APPENDIX D-1

GEOTECHNICAL REPORT

TETRA TECH

Geotechnical Engineering ● Engineering Geology

Addendum No.1 to
Geotechnical Design Report (dated July 15, 2022)

FURMAN PARK
STORMWATER CAPTURE, STORAGE AND INFILTRATION FACILITIES
10419 Rives Avenue
Downey, California



Prepared for:

Craftwater Engineering Inc.
10711 Oakbend Dr.
San Diego, CA 92131-2610

Prepared by:

Tetra Tech
21700 Copley Drive, Suite 200
Diamond Bar, California 91765

April 27, 2023
Project No. CWT 22-06E

TETRA TECH

Project No. CWT 22-06E
April 27, 2023

Mr. Oliver Galang
Craftwater Engineering Inc.
10711 Oakbend Dr.
San Diego, CA 92131-2610

Subject: **ADDENDUM NO.1 TO GDR (dated July 15, 2022)**
FURMAN PARK
STORMWATER CAPTURE, STORAGE AND INFILTRATION FACILITIES
10419 Rives Avenue
Downey, California

Dear Mr. Galang:

Presented herein is Tetra Tech's Addendum No.1 to our Geotechnical Design Report (GDR) dated July 15, 2022 for the proposed stormwater capture, storage and infiltration facilities at Furman Park located at 10419 Rives Avenue in the City of Downey, California. This report summarizes the results of our geotechnical investigation to characterize the soils at the site and the results of our infiltration testing at a location about 175 feet to the south of the original investigation. The appendices of this addendum include logs of borings, results of laboratory testing and results of field infiltration tests.

We appreciate the opportunity to provide our professional services on this project. If you have any questions regarding this report or if we can be of further service, please do not hesitate to contact the undersigned.

Respectfully submitted,
Tetra Tech BAS, Inc.

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Filename: 2023-04-27 Furman GEO RPT.docx

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1. INTRODUCTION AND PROJECT DESCRIPTION

On July15 of 2022, Tetra Tech presented in our Geotechnical Design Report (GDR), a summary of our field investigation and our design recommendations for the proposed stormwater capture, storage and infiltration facilities at Furman Park (see Figure 1 – Project Location Map) located at 10419 Rives Avenue, in the City of Downey, California. The appendices to this report included logs of borings, results of laboratory and field infiltration tests, a summary of seismic demand and liquefaction analyses. Infiltration testing was performed within the northern part of the park, and although the results indicated that the site is suitable for infiltration, the City indicated that moving the infiltration galleries approximately 175 feet to south within the park area might provide better infiltration rates that could optimize the design of the facilities.

Thus, a second round of infiltration testing was performed on April 17 of 2023 at the new proposed location immediately to the south of the previously proposed testing area. This addendum report includes boring logs from the current investigation, laboratory test results, and results of field infiltration tests performed within the central portion of the park.

2. SCOPE OF WORK

Tetra Tech's scope of services for this project consisted of the following tasks:

- Perform a reconnaissance site visit to observe ground conditions and mark boring locations.
- Obtain drilling permits from the Los Angeles County Department of Public Health (LACDPH) and from the City of Downey.
- Coordinate with LACDPH engineering staff, park personnel, City of Downey personnel, and Underground Service Alert (USA) for clearance of buried on-site utilities prior to drilling.
- Conduct a subsurface investigation within the general area where the proposed storage and infiltration facilities may be located, including excavating, logging, and geotechnical sampling of 2 soil exploratory borings to a maximum depth of 31.5 feet.
- Excavate 2 percolation borings to depths of approximately 20 feet within the central portion of the park's open field area and conduct percolation testing in general accordance with the boring percolation test procedure described in the Los Angeles County Department of Public Works (LACDPW) GS200.1 Guidelines (2021).
- Perform laboratory testing of selected soil samples recovered from the borings to evaluate geotechnical engineering properties of the on-site soils.
- Evaluate the collected data to determine the suitability of the subsurface soils for infiltration below the proposed infiltration units.
- Prepare this written report documenting the work performed, physical data acquired, and provide recommendations.

3. SUBSURFACE EXPLORATION

The subsurface soil and groundwater conditions beneath the site were explored on April 17, 2023 by Tetra Tech and included the drilling, logging, and sampling of 2 hollow stem auger exploratory borings denoted P-4 and P-5.

The hollow stem auger exploratory and percolation borings were excavated at the approximate locations indicated on Figure 2 using a CME-75 truck-mounted drill rig equipped with 8-inch diameter hollow stem augers. Percolation boreholes P-4 and P-5 were advanced to depths of approximately 31.5 feet and 20.2 feet respectively. For the percolation testing at P-4, a boring was initially drilled to a depth of 20.25 feet and used for percolation testing. Then and additional boring within 12 feet of the original was drilled to a depth of 31.5 feet to obtain information regarding the stratigraphy below the testing depth. The approximate latitude and longitude of the soil explorations, the approximate elevations, and depths of the explorations are included in Table 1.

Prior to starting the field exploration program, a field reconnaissance was conducted to observe surface conditions and to mark the locations of the planned exploratory and percolation boreholes in agreement with the park staff. A drilling permit was obtained from the Los Angeles County Department of Public Health (LACDPH) and from the City of Downey for all the subsurface explorations. Underground Service Alert, the LACDPH inspector, City of Downey personnel, and park staff were also notified of the subsurface exploration schedule at least 48 hours prior to drilling.

Bulk, driven ring-type, and small bag samples were retrieved at selected depths during drilling of the exploratory borings. Standard Penetration Testing (SPT) was performed using an SPT sampler driven by an automatic 140-pound hammer with a drop of 30 inches in general accordance with ASTM D1586. The hammer calibration record indicated an energy transfer ratio of 84.1 percent. Ring-type samples were collected utilizing a California-type sampler driven by the same equipment used for the SPTs. Sampling was carried out at 3.5- and 5-foot intervals at the 2 borings.

The soil borings were surface-logged by a California Professional Geologist in general accordance with the visual-manual procedure for description and identification of soils, ASTM D2488. The Geologist prepared the recovered samples for subsequent reference and laboratory testing. The soil boring logs are presented in Appendix A.

