	0.000
9.02	2.33	76.16	2.05	156.01	37	815	0.34	0.061	0.03	9.12	0.02	0.000
9.06	2.33	74.68	2.05	153.37	37	801	0.34	0.065	0.03	9.12	0.03	0.000
9.15	2.34	70.48	2.10	147.67	35	768	0.34	0.074	0.04	9.12	0.03	0.001
9.19	2.35	68.65	2.14	146.74	35	760	0.34	0.077	0.04	9.12	0.03	0.000
9.26	2.38	65.46	2.23	145.79	36	746	0.34	0.082	0.04	9.12	0.03	0.000
9.33	2.41	61.67	2.35	144.65	36	729	0.35	0.089	0.04	9.12	0.04	0.001
9.46	2.43	58.02	2.46	142.68	36	712	0.35	0.098	0.05	9.12	0.04	0.001
9.50	2.43	57.63	2.45	141.36	35	709	0.35	0.100	0.05	9.12	0.04	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	K_c	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
9.55	2.42	57.86	2.41	139.71	35	708	0.35	0.102	0.05	9.12	0.04	0.000
9.63	2.42	57.55	2.40	137.87	34	706	0.35	0.104	0.05	9.12	0.04	0.001
9.65	2.41	58.24	2.34	136.16	34	706	0.35	0.105	0.06	9.12	0.05	0.000
9.75	2.38	57.49	2.25	129.17	32	686	0.35	0.117	0.07	9.12	0.05	0.001
9.79	2.35	56.65	2.11	119.55	29	654	0.35	0.140	0.09	9.12	0.07	0.001
9.89	2.28	53.08	1.88	99.55	23	574	0.35	0.235	0.20	9.12	0.16	0.004
9.94	2.30	52.03	1.93	100.68	24	576	0.35	0.234	0.19	9.12	0.15	0.002
9.99	2.32	50.72	2.01	101.74	24	576	0.35	0.236	0.19	9.12	0.15	0.002
10.07	2.34	49.59	2.09	103.63	25	581	0.35	0.231	0.18	9.12	0.14	0.003
10.12	2.35	49.40	2.12	104.95	25	587	0.35	0.224	0.17	9.12	0.14	0.001
10.21	2.38	49.10	2.22	108.87	26	603	0.35	0.206	0.15	9.12	0.12	0.003
10.26	2.40	48.38	2.30	111.21	27	609	0.35	0.199	0.14	9.12	0.11	0.001
10.30	2.40	48.81	2.31	112.87	28	619	0.35	0.189	0.13	9.12	0.10	0.001
10.39	2.41	49.85	2.36	117.82	29	644	0.35	0.165	0.11	9.12	0.08	0.002
10.46	2.41	50.41	2.37	119.54	30	656	0.35	0.157	0.10	9.12	0.08	0.001
10.53	2.41	50.67	2.37	120.13	30	663	0.35	0.153	0.09	9.12	0.08	0.001
10.57	2.41	50.65	2.37	120.11	30	665	0.35	0.153	0.09	9.12	0.08	0.001
10.66	2.42	50.08	2.40	119.96	30	666	0.35	0.154	0.10	9.12	0.08	0.002
10.71	2.44	48.99	2.46	120.57	30	664	0.35	0.157	0.10	9.12	0.08	0.001
10.79	2.41	50.80	2.36	119.92	30	676	0.35	0.150	0.09	9.12	0.07	0.002
10.83	2.40	51.70	2.31	119.45	29	682	0.35	0.147	0.09	9.12	0.07	0.001
10.90	2.34	56.15	2.09	117.45	28	700	0.35	0.136	0.09	9.12	0.07	0.001
10.97	2.29	60.79	1.91	116.38	27	719	0.35	0.126	0.09	9.12	0.07	0.001
11.06	2.25	64.78	1.79	115.75	27	736	0.34	0.118	0.08	9.12	0.07	0.001
11.10	2.24	65.06	1.78	115.61	27	738	0.34	0.118	0.08	9.12	0.07	0.001
11.19	2.30	59.97	1.95	116.96	28	729	0.35	0.125	0.08	9.12	0.07	0.002
11.23	2.30	60.40	1.95	117.68	28	736	0.35	0.122	0.08	9.12	0.07	0.001
11.30	2.30	59.87	1.95	116.75	27	733	0.35	0.125	0.09	9.12	0.07	0.001
11.37	2.32	58.42	2.01	117.33	28	733	0.35	0.126	0.08	9.12	0.07	0.001
11.46	2.36	56.77	2.16	122.79	30	751	0.35	0.118	0.07	9.12	0.06	0.001
11.49	2.38	56.29	2.21	124.65	30	757	0.35	0.116	0.07	9.12	0.06	0.000
11.59	2.40	55.65	2.32	129.19	32	776	0.35	0.109	0.06	9.12	0.05	0.001
11.63	2.40	56.22	2.31	130.10	32	785	0.35	0.106	0.06	9.12	0.05	0.000
11.68	2.39	57.53	2.28	131.23	32	799	0.35	0.101	0.06	9.12	0.05	0.001
11.75	2.39	58.31	2.27	132.18	32	811	0.35	0.098	0.05	9.12	0.04	0.001
11.81	2.40	57.06	2.31	131.79	32	806	0.35	0.100	0.06	9.12	0.05	0.001
11.90	2.41	54.44	2.37	129.20	32	787	0.35	0.110	0.06	9.12	0.05	0.001
11.95	2.42	52.95	2.39	126.39	31	771	0.35	0.118	0.07	9.12	0.05	0.001
12.03	2.47	46.77	2.64	123.42	31	728	0.36	0.144	0.08	9.12	0.07	0.001
12.07	2.50	44.04	2.78	122.62	32	711	0.36	0.157	0.09	9.12	0.07	0.001
12.14	2.55	39.97	3.02	120.87	32	681	0.36	0.185	0.11	9.12	0.08	0.001
12.21	2.56	38.38	3.07	117.98	31	664	0.36	0.206	0.12	9.12	0.10	0.001
12.29	2.49	37.83	2.70	102.07	26	607	0.36	0.299	0.22	9.12	0.17	0.003
12.37	2.43	37.39	2.46	91.92	23	570	0.36	0.402	0.34	9.12	0.27	0.006
12.43	2.43	38.40	2.44	93.86	23	585	0.36	0.360	0.30	9.12	0.24	0.003
12.48	2.41	40.43	2.37	95.91	24	606	0.36	0.311	0.25	9.12	0.20	0.002
12.56	2.38	44.76	2.23	100.00	24	650	0.36	0.237	0.19	9.12	0.15	0.003
12.61	2.37	46.17	2.19	101.11	25	664	0.36	0.220	0.17	9.12	0.14	0.002

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	K_c	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
12.67	2.46	40.53	2.57	104.04	26	647	0.36	0.246	0.18	9.12	0.14	0.002
12.74	2.44	42.53	2.46	104.81	26	664	0.36	0.224	0.16	9.12	0.13	0.002
12.80	2.47	40.80	2.61	106.65	27	664	0.36	0.227	0.16	9.12	0.13	0.002
12.89	2.51	38.82	2.82	109.32	28	666	0.36	0.228	0.15	9.12	0.12	0.002
12.93	2.56	36.15	3.08	111.25	29	657	0.36	0.242	0.15	9.12	0.12	0.001
13.02	2.59	34.36	3.27	112.53	30	652	0.36	0.252	0.15	9.12	0.12	0.002
13.07	2.61	33.28	3.39	112.94	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.13	2.61	33.25	3.38	112.24	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.20	2.65	31.16	3.62	112.68	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.29	2.68	29.60	3.86	114.14	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.34	2.65	31.13	3.68	114.49	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.40	2.66	31.26	3.74	116.83	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.46	2.67	31.48	3.77	118.67	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.54	2.64	33.02	3.60	118.94	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.60	2.64	33.33	3.59	119.57	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.68	2.66	32.53	3.73	121.29	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.73	2.68	31.72	3.87	122.68	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.82	2.68	32.40	3.83	123.99	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.85	2.69	31.60	3.94	124.58	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.95	2.68	32.12	3.87	124.29	0	0	0.36	0.000	0.00	0.00	0.00	0.000
13.99	2.70	31.53	3.97	125.23	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.07	2.70	31.92	4.03	128.70	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.13	2.72	31.53	4.15	130.92	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.18	2.73	31.66	4.20	132.98	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.30	2.74	32.50	4.29	139.42	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.35	2.76	31.60	4.45	140.65	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.39	2.78	30.81	4.62	142.29	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.44	2.79	30.42	4.74	144.08	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.52	2.84	28.41	5.11	145.24	0	0	0.37	0.000	0.00	0.00	0.00	0.000
14.57	2.77	31.76	4.50	143.01	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.66	2.74	31.83	4.33	137.97	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.70	2.73	32.13	4.20	134.83	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.79	2.70	32.38	3.97	128.48	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.84	2.67	32.85	3.80	124.97	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.92	2.64	33.82	3.60	121.74	0	0	0.36	0.000	0.00	0.00	0.00	0.000
14.96	2.58	36.79	3.23	118.79	32	783	0.36	0.169	0.10	9.12	0.08	0.001
15.06	2.56	36.82	3.11	114.45	30	769	0.36	0.182	0.11	9.12	0.09	0.002
15.10	2.54	37.68	2.98	112.37	30	768	0.36	0.184	0.12	9.12	0.09	0.001
15.19	2.50	40.00	2.75	109.93	28	776	0.36	0.179	0.12	9.12	0.09	0.002
15.24	2.49	40.27	2.72	109.53	28	778	0.36	0.179	0.12	9.12	0.09	0.001
15.32	2.49	40.09	2.73	109.61	28	781	0.36	0.178	0.12	9.12	0.09	0.002
15.36	2.50	39.70	2.77	110.14	28	783	0.36	0.178	0.12	9.12	0.09	0.001
15.43	2.50	39.94	2.77	110.45	28	789	0.36	0.175	0.11	9.12	0.09	0.001
15.50	2.49	40.27	2.74	110.15	28	793	0.36	0.173	0.11	9.12	0.09	0.001
15.59	2.49	40.56	2.71	110.08	28	798	0.36	0.171	0.11	9.12	0.09	0.002
15.64	2.50	40.07	2.76	110.52	28	799	0.36	0.171	0.11	9.12	0.09	0.001
15.76	2.43	40.23	2.44	98.01	24	743	0.36	0.225	0.18	9.12	0.14	0.004
15.82	2.38	40.21	2.24	90.21	22	704	0.36	0.279	0.25	9.12	0.20	0.003

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	K_c	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
15.86	2.42	39.23	2.38	93.29	23	716	0.36	0.262	0.22	9.12	0.18	0.002
15.91	2.42	39.62	2.41	95.43	24	732	0.36	0.243	0.20	9.12	0.16	0.002
15.97	2.45	39.25	2.52	98.90	25	750	0.36	0.223	0.17	9.12	0.14	0.002
16.05	2.51	36.42	2.82	102.72	27	753	0.36	0.221	0.16	9.12	0.13	0.002
16.08	2.66	28.79	3.72	106.99	0	0	0.37	0.000	0.00	0.00	0.00	0.000
16.15	2.56	34.30	3.11	106.74	28	762	0.36	0.215	0.14	9.12	0.11	0.002
16.22	2.57	34.36	3.18	109.15	29	777	0.36	0.202	0.13	9.12	0.10	0.002
16.29	2.58	34.81	3.21	111.60	30	795	0.36	0.188	0.12	9.12	0.09	0.002
16.34	2.58	35.00	3.23	112.88	30	804	0.36	0.181	0.11	9.12	0.09	0.001
16.43	2.59	34.79	3.29	114.46	31	814	0.36	0.176	0.10	9.12	0.08	0.002
16.47	2.60	34.67	3.32	115.02	31	818	0.36	0.174	0.10	9.12	0.08	0.001
16.56	2.57	36.61	3.13	114.75	31	835	0.36	0.164	0.10	9.12	0.08	0.002
16.62	2.56	37.22	3.10	115.19	31	845	0.36	0.159	0.10	9.12	0.08	0.001
16.68	2.57	37.06	3.12	115.65	31	849	0.36	0.158	0.09	9.12	0.08	0.001
16.75	2.56	37.15	3.11	115.67	31	852	0.36	0.156	0.09	9.12	0.07	0.001
16.81	2.57	36.74	3.14	115.48	31	851	0.36	0.158	0.09	9.12	0.08	0.001
16.87	2.58	36.09	3.20	115.46	31	849	0.36	0.161	0.10	9.12	0.08	0.001
16.93	2.57	36.60	3.14	115.03	31	853	0.36	0.159	0.10	9.12	0.08	0.001

Total estimated settlement: 0.20

Abbreviations

Q_{tn}:	Normalized cone resistance
K_c:	Fines correction factor
$Q_{tn,cs}$:	Equivalent clean sand normalized cone resistance
G_{max}:	Small strain shear modulus
CSR:	Soil cyclic stress ratio
γ:	Cyclic shear strain
$e_{vol(15)}$:	Volumetric strain after 15 cycles
N_c:	Equivalent number of cycles
e_v:	Volumetric strain
Settle.:	Calculated settlement

:: Post-earthquake settlement due to soil liquefaction ::

Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
17.00	86.40	0.34	2.63	1.00	0.02	17.09	87.60	0.34	2.60	1.00	0.03
17.13	89.51	0.35	2.56	1.00	0.01	17.20	86.33	0.33	2.64	1.00	0.02
17.27	86.24	0.33	2.64	1.00	0.02	17.36	89.94	0.34	2.55	1.00	0.03
17.40	90.00	0.34	2.55	1.00	0.01	17.46	90.02	0.34	2.55	1.00	0.02
17.53	90.02	0.34	2.55	1.00	0.02	17.62	89.13	0.34	2.57	1.00	0.03
17.67	90.15	0.34	2.54	1.00	0.02	17.75	90.14	0.34	2.54	1.00	0.02
17.81	90.37	0.34	2.54	1.00	0.02	17.85	92.37	0.35	2.49	1.00	0.01
17.93	94.08	0.35	2.46	1.00	0.02	17.99	98.52	0.37	2.37	1.00	0.02
18.06	99.48	0.37	2.35	1.00	0.02	18.11	103.70	0.39	2.27	1.00	0.01
18.18	106.57	0.40	2.22	1.00	0.02	18.29	112.93	0.43	2.12	1.00	0.03
18.33	115.84	0.45	2.07	1.00	0.01	18.40	119.66	0.48	2.02	1.00	0.02
18.46	123.05	0.50	1.97	1.00	0.02	18.54	127.81	0.54	1.91	1.00	0.02
18.57	129.87	0.56	1.89	1.00	0.01	18.64	139.01	0.66	1.54	1.00	0.01
18.72	147.89	0.81	1.15	1.00	0.01	18.85	168.04	1.46	0.00	1.00	0.00
18.92	183.35	2.00	0.00	1.00	0.00	18.99	200.89	2.00	0.00	1.00	0.00
19.04	210.50	2.00	0.00	1.00	0.00	19.13	216.32	2.00	0.00	1.00	0.00
19.16	219.32	2.00	0.00	1.00	0.00	19.25	243.62	2.00	0.00	1.00	0.00

:: Post-earthquake settlement due to soil liquefaction :: (continued)

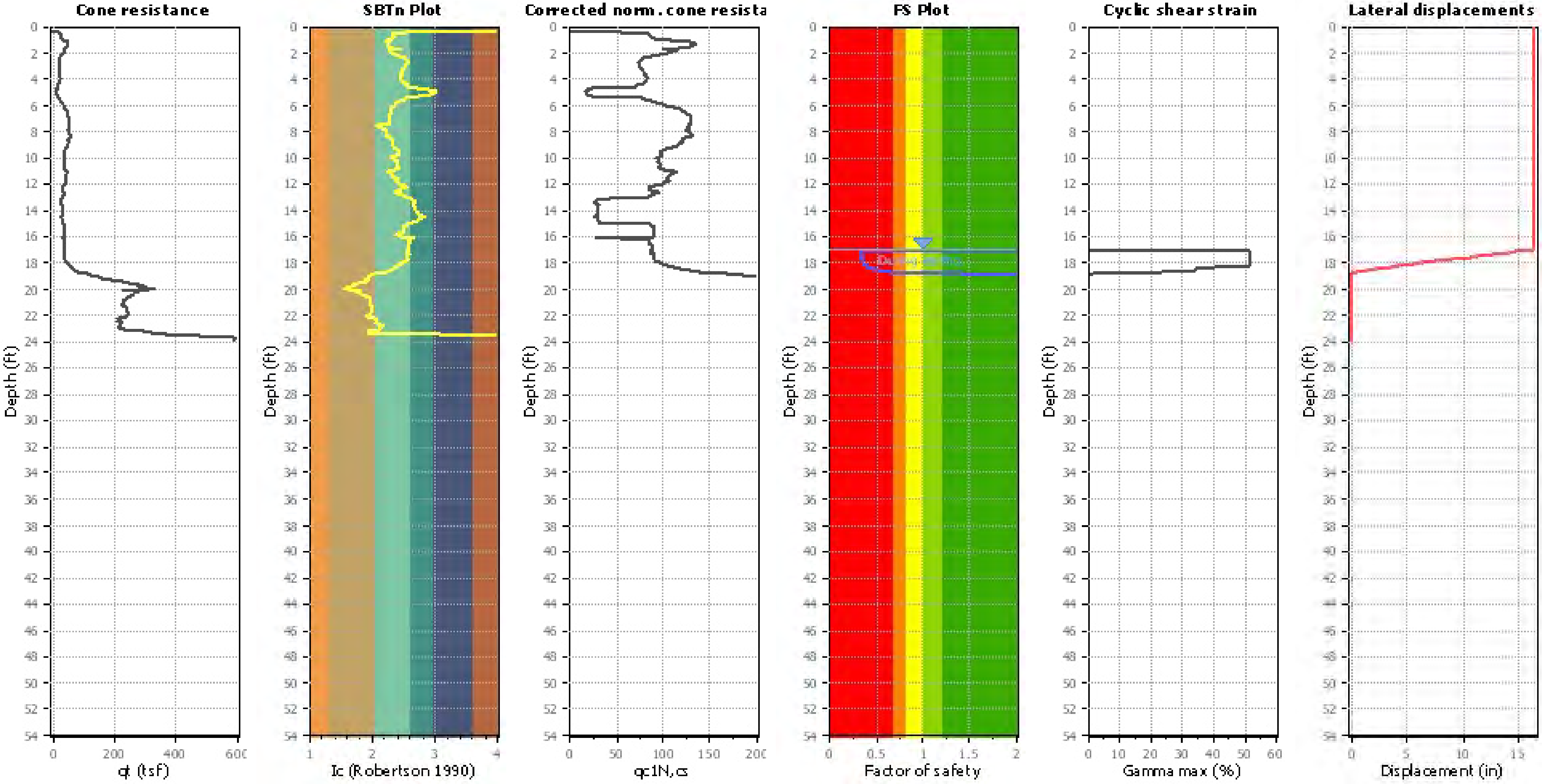
Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)	Depth (ft)	$q_{c1N,cs}$	FS	e_v (%)	DF	Settlement (in)
19.29	254.00	2.00	0.00	1.00	0.00	19.38	254.00	2.00	0.00	1.00	0.00
19.42	254.00	2.00	0.00	1.00	0.00	19.52	254.00	2.00	0.00	1.00	0.00
19.60	254.00	2.00	0.00	1.00	0.00	19.64	254.00	2.00	0.00	1.00	0.00
19.69	254.00	2.00	0.00	1.00	0.00	19.75	254.00	2.00	0.00	1.00	0.00
19.82	254.00	2.00	0.00	1.00	0.00	19.89	254.00	2.00	0.00	1.00	0.00
19.95	254.00	2.00	0.00	1.00	0.00	20.04	254.00	2.00	0.00	1.00	0.00
20.08	254.00	2.00	0.00	1.00	0.00	20.15	254.00	2.00	0.00	1.00	0.00
20.21	254.00	2.00	0.00	1.00	0.00	20.30	254.00	2.00	0.00	1.00	0.00
20.34	254.00	2.00	0.00	1.00	0.00	20.42	254.00	2.00	0.00	1.00	0.00
20.48	254.00	2.00	0.00	1.00	0.00	20.57	254.00	2.00	0.00	1.00	0.00
20.61	254.00	2.00	0.00	1.00	0.00	20.69	254.00	2.00	0.00	1.00	0.00
20.74	254.00	2.00	0.00	1.00	0.00	20.82	254.00	2.00	0.00	1.00	0.00
20.88	254.00	2.00	0.00	1.00	0.00	20.94	254.00	2.00	0.00	1.00	0.00
21.00	254.00	2.00	0.00	1.00	0.00	21.09	254.00	2.00	0.00	1.00	0.00
21.14	254.00	2.00	0.00	1.00	0.00	21.20	254.00	2.00	0.00	1.00	0.00
21.27	254.00	2.00	0.00	1.00	0.00	21.34	254.00	2.00	0.00	1.00	0.00
21.41	254.00	2.00	0.00	1.00	0.00	21.49	254.00	2.00	0.00	1.00	0.00
21.54	254.00	2.00	0.00	1.00	0.00	21.60	254.00	2.00	0.00	1.00	0.00
21.67	254.00	2.00	0.00	1.00	0.00	21.74	254.00	2.00	0.00	1.00	0.00
21.80	254.00	2.00	0.00	1.00	0.00	21.86	254.00	2.00	0.00	1.00	0.00
21.94	254.00	2.00	0.00	1.00	0.00	22.01	254.00	2.00	0.00	1.00	0.00
22.05	254.00	2.00	0.00	1.00	0.00	22.12	254.00	2.00	0.00	1.00	0.00
22.19	254.00	2.00	0.00	1.00	0.00	22.25	254.00	2.00	0.00	1.00	0.00
22.34	254.00	2.00	0.00	1.00	0.00	22.39	254.00	2.00	0.00	1.00	0.00
22.48	254.00	2.00	0.00	1.00	0.00	22.52	254.00	2.00	0.00	1.00	0.00
22.60	254.00	2.00	0.00	1.00	0.00	22.66	254.00	2.00	0.00	1.00	0.00
22.74	254.00	2.00	0.00	1.00	0.00	22.77	254.00	2.00	0.00	1.00	0.00
22.85	254.00	2.00	0.00	1.00	0.00	22.92	254.00	2.00	0.00	1.00	0.00
23.01	254.00	2.00	0.00	1.00	0.00	23.05	254.00	2.00	0.00	1.00	0.00
23.10	254.00	2.00	0.00	1.00	0.00	23.17	254.00	2.00	0.00	1.00	0.00
23.25	254.00	2.00	0.00	1.00	0.00	23.32	254.00	2.00	0.00	1.00	0.00
23.40	254.00	2.00	0.00	1.00	0.00	23.43	330.98	2.00	0.00	1.00	0.00
23.52	387.10	2.00	0.00	1.00	0.00	23.58	436.35	2.00	0.00	1.00	0.00
23.63	493.60	2.00	0.00	1.00	0.00	23.69	516.84	2.00	0.00	1.00	0.00
23.76	510.32	2.00	0.00	1.00	0.00						

Total estimated settlement: 0.49

Abbreviations

$Q_{tn,cs}$: Equivalent clean sand normalized cone resistance
FS: Factor of safety against liquefaction
e_v (%): Post-liquefaction volumentric strain
DF: e_v depth weighting factor
Settlement: Calculated settlement

Estimation of post-earthquake lateral Displacements



Abbreviations

q_t: Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c: Soil Behaviour Type Index
$q_{c1N,cs}$: Equivalent clean sand normalized CPT total cone resistance

F.S.: Factor of safety
γ_{max}: Maximum cyclic shear strain
LDI: Lateral displacement index

:: Lateral displacement index calculation ::

Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	$Gamma_{max}$ (%)	Lat. disp. (in)
17.00	36.72	35.57	3.14	86.40	0.34	32.88	51.20	0.74
17.09	37.82	36.48	3.04	87.60	0.34	33.72	51.20	0.89
17.13	39.47	38.00	2.91	89.51	0.35	35.06	51.20	0.48
17.20	36.89	35.35	3.11	86.33	0.33	32.68	51.20	0.70
17.27	36.90	35.23	3.14	86.24	0.33	32.57	51.20	0.73
17.36	40.11	38.18	2.98	89.94	0.34	35.22	51.20	0.92
17.40	40.21	38.19	3.03	90.00	0.34	35.23	51.20	0.46
17.46	40.30	38.16	3.08	90.02	0.34	35.21	51.20	0.60
17.53	40.39	38.11	3.08	90.02	0.34	35.16	51.20	0.75
17.62	39.75	37.31	3.13	89.13	0.34	34.46	51.20	0.95
17.67	40.67	38.09	3.06	90.15	0.34	35.15	51.20	0.54
17.75	40.75	38.02	3.06	90.14	0.34	35.08	51.20	0.84
17.81	41.02	38.16	3.09	90.37	0.34	35.21	51.20	0.59
17.85	42.77	39.75	2.99	92.37	0.35	36.55	51.20	0.45
17.93	44.33	41.06	2.89	94.08	0.35	37.62	51.20	0.86
17.99	48.19	44.58	2.61	98.52	0.37	40.34	51.20	0.63
18.06	49.11	45.30	2.60	99.48	0.37	40.86	51.20	0.75
18.11	52.79	48.64	2.55	103.70	0.39	43.21	51.20	0.53
18.18	55.36	50.88	2.49	106.57	0.40	44.70	51.20	0.77
18.29	60.96	55.88	2.37	112.93	0.43	47.79	34.10	0.71
18.33	63.53	58.16	2.38	115.84	0.45	49.11	34.10	0.31
18.40	66.93	61.14	2.37	119.66	0.48	50.76	34.10	0.49
18.46	69.95	63.77	2.34	123.05	0.50	52.15	34.10	0.45
18.54	74.19	67.46	2.32	127.81	0.54	54.01	34.10	0.55
18.57	76.01	69.06	2.32	129.87	0.56	54.78	34.10	0.21
18.64	84.01	76.26	2.15	139.01	0.66	58.05	22.02	0.30
18.72	91.82	83.20	2.07	147.89	0.81	60.93	9.14	0.15
18.85	109.45	99.11	1.46	168.04	1.46	66.70	1.06	0.03
18.92	122.77	111.08	1.45	183.35	2.00	70.47	0.00	0.00
18.99	138.02	124.82	1.34	200.89	2.00	74.32	0.00	0.00
19.04	146.37	132.24	1.40	210.50	2.00	76.22	0.00	0.00
19.13	151.61	136.47	1.55	216.32	2.00	77.26	0.00	0.00
19.16	154.28	138.70	1.59	219.32	2.00	77.80	0.00	0.00
19.25	175.30	157.44	1.56	243.62	2.00	81.98	0.00	0.00
19.29	185.97	166.85	1.57	254.00	2.00	83.90	0.00	0.00
19.38	204.80	182.95	1.98	254.00	2.00	86.94	0.00	0.00
19.42	219.31	195.82	1.95	254.00	2.00	89.18	0.00	0.00
19.52	242.63	216.77	1.55	254.00	2.00	92.54	0.00	0.00
19.60	262.93	235.08	1.26	254.00	2.00	95.21	0.00	0.00
19.64	270.74	241.72	1.32	254.00	2.00	96.13	0.00	0.00
19.69	289.38	258.05	1.36	254.00	2.00	98.29	0.00	0.00
19.75	287.45	256.36	1.14	254.00	2.00	98.07	0.00	0.00
19.82	277.72	247.06	1.12	254.00	2.00	96.85	0.00	0.00
19.89	324.92	289.97	0.92	254.00	2.00	100.00	0.00	0.00
19.95	329.61	293.73	0.92	254.00	2.00	100.00	0.00	0.00
20.04	299.48	265.09	1.07	254.00	2.00	99.18	0.00	0.00
20.08	229.21	200.77	1.46	254.00	2.00	90.01	0.00	0.00
20.15	275.59	242.17	1.28	254.00	2.00	96.19	0.00	0.00

:: Lateral displacement index calculation ::

Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	$Gamma_{max}$ (%)	Lat. disp. (in)
20.21	268.61	235.04	1.41	254.00	2.00	95.21	0.00	0.00
20.30	260.35	226.52	1.61	254.00	2.00	93.99	0.00	0.00
20.34	259.98	225.67	1.69	254.00	2.00	93.86	0.00	0.00
20.42	255.94	221.14	1.85	254.00	2.00	93.20	0.00	0.00
20.48	251.81	216.79	1.97	254.00	2.00	92.54	0.00	0.00
20.57	246.21	210.86	2.14	254.00	2.00	91.62	0.00	0.00
20.61	242.44	207.10	2.21	254.00	2.00	91.03	0.00	0.00
20.69	237.11	201.59	2.32	254.00	2.00	90.14	0.00	0.00
20.74	235.64	199.87	2.37	254.00	2.00	89.86	0.00	0.00
20.82	231.51	195.76	2.33	254.00	2.00	89.17	0.00	0.00
20.88	229.95	194.10	2.29	254.00	2.00	88.89	0.00	0.00
20.94	228.02	192.05	2.26	254.00	2.00	88.54	0.00	0.00
21.00	227.38	191.14	2.22	254.00	2.00	88.38	0.00	0.00
21.09	227.93	190.98	2.21	254.00	2.00	88.36	0.00	0.00
21.14	225.63	188.60	2.25	254.00	2.00	87.94	0.00	0.00
21.20	227.84	190.00	2.27	254.00	2.00	88.19	0.00	0.00
21.27	229.12	190.44	2.34	254.00	2.00	88.26	0.00	0.00
21.34	232.89	193.09	2.38	254.00	2.00	88.72	0.00	0.00
21.41	237.20	196.18	2.42	254.00	2.00	89.24	0.00	0.00
21.49	237.57	195.77	2.47	254.00	2.00	89.17	0.00	0.00
21.54	237.76	195.53	2.49	254.00	2.00	89.13	0.00	0.00
21.60	237.48	194.84	2.52	254.00	2.00	89.01	0.00	0.00
21.67	239.96	196.51	2.46	254.00	2.00	89.30	0.00	0.00
21.74	243.63	199.21	2.41	254.00	2.00	89.75	0.00	0.00
21.80	246.21	201.12	2.34	254.00	2.00	90.06	0.00	0.00
21.86	244.09	198.97	2.30	254.00	2.00	89.71	0.00	0.00
21.94	242.35	197.43	2.13	254.00	2.00	89.45	0.00	0.00
22.01	237.94	193.85	1.92	254.00	2.00	88.85	0.00	0.00
22.05	237.11	192.57	2.01	254.00	2.00	88.63	0.00	0.00
22.12	234.82	189.67	2.21	254.00	2.00	88.13	0.00	0.00
22.19	212.22	169.91	2.44	254.00	2.00	84.50	0.00	0.00
22.25	209.93	167.42	2.55	254.00	2.00	84.01	0.00	0.00
22.34	211.63	168.07	2.65	254.00	2.00	84.14	0.00	0.00
22.39	211.03	167.13	2.72	254.00	2.00	83.95	0.00	0.00
22.48	216.72	171.27	2.69	254.00	2.00	84.76	0.00	0.00
22.52	223.43	176.48	2.68	254.00	2.00	85.75	0.00	0.00
22.60	225.36	177.08	2.88	254.00	2.00	85.86	0.00	0.00
22.66	220.31	172.09	3.15	254.00	2.00	84.92	0.00	0.00
22.74	211.86	163.98	3.59	254.00	2.00	83.32	0.00	0.00
22.77	220.43	170.95	3.41	254.00	2.00	84.70	0.00	0.00
22.85	212.67	164.40	3.31	254.00	2.00	83.41	0.00	0.00
22.92	220.57	170.78	3.06	254.00	2.00	84.66	0.00	0.00
23.01	220.80	170.33	3.09	254.00	2.00	84.58	0.00	0.00
23.05	221.04	170.15	3.12	254.00	2.00	84.54	0.00	0.00
23.10	248.96	193.06	2.73	254.00	2.00	88.71	0.00	0.00
23.17	283.67	222.02	2.25	254.00	2.00	93.33	0.00	0.00
23.25	310.76	243.05	2.30	254.00	2.00	96.31	0.00	0.00
23.32	329.68	256.62	2.57	254.00	2.00	98.11	0.00	0.00

:: Lateral displacement index calculation ::

Depth (ft)	q_t (tsf)	Q_{tn}	R_f (%)	$Q_{tn,cs}$	FS	D_r	$Gamma_{max}$ (%)	Lat. disp. (in)
23.40	356.68	277.73	2.54	254.00	2.00	100.00	0.00	0.00
23.43	378.35	265.76	0.00	330.98	2.00	99.26	0.00	0.00
23.52	442.84	310.37	0.00	387.10	2.00	100.00	0.00	0.00
23.58	499.41	349.52	0.00	436.35	2.00	100.00	0.00	0.00
23.63	565.17	395.08	0.00	493.60	2.00	100.00	0.00	0.00
23.69	592.09	413.13	0.00	516.84	2.00	100.00	0.00	0.00
23.76	584.92	407.32	0.00	510.32	2.00	100.00	0.00	0.00

