



Adventure Park Groundwater Level Monitoring Results Technical Memorandum

TO:	COMPANY:	DATE:
Jennifer Walker Lindsay Maldonado Aric Torreyson	Waterarth Waterarth Tetra Tech	April 1, 2022

FROM:	PROJECT NUMBER:	PHONE NUMBER:
Don Lee, P.G, CHG		

RE:
Groundwater Level Monitoring Results
Adventure Park Stormwater Capture Project
10130 Gunn Avenue, Whittier, California

INTRODUCTION

At request of Los Angeles County Department of Public Works, Tetra Tech monitored groundwater levels from the existing monitoring wells at Adventure Park located at 10130 Gunn Avenue in Whittier, Los Angeles County, California (the Site) from November 2020 to December 2021. Site location is shown in Figure 1. The purpose of the groundwater level monitoring is to assess long-term groundwater level fluctuations and trends at the Site to support the excavation dewatering planning for the proposed construction of an underground stormwater capture facility at the Site.

Preliminary results of the Site groundwater level monitoring was provided in the report titled, *Groundwater Investigation Report and Excavation Dewatering Strategy, Adventure Park Stormwater Capture Project, 10130 Gunn Avenue, Whittier, Los Angeles County, California, January 28, 2022*, prepared by Tetra Tech (the 2022 Tetra Tech groundwater investigation report). The Tetra Tech 2022 groundwater investigation report included groundwater level data collected up to and including November 2021. This Technical Memorandum presents a summary of the site activities and results of the groundwater level monitoring including the additional groundwater level data collected in December 2021.

SITE ACTIVITIES

Tetra Tech monitored groundwater levels from a total of 5 monitoring wells at the Site on a monthly basis. The water levels were measured manually by electronic water level meter. Monitoring well locations are shown in Figure 2. Two monitoring wells, Tt-1/EW-1 and Tt-2/MW-1 which were installed in November 2020, were monitored from November 2020 to December 2021. Three additional monitoring wells MW-2, MW-3, and EW-3 were installed in October 2021 and monitored from October 2021 to December 2021. The monitoring wells were installed with well screen placed between 20 feet and 50 feet below ground surface (bgs) to intercept the sand layer at the base of the proposed excavation.

Details of the monitoring well installations are provided in *Engineering Memorandum No. 1, Rev 2. Adventure Park Monitoring and Extraction Well Installation and Development, Whittier, California, April 29, 2021* and in the 2022 Tetra Tech groundwater investigation report referenced above. Monitoring well construction details are provided in well construction logs in Appendix A. Tt-1/EW-1 and Tt-2/MW-1 were constructed identically.

On October 20, 2021, a California-licensed Tetra Tech surveyor surveyed the top of the monitoring wells for elevation and coordinates. The survey coordinates are based on California Coordinate System of 1983, Zone 5, North American Datum (NAD) 83 and Los Angeles Department of Public Works benchmark BM 0Y8220 for elevation. The surveyed coordinates and elevations and survey benchmark information are provided in Appendix B. The elevation data were used for evaluating groundwater level data.

RESULTS

The groundwater level data are summarized in Table 1. For reference, the base of the proposed underground stormwater capture structure is 114 feet above mean sea level (AMSL). The results of the groundwater level monitoring are summarized below.

- Average water level in Site monitoring well in December 2021 was 26.2 feet bgs or 114.18 feet AMSL.
- The highest water level in Site monitoring wells from November 2020 to December 2021 was 27.7 feet bgs or 116.84 feet AMSL.
- The lowest water level in Site monitoring wells from November 2020 to December 2021 was 24.1 feet bgs or 114.06 feet AMSL.
- The apparent direction of groundwater flow at the Site was to the west towards Sorensen Drain as expected (Figure 2).
- Groundwater level changes in the monitoring wells at the Site over time are shown in Figure 3. Groundwater level decreased approximately 1 foot during the monitoring period.

For the purpose of evaluating the potential groundwater level fluctuations and trends for a longer term, historical groundwater level data for Water Replenishment District of Southern California (WRD) monitoring well Whittier #1, located approximately 2 miles east of the Site, was obtained from WRD database. Monitoring well construction details are provided in well construction logs in Appendix A. Whittier #1 Zone 5 is the shallowest well screened approximately 200-220 feet bgs and the water level was at approximately 22.5 feet bgs in December 2021. Historical groundwater level data from Whittier #1 Zone 5 monitoring well since 2011 and the Site monitoring wells are shown in Figure 4. Historical groundwater level trend based on Whittier #1 Zone 5 and Site monitoring well groundwater levels are presented below.