At the completion of drilling, the borings were backfilled with a bentonite cement grout in accordance with LACDPH requirements. The excavated soils from the boreholes within the park area were disposed at locations specified by park personnel.

Table 1
Boring Information

Boring Number	General Location	Approximate			
		Latitude	Longitude	Ground Elevation (feet)*	Depth (feet)
P-4	Within the new proposed Storage and Infiltration BMP footprint (central portion of the park)	33.9534715	-118.1373975	123	31.5[1]
P-5	Within the new proposed Storage and Infiltration BMP footprint (central portion of the park)	33.9533830	-118.1377928	123	20.2

Cells highlighted in light blue correspond to percolation borings
[1]Percolation testing performed at a depth of 20.25 feet in adjacent boring

4. LABORATORY TESTING AND RECOMMENDATIONS

The investigation included laboratory tests on selected samples recovered from the soil borings to aid in the classification of soils and to evaluate their pertinent engineering properties. The following tests were performed:

- Particle Size Analysis of Soils, ASTM D1140 and ASTM D6913;
- Atterberg Limits, ASTM D4318;

Results of all laboratory tests are presented in Appendix B. For ease of referral to the soil profile, most of the laboratory results are also included on the boring logs in Appendix A.

5. SUBSURFACE CONDITIONS

Regional geology, site geology, subsurface and groundwater conditions at the site were described in detail in the GDR (Tetra Tech, 2022). The following sections supplement the previous information contained in the GDR with the findings of this exploration. For more detailed information regarding the units encountered within this exploration, refer to the boring logs which are included in Appendix A. It is noted however that the stratigraphy and geological units encountered during this exploration are very consistent with the stratigraphy and geological units encountered during the 2022 exploration.

5.1. Artificial Fill

Artificial fill was encountered up to a depth of 5.5 feet in borings P-4 and P-5. The fill materials consisted of medium dense fine silty sands.

5.2. Native Alluvium (Qya_2)

Native alluvial (Qya_2) soil was encountered below the fill soils to the maximum explored depth of 31.5 feet below the ground surface and included fine- and coarse-grained soils. The fine-grained materials consisted of olive to olive gray silt and sandy silt. The coarse-grained materials consisted of olive gray silty sand to poorly-graded sand. The coarse-grained soils appear to be more prevalent at depths greater than about 15 feet.

Uncorrected SPT blowcounts in the native alluvium for the fine-grained (clay, silt) soils ranged from 6 to 19 indicating firm to very stiff consistencies. SPT blowcounts in the native alluvial coarse-grained (sandy) soils ranged from 11 to larger than 50 indicating medium dense to very dense materials.

5.3. Groundwater

Groundwater was not encountered during our field exploration to the maximum explored depth of 31.5 feet, which is also consistent with the findings from the 2022 exploration.

Fluctuations of the groundwater level, localized zones of perched water, and increased soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on or adjacent to the site can also cause a fluctuation of local groundwater levels. Evaluation of such factors is beyond the scope of our services.

6. FIELD INFILTRATION TESTING AND RECOMMENDATIONS

Tetra Tech performed 2 small diameter borehole percolation tests denoted P-4 and P-5 located within the central portion of the park field area, using the test procedure described in the LACDPW infiltration guidelines GS200.1 (2021). The percolation tests were performed at a depth of about 20 feet.

The approximate coordinates of the percolation tests, the approximate top of borehole elevations, and borehole depths are included in Table 1. The infiltration test borings were constructed by placing 2 to 6 inches of ¾-inch gravel at the bottom of each boring and then installing a 2-inch-diameter slotted pipe (casing). The casings extended from the top of the gravel placed at the bottom of each boring to the ground surface and were wrapped in a protective cloth filter sock to limit the migration of soil particles into the pipe. The annular space of each boring was filled with ¾-inch gravel (filter pack) up to a few feet above the intended zone of infiltration testing. The ¾-inch gravel was selected as the filter pack material since it has a hydraulic conductivity significantly larger than that of the surrounding soil.

Percolation boreholes were presoaked for at least 1 hour before the test. For the percolation testing an initial constant water level ranging between about 1 and 2 feet was maintained above the bottom of the borehole. The readings to determine the water depth were taken with a well sounder every 10 minutes until a stabilized drop rate was obtained (per GS 200.1 a stabilized rate is obtained when the highest and lowest readings are within 10 percent from each other for 3 consecutive readings), however testing was not completed until a minimum of 6 readings were taken.

The raw field percolation rate was converted, as indicated in the infiltration test logs in Appendix C, to a corrected field infiltration rate considering the effect of porosity of the gravel pack estimated to be approximately 0.35. The corrected field infiltration rate expressed in inches per hour was then further adjusted as explained below and as noted on the percolation logs to obtain the design infiltration rates. A testing method reduction factor RF_t of 2 was applied as required by the guidelines to account for the direction of flow during the test and the reliability of the method. To account for effects related to the limited number of tests and the large area considered for the project, a reduction factor RF_v of 1.5 was used (typical range between 1 and 3). Lastly, to account for long-term siltation and plugging, a reduction factor RF_s of 2 was considered (typical range between 1 and 3). These reduction factors are the same that were used in our 2022 infiltration testing and reporting. The results of the borehole percolation testing from this exploration and the adjusted design infiltration rates are summarized in Table 2. For ease of referral the results from the percolation testing performed in 2022 are also included in Table 2.

Table 2
Infiltration Rates

Boring Percolation Test No.	Borehole Depth (feet)	Infiltration Rate (inches/hour)	
		Corrected (field)	Design
P-1 (2022)	22.1	3.63	0.66
P-2 (2022)	19.8	5.98	1.09
P-3 (2022)	19.8	1.75	0.32
P-4 (2023)	20.25	1.18	0.22
P-5 (2023)	20.2	1.70	0.31

The percolation results from this exploration indicate that the design infiltration rate within the range of depths tested ranges between 0.22 and 0.31 inches/hour. The design infiltration rate at P-5 is slightly higher than the acceptable minimum of 0.3 inches/hour required by the LACDPW Guidelines (2021). However, the infiltration rate at P-4 is lower than the acceptable minimum.

It is therefore recommended that the area within the northern portion of the park and originally explored in 2022 be considered for underground infiltration instead of the recently considered area within the central portion of the park and explored in 2023 during this task.