Total estimated displacement: 16.36

Abbreviations

q_t:	Total cone resistance
Q_{tn}:	Adjusted cone resistance to an effective overburden stress of 1 atm
R_f:	Friction ration
$Q_{tn,cs}$:	Adjusted and corrected cone resistance due to fines
FS:	Calculated factor of safety against liquefaction
D_r:	Calculated relative density
$Gamma_{max}$:	Calculated maximum cyclic shear strain
Lat. disp.:	Lateral displacement

:: Strength loss calculation Idriss & Boulanger (2008) ::

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
0.08	-0.09	-1.00	26.61	-26.61	4.06	N/A	N/A
0.16	-0.09	-1.00	26.61	-26.61	4.06	N/A	N/A
0.20	-0.09	-1.00	26.61	-26.61	4.06	N/A	N/A
0.30	-0.09	-1.00	26.61	-26.61	4.06	N/A	N/A
0.35	1.75	2.78	19.73	54.82	3.78	N/A	N/A
0.40	8.45	13.55	5.22	70.65	2.85	N/A	N/A
0.49	22.32	35.82	2.02	72.19	2.32	N/A	N/A
0.53	23.51	37.73	1.99	75.11	2.31	N/A	N/A
0.64	24.52	39.34	2.02	79.64	2.32	N/A	N/A
0.69	24.89	39.93	2.03	80.94	2.32	N/A	N/A
0.73	24.06	38.59	2.10	81.23	2.35	N/A	N/A
0.80	24.80	39.77	2.06	81.79	2.33	N/A	N/A
0.88	26.82	43.01	1.99	85.47	2.31	N/A	N/A
0.93	28.56	45.80	1.94	88.94	2.30	N/A	N/A
1.02	35.73	57.31	1.79	102.72	2.25	N/A	N/A
1.06	35.73	57.31	1.88	107.90	2.28	N/A	N/A
1.13	43.81	70.28	1.68	118.35	2.21	N/A	N/A
1.19	46.38	74.41	1.74	129.12	2.23	N/A	N/A
1.28	48.22	77.35	1.74	134.93	2.23	N/A	N/A
1.33	48.12	77.19	1.75	134.91	2.23	N/A	N/A
1.39	47.76	76.60	1.76	134.86	2.24	N/A	N/A
1.50	45.65	73.20	1.84	134.55	2.26	N/A	N/A
1.54	43.99	70.53	1.88	132.31	2.28	N/A	N/A
1.59	42.80	68.61	1.89	129.75	2.28	N/A	N/A
1.65	31.69	50.76	2.52	128.08	2.45	N/A	N/A
1.71	38.48	61.66	1.96	120.69	2.30	N/A	N/A
1.79	37.93	60.77	1.85	112.44	2.27	N/A	N/A
1.85	37.29	59.74	1.83	109.44	2.26	N/A	N/A
1.94	34.44	55.15	1.95	107.35	2.30	N/A	N/A
2.01	32.97	52.78	2.00	105.32	2.31	N/A	N/A
2.05	30.86	49.39	2.10	103.78	2.34	N/A	N/A
2.14	27.74	44.37	2.27	100.85	2.39	N/A	N/A
2.18	26.17	41.84	2.39	100.01	2.42	N/A	N/A
2.27	23.70	37.86	2.58	97.75	2.46	N/A	N/A
2.32	22.68	36.22	2.67	96.88	2.48	N/A	N/A
2.42	20.39	32.53	2.91	94.67	2.53	N/A	N/A
2.46	19.65	31.34	3.01	94.33	2.55	N/A	N/A
2.54	19.01	30.30	3.06	92.83	2.56	N/A	N/A
2.57	18.74	29.86	3.09	92.33	2.56	N/A	N/A
2.64	18.74	29.86	3.04	90.65	2.55	N/A	N/A
2.71	17.73	28.23	3.18	89.77	2.58	N/A	N/A
2.76	17.91	28.51	3.12	88.87	2.56	N/A	N/A
2.85	18.37	29.25	2.97	86.88	2.54	N/A	N/A
2.89	18.37	29.24	2.96	86.47	2.54	N/A	N/A
2.98	18.37	29.23	2.94	86.05	2.53	N/A	N/A
3.02	18.64	29.66	2.90	85.90	2.52	N/A	N/A
3.10	18.83	29.96	2.86	85.80	2.52	N/A	N/A
3.20	19.75	31.43	2.74	86.09	2.49	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
3.25	20.11	32.01	2.70	86.31	2.49	N/A	N/A
3.32	20.47	32.59	2.66	86.81	2.48	N/A	N/A
3.36	20.75	33.04	2.63	86.95	2.47	N/A	N/A
3.46	20.84	33.17	2.64	87.44	2.47	N/A	N/A
3.49	21.11	33.60	2.60	87.39	2.47	N/A	N/A
3.59	21.30	33.90	2.58	87.56	2.46	N/A	N/A
3.64	21.21	33.75	2.61	88.07	2.47	N/A	N/A
3.68	21.57	34.33	2.57	88.35	2.46	N/A	N/A
3.76	21.76	34.62	2.57	88.88	2.46	N/A	N/A
3.81	21.76	34.62	2.59	89.56	2.46	N/A	N/A
3.91	22.22	35.35	2.57	90.71	2.46	N/A	N/A
3.96	22.40	35.63	2.56	91.21	2.46	N/A	N/A
4.04	22.40	35.63	2.59	92.19	2.46	N/A	N/A
4.09	21.76	34.59	2.69	93.07	2.48	N/A	N/A
4.20	21.48	34.13	2.77	94.61	2.50	N/A	N/A
4.26	20.75	32.95	2.89	95.38	2.52	N/A	N/A
4.31	19.83	31.47	3.06	96.41	2.56	N/A	N/A
4.36	18.54	29.39	2.92	85.77	2.53	N/A	N/A
4.45	16.98	26.88	2.98	80.20	2.54	N/A	N/A
4.51	16.43	25.99	3.22	83.67	2.58	N/A	N/A
4.57	16.15	25.53	3.43	87.52	2.62	N/A	N/A
4.62	15.42	24.36	3.80	92.59	2.67	N/A	N/A
4.66	14.96	23.61	4.13	97.60	2.72	N/A	N/A
4.74	11.84	18.59	5.73	106.43	2.90	N/A	N/A
4.83	12.39	19.46	5.77	112.25	2.91	N/A	N/A
4.88	11.56	18.13	6.26	113.41	2.96	N/A	N/A
4.93	10.55	16.50	6.90	113.79	3.01	N/A	N/A
5.01	11.56	18.11	6.18	111.91	2.95	N/A	N/A
5.05	10.83	16.93	6.56	111.13	2.98	N/A	N/A
5.14	11.56	18.10	6.02	108.98	2.93	N/A	N/A
5.19	12.66	19.86	5.35	106.32	2.86	N/A	N/A
5.26	14.41	22.67	4.44	100.73	2.76	N/A	N/A
5.32	16.15	25.46	3.81	97.10	2.67	N/A	N/A
5.41	19.37	30.62	3.02	92.38	2.55	N/A	N/A
5.45	20.01	31.65	2.91	92.02	2.53	N/A	N/A
5.53	22.40	35.48	2.60	92.19	2.47	N/A	N/A
5.58	23.69	37.55	2.50	93.96	2.44	N/A	N/A
5.67	25.52	40.48	2.38	96.44	2.42	N/A	N/A
5.72	26.72	42.40	2.32	98.44	2.40	N/A	N/A
5.81	28.19	44.76	2.28	101.95	2.39	N/A	N/A
5.85	29.84	47.40	2.20	104.22	2.37	N/A	N/A
5.94	32.41	51.53	2.11	108.68	2.35	N/A	N/A
5.99	33.05	52.55	2.11	110.78	2.35	N/A	N/A
6.08	36.54	58.15	1.98	115.22	2.31	N/A	N/A
6.12	37.19	59.19	1.98	117.18	2.31	N/A	N/A
6.19	39.21	62.43	1.93	120.48	2.29	N/A	N/A
6.26	41.14	65.52	1.90	124.59	2.29	N/A	N/A
6.34	42.70	68.02	1.91	130.09	2.29	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
6.38	43.52	69.34	1.91	132.34	2.29	N/A	N/A
6.44	44.81	71.40	1.90	136.00	2.29	N/A	N/A
6.52	46.65	74.35	1.88	140.09	2.28	N/A	N/A
6.60	47.93	76.40	1.87	143.09	2.28	N/A	N/A
6.69	49.31	78.61	1.86	146.15	2.27	N/A	N/A
6.74	49.77	79.34	1.85	146.56	2.27	N/A	N/A
6.77	49.95	79.63	1.85	147.06	2.27	N/A	N/A
6.83	50.32	80.22	1.85	148.21	2.27	N/A	N/A
6.91	51.05	81.39	1.84	150.12	2.27	N/A	N/A
6.97	51.05	81.38	1.85	150.89	2.27	N/A	N/A
7.06	51.24	81.68	1.86	152.09	2.27	N/A	N/A
7.10	51.42	81.96	1.86	152.80	2.27	N/A	N/A
7.19	51.88	82.69	1.86	153.99	2.27	N/A	N/A
7.24	51.88	82.69	1.87	154.40	2.27	N/A	N/A
7.29	51.97	82.83	1.86	154.31	2.27	N/A	N/A
7.35	51.70	82.39	1.88	154.51	2.28	N/A	N/A
7.45	51.70	82.38	1.51	124.69	2.13	N/A	N/A
7.49	51.60	82.22	1.41	116.14	2.08	N/A	N/A
7.59	51.15	81.48	1.52	123.68	2.13	N/A	N/A
7.64	51.15	81.48	1.56	126.77	2.15	N/A	N/A
7.71	51.15	81.47	1.60	130.26	2.17	N/A	N/A
7.75	52.25	83.24	1.60	133.48	2.17	N/A	N/A
7.82	50.87	81.01	1.69	136.94	2.21	N/A	N/A
7.88	52.39	83.45	1.68	140.26	2.21	N/A	N/A
7.95	52.52	83.65	1.72	143.89	2.22	N/A	N/A
8.04	53.99	86.00	1.73	148.72	2.22	N/A	N/A
8.07	54.36	86.60	1.73	149.95	2.23	N/A	N/A
8.18	55.55	88.50	1.73	153.22	2.23	N/A	N/A
8.20	55.74	88.80	1.73	154.03	2.23	N/A	N/A
8.28	56.66	90.27	1.72	155.71	2.22	N/A	N/A
8.35	56.20	89.52	1.75	156.74	2.23	N/A	N/A
8.41	54.45	86.70	1.82	157.39	2.26	N/A	N/A
8.48	52.43	83.45	1.90	158.51	2.28	N/A	N/A
8.54	49.95	79.46	2.01	160.01	2.32	N/A	N/A
8.62	49.13	78.13	2.07	161.89	2.34	N/A	N/A
8.67	49.86	79.30	2.05	162.92	2.33	N/A	N/A
8.74	51.15	81.37	2.01	163.28	2.32	N/A	N/A
8.83	50.41	80.17	2.05	163.97	2.33	N/A	N/A
8.89	50.04	79.57	2.05	163.23	2.33	N/A	N/A
8.93	49.77	79.13	2.04	161.39	2.33	N/A	N/A
9.02	47.93	76.16	2.05	156.01	2.33	N/A	N/A
9.06	47.01	74.68	2.05	153.37	2.33	N/A	N/A
9.15	44.44	70.48	2.10	147.67	2.34	N/A	N/A
9.19	43.34	68.65	2.14	146.74	2.35	N/A	N/A
9.26	41.32	65.46	2.23	145.79	2.38	N/A	N/A
9.33	38.93	61.67	2.35	144.65	2.41	N/A	N/A
9.46	36.81	58.02	2.46	142.68	2.43	N/A	N/A
9.50	36.72	57.63	2.45	141.36	2.43	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
9.55	37.08	57.86	2.41	139.71	2.42	N/A	N/A
9.63	37.18	57.55	2.40	137.87	2.42	N/A	N/A
9.65	37.82	58.24	2.34	136.16	2.41	N/A	N/A
9.75	37.82	57.49	2.25	129.17	2.38	N/A	N/A
9.79	37.73	56.65	2.11	119.55	2.35	N/A	N/A
9.89	36.26	53.08	1.88	99.55	2.28	N/A	N/A
9.94	35.52	52.03	1.93	100.68	2.30	N/A	N/A
9.99	34.60	50.72	2.01	101.74	2.32	N/A	N/A
10.07	33.87	49.59	2.09	103.63	2.34	N/A	N/A
10.12	33.79	49.40	2.12	104.95	2.35	N/A	N/A
10.21	33.65	49.10	2.22	108.87	2.38	N/A	N/A
10.26	33.14	48.38	2.30	111.21	2.40	N/A	N/A
10.30	33.51	48.81	2.31	112.87	2.40	N/A	N/A
10.39	34.34	49.85	2.36	117.82	2.41	N/A	N/A
10.46	34.89	50.41	2.37	119.54	2.41	N/A	N/A
10.53	35.26	50.67	2.37	120.13	2.41	N/A	N/A
10.57	35.35	50.65	2.37	120.11	2.41	N/A	N/A
10.66	35.17	50.08	2.40	119.96	2.42	N/A	N/A
10.71	34.43	48.99	2.46	120.57	2.44	N/A	N/A
10.79	36.08	50.80	2.36	119.92	2.41	N/A	N/A
10.83	36.91	51.70	2.31	119.45	2.40	N/A	N/A
10.90	40.68	56.15	2.09	117.45	2.34	N/A	N/A
10.97	44.63	60.79	1.91	116.38	2.29	N/A	N/A
11.06	48.21	64.78	1.79	115.75	2.25	N/A	N/A
11.10	48.57	65.06	1.78	115.61	2.24	N/A	N/A
11.19	44.63	59.97	1.95	116.96	2.30	N/A	N/A
11.23	45.08	60.40	1.95	117.68	2.30	N/A	N/A
11.30	44.89	59.87	1.95	116.75	2.30	N/A	N/A
11.37	43.88	58.42	2.01	117.33	2.32	N/A	N/A
11.46	42.59	56.77	2.16	122.79	2.36	N/A	N/A
11.49	42.23	56.29	2.21	124.65	2.38	N/A	N/A
11.59	41.86	55.65	2.32	129.19	2.40	N/A	N/A
11.63	42.41	56.22	2.31	130.10	2.40	N/A	N/A
11.68	43.61	57.53	2.28	131.23	2.39	N/A	N/A
11.75	44.43	58.31	2.27	132.18	2.39	N/A	N/A
11.81	43.60	57.06	2.31	131.79	2.40	N/A	N/A
11.90	41.77	54.44	2.37	129.20	2.41	N/A	N/A
11.95	40.76	52.95	2.39	126.39	2.42	N/A	N/A
12.03	35.98	46.77	2.64	123.42	2.47	N/A	N/A
12.07	33.87	44.04	2.78	122.62	2.50	N/A	N/A
12.14	30.75	39.97	3.02	120.87	2.55	N/A	N/A
12.21	29.64	38.38	3.07	117.98	2.56	N/A	N/A
12.29	29.69	37.83	2.70	102.07	2.49	N/A	N/A
12.37	29.74	37.39	2.46	91.92	2.43	N/A	N/A
12.43	30.65	38.40	2.44	93.86	2.43	N/A	N/A
12.48	32.40	40.43	2.37	95.91	2.41	N/A	N/A
12.56	36.17	44.76	2.23	100.00	2.38	N/A	N/A
12.61	37.45	46.17	2.19	101.11	2.37	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
12.67	32.68	40.53	2.57	104.04	2.46	N/A	N/A
12.74	34.51	42.53	2.46	104.81	2.44	N/A	N/A
12.80	33.14	40.80	2.61	106.65	2.47	N/A	N/A
12.89	31.58	38.82	2.82	109.32	2.51	N/A	N/A
12.93	29.37	36.15	3.08	111.25	2.56	N/A	N/A
13.02	27.99	34.36	3.27	112.53	2.59	N/A	N/A
13.07	27.16	33.28	3.39	112.94	2.61	N/A	N/A
13.13	27.26	33.25	3.38	112.24	2.61	N/A	N/A
13.20	25.60	31.16	3.62	112.68	2.65	N/A	N/A
13.29	24.41	29.60	3.86	114.14	2.68	N/A	N/A
13.34	25.79	31.13	3.68	114.49	2.65	N/A	N/A
13.40	25.97	31.26	3.74	116.83	2.66	N/A	N/A
13.46	26.25	31.48	3.77	118.67	2.67	N/A	N/A
13.54	27.72	33.02	3.60	118.94	2.64	N/A	N/A
13.60	28.08	33.33	3.59	119.57	2.64	N/A	N/A
13.68	27.53	32.53	3.73	121.29	2.66	N/A	N/A
13.73	26.89	31.72	3.87	122.68	2.68	N/A	N/A
13.82	27.62	32.40	3.83	123.99	2.68	N/A	N/A
13.85	26.98	31.60	3.94	124.58	2.69	N/A	N/A
13.95	27.61	32.12	3.87	124.29	2.68	N/A	N/A
13.99	27.16	31.53	3.97	125.23	2.70	N/A	N/A
14.07	27.61	31.92	4.03	128.70	2.70	N/A	N/A
14.13	27.34	31.53	4.15	130.92	2.72	N/A	N/A
14.18	27.52	31.66	4.20	132.98	2.73	N/A	N/A
14.30	28.44	32.50	4.29	139.42	2.74	N/A	N/A
14.35	27.71	31.60	4.45	140.65	2.76	N/A	N/A
14.39	27.06	30.81	4.62	142.29	2.78	N/A	N/A
14.44	26.79	30.42	4.74	144.08	2.79	N/A	N/A
14.52	25.13	28.41	5.11	145.24	2.84	N/A	N/A
14.57	28.26	31.76	4.50	143.01	2.77	N/A	N/A
14.66	28.53	31.83	4.33	137.97	2.74	N/A	N/A
14.70	28.90	32.13	4.20	134.83	2.73	N/A	N/A
14.79	29.36	32.38	3.97	128.48	2.70	N/A	N/A
14.84	29.91	32.85	3.80	124.97	2.67	N/A	N/A
14.92	31.01	33.82	3.60	121.74	2.64	N/A	N/A
14.96	33.86	36.79	3.23	118.79	2.58	N/A	N/A
15.06	34.13	36.82	3.11	114.45	2.56	N/A	N/A
15.10	35.05	37.68	2.98	112.37	2.54	N/A	N/A
15.19	37.44	40.00	2.75	109.93	2.50	N/A	N/A
15.24	37.81	40.27	2.72	109.53	2.49	N/A	N/A
15.32	37.81	40.09	2.73	109.61	2.49	N/A	N/A
15.36	37.53	39.70	2.77	110.14	2.50	N/A	N/A
15.43	37.90	39.94	2.77	110.45	2.50	N/A	N/A
15.50	38.36	40.27	2.74	110.15	2.49	N/A	N/A
15.59	38.82	40.56	2.71	110.08	2.49	N/A	N/A
15.64	38.45	40.07	2.76	110.52	2.50	N/A	N/A
15.76	39.00	40.23	2.44	98.01	2.43	N/A	N/A
15.82	39.19	40.21	2.24	90.21	2.38	N/A	N/A

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
15.86	38.27	39.23	2.38	93.29	2.42	N/A	N/A
15.91	38.73	39.62	2.41	95.43	2.42	N/A	N/A
15.97	38.45	39.25	2.52	98.90	2.45	N/A	N/A
16.05	35.79	36.42	2.82	102.72	2.51	N/A	N/A
16.08	28.36	28.79	3.72	106.99	2.66	N/A	N/A
16.15	33.87	34.30	3.11	106.74	2.56	N/A	N/A
16.22	34.05	34.36	3.18	109.15	2.57	N/A	N/A
16.29	34.61	34.81	3.21	111.60	2.58	N/A	N/A
16.34	34.88	35.00	3.23	112.88	2.58	N/A	N/A
16.43	34.83	34.79	3.29	114.46	2.59	N/A	N/A
16.47	34.79	34.67	3.32	115.02	2.60	N/A	N/A
16.56	36.90	36.61	3.13	114.75	2.57	N/A	N/A
16.62	37.63	37.22	3.10	115.19	2.56	N/A	N/A
16.68	37.59	37.06	3.12	115.65	2.57	N/A	N/A
16.75	37.82	37.15	3.11	115.67	2.56	N/A	N/A
16.81	37.54	36.74	3.14	115.48	2.57	N/A	N/A
16.87	36.99	36.09	3.20	115.46	2.58	N/A	N/A
16.93	37.63	36.60	3.14	115.03	2.57	N/A	N/A
17.00	36.72	35.57	3.22	114.68	2.58	0.08	0.69
17.09	37.82	36.48	3.12	113.73	2.56	0.08	0.69
17.13	39.47	38.00	2.97	112.95	2.54	0.08	0.70
17.20	36.89	35.35	3.22	113.89	2.58	0.08	0.69
17.27	36.90	35.23	3.24	114.22	2.59	0.08	0.69
17.36	40.11	38.18	3.00	114.61	2.54	0.09	0.70
17.40	40.21	38.19	3.03	115.68	2.55	0.09	0.70
17.46	40.30	38.16	3.06	116.69	2.55	0.09	0.70
17.53	40.39	38.11	3.06	116.56	2.55	0.09	0.70
17.62	39.75	37.31	3.12	116.57	2.57	0.08	0.70
17.67	40.67	38.09	3.05	116.14	2.55	0.09	0.70
17.75	40.75	38.02	3.05	116.10	2.55	0.09	0.70
17.81	41.02	38.16	3.06	116.94	2.56	0.09	0.70
17.85	42.77	39.75	2.94	116.74	2.53	0.09	0.71
17.93	44.33	41.06	2.83	116.01	2.51	0.09	0.71
17.99	48.19	44.58	2.55	113.68	2.45	0.09	0.72
18.06	49.11	45.30	2.52	114.22	2.45	0.10	0.72
18.11	52.79	48.64	2.39	116.39	2.42	0.10	0.73
18.18	55.36	50.88	2.30	117.07	2.40	0.10	0.74
18.29	60.96	55.88	2.13	118.93	2.35	0.11	0.75
18.33	63.53	58.16	2.09	121.39	2.34	0.12	0.75
18.40	66.93	61.14	2.03	124.07	2.32	0.12	0.76
18.46	69.95	63.77	1.97	125.55	2.31	0.12	0.77
18.54	74.19	67.46	1.91	128.57	2.29	0.13	0.77
18.57	76.01	69.06	1.88	129.92	2.28	0.13	0.78
18.64	84.01	76.26	1.73	131.87	2.22	0.15	0.79
18.72	91.82	83.20	1.63	135.89	2.19	0.16	0.80
18.85	109.45	99.11	1.33	132.15	2.02	0.21	0.83
18.92	122.77	111.08	1.28	142.59	1.99	0.26	0.84
18.99	138.02	124.82	1.22	151.76	1.93	0.35	0.86

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
19.04	146.37	132.24	1.21	159.92	1.92	0.42	0.87
19.13	151.61	136.47	1.23	168.31	1.94	0.48	0.87
19.16	154.28	138.70	1.24	171.67	1.95	0.51	0.87
19.25	175.30	157.44	1.19	187.68	1.90	0.89	0.89
19.29	185.97	166.85	1.18	196.58	1.89	0.90	0.90
19.38	204.80	182.95	1.23	224.89	1.94	0.92	0.92
19.42	219.31	195.82	1.21	236.18	1.92	0.93	0.93
19.52	242.63	216.77	1.12	241.81	1.81	0.94	0.94
19.60	262.93	235.08	1.05	247.16	1.72	0.96	0.96
19.64	270.74	241.72	1.06	255.42	1.73	0.96	0.96
19.69	289.38	258.05	1.05	271.09	1.72	0.97	0.97
19.75	287.45	256.36	1.01	259.15	1.66	0.97	0.97
19.82	277.72	247.06	1.02	250.80	1.67	0.96	0.96
19.89	324.92	289.97	1.00	289.97	1.56	0.99	0.99
19.95	329.61	293.73	1.00	293.73	1.55	0.99	0.99
20.04	299.48	265.09	1.00	265.09	1.63	0.97	0.97
20.08	229.21	200.77	1.12	224.20	1.81	0.93	0.93
20.15	275.59	242.17	1.05	254.15	1.72	0.96	0.96
20.21	268.61	235.04	1.08	253.15	1.76	0.96	0.96
20.30	260.35	226.52	1.12	252.75	1.81	0.95	0.95
20.34	259.98	225.67	1.13	254.70	1.83	0.95	0.95
20.42	255.94	221.14	1.16	256.20	1.87	0.95	0.95
20.48	251.81	216.79	1.18	256.41	1.89	0.94	0.94
20.57	246.21	210.86	1.22	256.70	1.93	0.94	0.94
20.61	242.44	207.10	1.23	255.63	1.94	0.94	0.94
20.69	237.11	201.59	1.26	254.58	1.97	0.93	0.93
20.74	235.64	199.87	1.27	254.61	1.98	0.93	0.93
20.82	231.51	195.76	1.27	249.38	1.98	0.93	0.93
20.88	229.95	194.10	1.27	246.34	1.98	0.92	0.92
20.94	228.02	192.05	1.27	243.11	1.97	0.92	0.92
21.00	227.38	191.14	1.26	240.87	1.97	0.92	0.92
21.09	227.93	190.98	1.26	240.35	1.97	0.92	0.92
21.14	225.63	188.60	1.27	239.52	1.98	0.92	0.92
21.20	227.84	190.00	1.27	241.69	1.98	0.92	0.92
21.27	229.12	190.44	1.28	244.63	1.99	0.92	0.92
21.34	232.89	193.09	1.29	248.61	1.99	0.92	0.92
21.41	237.20	196.18	1.29	253.04	1.99	0.93	0.93
21.49	237.57	195.77	1.30	254.35	2.00	0.93	0.93
21.54	237.76	195.53	1.30	254.95	2.00	0.93	0.93
21.60	237.48	194.84	1.31	255.04	2.01	0.93	0.93
21.67	239.96	196.51	1.30	254.70	2.00	0.93	0.93
21.74	243.63	199.21	1.28	255.48	1.99	0.93	0.93
21.80	246.21	201.12	1.27	254.70	1.97	0.93	0.93
21.86	244.09	198.97	1.26	251.42	1.97	0.93	0.93
21.94	242.35	197.43	1.23	243.63	1.94	0.93	0.93
22.01	237.94	193.85	1.20	233.14	1.91	0.92	0.92
22.05	237.11	192.57	1.22	235.06	1.93	0.92	0.92
22.12	234.82	189.67	1.26	239.24	1.97	0.92	0.92

:: Strength loss calculation (Idriss & Boulanger (2008) :: (continued)

Depth (ft)	q_t (tsf)	Q_{tn}	K_c	$Q_{tn,cs}$	I_c	$S_{u(liq)}/\sigma'_v$	$S_{u(peak)}/\sigma'_v$
22.19	212.22	169.91	1.34	228.44	2.03	0.90	0.90
22.25	209.93	167.42	1.37	230.04	2.05	0.90	0.90
22.34	211.63	168.07	1.39	234.04	2.06	0.90	0.90
22.39	211.03	167.13	1.41	235.50	2.07	0.90	0.90
22.48	216.72	171.27	1.39	238.70	2.06	0.91	0.91
22.52	223.43	176.48	1.38	243.27	2.05	0.91	0.91
22.60	225.36	177.08	1.42	251.05	2.08	0.91	0.91
22.66	220.31	172.09	1.49	256.14	2.12	0.91	0.91
22.74	211.86	163.98	1.61	264.12	2.18	0.90	0.90
22.77	220.43	170.95	1.55	264.41	2.15	0.91	0.91
22.85	212.67	164.40	1.55	254.30	2.15	0.90	0.90
22.92	220.57	170.78	1.47	251.39	2.11	0.91	0.91
23.01	220.80	170.33	1.48	251.98	2.11	0.90	0.90
23.05	221.04	170.15	1.49	252.92	2.12	0.90	0.90
23.10	248.96	193.06	1.35	261.31	2.04	0.92	0.92
23.17	283.67	222.02	1.22	271.50	1.93	0.95	0.95
23.25	310.76	243.05	1.21	293.57	1.92	0.96	0.96
23.32	329.68	256.62	1.24	317.28	1.95	0.97	0.97
23.40	356.68	277.73	1.21	336.57	1.92	0.98	0.98
23.43	378.35	265.76	26.61	7070.82	4.06	0.97	18.98
23.52	442.84	310.37	26.61	8257.52	4.06	1.00	22.17
23.58	499.41	349.52	26.61	9299.20	4.06	1.02	24.97
23.63	565.17	395.08	26.61	10511.37	4.06	1.04	28.22
23.69	592.09	413.13	26.61	10991.63	4.06	1.05	29.51
23.76	584.92	407.32	26.61	10836.91	4.06	1.05	29.09

Abbreviations

q_t:	Total cone resistance
K_c:	Cone resistance correction factor due to fines
$Q_{tn,cs}$:	Adjusted and corrected cone resistance due to fines
I_c:	Soil behavior type index
$S_{u(liq)}/\sigma'_v$:	Calculated liquefied undrained strength ratio
$S_{u(peak)}/\sigma'_v$:	Calculated peak undrained strength ratio