- As shown in the hydrograph Figure 4, the Whittier #1 Zone 5 water level parallels the Site monitoring well water levels indicating that the Whittier #1 water level trend would be analogous to that of the Site monitoring wells. This indicates that the Site monitoring wells are screened in the same water-bearing zone as Whittier #1 Zone 5.
- Whittier #1 Zone 5 five-year (2016 – 2021) high and low water levels are 20.4 feet bgs (June 2020) and 24 feet bgs (December 2016), respectively, a range of 3.6 feet.
- Site monitoring well water level in September 2021 was 26.7 feet bgs. Based on the water level changes that occurred in Whittier #1 Zone 5, the five-year high and low groundwater levels at Site monitoring wells are estimated to be 25 and 28.6 feet bgs (113 to 118 feet AMSL). Therefore, in the short term the groundwater level change at the Site is expected to be no more than approximately 2 feet higher or lower from the current groundwater level at the Site, based on the five-year data.
- Seasonally, Whittier #1 Zone 5 groundwater levels fluctuated up to 3 feet in a year. The highest seasonal groundwater levels occurred generally during March to June and the lowest occurred during September to December (Figure 4). Therefore, construction during September to December is expected to require less dewatering than any other time of the year.

CONCLUSION

The conclusion derived from this groundwater level monitoring technical memorandum is consistent with that of the 2022 Tetra Tech groundwater investigation report. Based on historical groundwater levels in WRD Whittier #1 Zone 5 monitoring well, used as an index well, the five-year high and low groundwater levels at Site monitoring wells are estimated to be approximately 25 and 28.6 feet bgs (113 to 118 feet AMSL), which is no more than 2 feet higher or lower than the current groundwater levels. Additionally, based on the five-year data of the index well, groundwater levels are expected to fluctuate up to 3 feet seasonally within a year. The highest seasonal groundwater levels occur generally during March to June and the lowest groundwater level occur during September to December. Therefore, construction during September to December is expected to require less dewatering than any other time of the year. It should be noted that these estimates are to be used for planning purposes only, and the actual future water levels may vary depending on future weather conditions.

CLOSURE

We appreciate the opportunity to assist Watearth and the Los Angeles County with this phase of the Adventure Park Stormwater Capture Project. If you have any questions, please feel free to contact our office at (949) 809-5000.

Respectfully submitted,



Don Lee, PG, CHG

Attachments:	Table 1	Groundwater Elevations
	Figure 1	Project Location Map
	Figure 2	Groundwater Level in Wells
	Figure 3	Groundwater at the Site
	Figure 4	10-Year Groundwater Levels in Whittier
	Appendix A	Well Construction Logs
	Appendix B	Survey Data

TABLE 1

GROUNDWATER ELEVATIONS
Adventure Park Stormwater Capture Project, Whittier, CA

Well Name	Screened Interval (ft-bgs)	Top of Casing Elevation (ft-MSL)	Date Measured	Depth to Groundwater (feet below TOC)	Groundwater Elevation (ft-MSL)
Tt-1/EW-1	20-50	141.35	11/2/2020	25.79	115.56
			11/30/2020	25.82	115.53
			12/23/2020	26.00	115.35
			1/6/2021	26.01	115.34
			2/11/2021	26.54	114.81
			3/15/2021	26.05	115.30
			4/8/2021	26.10	115.25
			5/11/2021	26.20	115.15
			6/29/2021	26.30	115.05
			7/29/2021	26.40	114.95
			8/15/2021	26.55	114.80
			9/27/2021	26.41	114.94
			10/22/2021	26.79	114.56
11/23/2021	26.95	114.40			
12/20/2021	27.09	114.26			
Tt-2/MW-1	20-50	141.97	11/2/2020	25.37	116.60
			11/30/2020	25.13	116.84
			12/23/2020	26.60	115.37
			1/6/2021	26.61	115.36
			2/11/2021	26.92	115.05
			3/15/2021	26.66	115.31
			4/8/2021	26.71	115.26
			5/11/2021	26.80	115.17
			6/29/2021	26.92	115.05
			7/29/2021	27.02	114.95
			8/15/2021	27.15	114.82
			9/27/2021	27.03	114.94
			10/22/2021	27.37	114.60
11/23/2021	27.54	114.43			
12/20/2021	27.66	114.31			
MW-2	30-40	138.41	10/22/2021	24.10	114.31
			11/23/2021	24.25	114.16
			12/20/2021	24.35	114.06
MW-3	30-40	139.54	10/22/2021	25.14	114.40
			11/23/2021	25.30	114.24
			12/20/2021	25.36	114.18
EW-2	30-40	139.96	10/20/2021	25.61	114.35
			11/23/2021	25.72	114.24
			12/20/2021	25.87	114.09