7. LIMITATIONS

The recommendations and opinions expressed in this report are based on Tetra Tech's geotechnical investigation data, laboratory testing, and engineering analyses. It should be noted that this study did not evaluate the presence of hazardous materials although the results of analytical testing for one soil sample are presented herein.

Due to the limited nature of the field explorations, conditions not observed and described in this report may be present on the site. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation and laboratory testing can be performed upon request. It should be understood that conditions different from those anticipated in this report may be encountered during grading operations, for example, the extent of unsuitable soil and the associated additional effort required to mitigate them.

Site conditions can change with time as a result of natural processes or the activities of man. Changes to the applicable laws, regulations, codes, and standards of practice may occur as a result of government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Tetra Tech has no control. Therefore, this report should be reviewed and recertified by Tetra Tech if it were to be used for a project design commencing more than one year after the date of issuance of this report.

Tetra Tech's recommendations for this site are dependent upon verification of the actual encountered field conditions, appropriate quality control of grading operations including shoring installation, overexcavation, processing and replacement of the on-site materials, and foundation construction. Accordingly, the recommendations are made contingent upon the opportunity for Tetra Tech to observe all aspects of subgrade preparation for the proposed construction. If parties other than Tetra Tech are engaged to provide such services, such parties are automatically and expressly assuming complete responsibility as the Geotechnical Engineer of Record for the project and are deemed concurring with the recommendations in this report and/or are obligated to provide alternative recommendations.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Tetra Tech should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document. Reliance by others on the data presented herein or for purposes other than those stated in the text is authorized only if so permitted in writing by Tetra Tech. It should be understood that such an authorization may incur additional expenses and charges.

Tetra Tech has endeavored to perform its evaluation using the degree of care and skill ordinarily exercised under similar circumstances by reputable geotechnical professionals with experience in this area in similar soil conditions. No other warranty, either expressed or implied, is made as to the conclusions and recommendations contained in this report.

8. SELECTED REFERENCES

California Building Standards Commission, 2022 California Building Code, California Code of Regulations Title 24, Based on the 2021 International Building Code.

County of Los Angeles, Department of Public Works (LACDPW), 2014, Low Impact Development Standards Manual, February 2014.

County of Los Angeles, Department of Public Works (LACDPW), 2021, Guidelines for Geotechnical Investigation and Reporting, Low Impact Development Stormwater Infiltration, Geotechnical and Materials Engineering Division, GS 200.1. Rev 6/30/21.

Tetra Tech, 2022. Geotechnical Design Report. Furman Park – Stormwater Capture, Storage and Infiltration Facilities. 10419 Rives Avenue, Downey California. July 15, 2022.

Figures



FIGURE 1

TETRA TECH

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TEL 909.860.7777 www.tetratech.com

FURMAN PARK STORMWATER CAPTURE - DOWNEY, CA

SITE LOCATION MAP

JOB NO.	CWT 22-06E
DATE	APR 2023
DRAWN BY	TAC
CHECKED BY	FC



FIGURE 2

TETRA TECH
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FURMAN PARK STORMWATER CAPTURE - DOWNEY, CA

SITE LAYOUT AND BORING LOCATION MAP

JOB NO.	CWT 22-06E
DATE	APR 2023
DRAWN BY	TAC/SCM
CHECKED BY	FC

Appendix A

Logs of Exploratory Borings

Tetra Tech
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(909) 860-7777

BORING P-4

Sheet 1 of 1

PROJECT NAME Furman Park Stormwater Capture
CLIENT City of Downey
GROUND ELEVATION 123 ft
PROJECT NUMBER CWT 22-06E
PROJECT LOCATION Downey, CA
GROUNDWATER DEPTH Not encountered
DATES DRILLED 4/17/2023
DRILLING CONTRACTOR 2R Drilling Company
BOREHOLE DEPTH 31.5 ft
LOGGED/CHECKED BY SMS/FC
DRILLING METHOD Hollow Stem Auger, CME 75
BOREHOLE DIAMETER 8 in
COORDINATES 33.9534715, -118.1373975
HAMMER DATA 140 lbs, 30" drop
BACKFILL Percolation well
LOCATION DESCRIPTION Furman Park, central field

Standard Penetration Test (SPT) | No Recovery | Shelby Tube
California-Type Ring Sample | No Recovery | Grab/Bulk Sample

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOWCOUNT blows/6" (bpf)	USCS	MATERIAL DESCRIPTION	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	Notes	ELEVATION (ft)
0								
	SK-1		SM	Surface- maintained grass [FILL] Silty SAND to Sandy SILT, olive gray (5Y 4/2), moist, very fine to fine grained, micaceous, rootlets				120
5	R-2	5-6-10 (16)	SP-SM	[NATIVE] Alluvium (Qal) Poorly-graded SAND with Silt to Silty SAND, medium dense, light brownish gray (2.5Y 6/2), moist, fine grained, some medium				
			ML	SILT, stiff, olive (5Y 5/4) mottled with orange, moist, blocky fracture				115
10	SPT-3	4-5-10 (15)	SM/ML	Interlayered Silty SAND and SILT, medium dense to stiff, moist, fine grained, thinly bedded to laminated, olive and gray layering				
								110
15	R-4	10-20-27 (47)	SP	Poorly-graded SAND, dense, olive (5Y 5/4), moist, fine to medium grained, micaceous, oxidized, some silt				
								105
20	SPT-5	5-10-12 (22)		@18.ft becomes medium dense, gray (N 6/1) and white, unoxidized.			G/S/F/2µ= 0/96/4/0	
								100
25	SPT-6	3-3-12 (15)	SM	Silty SAND, medium dense, olive (5Y 5/4), moist, fine to medium grained, thinly bedded to laminated		22.0	#200=46% LL= 25 PL= 23 PI= 2	
								95
30	SPT-7	8-12-15 (27)	SP-SM	Poorly-graded SAND with Silt and Gravel, medium dense, pale olive (5Y 6/4), moist, fine to medium grained			G/S/F/2µ= 5/87/8/0	

Total depth: 31.5 feet below grade.
No groundwater encountered during drilling.
Boring used for percolation testing to 20 feet.
Backfilled with cuttings upon completion.