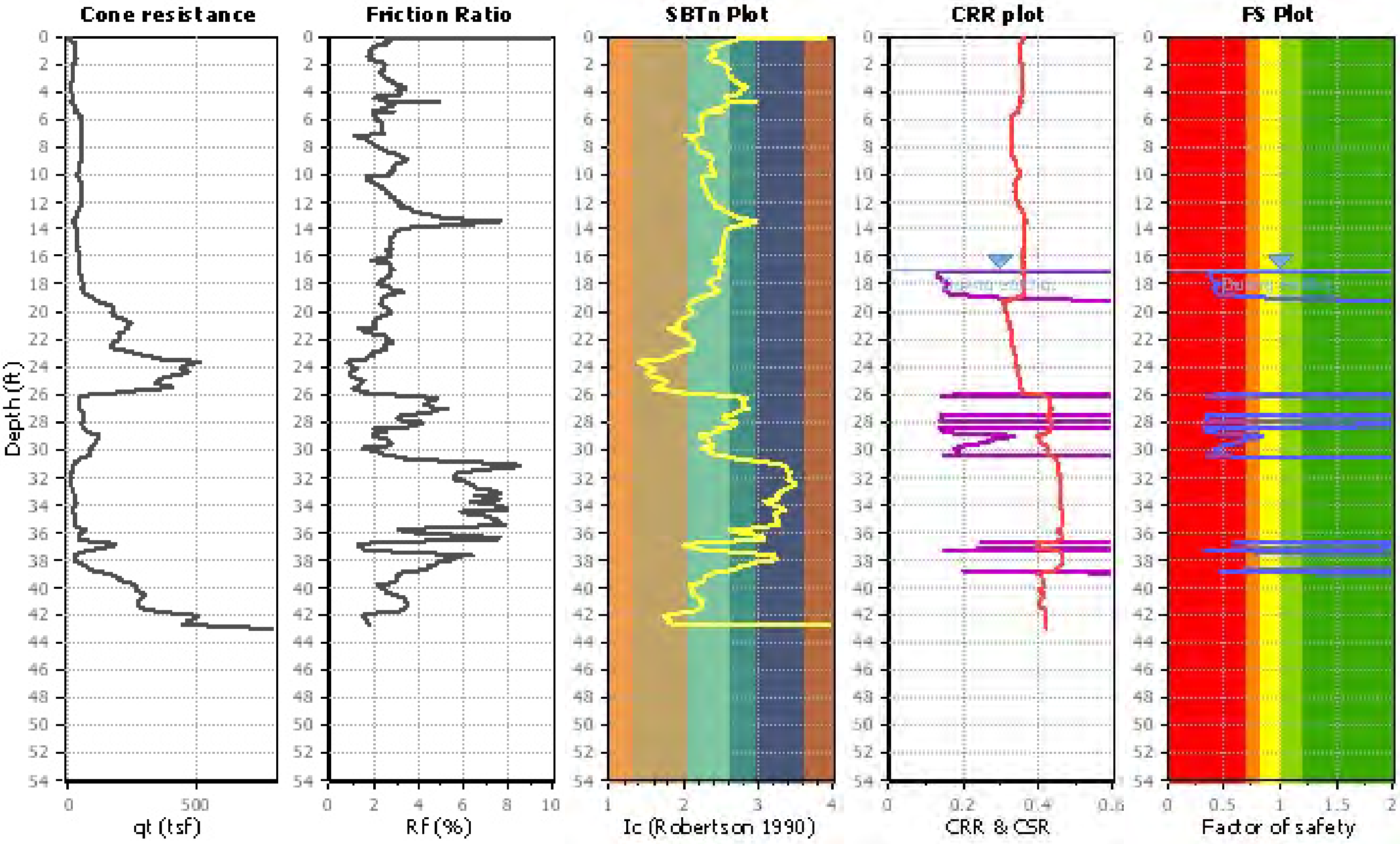
LIQUEFACTION ANALYSIS REPORT

Project title : TOS-25 North Hollywood Park **Location :**

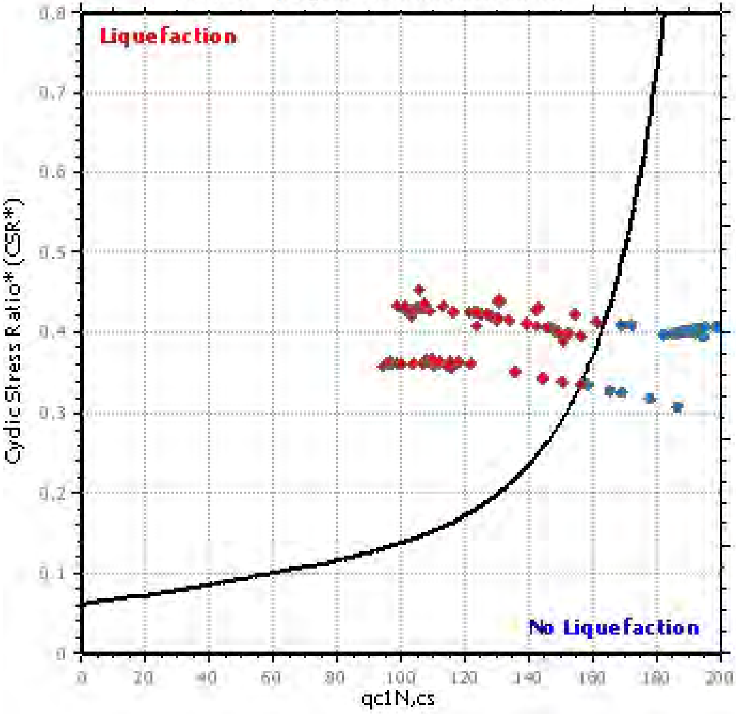
CPT file : NH-CPT-1A

Input parameters and analysis data

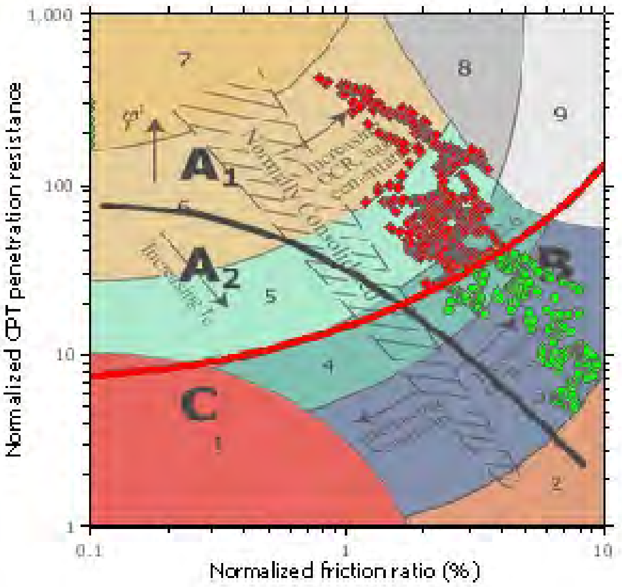
Analysis method:	B&I (2014)	G.W.T. (in-situ):	107.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	B&I (2014)	G.W.T. (earthq.):	17.00 ft	Fill height:	N/A	Limit depth applied:	Yes
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	60.00 ft
Earthquake magnitude M_w:	6.77	Ic cut-off value:	2.60	Trans. detect. applied:	No	MSF method:	Method
Peak ground acceleration:	0.63	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		



$M_w=7^{1/2}$, sigma'=1 atm base curve



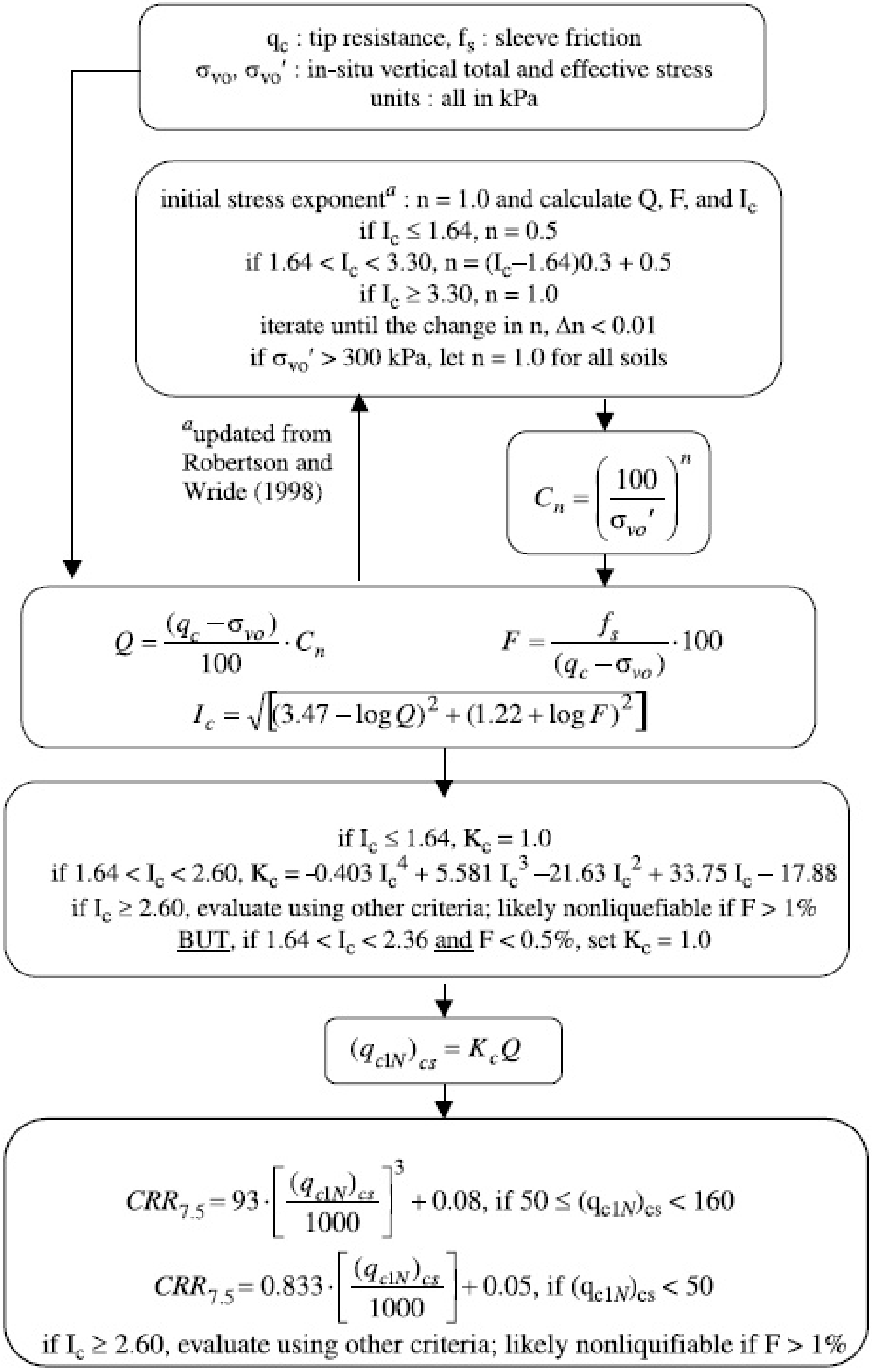
Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

Procedure for the evaluation of soil liquefaction resistance, NCEER (1998)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. The procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



q_c : tip resistance, f_s : sleeve friction
σ_{vo}, σ_{vo}' : in-situ vertical total and effective stress
units : all in kPa

initial stress exponent^a : n = 1.0 and calculate Q, F, and I_c
if $I_c \le 1.64$, $n = 0.5$
if $1.64 < I_c < 3.30$, $n = (I_c - 1.64)0.3 + 0.5$
if $I_c \ge 3.30$, $n = 1.0$
iterate until the change in n, $\Delta n < 0.01$
if $\sigma_{vo}' > 300$ kPa, let n = 1.0 for all soils

^{a}updated from Robertson and Wride (1998)

$$C_n = \left(\frac{100}{\sigma_{vo}'}\right)^n$$

$$Q = \frac{(q_c - \sigma_{vo})}{100} \cdot C_n \qquad F = \frac{f_s}{(q_c - \sigma_{vo})} \cdot 100$$

$$I_c = \sqrt{\left[(3.47 - \log Q)^2 + (1.22 + \log F)^2\right]}$$

if $I_c \le 1.64$, $K_c = 1.0$
if $1.64 < I_c < 2.60$, $K_c = -0.403\, I_c^4 + 5.581\, I_c^3 - 21.63\, I_c^2 + 33.75\, I_c - 17.88$
if $I_c \ge 2.60$, evaluate using other criteria; likely nonliquefiable if F > 1%
BUT, if $1.64 < I_c < 2.36$ and F < 0.5%, set $K_c = 1.0$

$$(q_{c1N})_{cs} = K_c Q$$

$$CRR_{7.5} = 93 \cdot \left[\frac{(q_{c1N})_{cs}}{1000}\right]^3 + 0.08, \text{ if } 50 \le (q_{c1N})_{cs} < 160$$

$$CRR_{7.5} = 0.833 \cdot \left[\frac{(q_{c1N})_{cs}}{1000}\right] + 0.05, \text{ if } (q_{c1N})_{cs} < 50$$

if $I_c \ge 2.60$, evaluate using other criteria; likely nonliquifiable if F > 1%

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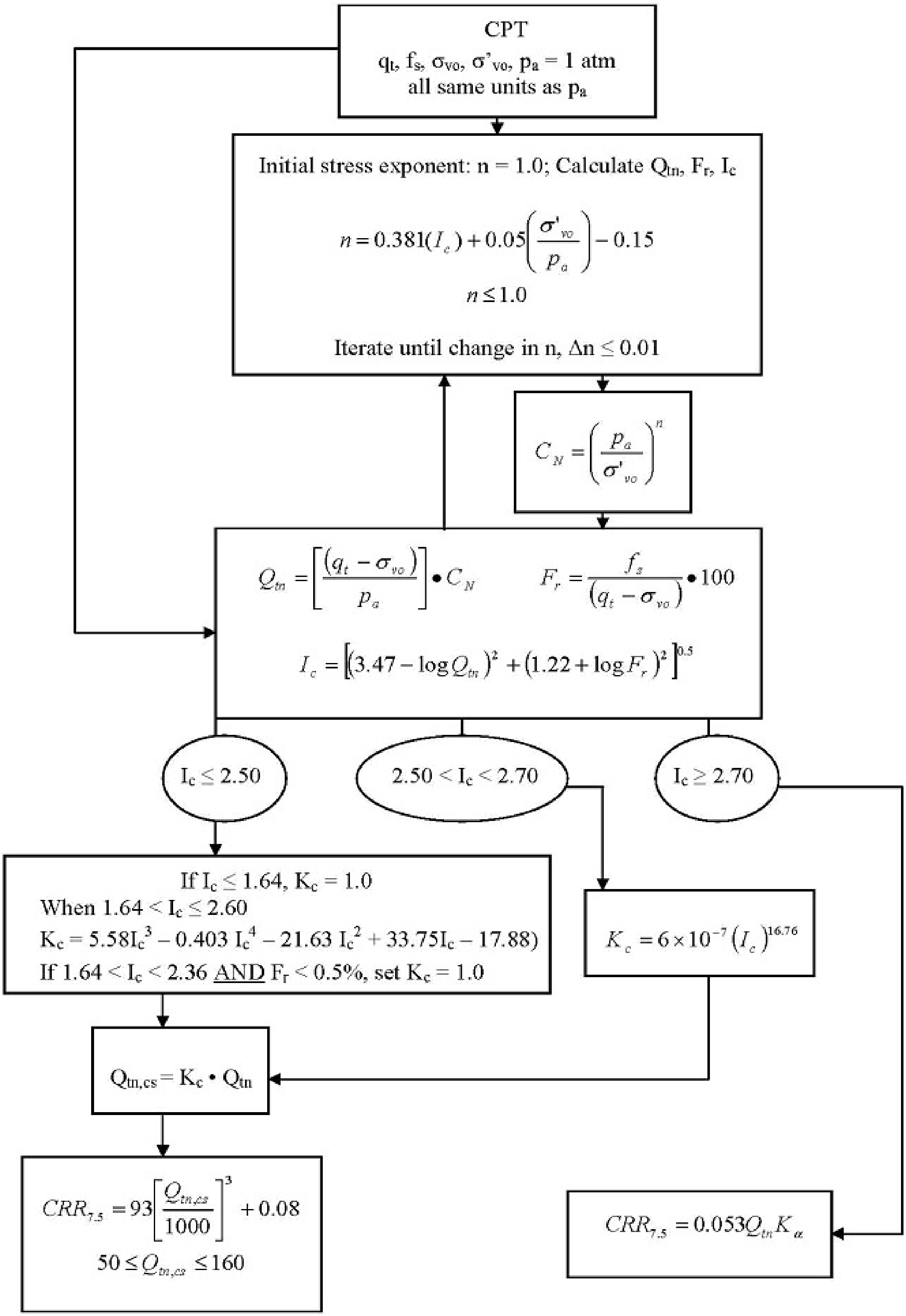
[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the evaluation of soil liquefaction resistance (all soils), Robertson (2010)

Calculation of soil resistance against liquefaction is performed according to the Robertson & Wride (1998) procedure. This procedure used in the software, slightly differs from the one originally published in NCEER-97-0022 (Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils). The revised procedure is presented below in the form of a flowchart[1]:



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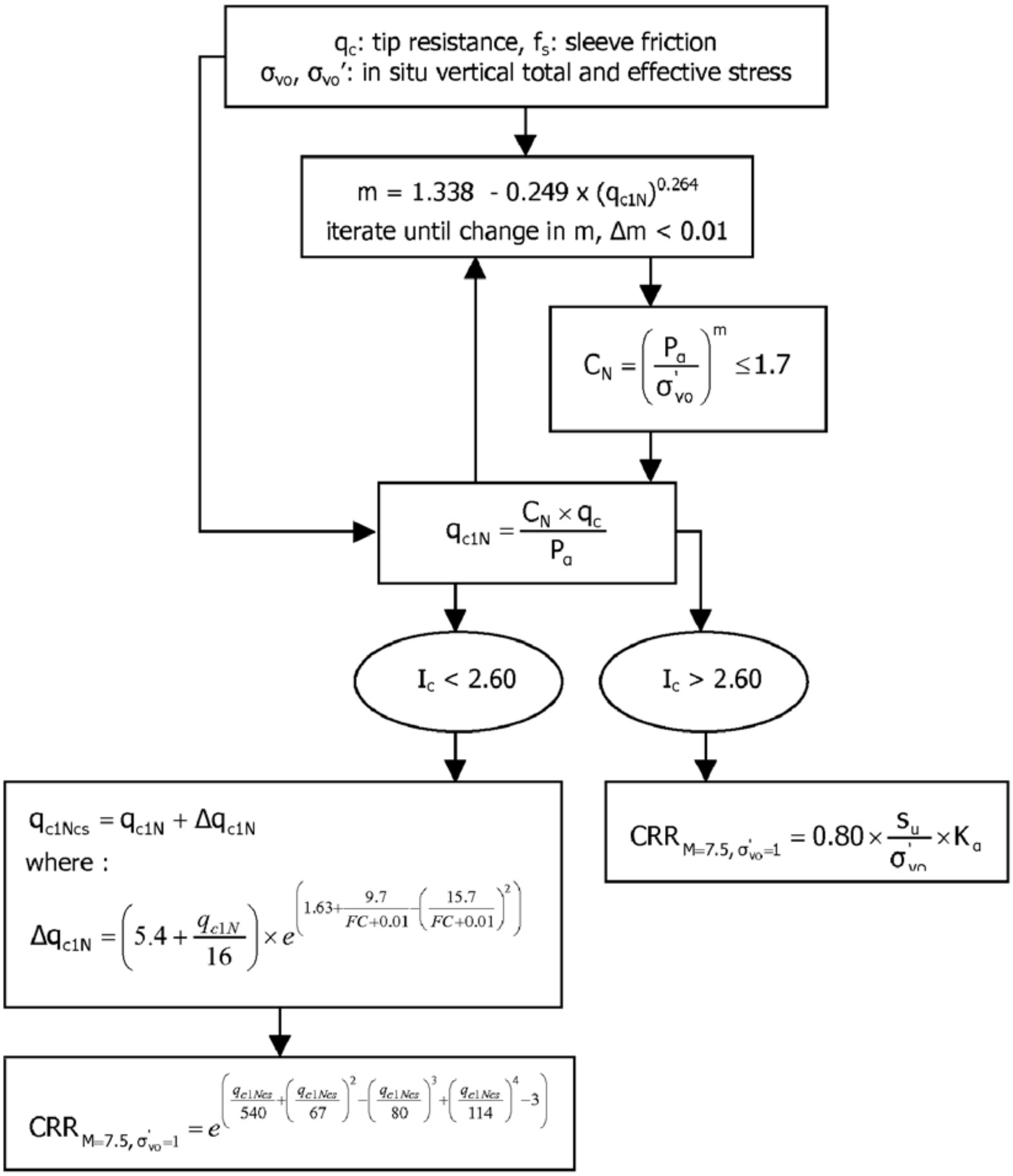
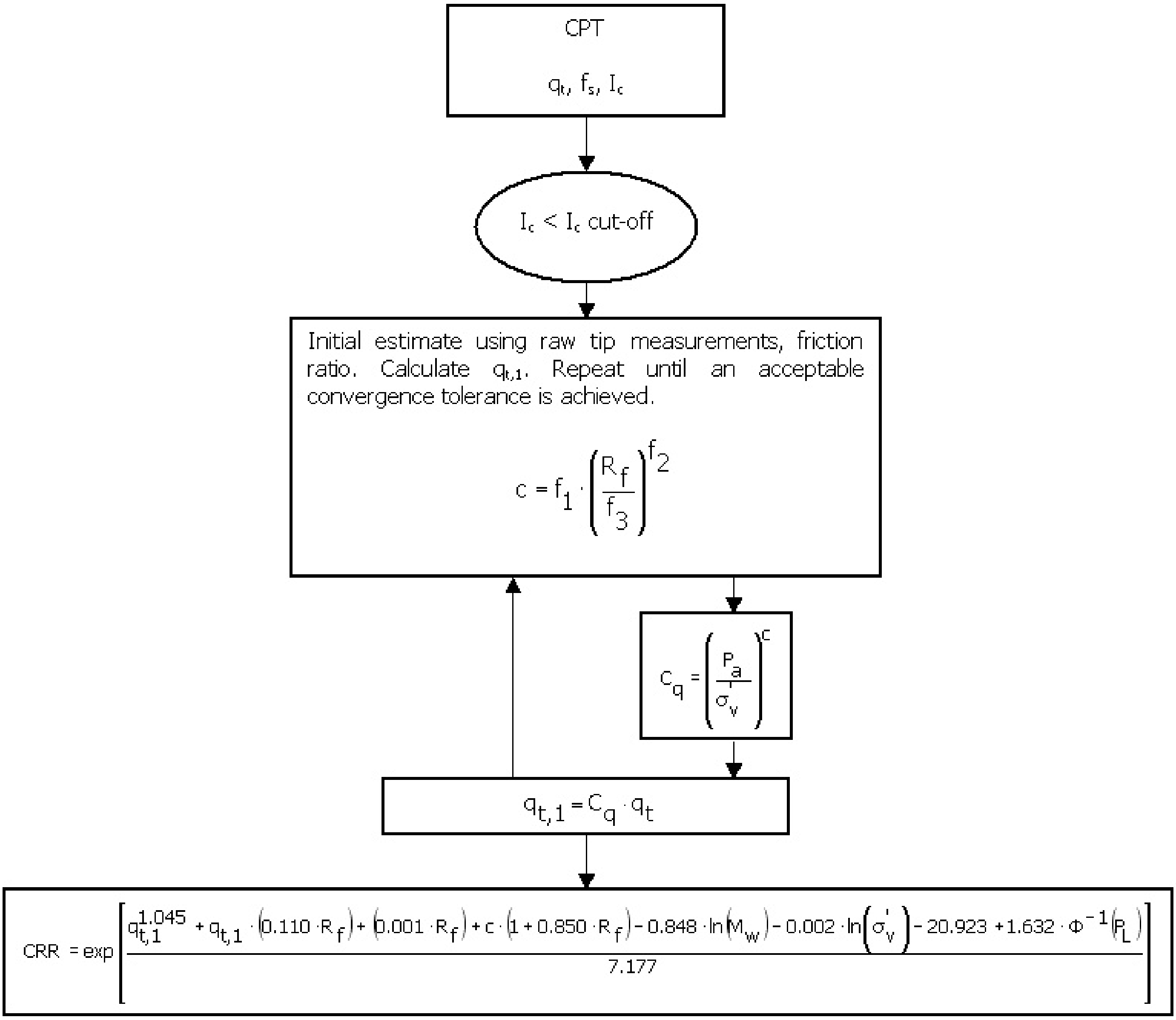
[1] P.K. Robertson, 2009. "Performance based earthquake design using the CPT", Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009

Procedure for the evaluation of soil liquefaction resistance, Idriss & Boulanger (2008)



Procedure for the evaluation of soil liquefaction resistance (sandy soils), Moss et al. (2006)



Initial estimate using raw tip measurements, friction ratio. Calculate $q_{t,1}$. Repeat until an acceptable convergence tolerance is achieved.

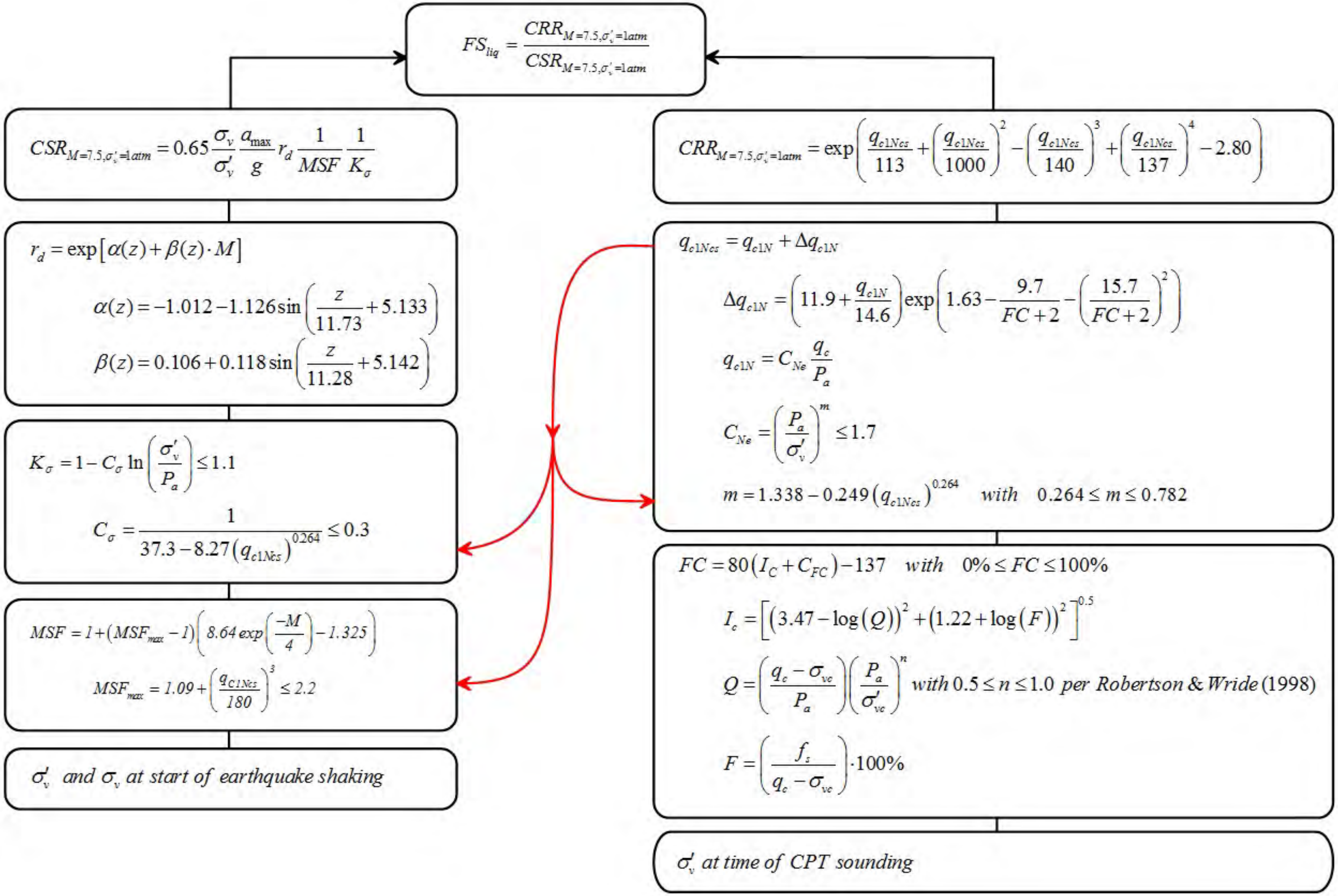
$$c = f_1 \cdot \left(\frac{R_f}{f_3}\right)^{f_2}$$

$$C_q = \left(\frac{P_a}{\sigma'_v}\right)^c$$

$$q_{t,1} = C_q \cdot q_t$$

$$CRR = \exp\left[\frac{q_{t,1}^{1.045} + q_{t,1} \cdot (0.110 \cdot R_f) + (0.001 \cdot R_f) + c \cdot (1 + 0.850 \cdot R_f) - 0.848 \cdot \ln(M_w) - 0.002 \cdot \ln(\sigma'_v) - 20.923 + 1.632 \cdot \Phi^{-1}(P_L)}{7.177}\right]$$

Procedure for the evaluation of soil liquefaction resistance, Boulanger & Idriss(2014)



$$FS_{liq}=\frac{CRR_{M=7.5,\sigma'_v=1atm}}{CSR_{M=7.5,\sigma'_v=1atm}}$$

$$CSR_{M=7.5,\sigma'_v=1atm}=0.65\frac{\sigma_v}{\sigma'_v}\frac{a_{\max}}{g}r_d\frac{1}{MSF}\frac{1}{K_\sigma}$$

$$r_d=\exp\left[\alpha(z)+\beta(z)\cdot M\right]$$

$$\alpha(z)=-1.012-1.126\sin\left(\frac{z}{11.73}+5.133\right)$$

$$\beta(z)=0.106+0.118\sin\left(\frac{z}{11.28}+5.142\right)$$

$$K_\sigma=1-C_\sigma\ln\left(\frac{\sigma'_v}{P_a}\right)\leq 1.1$$

$$C_\sigma=\frac{1}{37.3-8.27\left(q_{c1Ncs}\right)^{0.264}}\leq 0.3$$

$$MSF=1+(MSF_{max}-1)\left(8.64\exp\left(\frac{-M}{4}\right)-1.325\right)$$

$$MSF_{max}=1.09+\left(\frac{q_{c1Ncs}}{180}\right)^3\leq 2.2$$

σ'_v *and* σ_v *at start of earthquake shaking*

$$CRR_{M=7.5,\sigma'_v=1atm}=\exp\left(\frac{q_{c1Ncs}}{113}+\left(\frac{q_{c1Ncs}}{1000}\right)^2-\left(\frac{q_{c1Ncs}}{140}\right)^3+\left(\frac{q_{c1Ncs}}{137}\right)^4-2.80\right)$$

$$q_{c1Ncs}=q_{c1N}+\Delta q_{c1N}$$

$$\Delta q_{c1N}=\left(11.9+\frac{q_{c1N}}{14.6}\right)\exp\left(1.63-\frac{9.7}{FC+2}-\left(\frac{15.7}{FC+2}\right)^2\right)$$

$$q_{c1N}=C_N\frac{q_c}{P_a}$$

$$C_N=\left(\frac{P_a}{\sigma'_v}\right)^m\leq 1.7$$

$$m=1.338-0.249\left(q_{c1Ncs}\right)^{0.264}\quad with\quad 0.264\leq m\leq 0.782$$

$$FC=80\left(I_C+C_{FC}\right)-137\quad with\quad 0\%\leq FC\leq 100\%$$

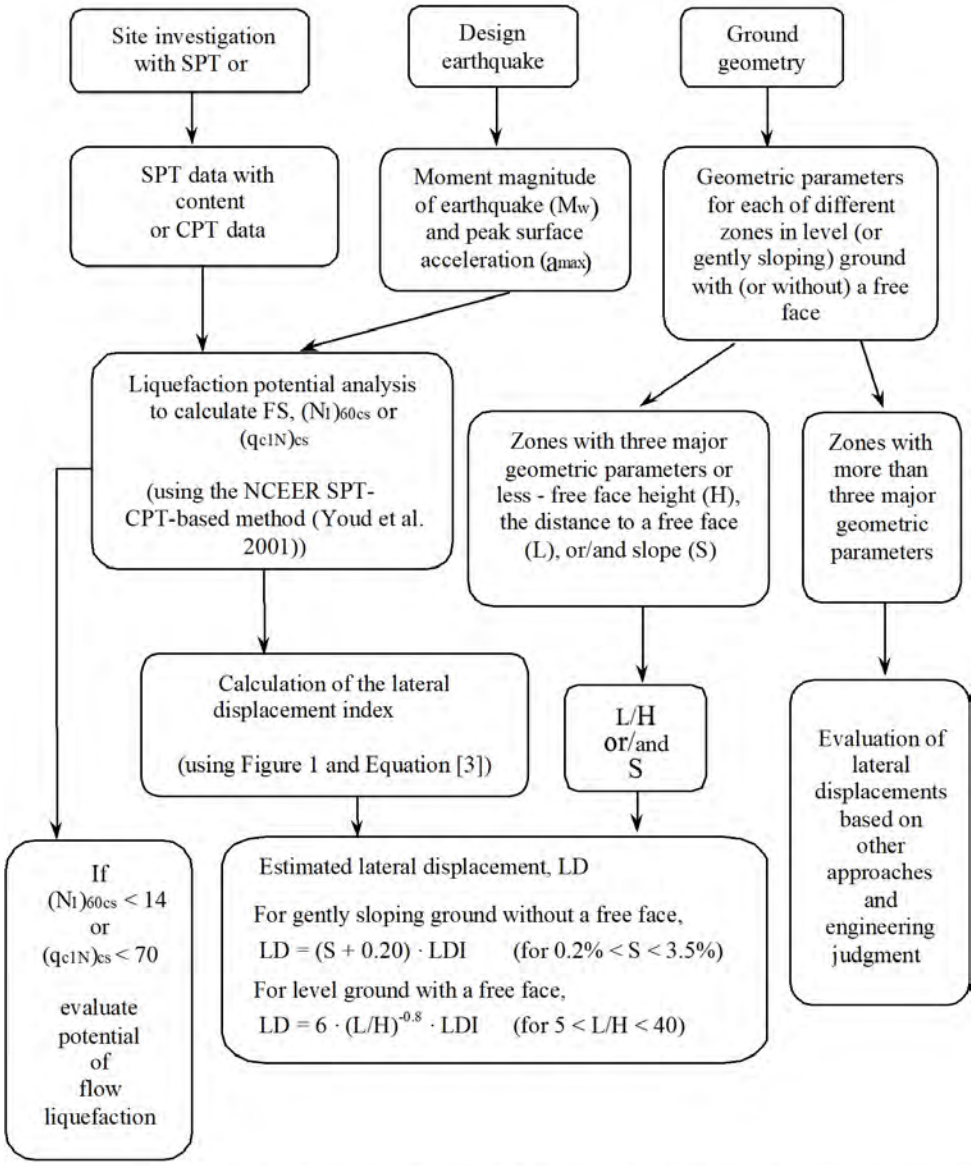
$$I_c=\left[\left(3.47-\log(Q)\right)^2+\left(1.22+\log(F)\right)^2\right]^{0.5}$$

$$Q=\left(\frac{q_c-\sigma_{vc}}{P_a}\right)\left(\frac{P_a}{\sigma'_{vc}}\right)^n\ with\ 0.5\leq n\leq 1.0\ per\ Robertson\ \&\ Wride\ (1998)$$