Average water level in December 2021: 26.2 114.18
Maximum water level Nov 2020 - Dec 2021: 27.7 116.84
Minimum water level Nov 2020 - Dec 2021: 24.1 114.06

Notes:

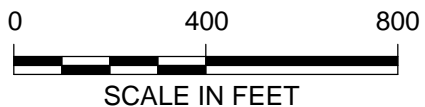
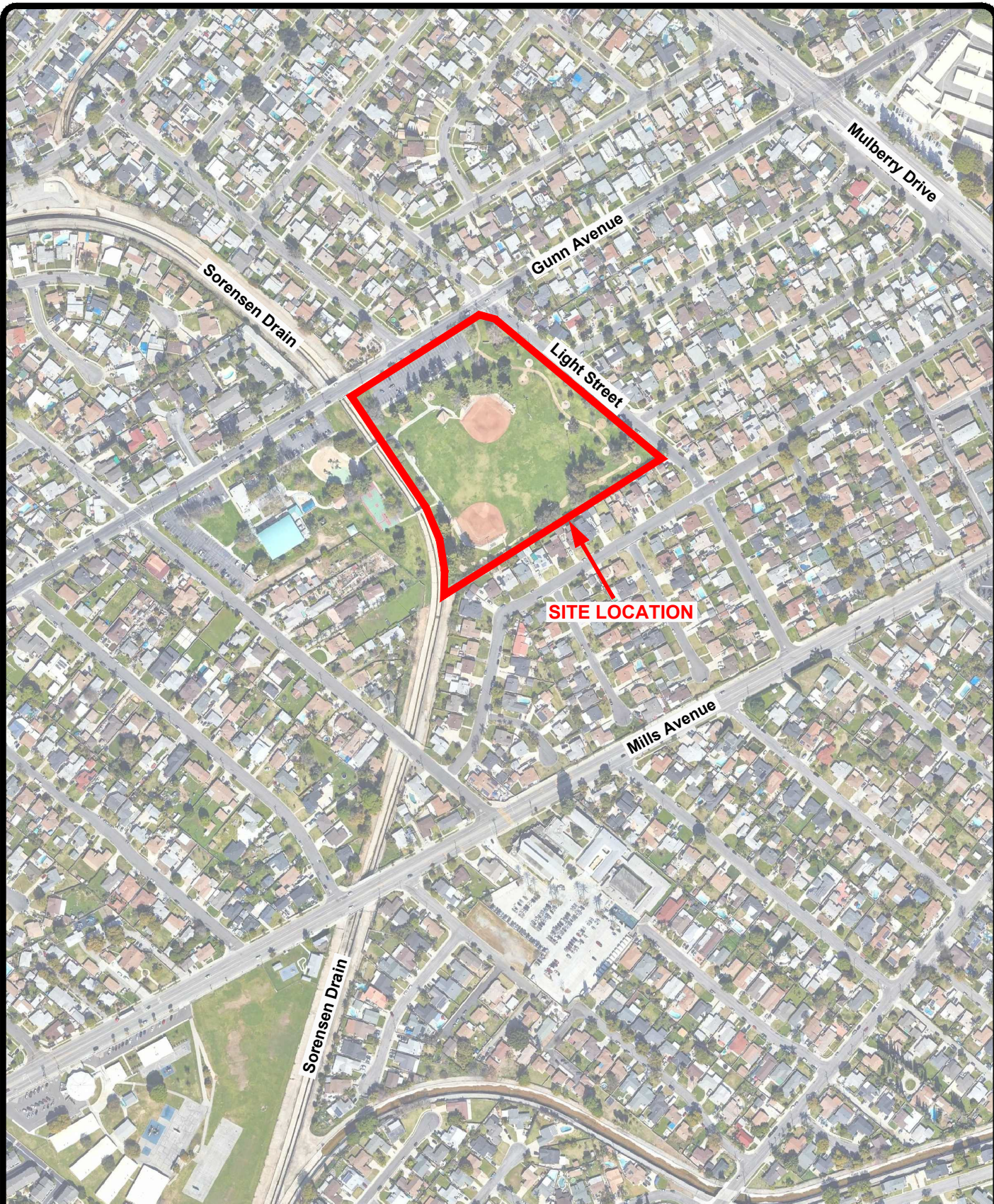
ft-bgs - feet below ground surface

MSL - mean sea level

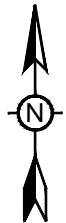
TOC - top of casing

Water levels are static water levels, unless otherwise noted.