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - L:\03 - TECHNICAL RESOURCES\02 SOFTWARE LIBRARY\GINT\PROJECTS\197-4703-0006 CWT 22-06 FURMAN PARK.GPJ

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Tetra Tech
21700 Copley Dr #200
Diamond Bar, CA 91765
(909) 860-7777

BORING P-5

PROJECT NAME Furman Park Stormwater Capture
CLIENT City of Downey
GROUND ELEVATION 123 ft
PROJECT NUMBER CWT 22-06E
PROJECT LOCATION Downey, CA
GROUNDWATER DEPTH Not encountered
DATES DRILLED 4/17/2023
DRILLING CONTRACTOR 2R Drilling Company
BOREHOLE DEPTH 20 ft
LOGGED/CHECKED BY SMS/FC
DRILLING METHOD Hollow Stem Auger, CME 75
BOREHOLE DIAMETER 8 in
COORDINATES 33.9533830, -118.1377928
HAMMER DATA 140 lbs, 30" drop
BACKFILL Percolation well
LOCATION DESCRIPTION Furman Park, central field

Standard Penetration Test (SPT) | No Recovery | Shelby Tube
California-Type Ring Sample | No Recovery | Grab/Bulk Sample

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOWCOUNT blows/6" (bpf)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	Notes	ELEVATION (ft)
0				SM	Surface- maintained grass [FILL] Silty SAND, olive gray (5Y 4/2), moist, fine grained, rootlets				120
5	SPT-1	1-3-3 (6)		ML/SM	[NATIVE] Alluvium (Qal) Interbedded Silty SAND and SILT, firm to loose, olive gray (5Y 4/2), moist, fine grained, laminated to layered				115
10	R-2	5-13-16 (29)		ML	Sandy SILT, very stiff, olive brown (2.5Y 4/3), moist, micaceous, laminated			#200=57%	110
15	SPT-3	6-8-10 (18)		SP	Poorly-graded SAND, medium dense, orange, moist, oxidized, fine to coarse grained, occasional gravel @16ft color changes to gray (N 6/1), thinly bedded, fine to medium grained, unoxidized				105
20	R-4	12-21-30 (51)			@18.5ft becomes dense				

Total depth: 20 feet below grade.
No groundwater encountered during drilling.
Boring used for percolation testing.
Backfilled with cuttings upon completion.

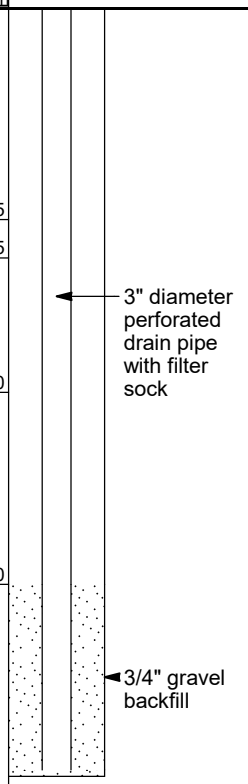
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Tetra Tech
21700 Copley Dr #200
Diamond Bar, CA 91765
(909) 860-7777

WELL P-4

PROJECT NAME Furman Park Stormwater Capture
CLIENT City of Downey
GROUND ELEVATION 123 ft
PROJECT NUMBER CWT 22-06E
PROJECT LOCATION Downey, CA
GROUNDWATER DEPTH Not encountered
DATES DRILLED 4/17/2023
DRILLING CONTRACTOR 2R Drilling Company
BOREHOLE DEPTH 31.5 ft
LOGGED/CHECKED BY SMS/FC
DRILLING METHOD Hollow Stem Auger, CME 75
BOREHOLE DIAMETER 8 in
COORDINATES 33.9534715, -118.1373975
HAMMER DATA 140 lbs, 30" drop
BACKFILL Percolation well
LOCATION DESCRIPTION Furman Park, central field

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	Elevation (ft)
0					Surface- maintained grass	
	SK 1		SM		[FILL] Silty SAND to Sandy SILT, olive gray (5Y 4/2), moist, very fine to fine grained, micaceous, rootlets	
5						
	R 2	5-6-10 (16)	SP-SM		5.5	117.5
					[NATIVE] Alluvium (Qal) Poorly-graded SAND with Silt to Silty SAND, medium dense, light brownish gray (2.5Y 6/2), moist, fine grained, some medium	116.5
			ML		6.5 SILT, stiff, olive (5Y 5/4) mottled with orange, moist, blocky fracture	
10					10.0	113.0
	SPT 3	4-5-10 (15)	SM/ML		Interlayered Silty SAND and SILT, medium dense to stiff, moist, fine grained, thinly bedded to laminated, olive and gray layering	
15					15.0	108.0
	R 4	10-20-27 (47)	SP		Poorly-graded SAND, dense, olive (5Y 5/4), moist, fine to medium grained, micaceous, oxidized, some silt	
	SPT 5	5-10-12 (22)			@18.ft becomes medium dense, gray (N 6/1) and white, unoxidized.	
20						
25					25.0	98.0
	SPT 6	3-3-12 (15)	SM		Silty SAND, medium dense, olive (5Y 5/4), moist, fine to medium grained, thinly bedded to laminated	
30					30.0	93.0
	SPT 7	8-12-15 (27)	SP-SM		31.5 Poorly-graded SAND with Silt and Gravel, medium dense, pale olive (5Y 6/4), moist, fine to medium grained	91.5



WELL DIAGRAM

Total depth: 31.5 feet below grade.
No groundwater encountered during drilling.
Boring used for percolation testing to 20 feet.
Backfilled with cuttings upon completion.