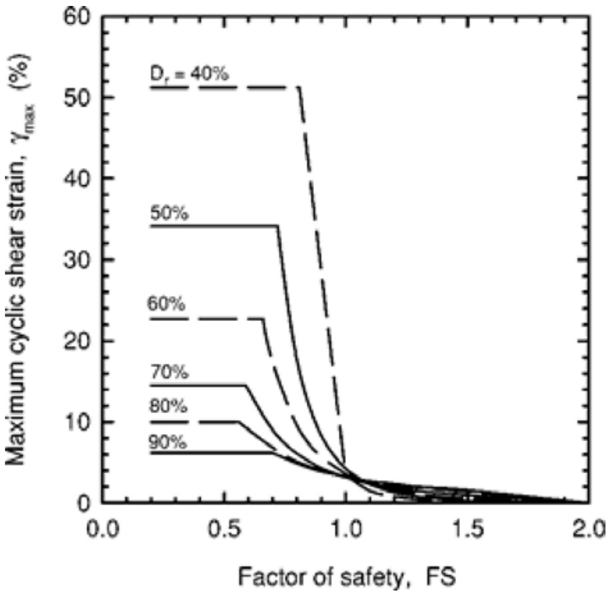
$$F=\left(\frac{f_s}{q_c-\sigma_{vc}}\right)\cdot 100\%$$

σ'_v *at time of CPT sounding*

Procedure for the evaluation of liquefaction-induced lateral spreading displacements



[1] Flow chart illustrating major steps in estimating liquefaction-induced lateral spreading displacements using the proposed approach



[1] **Figure 1**

$$\mathrm{LDI} = \int_0^{Z_{\max}} \gamma_{\max} dz$$

[1] **Equation [3]**

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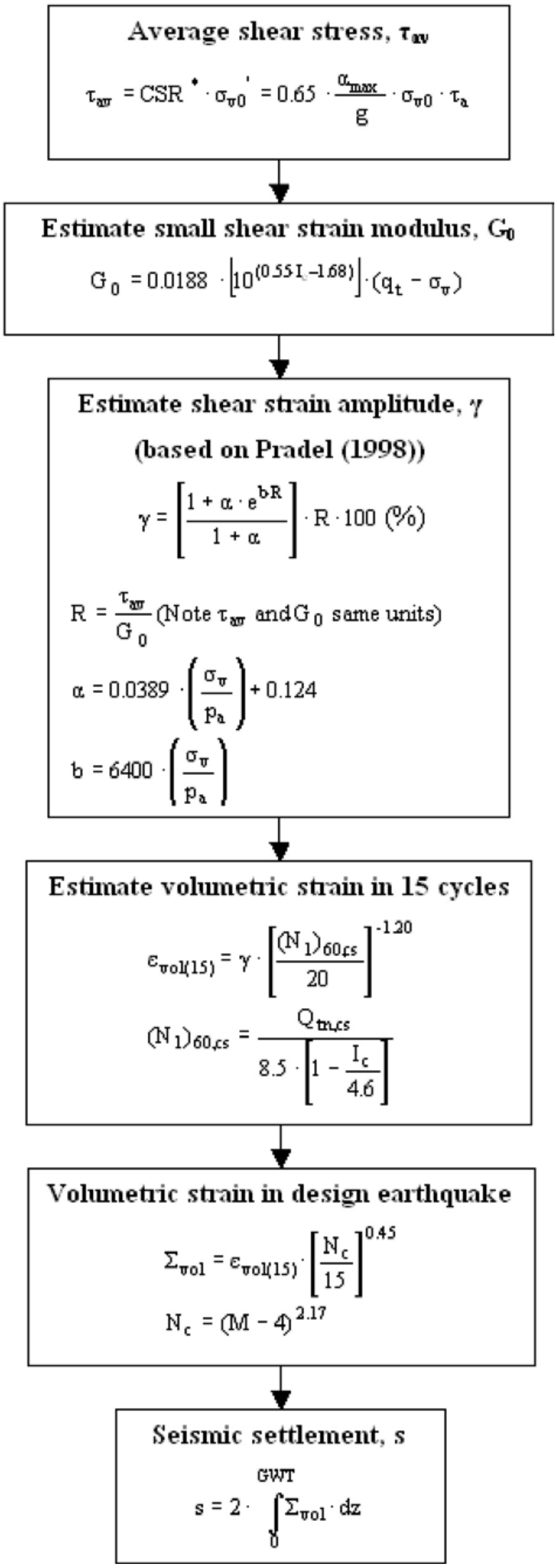
[1] "Estimating liquefaction-induced ground settlements from CPT for level ground", G. Zhang, P.K. Robertson, and R.W.I. Brachman

Procedure for the estimation of seismic induced settlements in dry sands



Average shear stress, τ_{av}

$$\tau_{av} = CSR^{*} \cdot \sigma_{v0}' = 0.65 \cdot \frac{\alpha_{max}}{g} \cdot \sigma_{v0} \cdot \tau_{a}$$

Estimate small shear strain modulus, G_0

$$G_0 = 0.0188 \cdot \left[10^{(0.55 I_c - 1.68)}\right] \cdot (q_t - \sigma_v)$$

Estimate shear strain amplitude, γ (based on Pradel (1998))

$$\gamma = \left[\frac{1 + \alpha \cdot e^{bR}}{1 + \alpha}\right] \cdot R \cdot 100\ (\%)$$

$$R = \frac{\tau_{av}}{G_0}\ \text{(Note } \tau_{av} \text{ and } G_0 \text{ same units)}$$

$$\alpha = 0.0389 \cdot \left(\frac{\sigma_v}{p_a}\right) + 0.124$$

$$b = 6400 \cdot \left(\frac{\sigma_v}{p_a}\right)$$

Estimate volumetric strain in 15 cycles

$$\varepsilon_{vol(15)} = \gamma \cdot \left[\frac{(N_1)_{60cs}}{20}\right]^{-1.20}$$

$$(N_1)_{60,cs} = \frac{Q_{tn,cs}}{8.5 \cdot \left[1 - \frac{I_c}{4.6}\right]}$$

Volumetric strain in design earthquake

$$\Sigma_{vol} = \varepsilon_{vol(15)} \cdot \left[\frac{N_c}{15}\right]^{0.45}$$

$$N_c = (M - 4)^{2.17}$$

Seismic settlement, s

$$s = 2 \cdot \int_{0}^{GWT} \Sigma_{vol} \cdot dz$$

Robertson, P.K. and Lisheng, S., 2010, “Estimation of seismic compression in dry soils using the CPT” FIFTH INTERNATIONAL CONFERENCE ON RECENT ADVANCES IN GEOTECHNICAL EARTHQUAKE ENGINEERING AND SOIL DYNAMICS, Symposium in honor of professor I. M. Idriss, San Diego, CA

Liquefaction Potential Index (LPI) calculation procedure

Calculation of the Liquefaction Potential Index (LPI) is used to interpret the liquefaction assessment calculations in terms of severity over depth. The calculation procedure is based on the methology developed by Iwasaki (1982) and is adopted by AFPS.

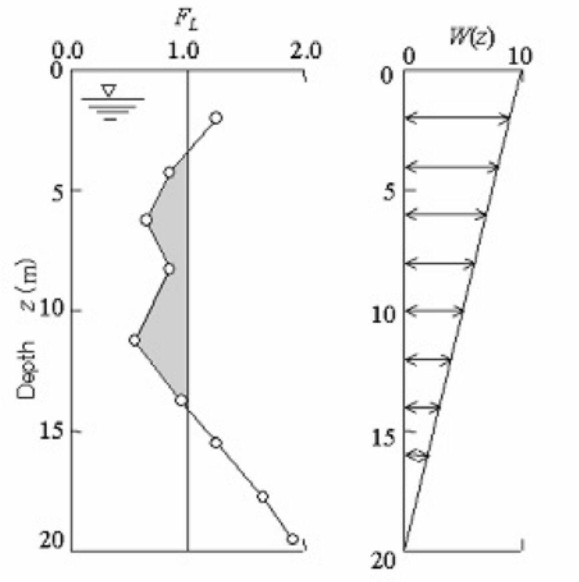
To estimate the severity of liquefaction extent at a given site, LPI is calculated based on the following equation:

$$\textbf{LPI} = \int_{0}^{20} (10 - 0{,}5_{z}) \times F_{L} \times d_{z}$$

where:
F_L = 1 - F.S. when F.S. less than 1
F_L = 0 when F.S. greater than 1
z depth of measurment in meters

Values of LPI range between zero (0) when no test point is characterized as liquefiable and 100 when all points are characterized as susceptible to liquefaction. Iwasaki proposed four (4) discrete categories based on the numeric value of LPI:

- LPI = 0 : Liquefaction risk is very low
- 0 < LPI <= 5 : Liquefaction risk is low
- 5 < LPI <= 15 : Liquefaction risk is high
- LPI > 15 : Liquefaction risk is very high



Graphical presentation of the LPI calculation procedure

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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.

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:	August 26, 2020
Subject:	Task Order Solicitation (TOS) No. 25: North Hollywood Park 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 North Hollywood Park.

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 infrastructure 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 North Hollywood Park Overview and Objectives

As part of the Los Angeles Stormwater Capture Parks Program, a stormwater capture project is proposed for North Hollywood Park. This park is located in the North Hollywood neighborhood south of Chandler Boulevard between State Route 170 (SR-170) and Tujunga Avenue (Figure 1) and is owned by the City of Los Angeles Department of Recreation and Parks. North Hollywood Park 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 1,176 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 1,176 AFY volume goal. This memorandum presents the results of the H&H modeling analysis.

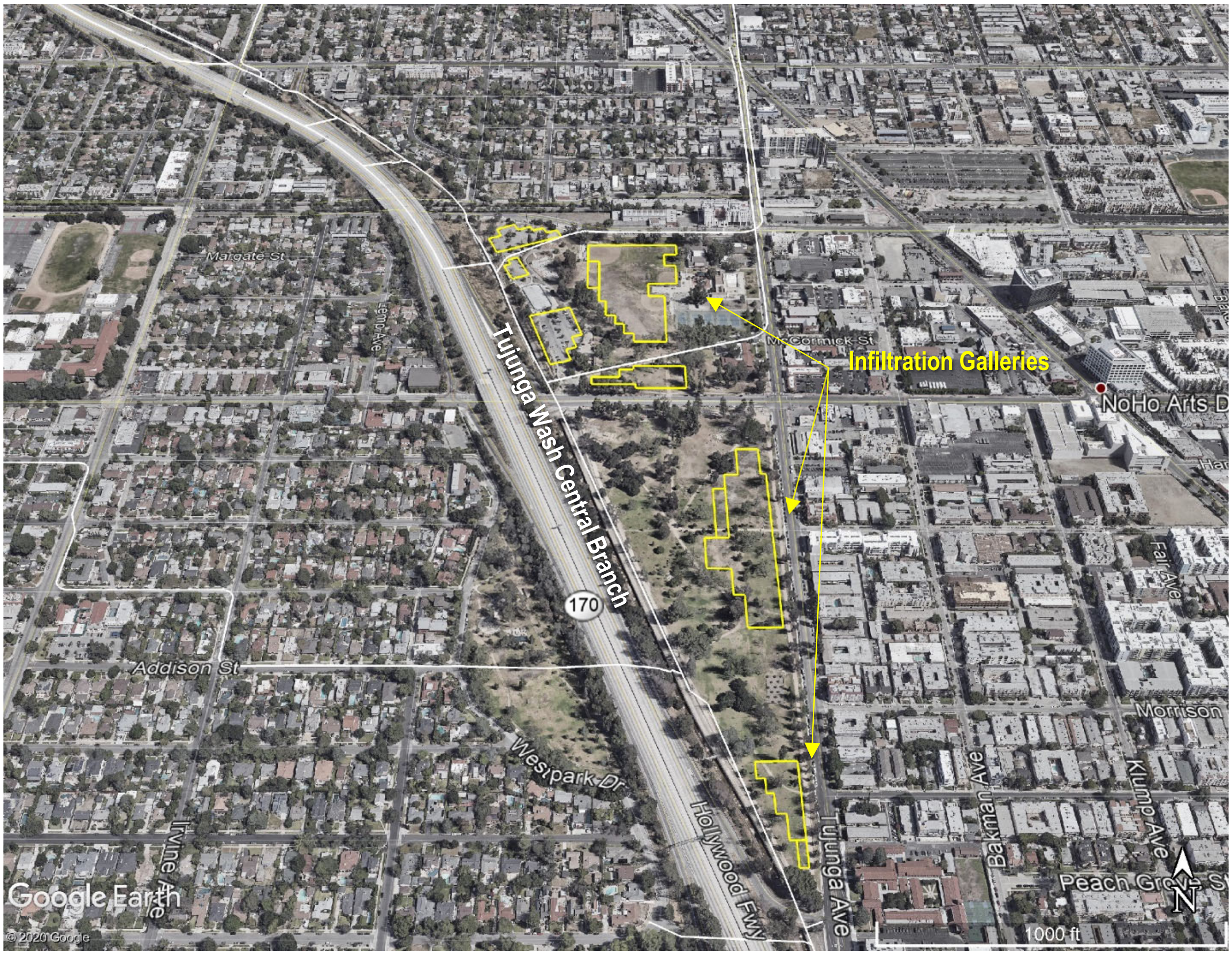

Figure 1. North Hollywood Park potential stormwater capture project location

2.0 Current Conditions

2.1 Drainage Area Delineation and Land Use

The initial drainage area for the North Hollywood Park 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

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[1] http://geohub.lacity.org/datasets/drainage-subareas

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 North Hollywood Park project encompasses several drainage areas upstream that also discharge to Tujunga Wash, including the drainage areas associated with the following projects: Valley Village Park, Alexandria Park, Valley Plaza Park South, Valley Plaza Park North, Whitsett Fields Park and Strathern Park. However, the hydrologic analysis presented herein only accounts for the runoff and pollutant loads generated from the watershed associated only with the North Hollywood 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 North Hollywood Park 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 North Hollywood Park contributing drainage area

Land Use Classification	Area (acres)	Impervious Area (acres)
Single-Family Residential (High-Density)	664.2	270.8
Single-Family Residential (Low-Density)	55.6	5.5
Multi-Family Residential	365.2	263.4
Commercial	226.4	207.2
Institutional	47.7	38.8
Industrial	212.7	185.8
Transportation	75.6	68.7
Secondary Roads	370.1	241.6
Vacant (Moderate Slope, HSG D)	4.7	0.0
Vacant (Steep Slope, HSG D)	0.3	0.0
Agriculture (Moderate Slope, HSG D)	22.9	0.0
Total	**2045.2**	**1281.8**

Table 2. WMMS simulated runoff, sediment, nutrients, metals and bacteria loads for North Hollywood Park

Constituent	Runoff (AFY)	Sediment (lbs/year)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	Copper (lbs/year)	Lead (lbs/year)	Zinc (lbs/year)	Fecal coliform (#)
Simulated Load	2011.4	249,491.3	8,646.7	7,047.4	99.2	89.1	947.8	1.728E+14

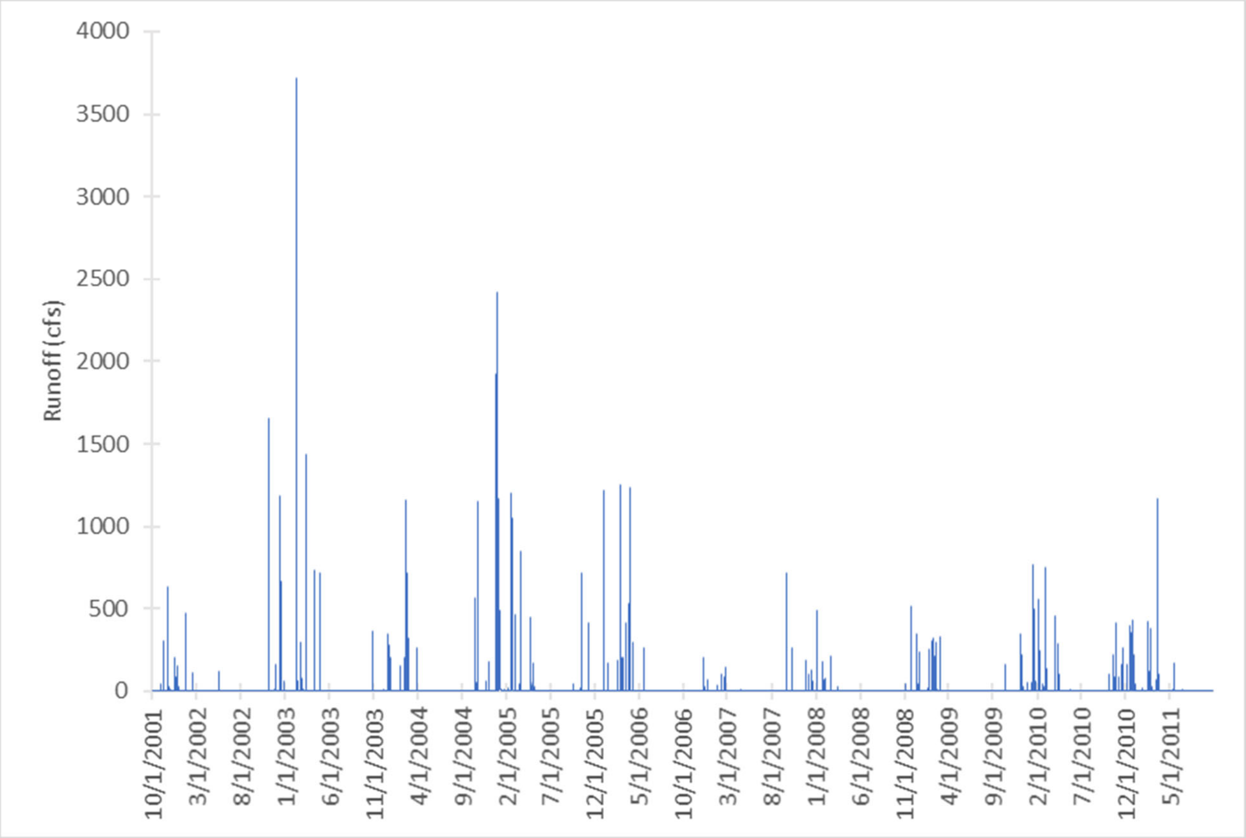


Figure 2. WMMS simulated runoff timeseries for the North Hollywood Park

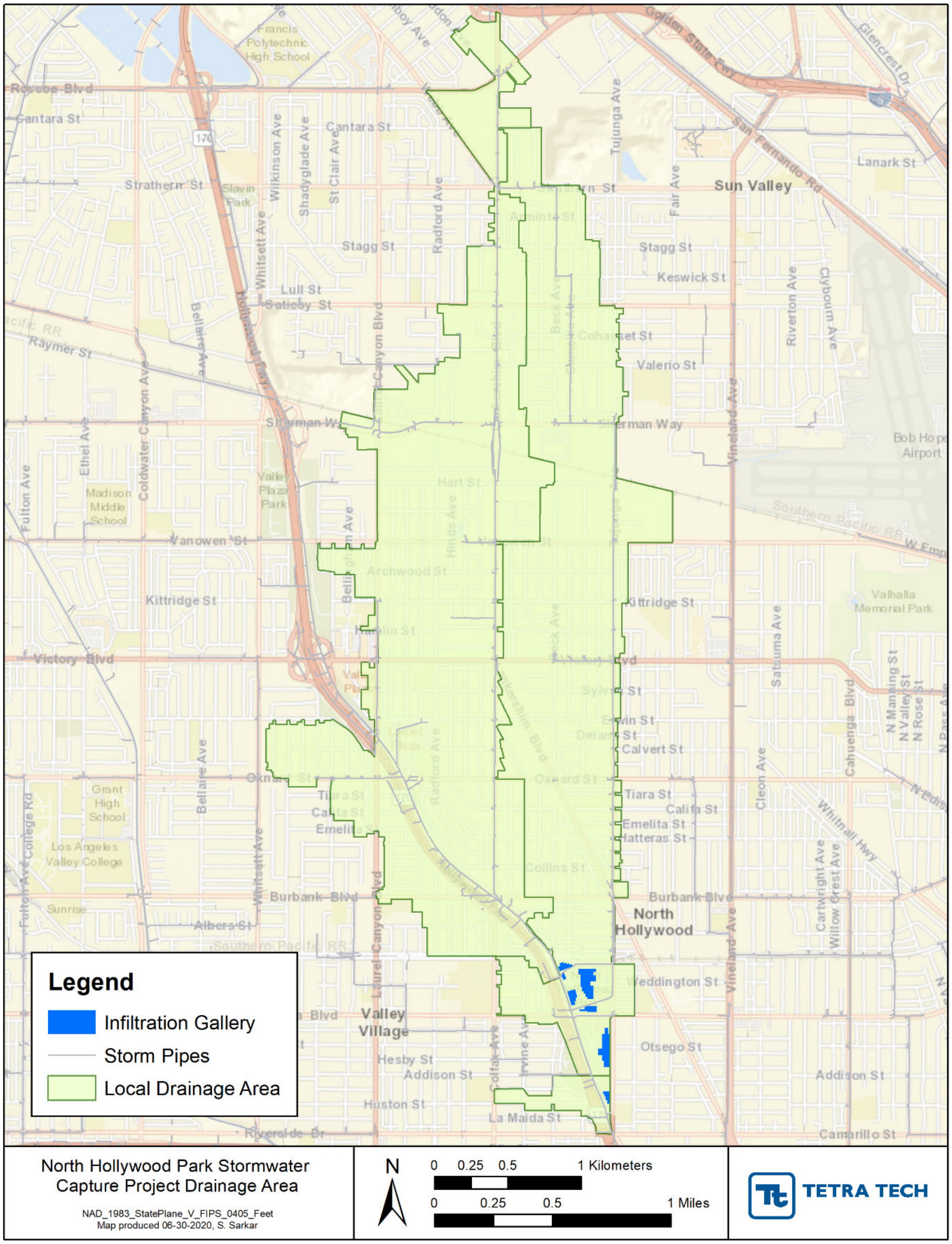


Figure 3. Contributing drainage area for North Hollywood Park stormwater capture project

2.2 Geotechnical Investigation

Geotechnical investigations and infiltration testing studies were performed by Geosyntec Consultants, Inc. (Geosyntec) at North Hollywood Park between April 10 and May 4, 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 Sand (SP) and Silty Sand (SM) with interbedded layers of Sandy Silt (ML) in the upper 30 to 35 ft below ground surface (bgs). The upper approximately 5 ft is believed to consist generally of artificial fills, while the material below consists of young alluvium. Within the portion of the site south of Magnolia Boulevard, an upper silty layer up to 15-ft thick with fines content ranging from 40 to 65 percent was encountered immediately below the fill at several locations. A second silty layer, with some clay, varying between 6- to 10-ft thick was encountered at some locations. Below the silt, silty sands were generally found to contain a greater proportion of sand and less silt at depths greater than 40 to 45 ft bgs. North of Magnolia Boulevard, an upper layer of Sandy Silt (ML) and Silty Sand (SM) up to 25 ft thick, with fines content generally between 40 and 70 percent, was encountered below the fill mantle across a majority of the area. This silty layer is generally underlain by Silty Sands (SM) and Sands (SP and SW); however, a second silty layer up to 12 ft thick was also encountered at some locations, particularly near the northern and southern ends of this portion of the park. Pockets of Sandy Silty Clay (CL-ML) and Silty Clayey Sand (SC-SM) were encountered within and just below these silty layers at some locations.

2.2.2 Groundwater Elevation

Regarding elevation of the seasonal high-water table (SHWT), Geosyntec (2020) reports that groundwater depths in the range of 107 ft bgs to 194 bgs have been measured between 2009 and 2018 at monitoring wells located between 615 ft. and 1.7 miles from the site. In contrast, a 1997 California Geologic Survey map indicates a “historic high” groundwater level at the site of 10 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 $5x10^{-4}$ cm/s to $9x10^{-3}$ cm/s (0.64 in/hr to 8.4 in/hr). Hydraulic conductivity values were also estimated from CPT data by implementing the correlations presented by Robertson (2010) using Soil Behavior Type Index, Ic. These values were compared to the field-measured values and used to help develop estimated infiltration rates for soil layers not assessed during the field infiltration testing.

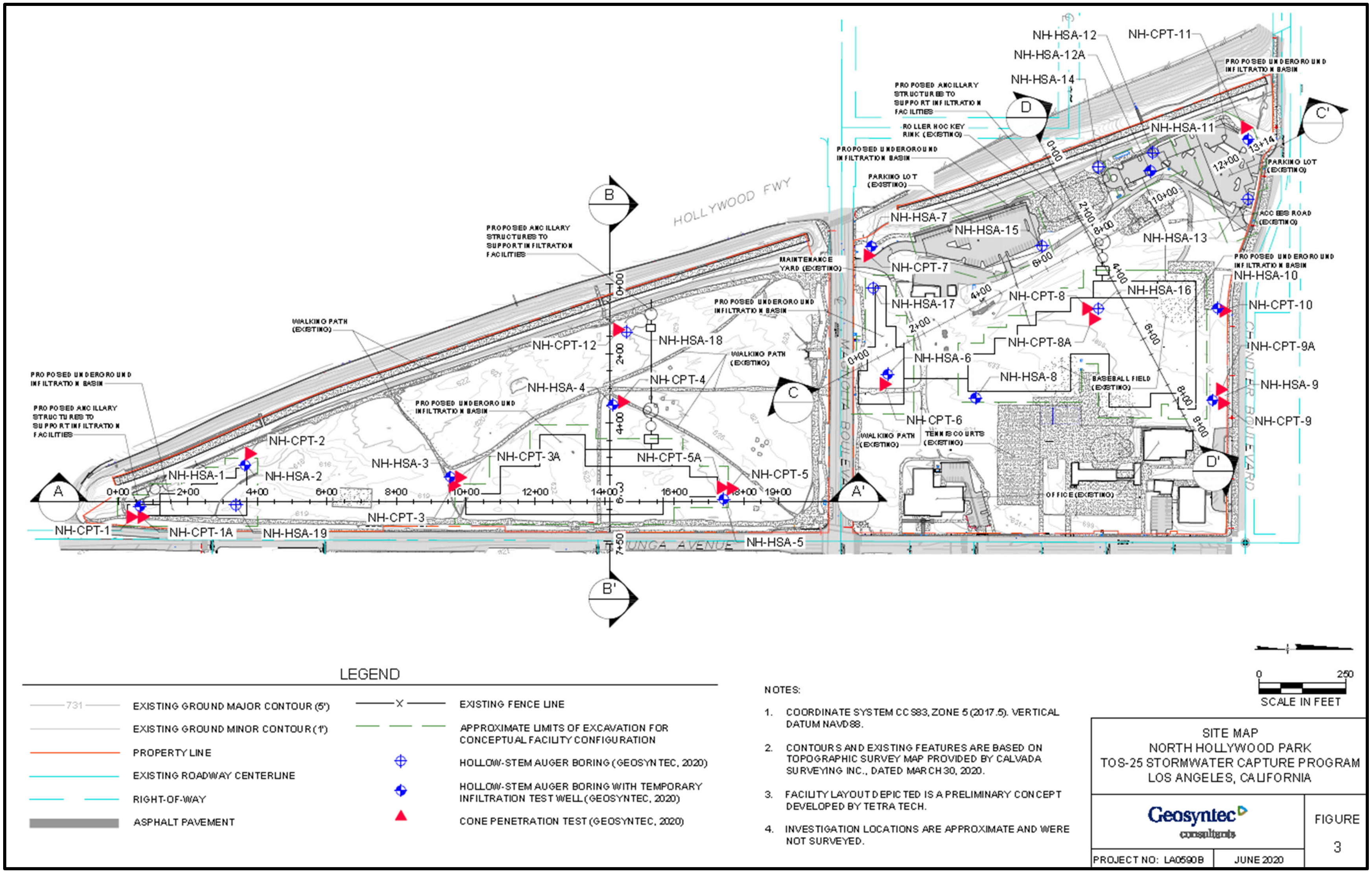
Based on preliminary conceptual designs for North Hollywood Park, the materials in which the stormwater will infiltrate classify predominantly as Sandy Silt (ML). Because fine-grained soils such as silt and clay are not generally conducive to infiltration, these upper silt layers and silty sands with relatively high fines content located at or below the base of the proposed infiltration galleries should be over-excavated to remove the lower permeability material until materials exposed in the base of the excavation have a fines content of less 25 percent. Approximate depths of required removals for each basin location are indicated in the table below, along with the corresponding infiltration rates that may be used for design purposes.

In the portion of the Site north of Magnolia Boulevard, infiltration rates generally improve with depth due to the presence of cleaner sands below a layer of silty sand. To take advantage of this, basins constructed within this area may be founded at lower elevations where sandier material provides better infiltration. The table provides an option for either shallower basins founded on Silty Sand (Option 1) and deeper basins founded on Sand and Silty Sand (Option 2).

Table 3. Recommended design infiltration rates at North Hollywood Park (Geosyntec, 2020)

Basin Location[1]	Assumed Base of Excavation	Measured Infiltration Rate, cm/s (in/hr)	Infiltration Rate Estimated from CPT Correlation, cm/s (in/hr)	Design Infiltration Rate, cm/s (in/hr)
Section A-A' Approx. Sta 0+30 to 3+65	El. 580 ft	2.8×10^{-3} (3.9) [HSA-2]	5.0×10^{-3} (7.1)	2.5×10^{-3} (3.5)
Section A-A' Approx. Sta 10+00 to 17+30	El. 585 ft.	7.9×10^{-4} (1.1) [HSA-3]	5.0×10^{-3} (7.1)	2.5×10^{-3} (3.5)
Basins North of Magnolia Boulevard – Option 1: Founded in Silty Sand	Refer to Figure 5	3.5×10^{-3} (4.9) [HSA-12]	1.0×10^{-3} (1.4)	1.7×10^{-3} (2.5)
Basins North of Magnolia Boulevard – Option 2: Founded in Sand/Silty Sand	Refer to Figure 5	5.9×10^{-3} (8.4) [HSA-8]	5.0×10^{-3} (7.1)	2.5×10^{-3} (3.5)

[1] See Figure 4



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.

Figure 4. North Hollywood Park site map indicating locations of infiltration test wells (Geosyntec, 2020)

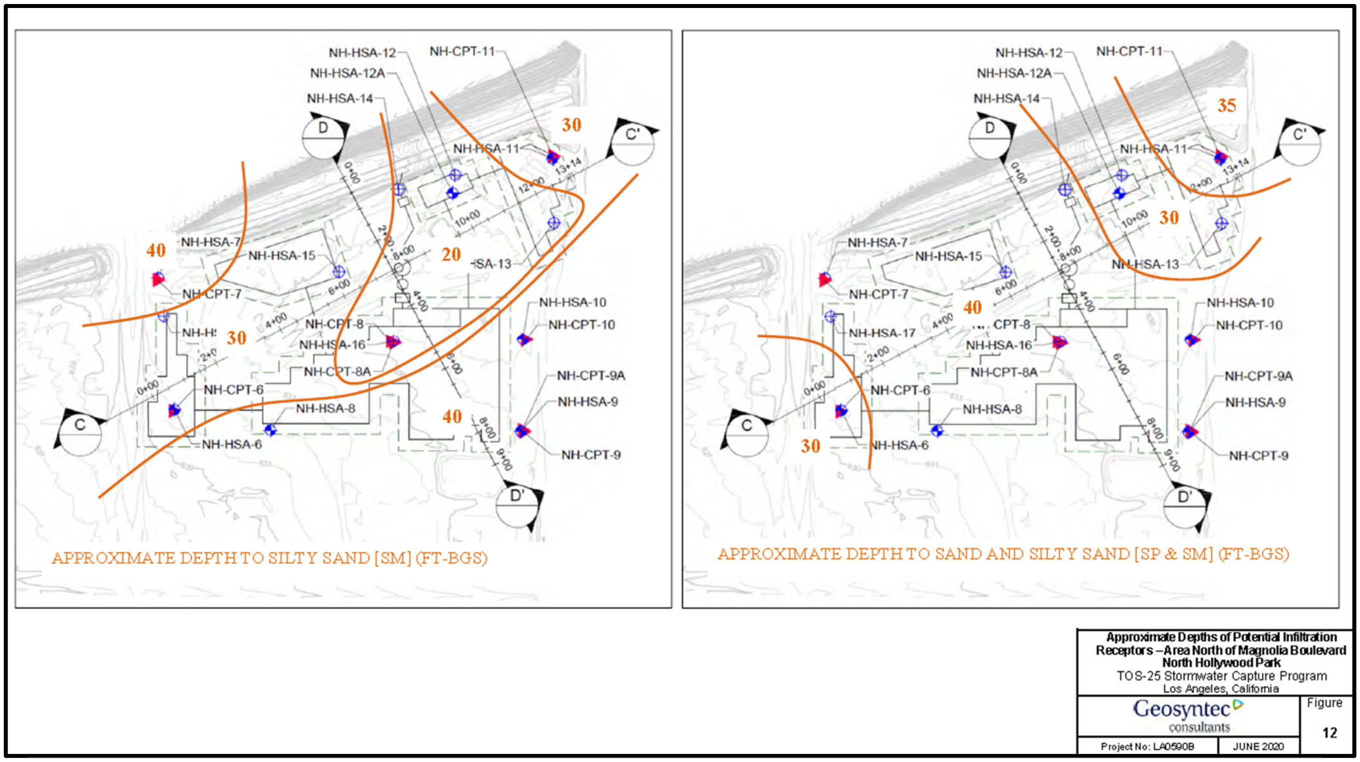


Figure 5. Approximate depths of infiltration receptors, areas north of Magnolia Boulevard (Geosyntec, 2020)

3.0 Hydrologic and Hydraulic Modeling

3.1 Optimization Model

The proposed stormwater best management practice (BMP) for North Hollywood Park consists of several subterranean infiltration galleries. Tetra Tech has developed a robust optimization routine to determine the most cost-effective BMP configurations and diversion rates from Tujunga Wash to achieve the annual stormwater volume capture target of 1,176 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 North Hollywood Park site based on the long-term average annual infiltration (recharge) simulated using SUSTAIN.