GENERAL BH / TP / WELL - GINT STD US LAB.GDT - L:\03 - TECHNICAL RESOURCES\02 SOFTWARE LIBRARY\GINT\PROJECTS\197-4703-0006 CWT 22-06 FURMAN PARK.GPJ

Tetra Tech
21700 Copley Dr #200
Diamond Bar, CA 91765
(909) 860-7777

WELL P-5

PROJECT NAME Furman Park Stormwater Capture
CLIENT City of Downey
GROUND ELEVATION 123 ft
PROJECT NUMBER CWT 22-06E
PROJECT LOCATION Downey, CA
GROUNDWATER DEPTH Not encountered
DATES DRILLED 4/17/2023
DRILLING CONTRACTOR 2R Drilling Company
BOREHOLE DEPTH 20 ft
LOGGED/CHECKED BY SMS/FC
DRILLING METHOD Hollow Stem Auger, CME 75
BOREHOLE DIAMETER 8 in
COORDINATES 33.9533830, -118.1377928
HAMMER DATA 140 lbs, 30" drop
BACKFILL Percolation well
LOCATION DESCRIPTION Furman Park, central field

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	Elevation (ft)	WELL DIAGRAM
0			SM		Surface- maintained grass [FILL] Silty SAND, olive gray (5Y 4/2), moist, fine grained, rootlets		
5	SPT 1	1-3-3 (6)					
			ML/SM		[NATIVE] Alluvium (Qal) Interbedded Silty SAND and SILT, firm to loose, olive gray (5Y 4/2), moist, fine grained, laminated to layered	117.5	
10	R 2	5-13-16 (29)				113.0	3" diameter perforated drain pipe with filter sock
			ML		Sandy SILT, very stiff, olive brown (2.5Y 4/3), moist, micaceous, laminated		
15	SPT 3	6-8-10 (18)				108.0	
			SP		Poorly-graded SAND, medium dense, orange, moist, oxidized, fine to coarse grained, occasional gravel @16ft color changes to gray (N 6/1), thinly bedded, fine to medium grained, unoxidized		3/4" gravel backfill
20	R 4	12-21-30 (51)			@18.5ft becomes dense	103.0	

Total depth: 20 feet below grade.
No groundwater encountered during drilling.
Boring used for percolation testing.
Backfilled with cuttings upon completion.

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Appendix B

Results of Laboratory Testing

TETRA TECH

PERCENT PASSING # 200 SIEVE

ASTM D1140

Job Name:	Furman Park Stormwater Capture	**Date Completed:**	4/17/2023
Job Number:	CWT-22-06E	**Date Sampled:**	4/23/2023
Note:			
Tested By :	MG		

Boring Number	Sample Number	Depth (ft)	Weight Before Wash - Dry (grams)	Weight After Wash - Dry (grams)	Percent Passing # 200 Sieve	USCS Classification
P-4	**SPT-6**	25.0	524	283.5	46%	SM
P-5	**R-2**	10.0	313.3	135	57%	ML

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TETRA TECH

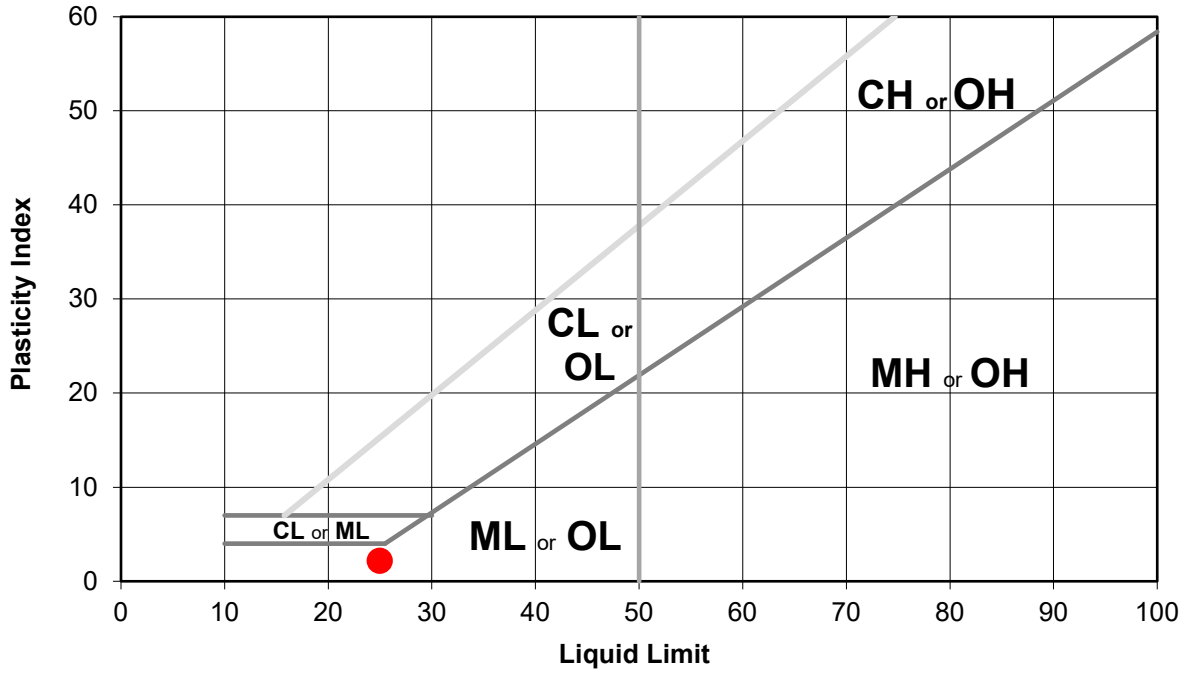
ATTERBERG LIMITS

ASTM D4318

Job Name:	Furman Park	**Date Sampled:**	4/17/2023
Job Number:	CWT-22-06E	**Date Completed:**	4/23/2023
Tested By:	MG	**Sample Identification:**	P-4, SPT-6
Note:		**Sample Depth:**	25ft
Sample Description:	Olive Gray ML, Native		

		Plastic Limit	
Test No.		**1**	**2**
Number of Blows			
Container ID		D7	P2
Wet Weight of Soil + Cont.	*grams*	21.70	22.40
Dry Weight of Soil + Cont.	*grams*	19.90	20.60
Weight of Container	*grams*	12.33	12.36
Moisture Weight	*grams*	1.80	1.80
Weight of Dry Soil	*grams*	7.57	8.24
Moisture Content	*%*	**23.8**	**21.8**

Liquid Limit			
1	**2**	**3**	**4**
35	28	15	
F13	N11	S5	
55.70	53.40	51.90	
49.20	47.10	45.40	
25.28	25.28	25.58	
6.50	6.30	6.50	
23.92	21.82	19.82	
27.2	**28.9**	**32.8**	