A schematic representation of the North Hollywood Park SUSTAIN optimization framework is shown in Figure 5. The conceptual design proposed three galleries with areal footprints of 7.3, 3.2 and 0.6 acres, respectively. The optimization modeling consisted of varying the diversion rates at the diversion points and infiltration gallery depths to determine the most cost-effective configurations to meet or exceed the average annual recharge target of 1,176 AFY. Since the objective is to maximize infiltration, the maximum available infiltration areas per the conceptual design were used in the optimization modeling. The geotechnical investigation identified the presence of methane gas in the vicinity of the southernmost infiltration gallery. The optimization modeling therefore also evaluated potential options to maximize recharge with and without the southernmost infiltration gallery.

Based on the geotechnical investigation, the suggested design infiltration rate for the gallery north of Magnolia Blvd. (the northern gallery complex shown in Figure 5) is 2.5 in/hr or 3.5 in/hr depending on whether the gallery is founded in silty sand or sand/silty/sand, respectively. While site configurations were evaluated using both infiltration rates, founding the gallery in sand/silty sand would require excavating to more than 30-ft and was therefore deemed not feasible. The results presented here are therefore based on a design infiltration rate of 2.5 in/hr for the galleries north of Magnolia Blvd. and 3.5 in/hr for the other galleries.

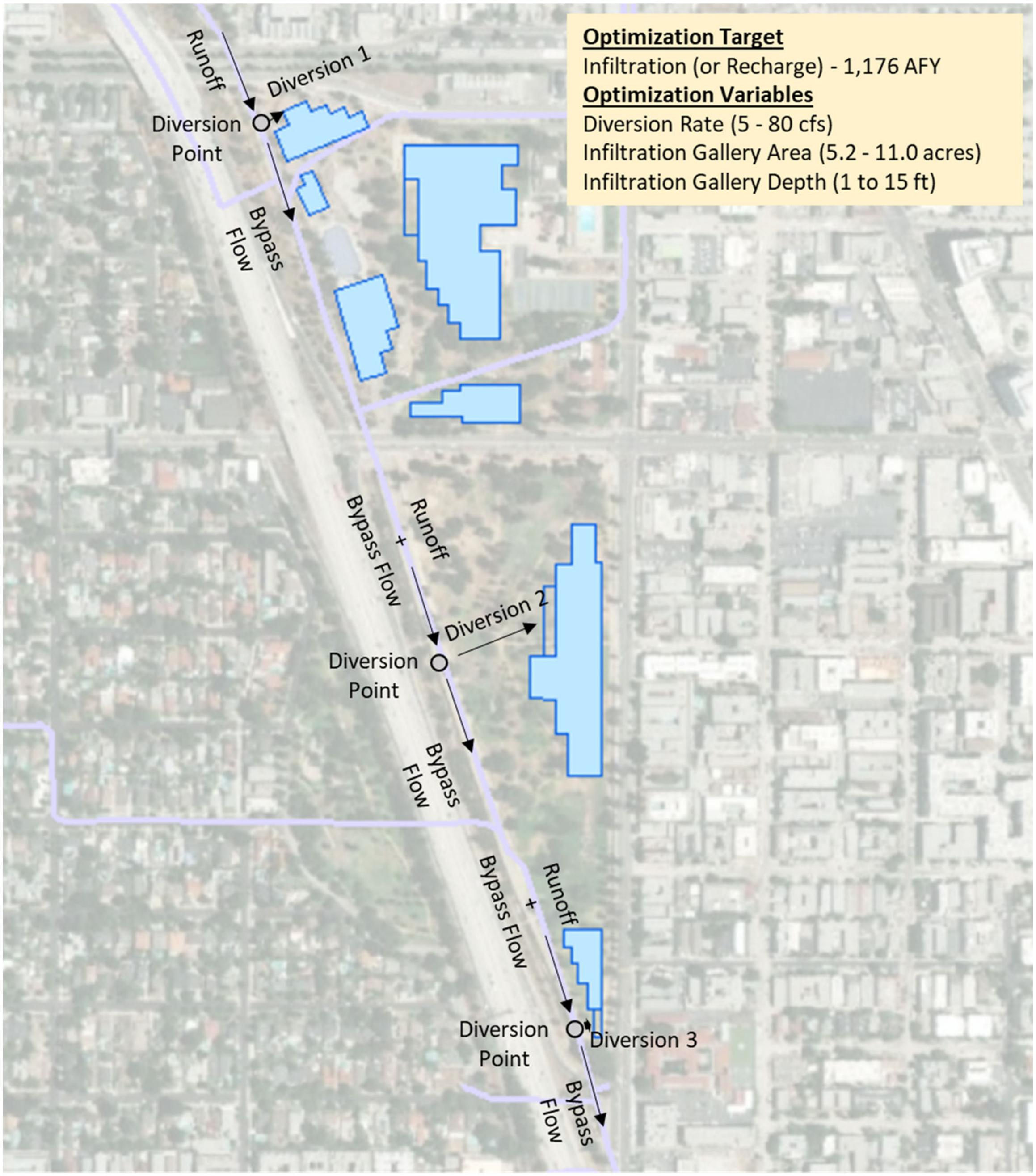


Figure 5. Schematic representation of SUSTAIN optimization framework for North Hollywood Park

The average annual recharge simulated by the SUSTAIN model was evaluated for diversion rates ranging from 5 to 80 cfs at each diversion point and infiltration gallery depths ranging between 1 and 15-ft. Due to site restrictions the maximum feasible depth for the galleries is determined to be approximately 11-ft. Based on the subset of simulated results shown in Figure 6, it is evident that the target infiltration volume of 1,176 AFY is achieved with a minimum storage volume of approximately 38 ac-ft (or 3.4-ft average gallery depth) and a corresponding total diversion rate of 215 cfs. As the storage volume is increased, the recharge target is met with a lower diversion rate. Maximizing the storage volume to 121 ac-ft (11-ft depth) requires a total diversion rate of 170 cfs to meet the annual recharge goal of 1,176 AFY.

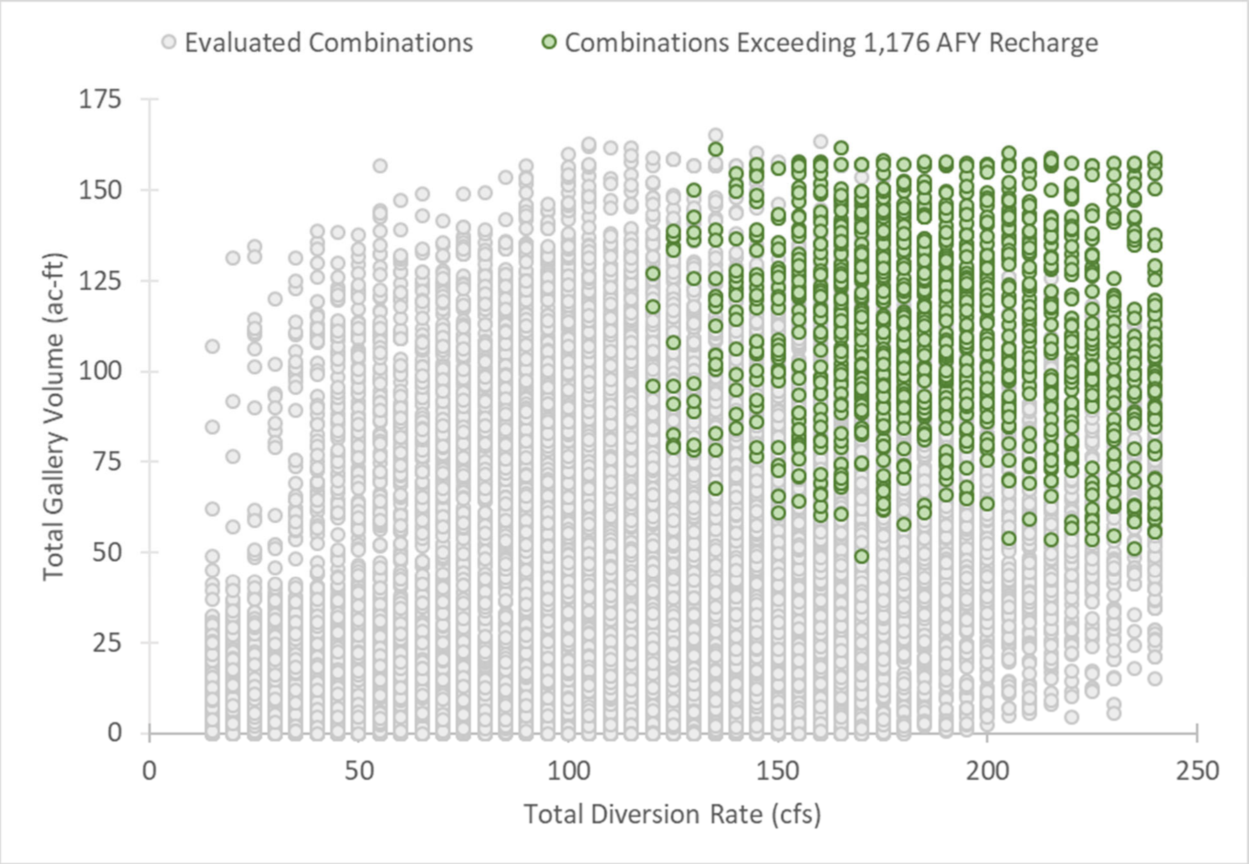


Figure 6. Tested combinations of total storage volume and total diversion rates that yield at least 1,176 AFY recharge

Due to the presence of methane gas below the site for the southernmost infiltration gallery, the optimization model was used to evaluate the potential average annual recharge without the southernmost gallery. The SUSTAIN simulates an average annual recharge of 1,165 (slightly lower than the target) with diversion rates of 60 cfs each for diversions 1 and 2, respectively, and a storage depth of 11-ft (or total storage volume of approximately 115 ac-ft) for the remaining infiltration galleries.

Dry wells in combination with an infiltration gallery were tested to determine the potential for additional stormwater capture, specifically for the scenarios that eliminate the southernmost infiltration gallery. Note that at diversion rates of 60 cfs, a significant proportion of the runoff generated from the local watershed is captured by the infiltration galleries. However, when the incoming runoff rate exceed the diversion rates or the infiltration galleries are at capacity, the excess flows are bypassed. Therefore, the most effective use of dry wells is to capture and infiltrate part of the excess bypass flow for additional stormwater capture. Based on the geotechnical investigation, the design infiltration rate for the dry wells is assumed at 3.5 in/hr. The average annual recharge with 10 dry wells at the site of the southernmost infiltration gallery increases from 1,165 AFY to 1,182 AFY. Dry well diameters of 10-ft and center-to-center spacing of 50-ft were assumed for the analysis.

The total cost associated with each tested combination of diversion rate and infiltration gallery volume was 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.

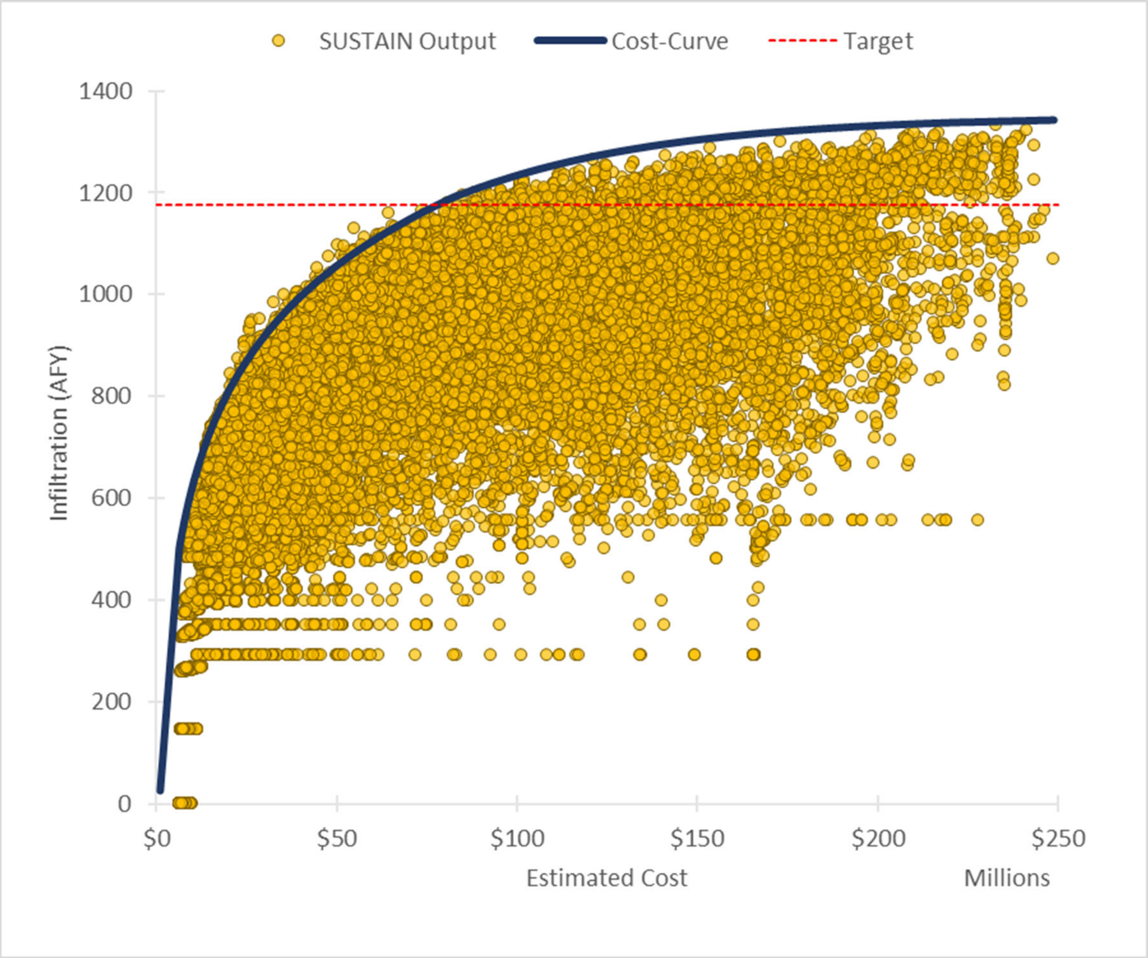


Figure 7. Relative performances of tested range of diversion rates and basin sizes versus estimated cost

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 (3 nos.)
2. Infiltration Gallery (2 nos.)
3. TBD (pending completion of programmatic analysis)

Based on field reconnaissance, results of the geotechnical investigation, and 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 North Hollywood Park 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 Galleries	Infiltration Galleries
Number of BMP units	--	3	2
BMP depth (each)	ft.	11	11
BMP surface area	sq. ft.	479,822	454,864
BMP storage volume	ac. ft.	121.2	114.9
Design infiltration rate	in/hr	3.50, 2.50	3.50, 2.50
Total Infiltration	AFY	1,198	1,165

Note: Infiltration rate of 2.5 in/hr was used for galleries North of Magnolia Boulevard

Table 5. Simulated sediment, nutrients, metals and bacteria load reductions for the proposed alternatives

BMP Scenario	Sediment (lbs/year)	Total Nitrogen (lbs/year)	Total Phosphorus (lbs/year)	Copper (lbs/year)	Lead (lbs/year)	Zinc (lbs/year)	Fecal coliform (#)
Alternative 1	129,386.4	5,111.5	4,171.6	51.5	46.3	495.3	1.024E+14
Alternative 2	119,645.1	4,530.8	3,714.0	47.8	43.1	461.2	9.142E+13

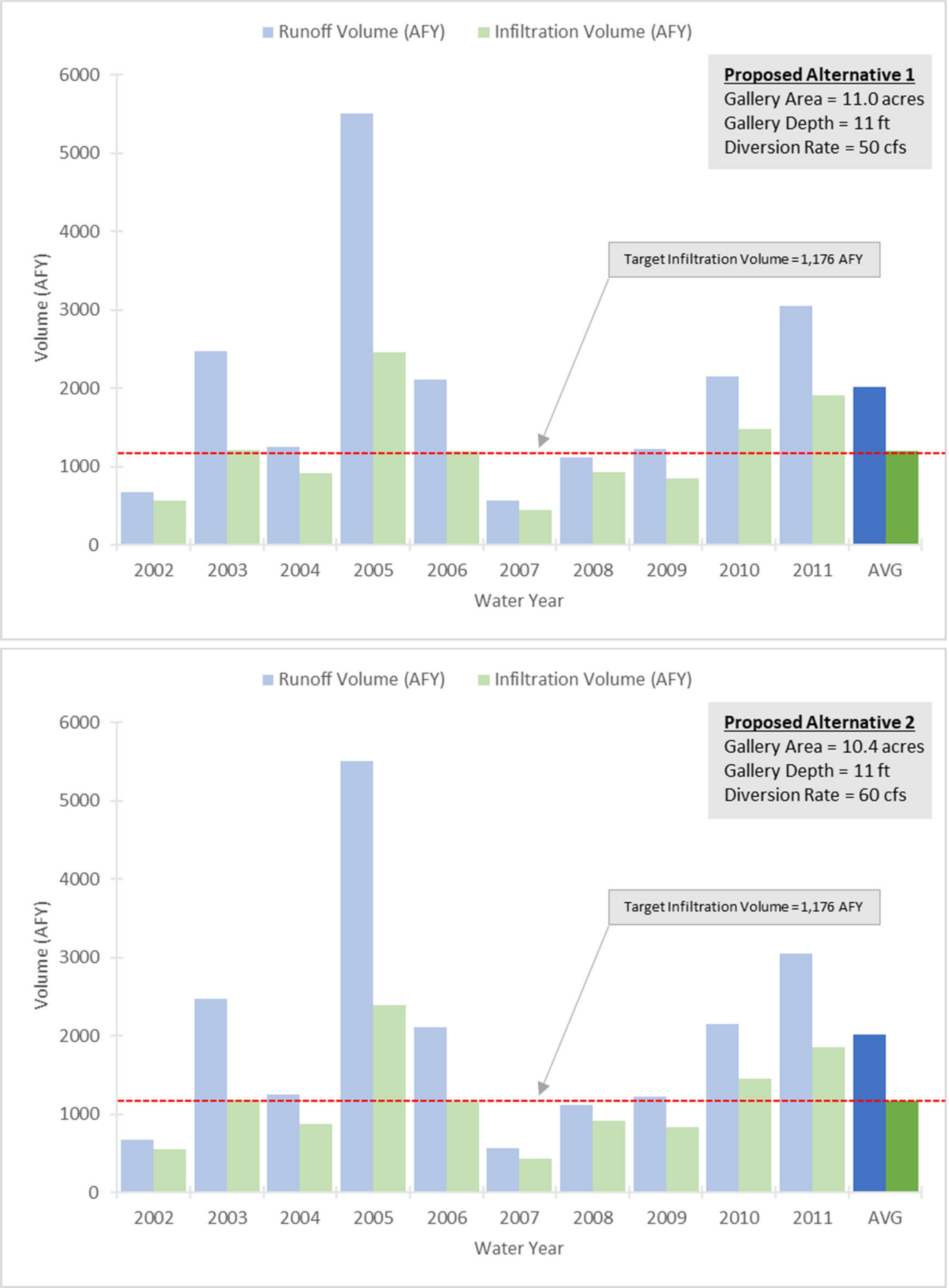


Figure 8. Simulated annual runoff and infiltration volumes for the proposed alternatives 1 and 2

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 North Hollywood Park watershed for the 85th-percentile 24-hour storm is shown in Figure 9.

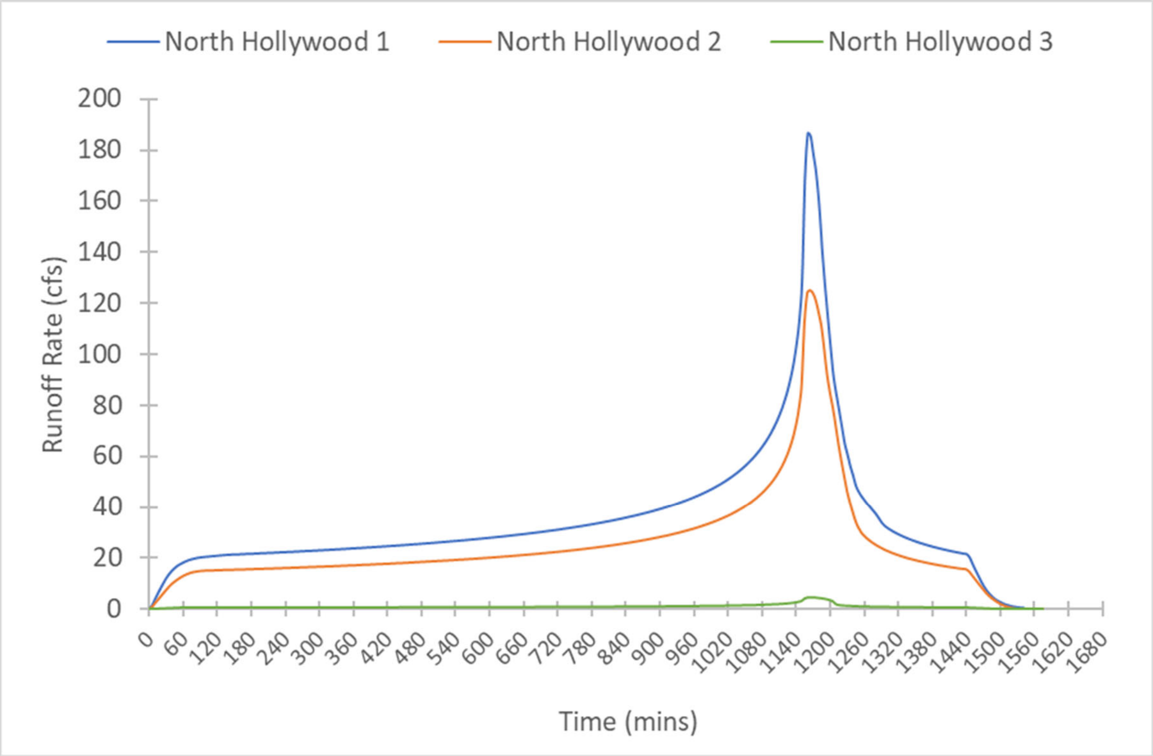


Figure 9. Simulated runoff for the 85th-percentile 24-hour storm

The 85th-percentile storm generates a total runoff volume of 132.1 ac-ft and a peak runoff rates of approximately 190-cfs, 130-cfs and 5-cfs for the drainage areas associated with infiltration galleries 1,2 and 3, respectively. At recommended diversion rates of 50-cfs (alternative 1) and 60-cfs (alternative 2), the runoff associated with the 85th-percentile storm is not completely captured by the infiltration galleries. The SUSTAIN model simulates capture and recharge of 92% of the 85th-percentile storm runoff volume for alternative 1. For proposed alternative 2, approximately 89% of the 85th-percentile storm runoff volume is captured.

Analysis of diversion structures (discussed below) shows that an appropriately sized drop inlet in combination with a berm may be used to completely capture the peak flows associated with the 85th-percentile storm. The maximum depth of water in the infiltration galleries simulated by SUSTAIN for complete capture of the 85th-percentile storm runoff volume were approximately 4-ft for infiltration gallery #1,10-ft for infiltration gallery #2 and less than 1-ft or infiltration gallery #3.

---

[2] https://dpw.lacounty.gov/wrd/publication/Engineering/hydrology/HydroCalc.zip

Note that 85th-percentile storm runoff volume is greater than the total storage capacity of the infiltration galleries 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 1,176 AFY is met with a storage capacity less than the 85th-percentile storm volume.

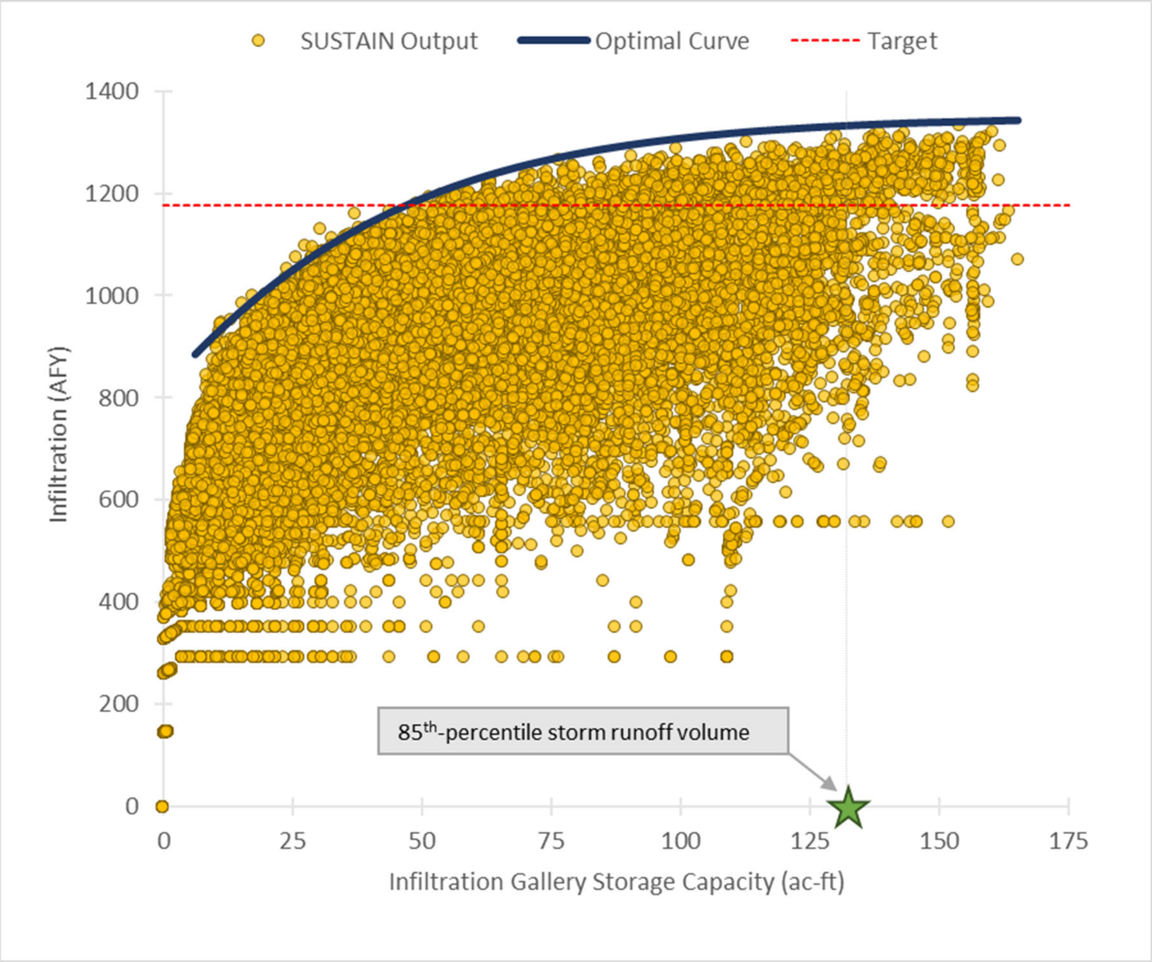
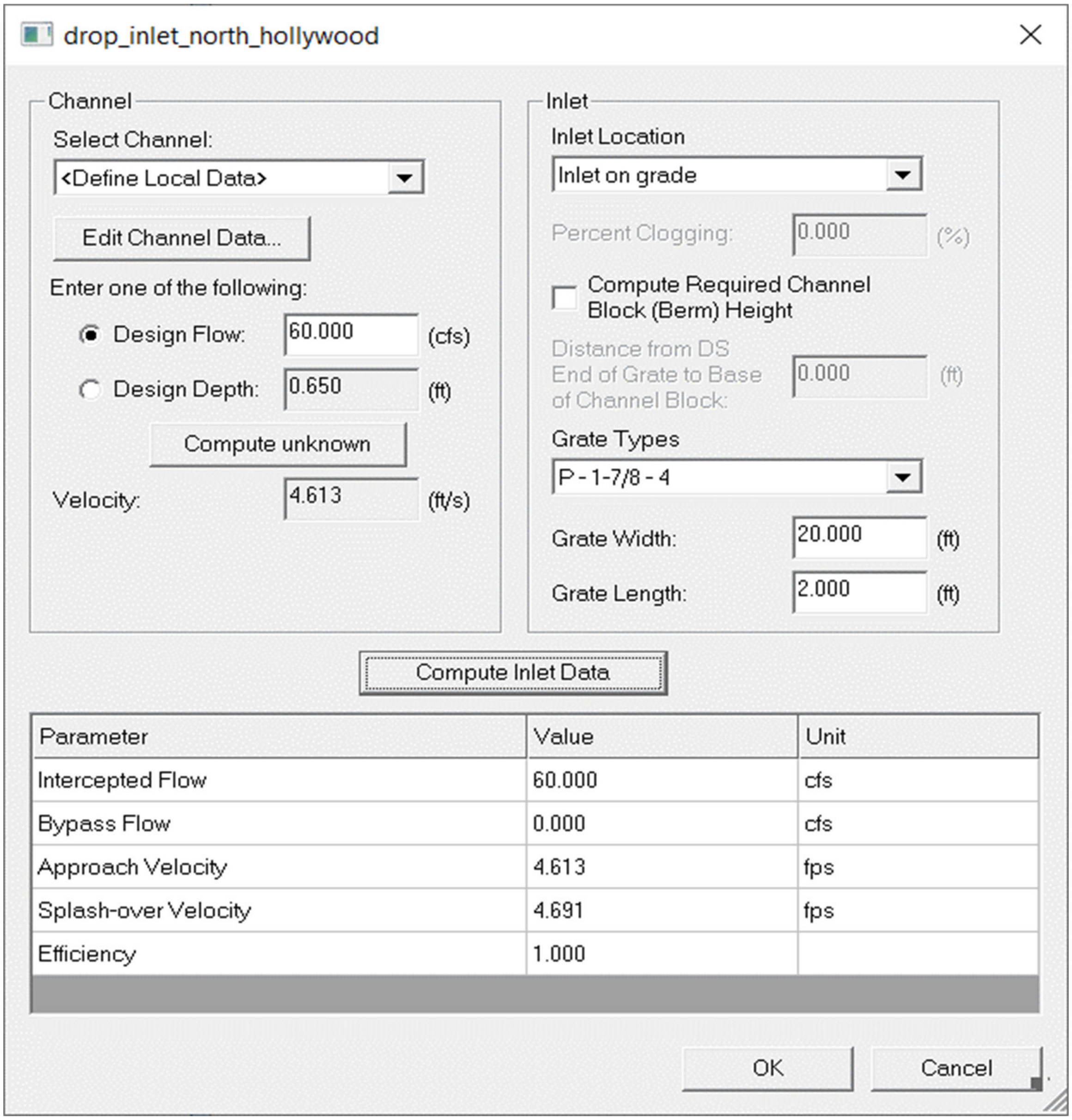


Figure 10. Simulated average annual infiltration versus infiltration gallery storage capacity

3.2 Diversion Structure Analysis

The storm drain system at North Hollywood Park 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 to 60-cfs to the offline BMP units. Drop inlets were sized for the three (3) diversion points using HEC-22 methods (Brown et al. 2009) as inlet on grade with grate type P-1-7/8-4 (equivalent to Pacific Grating 30-W-4), as shown in Figure 11.

As evident from the above below, a 20-ft long (width of the Tujunga Wash) and 2-ft wide P-1-7/8-4 grate is able to completely capture an influent flow of 60-cfs. However, it may not be feasible to provide a drop inlet spanning the entire width of the channel and in such cases a small proportion of the influent flow will bypass the inlet. A complete capture may still be possible by placing a berm (or weir) immediately downstream of the drop inlet. For example, keeping the inlet length at 2-ft, and providing clearance of 1-ft were on either side of the drop inlet (a total width of 18-ft), approximately 90% of the influent 60-cfs flow will be captured by the inlet. Assuming a 0.5-ft freeboard and 50% clogging, a 1.5-ft berm placed immediately downstream of the drop inlet will enable complete capture of the influent 60-cfs flow (Figure 12).



Select Channel: <Define Local Data>

● Design Flow: 60.000 (cfs)

○ Design Depth: 0.650 (ft)

Velocity: 4.613 (ft/s)

Inlet Location: Inlet on grade

Percent Clogging: 0.000 (%)

☐ Compute Required Channel Block (Berm) Height

Distance from DS End of Grate to Base of Channel Block: 0.000 (ft)

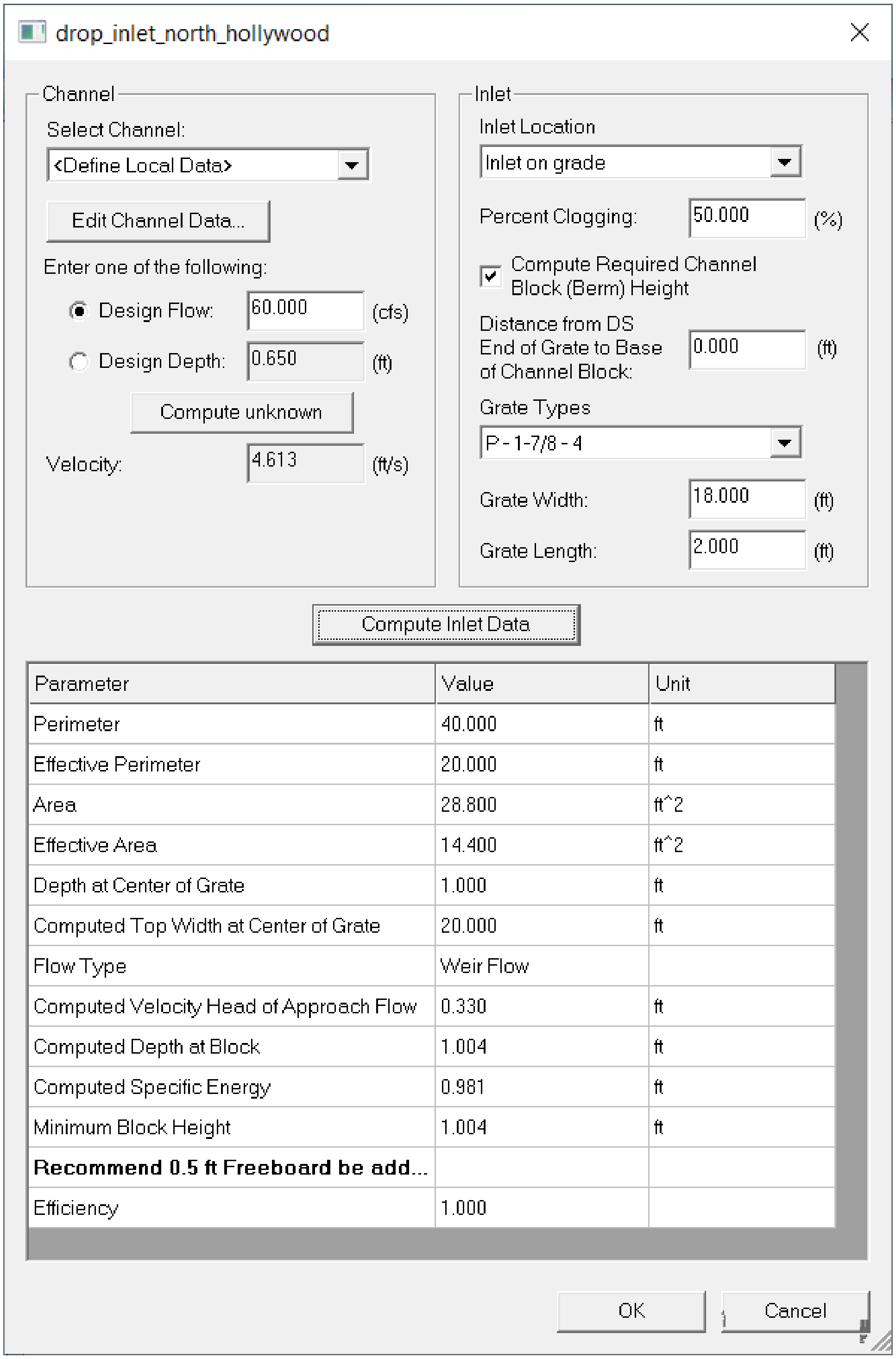
Grate Types: P - 1-7/8 - 4

Grate Width: 20.000 (ft)

Grate Length: 2.000 (ft)

Parameter	Value	Unit
Intercepted Flow	60.000	cfs
Bypass Flow	0.000	cfs
Approach Velocity	4.613	fps
Splash-over Velocity	4.691	fps
Efficiency	1.000	

Figure 11. Grated drop inlet dimensions for compete capture of 60-cfs flow based on HEC-22 methods.



Select Channel: <Define Local Data>

Enter one of the following:

● Design Flow: 60.000 (cfs)

○ Design Depth: 0.650 (ft)

Velocity: 4.613 (ft/s)

Inlet Location: Inlet on grade

Percent Clogging: 50.000 (%)

☑ Compute Required Channel Block (Berm) Height

Distance from DS End of Grate to Base of Channel Block: 0.000 (ft)

Grate Types: P - 1-7/8 - 4

Grate Width: 18.000 (ft)

Grate Length: 2.000 (ft)

Parameter	Value	Unit
Perimeter	40.000	ft
Effective Perimeter	20.000	ft
Area	28.800	ft^2
Effective Area	14.400	ft^2
Depth at Center of Grate	1.000	ft
Computed Top Width at Center of Grate	20.000	ft
Flow Type	Weir Flow	
Computed Velocity Head of Approach Flow	0.330	ft
Computed Depth at Block	1.004	ft
Computed Specific Energy	0.981	ft
Minimum Block Height	1.004	ft
Recommend 0.5 ft Freeboard be add...		
Efficiency	1.000	

Figure 12. Drop inlet and weir dimensions assuming 50% clogging and drop inlet width of 18-ft.

As noted above, the peak flow associated with the 85th-percentile storm is approximately 190-cfs. A 20-ft by 2-ft P-1-7/8-4 grate is not able to completely capture the 85th-percentile storm peak flow. However, increasing the length of the grate to 4-ft enables complete capture of the peak flow of 190-cfs. If the width of the grate were reduced to 18-ft to provide 1-ft clearance on either side, a 2.5-ft high berm would be required for complete capture of the peak flow assuming a freeboard of 0.5-ft and 50% clogging of the grate.

Rating curves were developed for the diversion structures based on the HEC-22 analysis and subsequently used in an EPA-SWMM model. Note that at this time a Water Surface Pressure Gradient (WSPG) analysis has not been completed for the proposed diversion structures but will be conducted prior to the final submission of the proposed alternatives. Reinforced concrete pipes (RCP) of internal diameter 42” are proposed to convey the diverted flows to the infiltration galleries.

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 North Hollywood Park 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 13. 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.

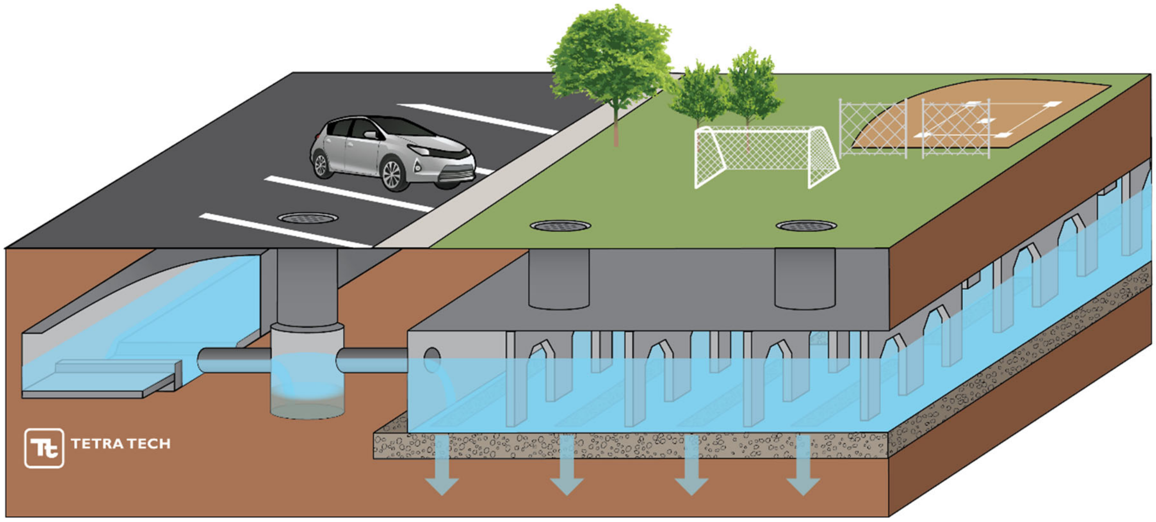


Figure 13. Conceptual layout of regional underground infiltration gallery configuration

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 North Hollywood Park, the dry wells may be located along the eastern edge of the proposed infiltration gallery at a spacing of 50 ft. center-to-center. The proposed location for the dry wells is shown in .Figure 5

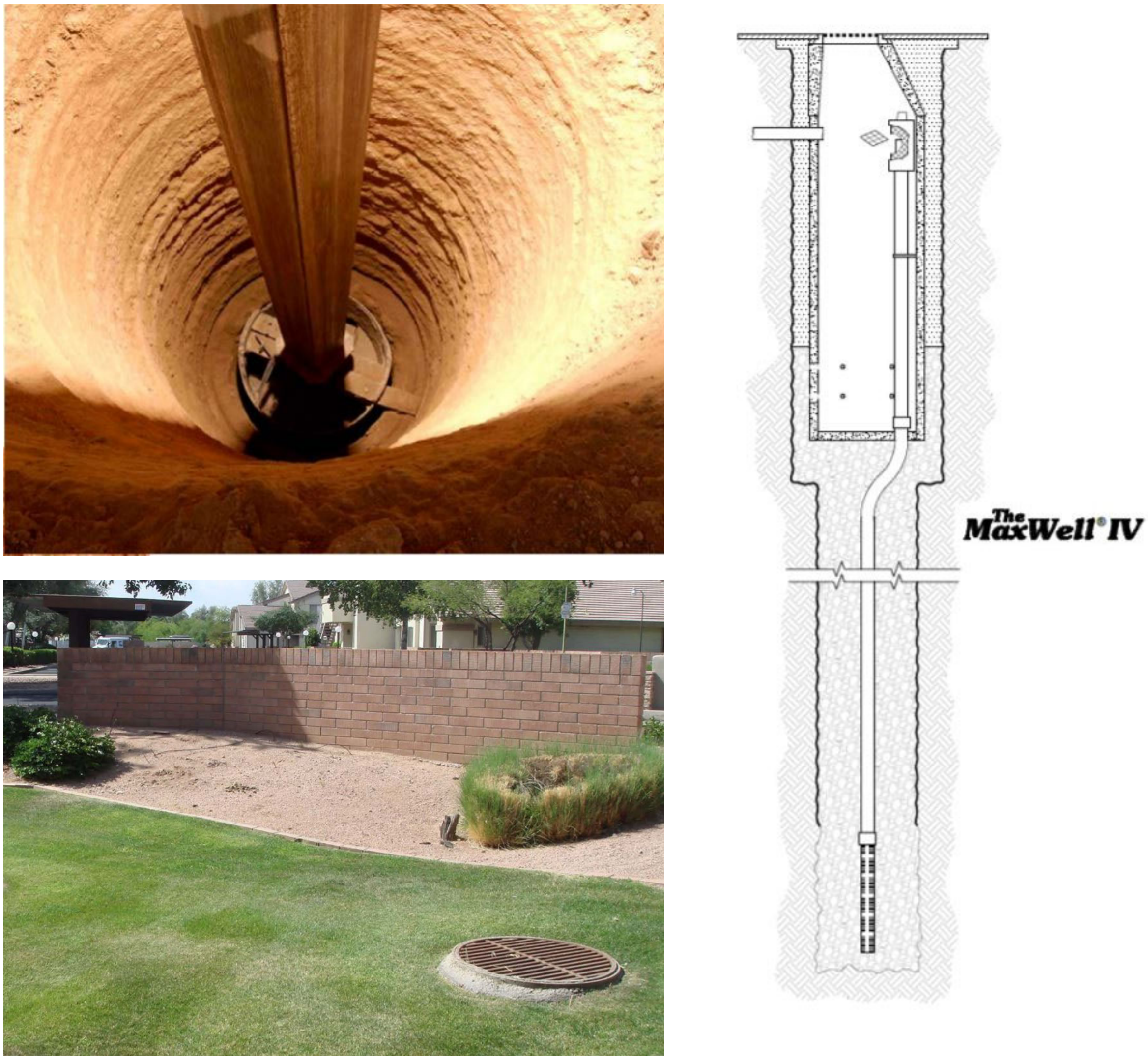


Figure 14. Typical deep drywell infiltration application (source: Torrent Resources)

(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 15 represents a typical Contech CDS type hydrodynamic separator.

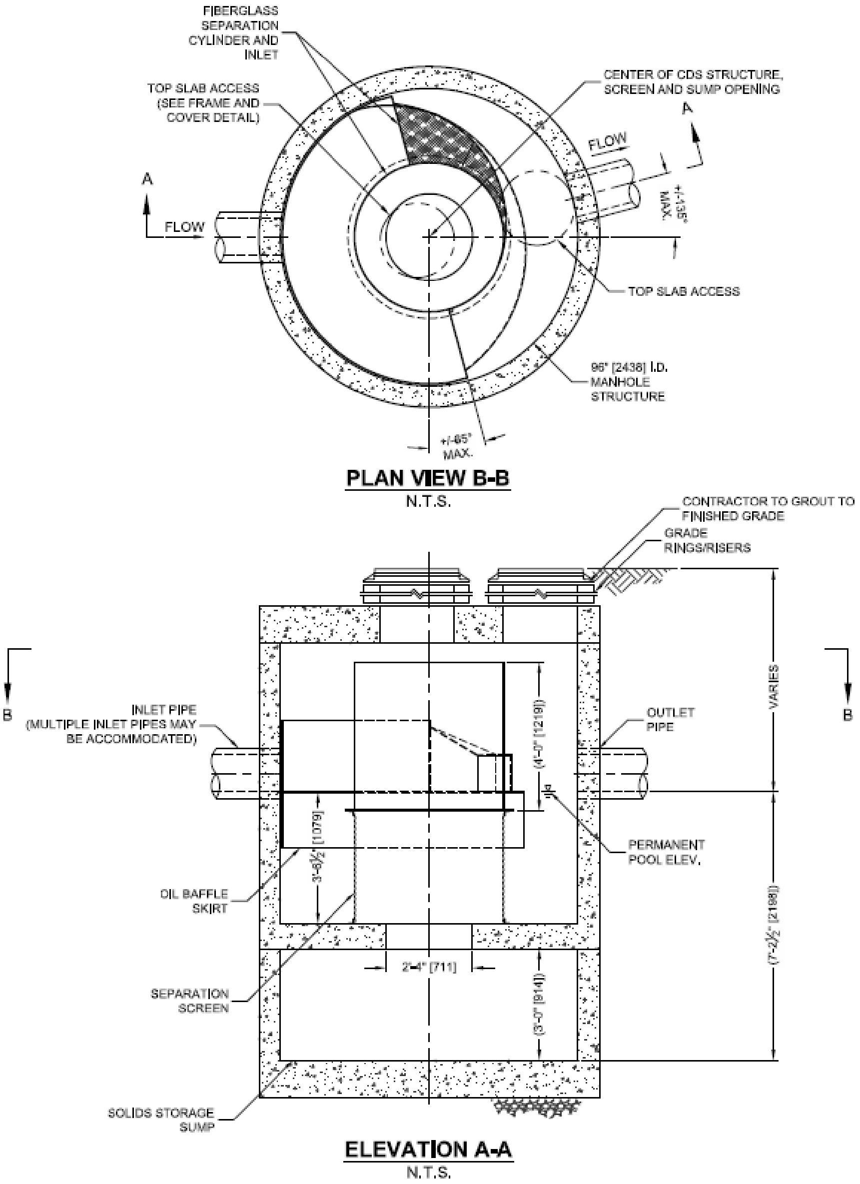


Figure 15. Standard detail for a typical CDS system (source: Contech Engineered Solutions)

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 16 illustrates the typical operation of a DSBB system.

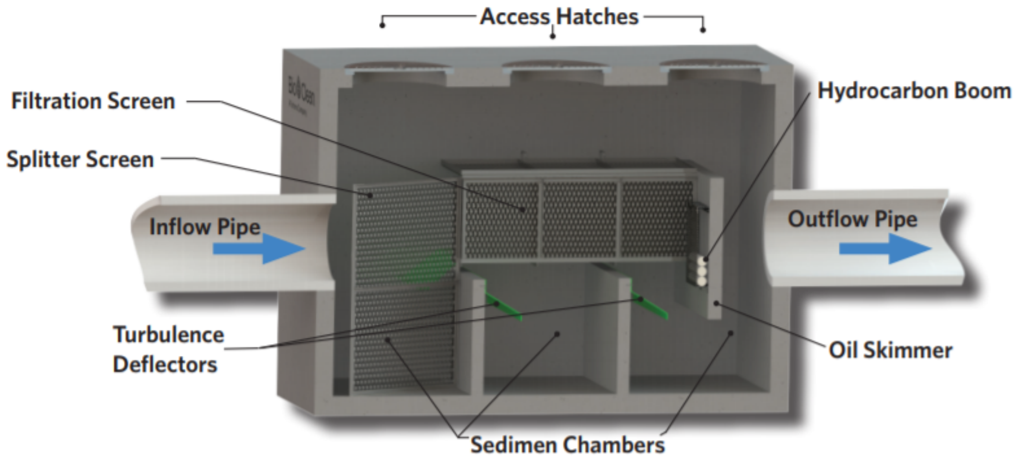


Figure 16. Typical DSBB system (source: BioClean Environmental)

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 17.

Figure 17**.** 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 North Hollywood Park, 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. North Hollywood Park 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.

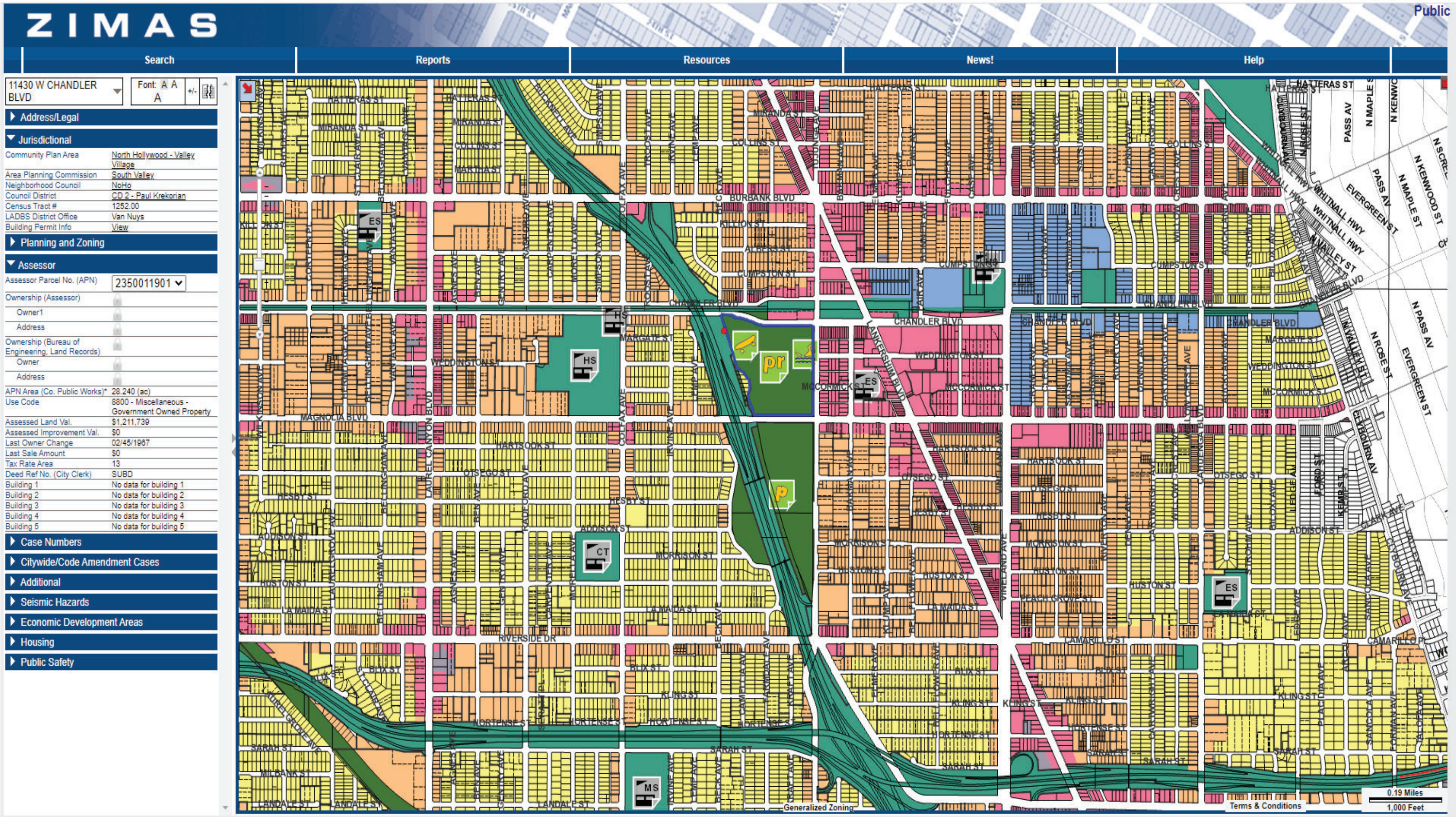
Tetra Tech. 2020. “TOS25 - Proposed Cost Functions for Programmatic Analysis (DRAFT).” Dated May 14, 2020.

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.



11430 W CHANDLER BLVD

Community Plan Area	North Hollywood - Valley Village
Area Planning Commission	South Valley
Neighborhood Council	NoHo
Council District	CD 2 - Paul Krekorian
Census Tract #	1252.00
LADBS District Office	Van Nuys
Building Permit Info	View
Assessor Parcel No. (APN)	2350011901
Ownership (Assessor)	
Owner1	
Address	
Ownership (Bureau of Engineering, Land Records)	
Owner	
Address	
APN Area (Co. Public Works)*	28.240 (ac)
Use Code	8800 - Miscellaneous - Government Owned Property
Assessed Land Val.	$1,211,739
Assessed Improvement Val.	$0
Last Owner Change	02/45/1967
Last Sale Amount	$0
Tax Rate Area	13
Deed Ref No. (City Clerk)	SUBD
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 North Hollywood 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

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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

CAUTION: External Email. Proceed Responsibly.

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

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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

CAUTION: External Email. Proceed Responsibly.

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

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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

-------------------------Confidentiality Notice-------------------------
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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
Wastewater Infrastructure	City of Los Angeles	No
Drinking Water Infrastructure	Los Angeles Department of Water & Power	Yes; 60-inch water line underneath west side of park, parallel to the channel
Recycled Water Infrastructure	City of Los Angeles	No
Natural Gas Infrastructure	Southern California Gas High Pressure Line	No
Telecommunication Infrastructure	AT&T Charter Communications Verizon	No

The existing irrigation system will be temporarily removed and replaced in order to facilitate construction of the Project. The existing 60-inch LADWP water line within the Park is the only known restricting utility for the Project. The proposed Project will be designed to avoid interfering with this water line, and adequate buffer will be maintained between the water line and proposed facilities per LADWP's guidelines.

Refer to the figure below for an opportunities and constraints map, including restricting utilities. Additional information and preliminary utility maps have been extracted from preliminary design reports and are included in the following pages.

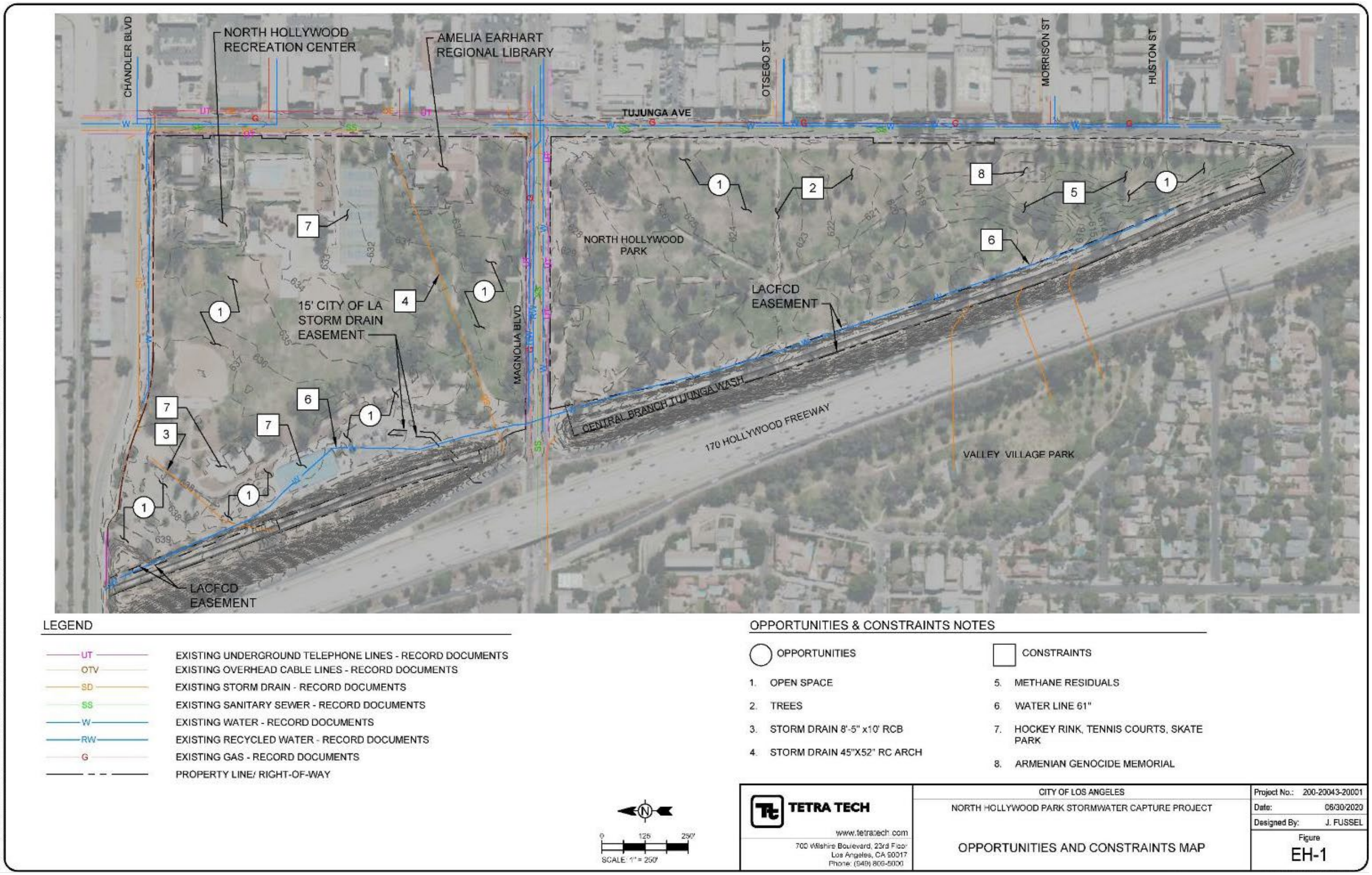

Figure Project Utility Constraints Map

7.8 Utility Interference Evaluation

7.8.1 Existing Utilities

Runoff from the 2,045-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 southwest side of the park, adjacent to SR-170. Four other storm drains are also present at the project site. One drain is owned and maintained by the City of Los Angeles, the other three are owned and maintained by LACFCD. Two of these storm drains cross the area of the park, north of Magnolia Avenue. One is a 8'-5"W x 10'H reinforced concrete box owned by LACFCD. The other is a 45" x 52" reinforced concrete arch owned by the City of Los Angeles.

An existing 60-inch water line, owned and operated by LADWP, runs underneath the west side of the park, parallel to the channel. The line size increases to 61-inch, 61.25-inch, and 61.5-inch as it runs north to south.

Other existing utilities near North Hollywood Park include the following:

- Within Chandler Boulevard
    - 8-inch, 6-inch, and 4-inch LADWP water lines
    - 2-inch Southern California Gas Company line
    - One overhead Verizon communications line
    - One overhead Charter communications line

- Within Tujunga Avenue
    - 36-inch and 8-inch LADWP water lines
    - 4-inch Southern California Gas Company line
    - 8-inch City sanitary sewer line
    - Three underground PT&T communications lines
    - One overhead Charter communications line
    - One overhead Verizon communications line

- Within Magnolia Boulevard:
    - 12-inch LADWP water line
    - Two 16-inch City recycled water lines
    - 4-inch Southern California Gas Company line
    - 8-inch City sanitary sewer line
    - One underground AT&T communications line
    - Two underground PT&T communications lines

The utilities map is included in Appendix A.

7.8.2 Utility Interference

With the exception of the existing irrigation system, only the existing 60-inch LADWP water line within the North Hollywood Park property will restrict the recommended project. The proposed storm drain diversion pipes and facilities shall be designed to avoid interfering with the existing water line. An adequate buffer will be maintained between the water line and proposed facilities per LADWP guidelines. At the north end of the site, the proposed storm drain line for Diversion System A crosses the existing water line. That portion of the water line will require vertical relocation to provide sufficient clearance between the two utilities. 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.