Plastic Limit	**23**
Liquid Limit	**25**
Plasticity Index	**2**

USCS Classification	**ML**
Based on Atterberg Limits only	

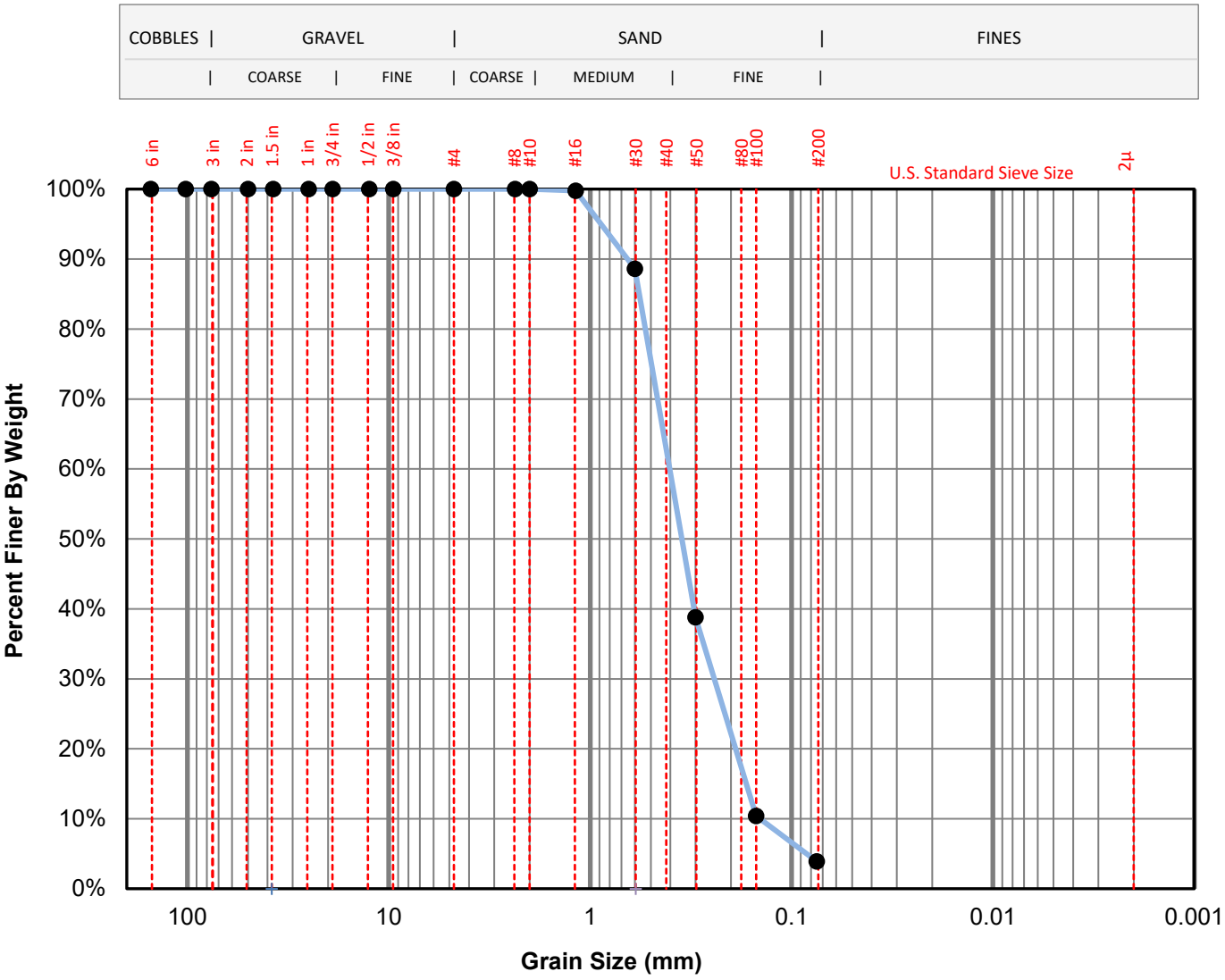
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TETRA TECH

GRAIN SIZE DISTRIBUTION ANALYSIS

ASTM C136/C117/D7928/D6913

Job Name:	Furman Park Storm water	**Date Sampled:**	4/17/2023
Job Number:	CWT-22-06E	**Date Completed:**	4/23/2023
Tested By:	MG	**Sample Identification:**	P-4, SPT-5
Note:		**Sample Depth:**	18.5 ft
Sample Description:	Olive Gray SP, Native		



Symbol	Boring No.	Sample No.	Depth	LL	PI	USCS	Cobbles	Gravel	Sand	Fines	2µ
●	P-4	SPT-5	18.5 ft			SP	**0%**	**0%**	**96%**	**4%**	**0%**