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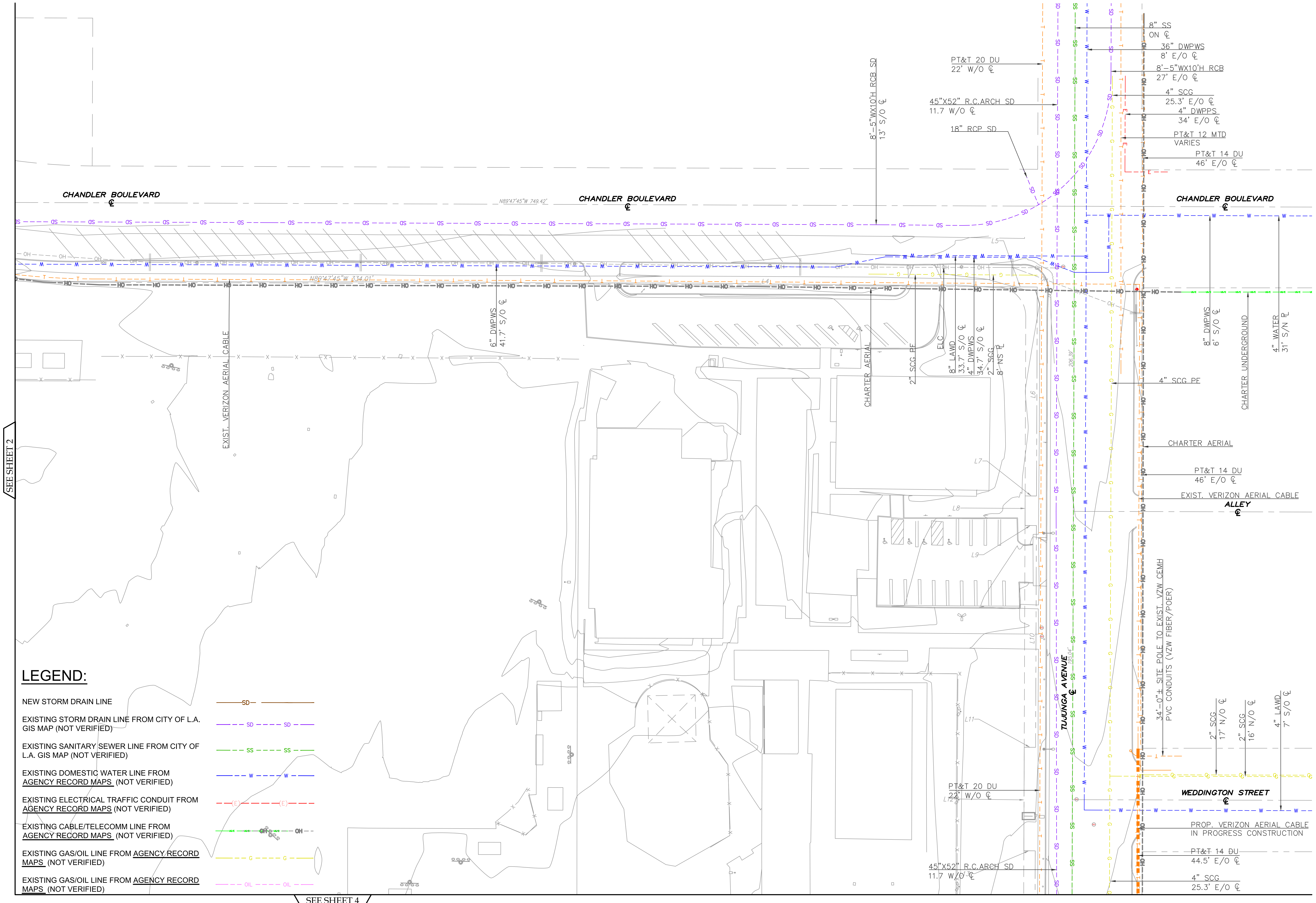

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PLAN VIEW

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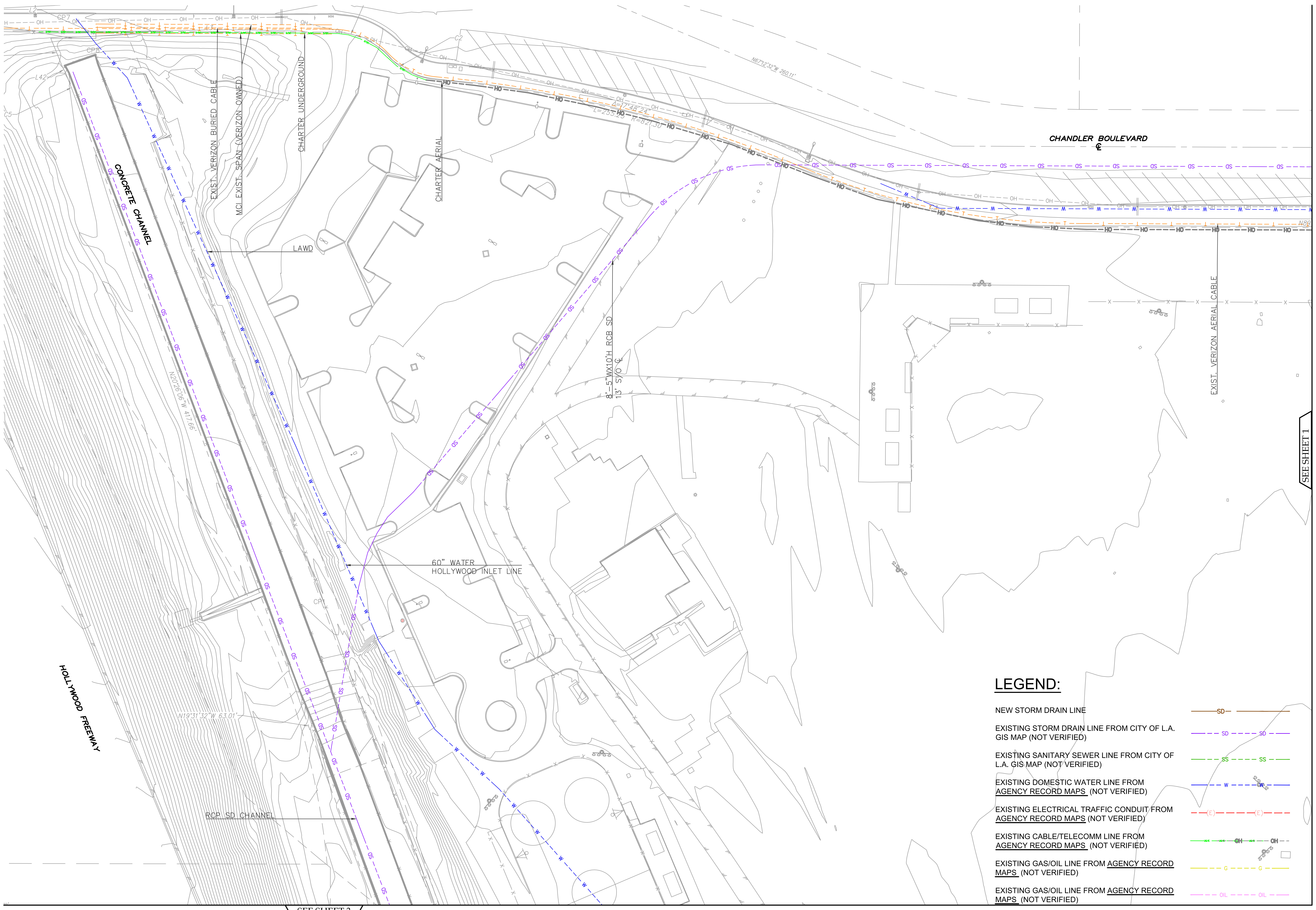

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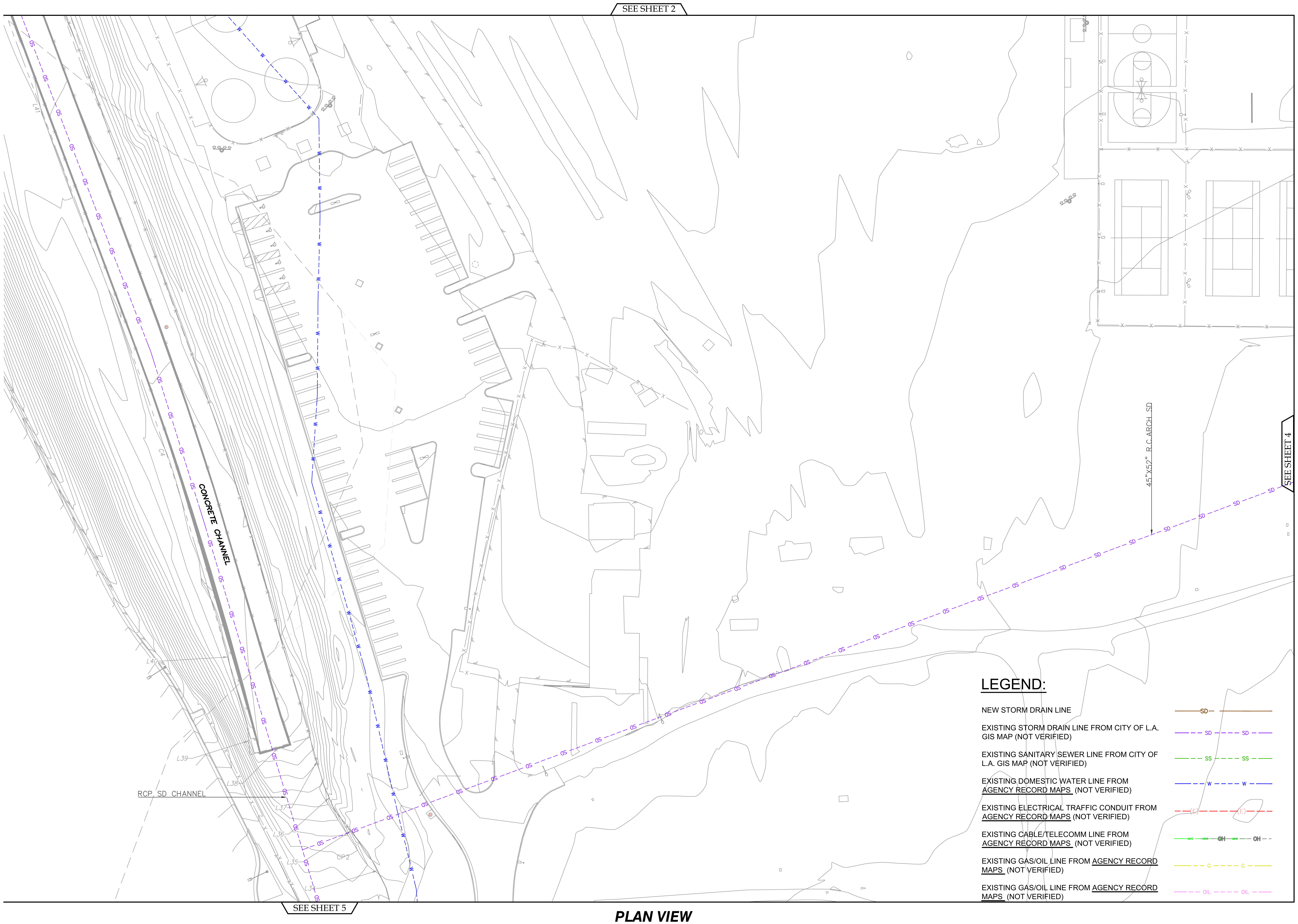

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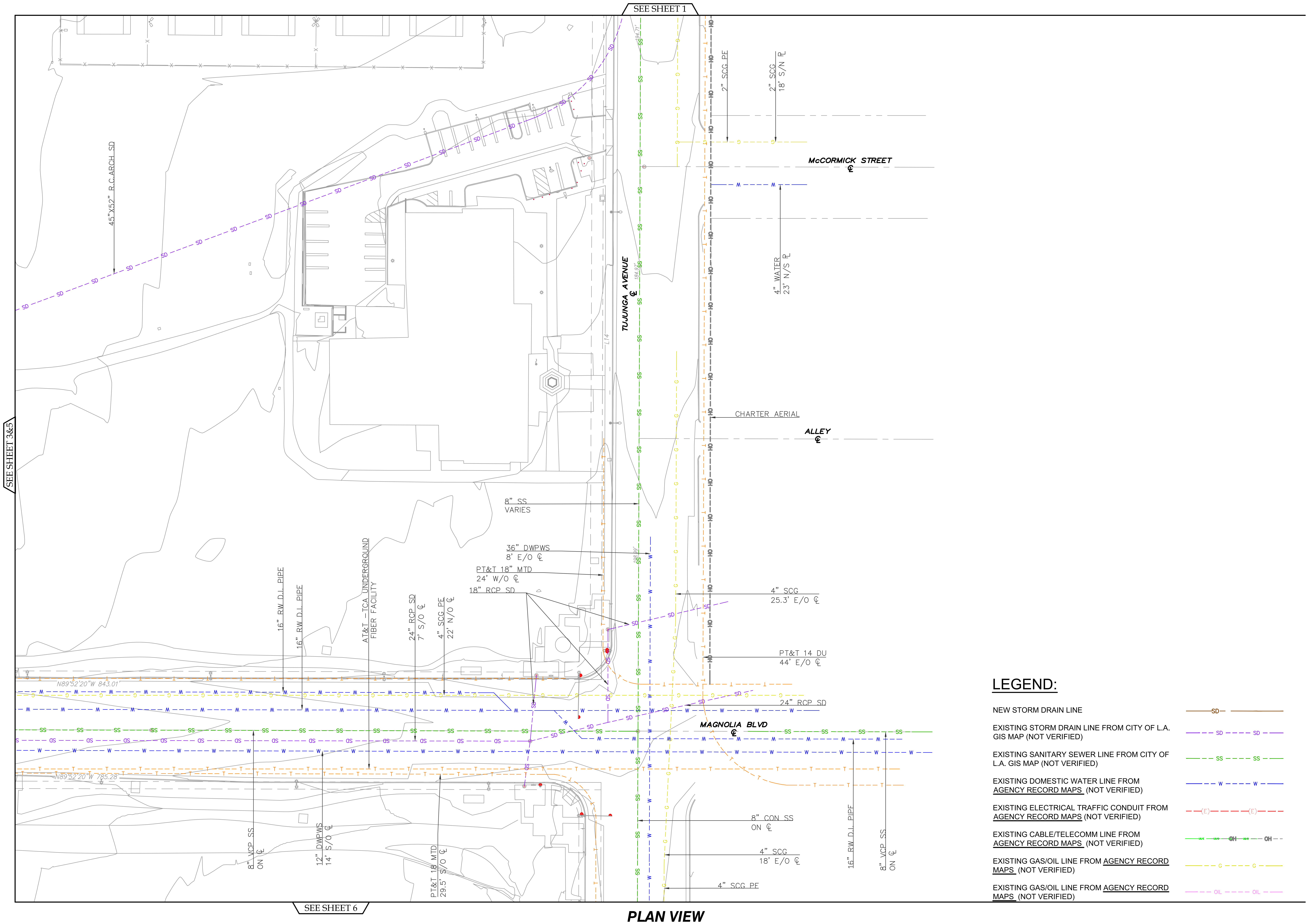

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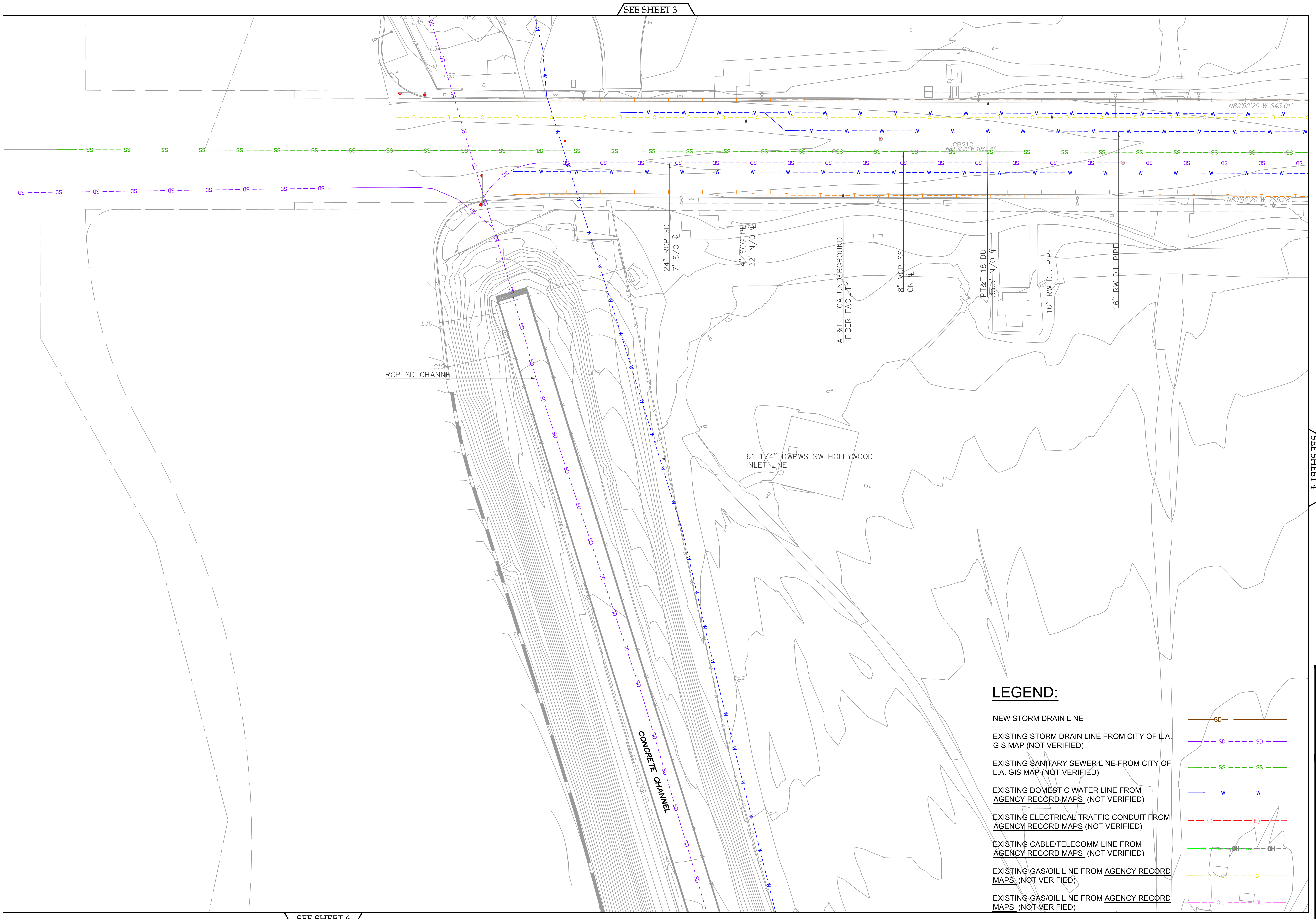

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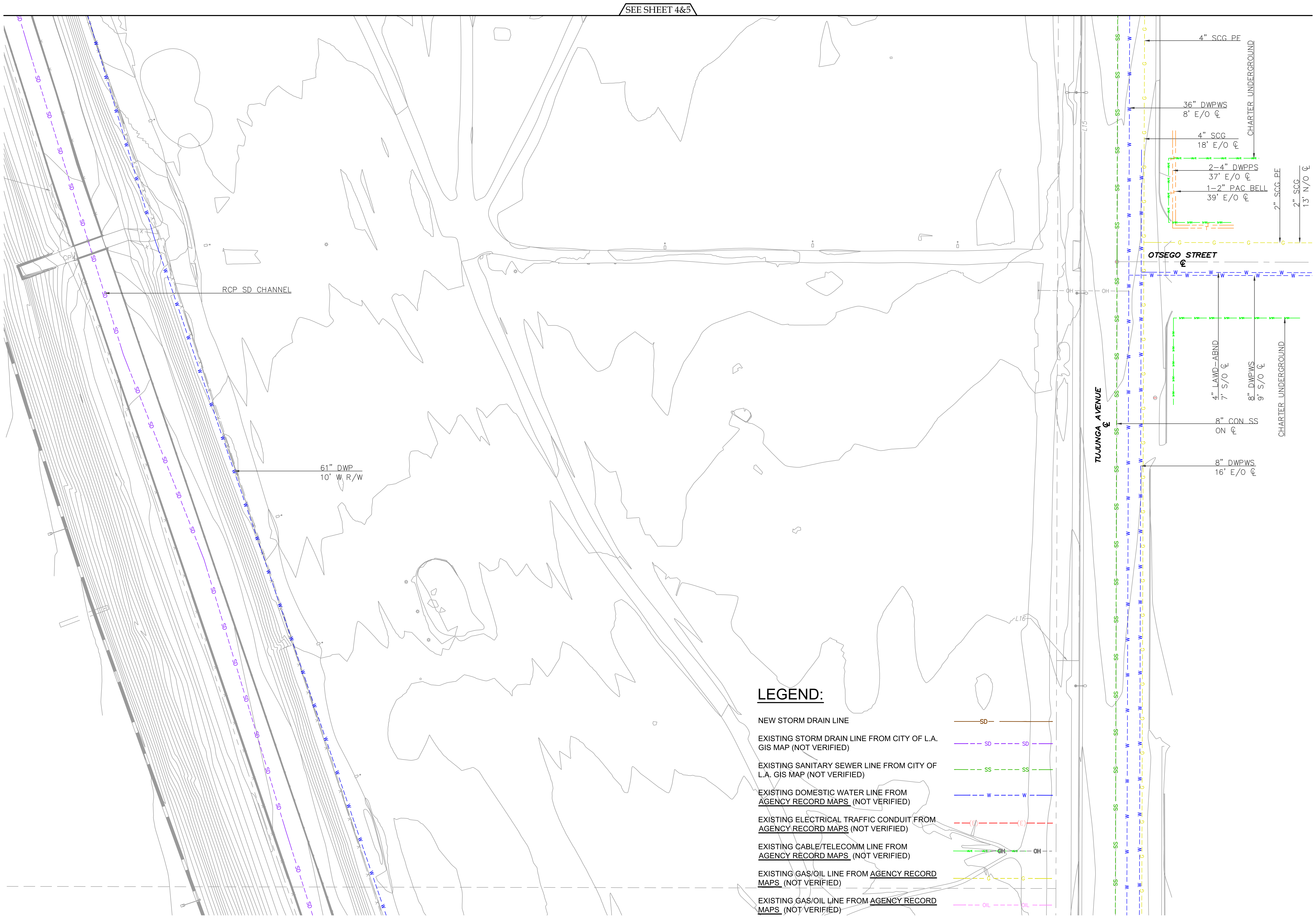

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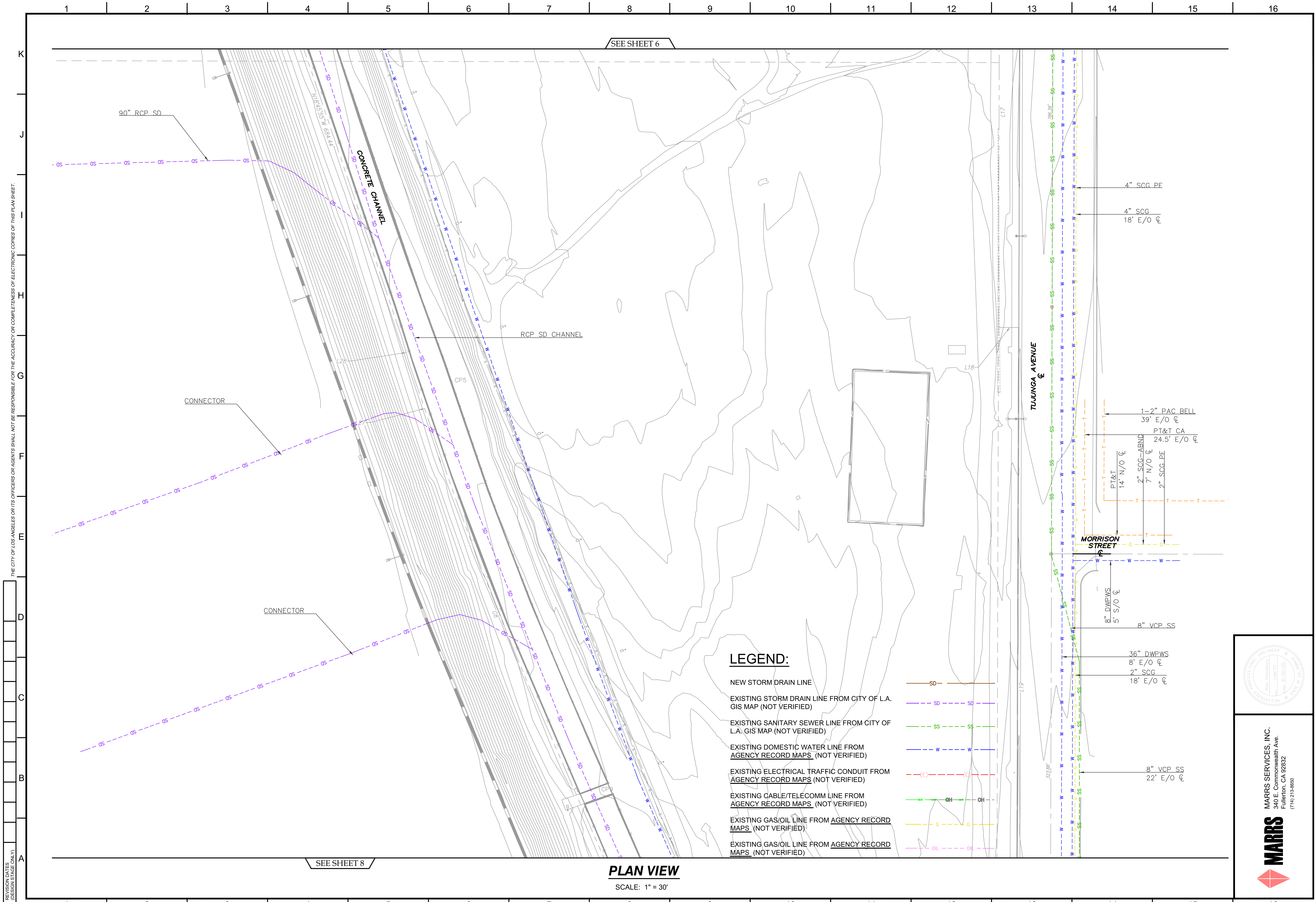

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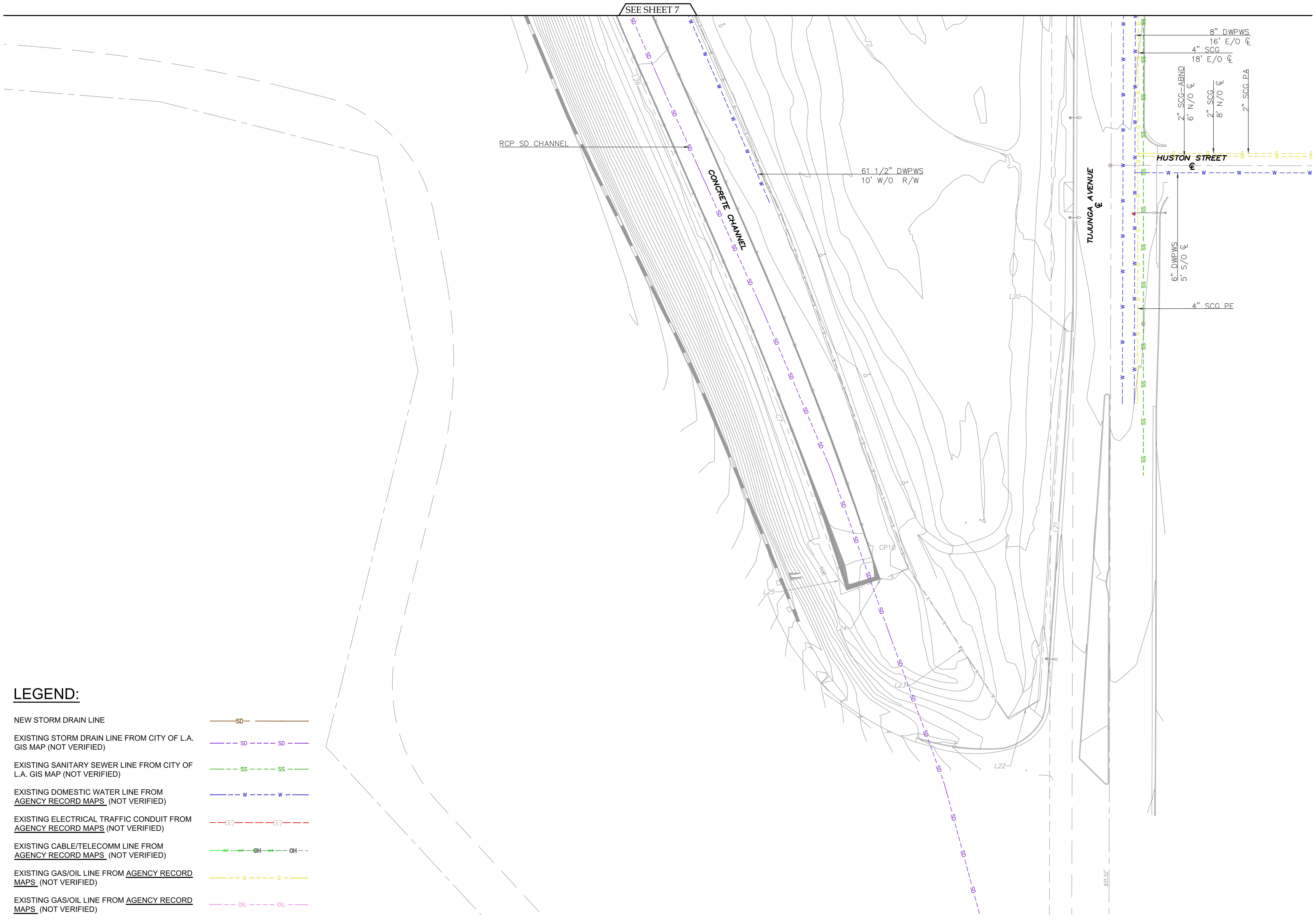

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ATTACHMENTS FOR SECTION 2.5:

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. The table below provides a summary of the expected monitoring frequency. This will be confirmed in the project-specific monitoring plan to be developed.

Table 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

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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**

Note:

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
Diversion Structures, Maintenance Holes, and Desilting Basin	Structures shall be periodically inspected and maintained to prevent accumulation of debris and potential for vector breeding.
	If vector breeding is occurring at a site from 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.
	The infiltration facility shall be maintained to prevent clogging. Maintenance activities include checking for debris/sediment accumulation and removing such debris with a vacuum truck.
Permeable Pavement Operations and Maintenance	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.

An O&M cost estimate for the Project is provided in Table 2. This estimate includes 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. Please refer to the following pages for confirmation of the agency responsible for O&M.

Table 2 O&M Plan and Cost estimate

Description	No. of Times per Year	No. of Personnel	Hours Per visit	Personnel Expertise Level	Unit Price	Total
Common Maintenance Items						**$3,300**
Vacuum Truck Rental	6				$550	$3,300
Channel Diversion and Pretreatment						**$69,000**
Rubber Dam System – Inspection and Cleaning	12	2	8	Trash Removal Crew	$750	$9,000
Diversion Structure – Inspection and Cleaning	12	2	8	Trash Removal Crew	$500	$6,000
Pretreatment Device – Vacuum	12	2	4	Vactor Truck Operator	$3,000	$36,000
Sedimentation Basin – Inspection and Cleaning	12	2	4	Trash Removal Crew	$1,500	$18,000
Pump Station						**$37,050**
Dry Season Inspection and Cleaning (Vacuum)	3	2	4	Vactor Truck Operator	$2,250	$6,750
Wet Season Inspection and Cleaning (Vacuum)	6	2	4	Vactor Truck Operator	$2,250	$13,500
Electrical Usage	12				$900	$10,800
Valve Maintenance	1	1	8	Mechanical Technician	$3,000	$3,000
Control Panel Maintenance	1	1	8	Electrical Technician	$3,000	$3,000
Storage						**$48,000**
Dry Season Inspection and Cleaning (Vacuum)	2	4	8	Vactor Truck Operator	$12,000	$24,000
Wet Season Inspection and Cleaning (Vacuum)	2	4	8	Vactor Truck Operator	$12,000	$24,000
Total						**$157,350**

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:

DRY WEATHER INFO

ATTACHMENTS FOR SECTION 4.1:

NEXUS

4.1 Nexus

The figure below depicts the anticipated flow regimes and realization of supply benefits for the Project. Confirmation of the groundwater augmentation benefit is included in the following pages.