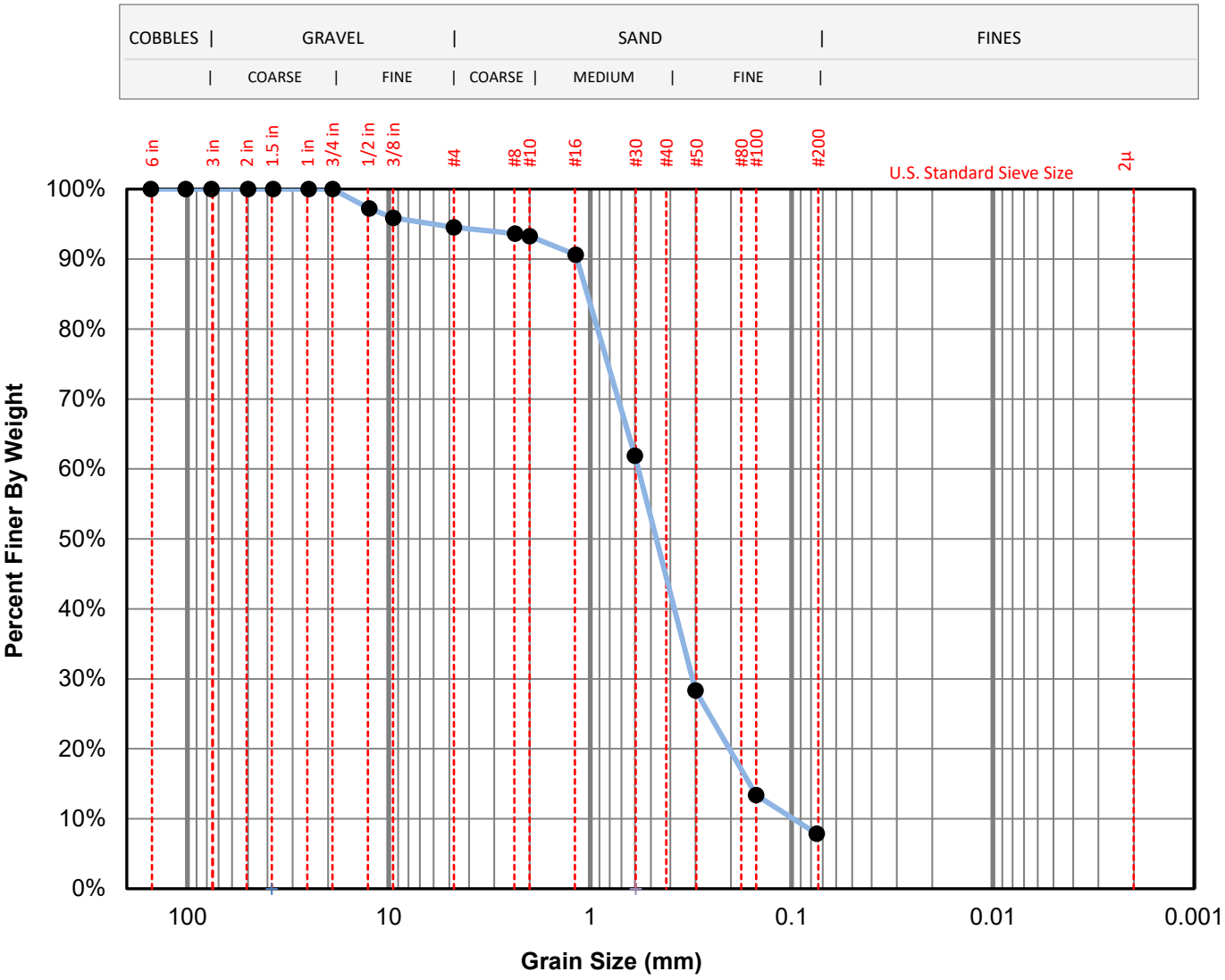
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TETRA TECH

GRAIN SIZE DISTRIBUTION ANALYSIS

ASTM C136/C117/D7928/D6913

Job Name:	Furman Park Storm water	**Date Sampled:**	4/17/2023
Job Number:	CWT-22-06E	**Date Completed:**	4/23/2023
Tested By:	MG	**Sample Identification:**	P-4, SPT-7
Note:		**Sample Depth:**	30 ft
Sample Description:	Olive Gray SP, Native		



Symbol	Boring No.	Sample No.	Depth	LL	PI	USCS	Cobbles	Gravel	Sand	Fines	2µ
●	P-4	SPT-7	30 ft			SP-SM	**0%**	**5%**	**87%**	**8%**	**0%**

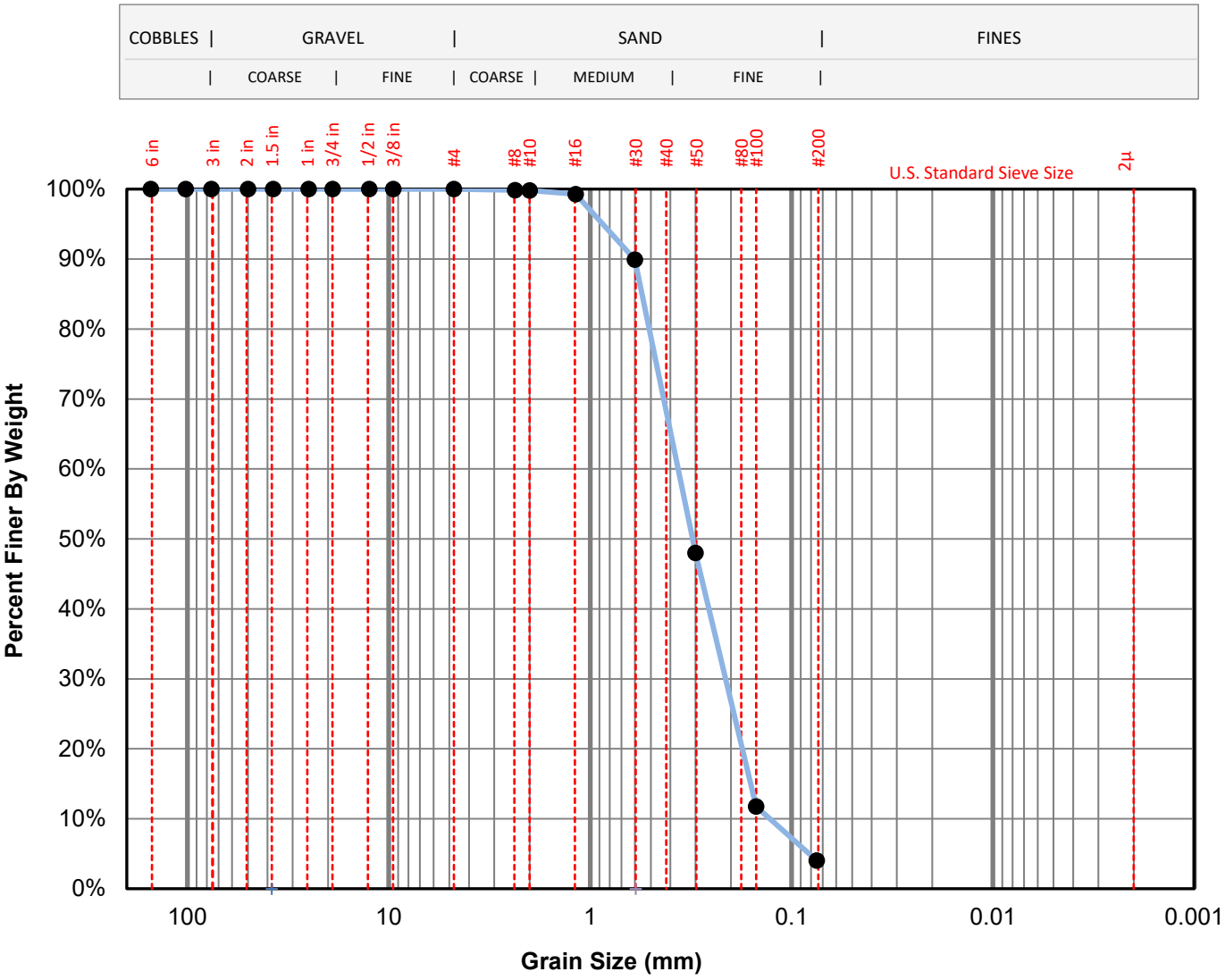
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TETRA TECH