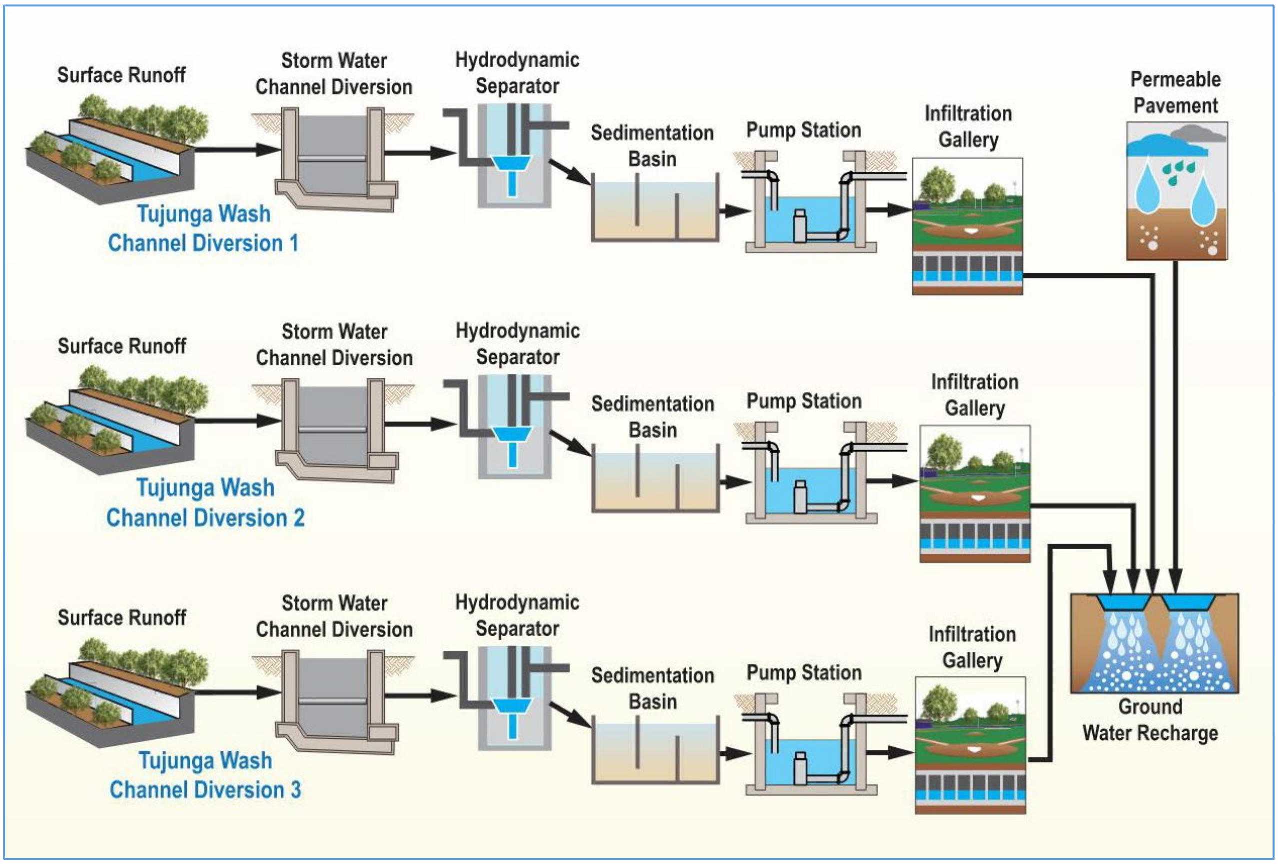


Figure Process Flow Diagram

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:

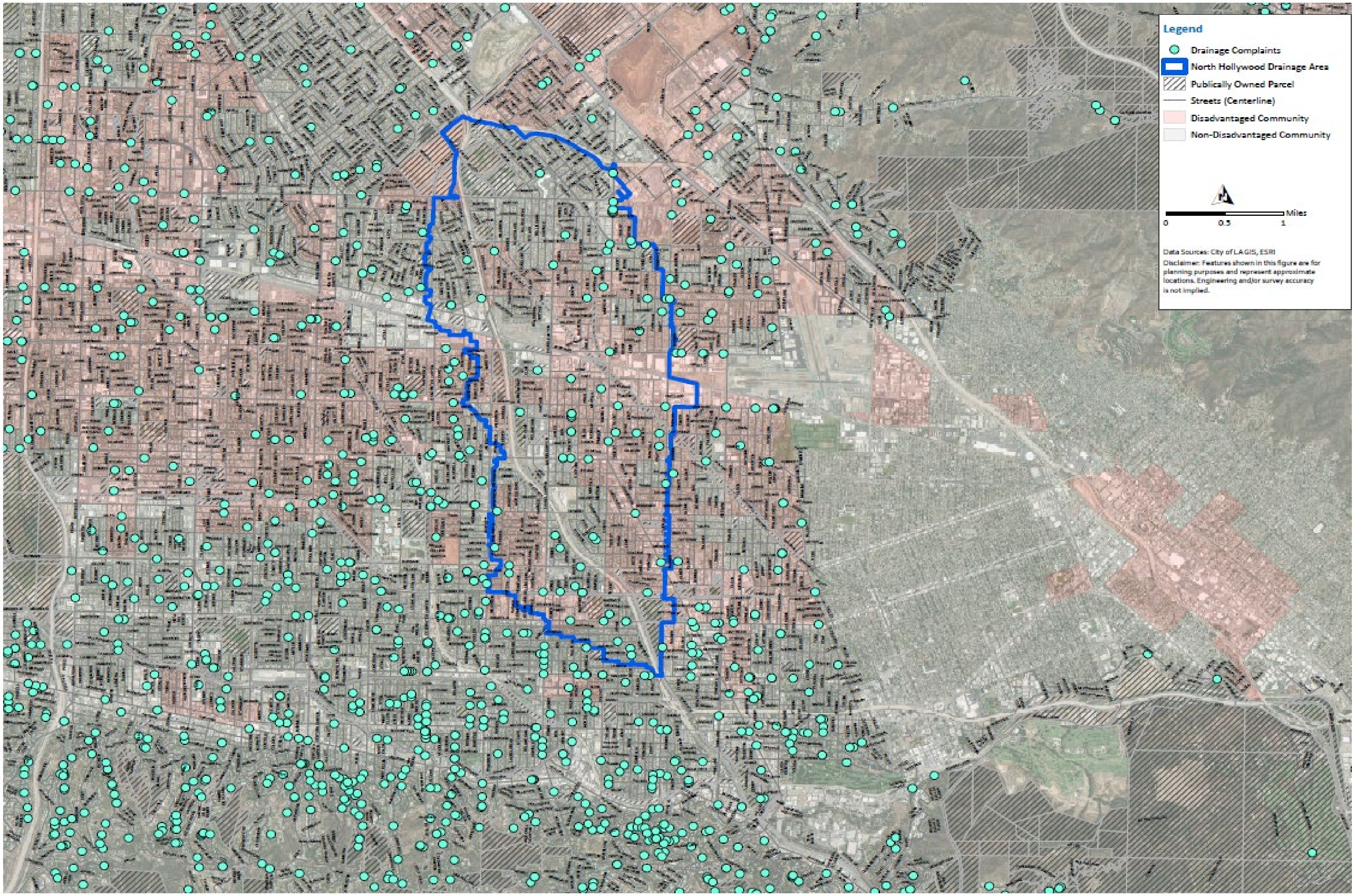
COMMUNITY INVESTMENT

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 293 trees added and more native vegetation proposed at the pre-k school that is located on-site. Other key features include three new natural multipurpose soccer fields, three upgraded ball fields with integral shade structures, proposed pedestrian trails along the open channel, new park benches, hydration stations, educational signage, a new LED sports lighting system, new sod, enhanced irrigation at the park, proposed EV chargers, 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 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.



Data Sources: City of LA GIS, ESRI

Disclaimer: Features shown in this figure are for planning purposes and represent approximate locations. Engineering and/or survey accuracy is not implied.

Figure 1 Flooding Complaints in the Drainage Area of North Hollywood 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 compares a rendering of proposed improvements with a photo of a park similar to North Hollywood Park, also located adjacent to the same waterway.

Figure 2 Left: Example of Conditions Along Waterway Right: Proposed Improvements Along Waterway

5.1.4 Enhanced or new recreational opportunities

Figure 3 illustrates key recreational improvements at North Hollywood Park. 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 Overview of Above-Ground Features at North Hollywood Park

5.1.5 Greening of schools

Native landscaping will be incorporated in the area surrounding the on-site pre-k school and school parking lot. Only smaller native plantings that will not interfere with RAP's future plans for the recreation center will be selected in the area immediately surrounding the school. Figure 3, above, outlines the location of the school relative to the added greenery at the parking lot and throughout the park. Figure 4, below, provides a more detailed visual representation of the proposed improvements to the parking lot of the school.

Figure 4 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 5 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 5 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 5, 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 29, 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

As shown in Figure 3, the two main parking lots for the park will be replaced with permeable pavement and accented with native vegetation. The parking lot for the pre-k school, which is located on-site, will also feature native landscaping, as shown in Figure 4. 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

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

177 E. Colorado Blvd, Suite 200, Pasadena, CA 91101 | watershedhealth.org | 213.229.9945

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:

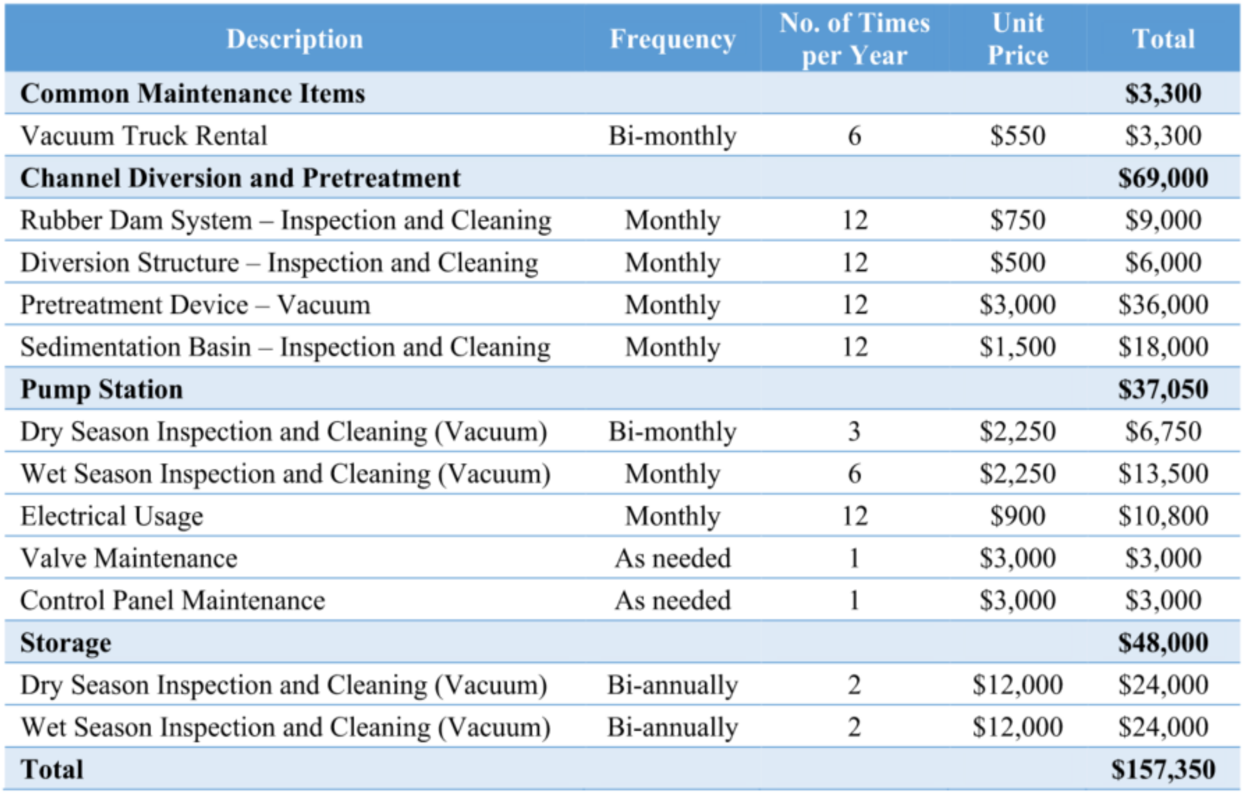
COST & SCHEDULE

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. 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 the table below for a summary of annual O&M costs. Monitoring costs were calculated as 0.5% of the capital cost for 40 years.

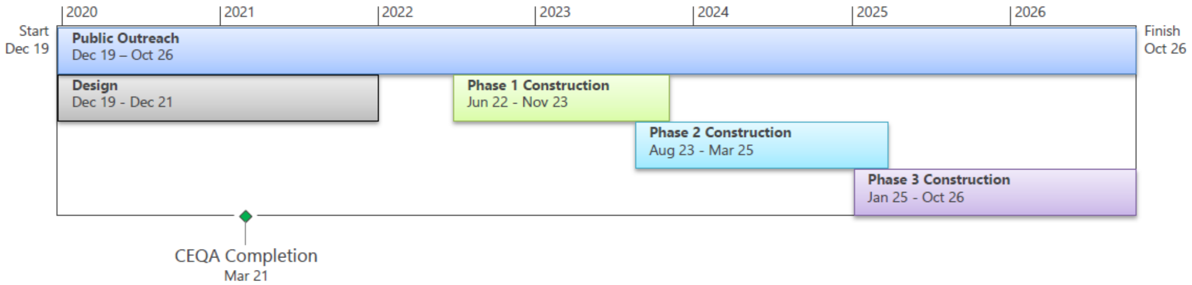
Table Annual O&M Cost Estimate



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				**$69,000**
Rubber Dam System – Inspection and Cleaning	Monthly	12	$750	$9,000
Diversion Structure – Inspection and Cleaning	Monthly	12	$500	$6,000
Pretreatment Device – Vacuum	Monthly	12	$3,000	$36,000
Sedimentation Basin – Inspection and Cleaning	Monthly	12	$1,500	$18,000
Pump Station				**$37,050**
Dry Season Inspection and Cleaning (Vacuum)	Bi-monthly	3	$2,250	$6,750
Wet Season Inspection and Cleaning (Vacuum)	Monthly	6	$2,250	$13,500
Electrical Usage	Monthly	12	$900	$10,800
Valve Maintenance	As needed	1	$3,000	$3,000
Control Panel Maintenance	As needed	1	$3,000	$3,000
Storage				**$48,000**
Dry Season Inspection and Cleaning (Vacuum)	Bi-annually	2	$12,000	$24,000
Wet Season Inspection and Cleaning (Vacuum)	Bi-annually	2	$12,000	$24,000
Total				**$157,350**

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, and a detailed design schedule is included at the end of this attachment.

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.

Revised: October 12, 2015

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: North Hollywood Park 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: Bryan Powell, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
SYSTEM "A"				
STORMWATER CAPTURE IMPROVEMENTS				***$ 50,850,734***
Stormwater Components				***$ 47,673,099***
Clearing and Grubbing	SF	287,205	$ 0.20	$ 57,441
Finish Grading	SF	287,205	$ 0.45	$ 129,242
Excavation for Basin 1	CY	197,535	$ 11.00	$ 2,172,885
Excavation for Basin 2	CY	35,765	$ 11.00	$ 393,415
Excavation for Basin 3	CY	17,297	$ 11.00	$ 190,267
Excavation for Basin 4	CY	11,360	$ 11.00	$ 124,960
Shoring for Basin 1	SF	76,678	$ 24.00	$ 1,840,278
Shoring for Basin 2	SF	23,513	$ 24.00	$ 564,318
Shoring for Basin 3	SF	14,049	$ 24.00	$ 337,164
Shoring for Basin 4	SF	9,735	$ 24.00	$ 233,634
Hauling for Basin 1	CY	124,664	$ 35.00	$ 4,363,240
Hauling for Basin 2	CY	20,103	$ 35.00	$ 703,605
Hauling for Basin 3	CY	11,607	$ 35.00	$ 406,245
Hauling for Basin 4	CY	8,811	$ 35.00	$ 308,385
Underground Infiltration Basin 1 (50 AC-FT)	LS	1	$ 22,248,954.00	$ 22,248,954
Underground Infiltration Basin 2 (8 AC-FT)	LS	1	$ 3,515,940.00	$ 3,515,940
Underground Infiltration Basin 3 (5 AC-FT)	LS	1	$ 2,009,094.00	$ 2,009,094
Underground Inflitration Basin 4 (4 AC-FT)	LS	1	$ 1,520,922.00	$ 1,520,922
Backfill and Compaction for Basin 1	CY	72,871	$ 29.00	$ 2,113,259
Backfill and Compaction for Basin 2	CY	15,662	$ 29.00	$ 454,198
Backfill and Compaction for Basin 3	CY	5,690	$ 29.00	$ 165,010
Backfill and Compaction for Basin 4	CY	2,549	$ 29.00	$ 73,921
Backfill of Sides (Aggregate) for Basin 1	CY	2,968	$ 40.00	$ 118,704
Backfill of Sides (Aggregate) for Basin 2	CY	809	$ 40.00	$ 32,370
Backfill of Sides (Aggregate) for Basin 3	CY	581	$ 40.00	$ 23,222
Backfill of Sides (Aggregate) for Basin 4	CY	468	$ 40.00	$ 18,704
Gravel Base for Basin 1	CY	4,039	$ 35.00	$ 141,379
Gravel Base for Basin 2	CY	638	$ 35.00	$ 22,342
Gravel Base for Basin 3	CY	365	$ 35.00	$ 12,767
Gravel Base for Basin 4	CY	276	$ 35.00	$ 9,665
Pipe Penetration/Connection to Underground Infiltration Basin	EACH	7	$ 2,300.00	$ 16,100
Flap Gate	EACH	1	$ 4,650.00	$ 4,650
Access Opening (includes steps)	EACH	9	$ 16,500.00	$ 148,500
Basin Vents	EACH	9	$ 3,700.00	$ 33,300
Diversion Structure (includes channel demolition)	LS	1	$ 195,000.00	$ 195,000
Pretreatment Device	EACH	1	$ 340,000.00	$ 340,000
Actuated Valve and Vault	EACH	1	$ 26,000.00	$ 26,000
Flow Meter and Vault	EACH	1	$ 25,000.00	$ 25,000
Pump Station	EACH	1	$ 1,830,000.00	$ 1,830,000
Check Valve and Vault	EACH	1	$ 35,000.00	$ 35,000
42" Pipe (includes excavation, installation, and backfill)	LF	219	$ 290.00	$ 63,510
Equalization Pipe - 42" Pipe (includes excavation, installation, and backf	LF	519	$ 290.00	$ 150,510
Methane Mitigation	LS	1	$ 500,000.00	$ 500,000

Revised: October 12, 2015

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: North Hollywood Park 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: Bryan Powell, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
Park Components				***$ 3,177,636***
Adjust to Grade (manholes, inlets, valves, etc.)	EACH	9	$ 1,000.00	$ 9,000
AC Pavement Removal	SF	105,456	$ 4.00	$ 421,824
Concrete Curb Removal	LF	4,651	$ 9.00	$ 41,859
Fence Removal	LF	30	$ 7.00	$ 210
Trail Removal	SF	10,972	$ 4.00	$ 43,888
Light Removal (in parking lot only)	EACH	8	$ 1,200.00	$ 9,600
Tree Removal	EACH	39	$ 700.00	$ 27,300
Irrigation Removal	LS	1	$ 7,000.00	$ 7,000
AC Paving	SF	63,213	$ 7.50	$ 474,098
Pervious Pavement (Parking Spaces)	SF	29,400	$ 15.00	$ 441,000
Concrete Paving	SF	32,905	$ 14.00	$ 460,670
Concrete Curb	LF	4,218	$ 20.00	$ 84,360
Striping	LF	1,759	$ 0.67	$ 1,179
ADA Parking Lot Striping and Signage	EACH	8	$ 422.00	$ 3,376
ADA Curb Ramp	EACH	4	$ 8,000.00	$ 32,000
Chain Link Fence	LF	30	$ 32.00	$ 960
Baseball Infield	SF	43,360	$ 3.50	$ 151,760
Educational Signage	EACH	2	$ 13,000.00	$ 26,000
Light Pole (in parking lot only)	EACH	8	$ 3,500.00	$ 28,000
Turf Lawn	SF	341,085	$ 0.50	$ 170,543
Tree Planting	EACH	117	$ 520.00	$ 60,840
Irrigation System (including all components and mainline)	SF	272,868	$ 2.50	$ 682,170
PARK IMPROVEMENTS				***$ 984,241***
Sports Light Removal	EACH	12	$ 1,350.00	$ 16,200
Backstop, Dugout, Bullpen, Bleacher Removal	EACH	3	$ 9,400.00	$ 28,200
Baseball Backstop	EACH	3	$ 10,000.00	$ 30,000
Baseball Dugout	EACH	6	$ 9,000.00	$ 54,000
Baseball Bullpen	EACH	3	$ 10,000.00	$ 30,000
Baseball Bleachers	EACH	6	$ 3,756.00	$ 22,536
Shade Structure over Bleachers	EACH	6	$ 22,000.00	$ 132,000
Equipment Storage	SF	600	$ 35.70	$ 21,420
Musco Lights	EACH	12	$ 35,000.00	$ 420,000
Soccer Field Striping	LF	4,130	$ 2.00	$ 8,260
Hydration Station	EACH	9	$ 8,625.00	$ 77,625
Electric Car Charging Station	EACH	16	$ 9,000.00	$ 144,000

Revised: October 12, 2015

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: North Hollywood Park 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: Bryan Powell, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
SYSTEM "B"				
STORMWATER CAPTURE IMPROVEMENTS				***$ 40,014,212***
Stormwater Components				***$ 37,381,064***
Clearing and Grubbing	SF	350,000	$ 0.20	$ 70,000
Finish Grading	SF	350,000	$ 0.45	$ 157,500
Excavation for Basin B1	CY	102,406	$ 11.00	$ 1,126,466
Excavation for Basin B2	CY	82,762	$ 11.00	$ 910,382
Shoring for Basin B1	SF	55,246	$ 24.00	$ 1,325,898
Shoring for Basin B2	SF	59,616	$ 24.00	$ 1,430,778
Hauling for Basin B1	CY	63,103	$ 35.00	$ 2,208,605
Hauling for Basin B2	CY	64,583	$ 35.00	$ 2,260,405
Underground Infiltration Basin B1 (25 AC-FT)	LS	1	$ 10,996,314.00	$ 10,996,314
Underground Infiltration Basin B2 (25 AC-FT)	LS	1	$ 11,363,718.00	$ 11,363,718
Backfill and Compaction for Basin B1	CY	39,303	$ 29.00	$ 1,139,787
Backfill and Compaction for Basin B2	CY	18,179	$ 29.00	$ 527,191
Backfill of Sides (Aggregate) for Basin B1	CY	2,091	$ 40.00	$ 83,630
Backfill of Sides (Aggregate) for Basin B2	CY	1,607	$ 40.00	$ 64,296
Gravel Base for Basin B1	CY	1,996	$ 35.00	$ 69,875
Gravel Base for Basin B2	CY	2,063	$ 35.00	$ 72,210
Pipe Penetration/Connection to Underground Infiltration Basin	EACH	6	$ 2,300.00	$ 13,800
Flap Gate	EACH	1	$ 4,650.00	$ 4,650
Access Opening (includes steps)	EACH	10	$ 16,500.00	$ 165,000
Basin Vents	EACH	10	$ 3,700.00	$ 37,000
Diversion Structure (includes channel demolition)	LS	1	$ 195,000.00	$ 195,000
Pretreatment Device	EACH	1	$ 340,000.00	$ 340,000
Actuated Valve and Vault	EACH	1	$ 26,000.00	$ 26,000
Flow Meter and Vault	EACH	1	$ 25,000.00	$ 25,000
Pump Station	EACH	1	$ 2,090,000.00	$ 2,090,000
Check Valve and Vault	EACH	1	$ 35,000.00	$ 35,000
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	600	$ 14.00	$ 8,400
42" Pipe (includes excavation, installation, and backfill)	LF	130	$ 290.00	$ 37,700
Equalization Pipe - 42" Pipe (includes excavation, installation, and backf	LF	74	$ 290.00	$ 21,460
Methane Mitigation	LS	1	$ 390,000.00	$ 390,000
Park Components				***$ 2,633,148***
Fence Removal	LF	20	$ 7.00	$ 140
Trail Removal	SF	54,921	$ 4.00	$ 219,684
Light Removal	EACH	15	$ 1,200.00	$ 18,000
Tree Removal	EACH	114	$ 700.00	$ 79,800
Irrigation Removal	LS	1	$ 3,500.00	$ 3,500
Trail	SF	12,706	$ 6.00	$ 76,236
Concrete Paving	SF	79,772	$ 14.00	$ 1,116,808
Chain Link Fence	LF	20	$ 32.00	$ 640
Educational Signage	EACH	1	$ 13,000.00	$ 13,000
Light Pole	EACH	15	$ 3,500.00	$ 52,500

Revised: October 12, 2015

BUREAU OF ENGINEERING
PROJECT CONSTRUCTION COST ESTIMATE

Project Title: North Hollywood Park 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: Bryan Powell, PE

Type of Estimate: ☐ Class "B" ☑ Class "C" ☐ Class "O"

Description	Unit	Quantity	Unit Price	Item Total
Turf Lawn	SF	350,000	$ 0.50	$ 175,000
Tree Planting	EACH	342	$ 520.00	$ 177,840
Irrigation System (including all components and mainline)	SF	280,000	$ 2.50	$ 700,000
PARK IMPROVEMENTS				***$ 34,500***
Hydration Station	EACH	4	$ 8,625.00	$ 34,500
COMMON ITEMS				
LADWP Transformer and Service Connection Fee	LS	1	$ 180,000.00	$ 180,000
MCC	LS	1	$ 300,000.00	$ 300,000
PLC Cabinet with A/C and Programming	LS	1	$ 120,000.00	$ 120,000
Cables, conduit, disconnect switches, hand holes, ductbank	LS	1	$ 250,000.00	$ 250,000
Instrumentation, floats, flow meter, level transmitters, gas detector	LS	1	$ 100,000.00	$ 100,000
90-Day Plant Establishment	LS	1	$ 75,000.00	$ 75,000
Subtotal (1)				**$ 92,908,688**

Mobilization - 0% to 7% of Subtotal (1), used **2%**	$ 1,858,174
Permits Allowances - 1% to 3% of Subtotal (1), used **1.5%**	$ 1,393,630
Other Allowances - 5% of Subtotal (1), used **3%**	$ 2,787,261
Subtotal (2)	**$ 98,947,752**

Estimating Contingency - 10% to 25% of Subtotal (2), used **15%**	$ 14,842,163
Subtotal (3)	**$ 113,789,915**

Escalation - **3%** per year of Subtotal (3), used **compound amount factor: (1+i)^n**	$ 6,929,806
Subtotal (4)	**$ 120,719,721**

Construction Contingency - 10% to 20% of Subtotal (4), used ~ **15%**	$ 18,107,958
Total Estimated Project Construction Cost	**$ 138,828,000**

Project Right of Way Estimated Cost	**$ -**

Design Phases Cost (Per City Budget Guidelines for Proposition O Projects), used **21.2%**	$ 29,431,536
Construction Phases Cost (Per City Budget Guidelines for Proposition O Projects), used **13.25%**	$ 18,394,710
Total Estimated Project Cost	**$ 186,654,246**

Assumptions: Escalation: Assumes mid point of construction 2023-2022= 2 years, use 4% for Escalation Rate, Compound amount factor: (1+i)^n

Prepared by: Austin McCollum, PE Date: 8/28/2020

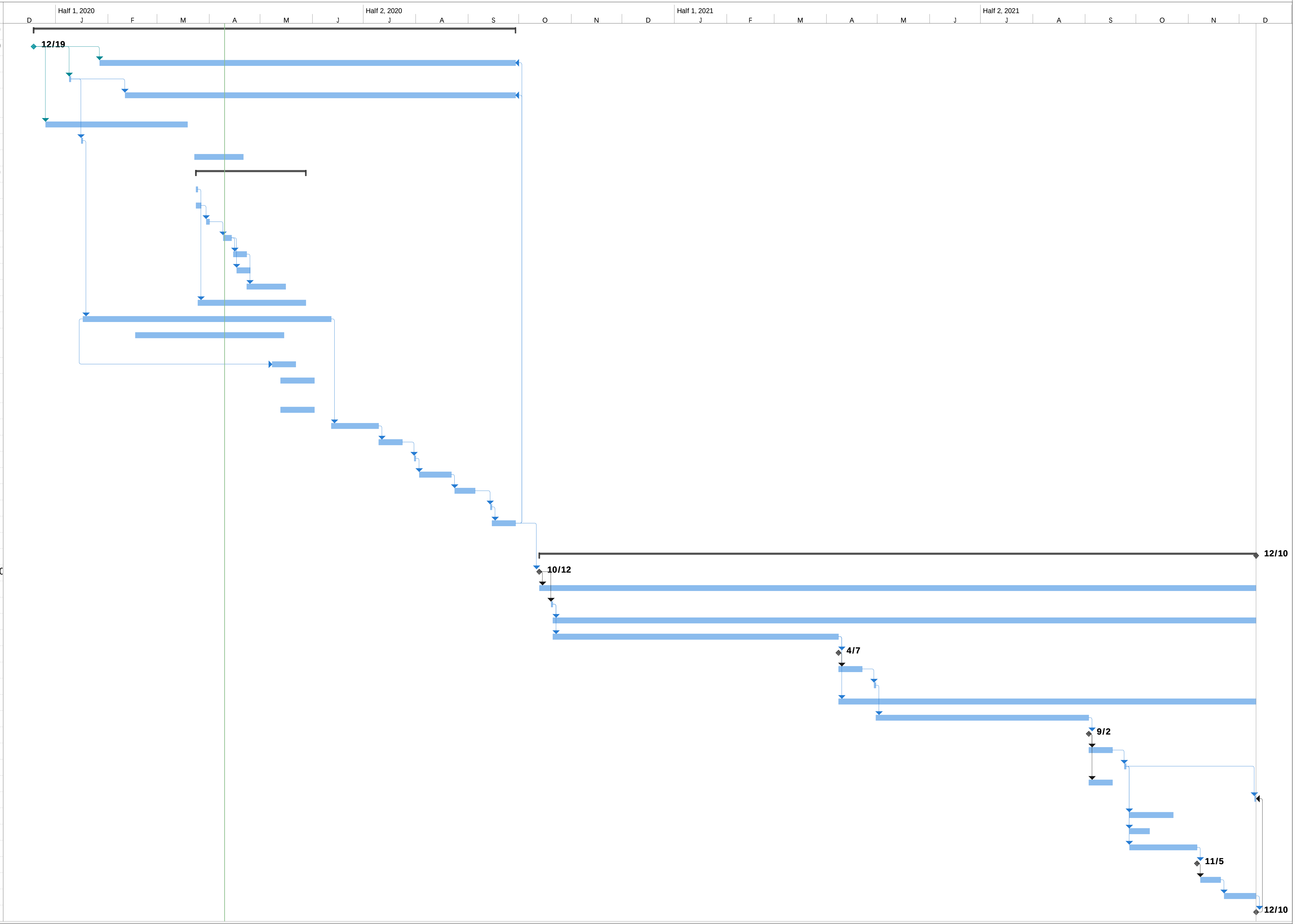
Checked by: Elva Pangilinan, PE Date:

Approved by: Jason Fussel, PE Date:

Client Approval: Andy Flores Date:

North Hollywood Park

ID	Task Name	Duration	Start	Finish
1	**PREDESIGN PHASE**	**203 days**	**Thu 12/19/19**	**Mon 9/28/20**
2	NTP	0 days	Thu 12/19/19	Thu 12/19/19
3	PM and Weekly Meetings	176 days	Mon 1/27/20	Mon 9/28/20
4	Kickoff Meeting	1 day	Thu 1/9/20	Thu 1/9/20
5	Predesign Community Outreach	165 days	Tue 2/11/20	Mon 9/28/20
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 Investigations**	**47 days**	**Tue 3/24/20**	**Wed 5/27/20**
10	Location Marking	1 day	Tue 3/24/20	Tue 3/24/20
11	Dig Alert	3 days	Tue 3/24/20	Thu 3/26/20
12	Geophysical Locating	2 days	Mon 3/30/20	Tue 3/31/20
13	CPT	3 days	Thu 4/9/20	Mon 4/13/20
14	HAS Drilling	6 days	Wed 4/15/20	Wed 4/22/20
15	Infiltration Testing	6 days	Fri 4/17/20	Fri 4/24/20
16	Lab Testing Complete	17 days	Thu 4/23/20	Fri 5/15/20
17	Report	46 days	Wed 3/25/20	Wed 5/27/20
18	Preliminary Design	105 days	Fri 1/17/20	Thu 6/11/20
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 6/12/20	Thu 7/9/20
24	City Review	10 days	Fri 7/10/20	Thu 7/23/20
25	Draft PDR Review Meeting	1 day	Fri 7/31/20	Fri 7/31/20
26	Draft Final PDR	15 days	Mon 8/3/20	Fri 8/21/20
27	City Review	10 days	Mon 8/24/20	Fri 9/4/20
28	Draft Final Review Meeting	1 day	Mon 9/14/20	Mon 9/14/20
29	Final PDR	10 days	Tue 9/15/20	Mon 9/28/20
30				
31	**DESIGN PHASE**	**304 days**	**Mon 10/12/20**	**Fri 12/10/21**
32	NTP	0 days	Mon 10/12/20	Mon 10/12/20
33	PM and Weekly Meetings	304 days	Tue 10/13/20	Fri 12/10/21
34	Kickoff Meeting	1 day	Tue 10/20/20	Tue 10/20/20
35	Design Phase Outreach	298 days	Wed 10/21/20	Fri 12/10/21
36	50% Design Development	121 days	Wed 10/21/20	Wed 4/7/21
37	50% Submittal	0 days	Wed 4/7/21	Wed 4/7/21
38	City Review	10 days	Thu 4/8/21	Wed 4/21/21
39	50% Review Meeting	1 day	Thu 4/29/21	Thu 4/29/21
40	Utility Coordination	177 days	Thu 4/8/21	Fri 12/10/21
41	90% Design Development	90 days	Fri 4/30/21	Thu 9/2/21
42	90% Submittal	0 days	Thu 9/2/21	Thu 9/2/21
43	City Review	10 days	Fri 9/3/21	Thu 9/16/21
44	90% Review Meeting	1 day	Fri 9/24/21	Fri 9/24/21
45	Constructability Review	10 days	Fri 9/3/21	Thu 9/16/21
46	Permitting/Plan Check	1 day	Fri 12/10/21	Fri 12/10/21
47	Easement Services	20 days	Mon 9/27/21	Fri 10/22/21
48	SWPPP	10 days	Mon 9/27/21	Fri 10/8/21
49	100% Design Development	30 days	Mon 9/27/21	Fri 11/5/21
50	100% Submittal	0 days	Fri 11/5/21	Fri 11/5/21
51	City Review	10 days	Mon 11/8/21	Fri 11/19/21
52	Final Design Development	15 days	Mon 11/22/21	Fri 12/10/21
53	Final Design Submittal	0 days	Fri 12/10/21	Fri 12/10/21



Project: TOS 25 Schedule_North
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	─	

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 would consist of noise and traffic control at less than significant levels. Noise impacts would arise from exposure to construction activities, and construction machinery operation specifications to curb any noise impacts will be provided to the contractors of the proposed Project. Traffic controls will be set in place to mitigate any impacts on traffic that may arise from construction activities and scheduling.

The sports fields and areas within the Project limits will have construction impacts that will limit their use. However, special consideration will be given to minimize impacts to park activities and to preserve existing trees. Additionally, periodic O&M 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

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								🟩	🟩	🟩	🟩	🟩	🟩	🟩						
Outreach	🟩				🟩		🟩		🟩		🟩		🟩							

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 – No fee required
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 Permit No. CAG9904004 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- No fee required
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