GRAIN SIZE DISTRIBUTION ANALYSIS

ASTM C136/C117/D7928/D6913

Job Name:	Furman Park Storm water	**Date Sampled:**	4/17/2023
Job Number:	CWT-22-06E	**Date Completed:**	4/23/2023
Tested By:	MG	**Sample Identification:**	P-5, R-4
Note:		**Sample Depth:**	18.5 ft
Sample Description:	Olive Gray SP, Native		



Symbol	Boring No.	Sample No.	Depth	LL	PI	USCS	Cobbles	Gravel	Sand	Fines	2µ
●	P-5	R-4	18.5 ft			SP	**0%**	**0%**	**96%**	**4%**	**0%**

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Appendix C

Results of Infiltration Testing

TETRA TECH

PERCOLATION DATA SHEET

Project:	Furman Park BMP - Downey		Job No:	CWT22-06E	
Test Hole No:	**P-4**		Date Excavated:	Monday, April 17, 2023	
Test Hole Depth (feet):	20.25	feet	Soil Classification:	SP	
Stick up Length (feet):	0.5	foot	Gravel Porosity:	0.35	
Sandy Soil Criteria Tested By:	SMS		Presoak Date:	Monday, April 17, 2023	Presoak:
Actual Percolation Tested By:	SMS		Test Date:	Monday, April 17, 2023	
Test Hole Diameter (inches):	8	inches	Latitude:	33.9535	Longitude: -118.1374
Casing Diameter (inches):	3	inches	Elevation:	123 feet	

PERCOLATION TEST (presoaking for at least 1 hour)

Time	Time Interval (min)	Initial Reading (feet below the top of the pipe)	Final Reading (feet below the top of the pipe)	Initial Water Level (feet above bottom of hole)	Final Water Level (feet above bottom of hole)	Δ in Water Level (inches)	Measured Raw Percolation Rate (inches/hour)
10:10 AM 10:15 AM	5	18.50	19.60	2.25	1.15	13.20	6.243
10:18 AM 10:28 AM	10	18.00	19.75	2.75	1.00	21.00	4.540
10:35 AM 10:45 AM	10	17.90	19.50	2.85	1.25	19.20	3.823
10:48 AM 10:58 AM	10	18.20	19.20	2.55	1.55	12.00	2.390
11:00 AM 11:10 AM	10	18.80	19.56	1.95	1.19	9.12	2.318
11:12 AM 11:22 AM	10	18.00	18.53	2.75	2.22	6.36	1.059
11:24 AM 11:34 AM	10	18.30	18.90	2.45	1.85	7.20	1.372
11:36 AM 11:46 AM	10	18.30	18.80	2.45	1.95	6.00	1.119

Reduction Factor Method (1 to 3)	2.00	Corrected short-term field infiltration rate (in/hr)=	1.183
Reduction Factor Site Variability (1 to 3)	1.50		
Reduction Factor Long Term Siltation (1 to 3)	2.00		

County of Los Angeles GS200.1 Guidelines for Geotechnical Investigation and Reporting. Low Impact Development Stormwater Infiltration 6/30/21

Design Infiltration Rate = 0.22 in/hour

TETRA TECH

PERCOLATION DATA SHEET

Project:	Furman Park BMP - Downey		Job No:	CWT22-06E	
Test Hole No:	**P-5**		Date Excavated:	Monday, April 17, 2023	
Test Hole Depth (feet):	20.2	feet	Soil Classification:	SP	
Stick up Length (feet):	0.6	foot	Gravel Porosity:	0.35	
Sandy Soil Criteria Tested By:	SMS		Presoak Date:	Monday, April 17, 2023	Presoak: 10:50 AM
Actual Percolation Tested By:	SMS		Test Date:	Monday, April 17, 2023	
Test Hole Diameter (inches):	8	inches	Latitude:	33.9534	Longitude: -118.1378
Casing Diameter (inches):	3	inches	Elevation:	123 feet	

PERCOLATION TEST (presoaking for at least 1 hour)

Time	Time Interval (min)	Initial Reading (feet below the top of the pipe)	Final Reading (feet below the top of the pipe)	Initial Water Level (feet above bottom of hole)	Final Water Level (feet above bottom of hole)	Δ in Water Level (inches)	Measured Raw Percolation Rate (inches/hour)
11:50 AM 12:00 PM	10	17.60	20.03	3.20	0.77	29.16	5.982
12:03 PM 12:13 PM	10	16.30	19.27	4.50	1.53	35.64	4.944
12:15 PM 12:25 PM	10	16.50	19.10	4.30	1.70	31.20	4.349
12:28 PM 12:38 PM	10	16.20	18.90	4.60	1.90	32.40	4.186
12:39 PM 12:49 PM	10	17.30	18.90	3.50	1.90	19.20	2.956
12:50 PM 1:00 PM	10	17.70	18.92	3.10	1.88	14.64	2.432
1:01 PM 1:11 PM	10	18.30	19.06	2.50	1.74	9.12	1.760
1:12 PM 1:22 PM	10	18.40	19.08	2.40	1.72	8.16	1.618
1:23 PM 1:33 PM	10	19.10	19.65	1.70	1.15	6.60	1.830
1:34 PM 1:44 PM	10	19.30	19.75	1.50	1.05	5.40	1.653

Reduction Factor Method (1 to 3)	2.00
Reduction Factor Site Variability (1 to 3)	1.50
Reduction Factor Long Term Siltation (1 to 3)	2.00

Corrected short-term field infiltration rate (in/hr)=	1.700

County of Los Angeles GS200.1 Guidelines for Geotechnical Investigation and Reporting. Low Impact Development Stormwater Infiltration 6/30/21

Design Infiltration Rate = 0.31 in/hour