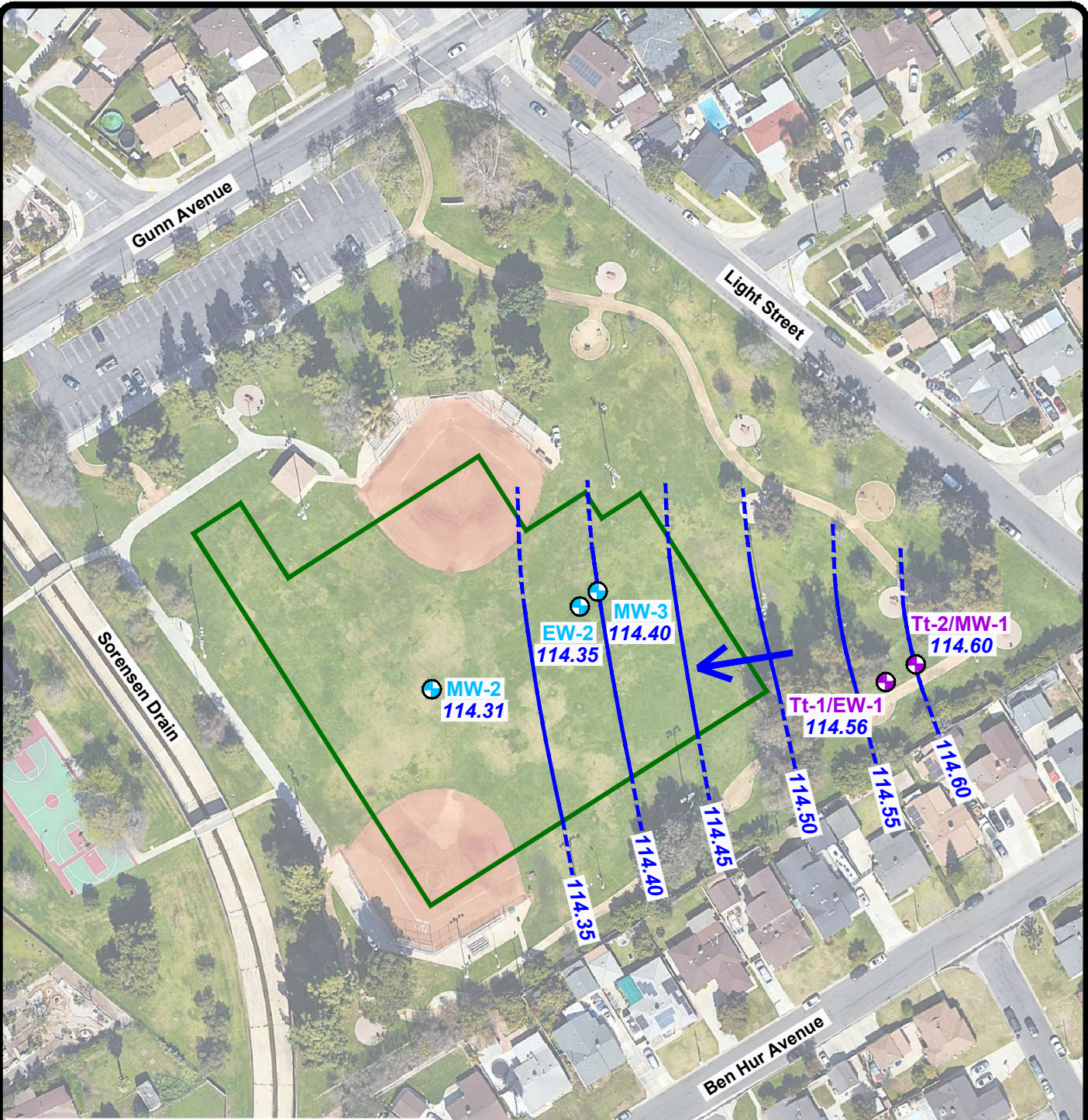
P:\0524-338-ADPK\0524338001A.DWG



SCALE IN FEET

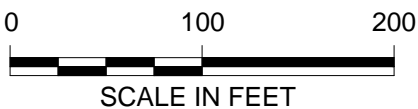


TITLE:		PROJECT LOCATION MAP	
LOCATION:		Adventure Park Multi-Benefit Project 10130 S. Gunn Avenue, Whittier, California	
	APPROVED	DL	FIGURE 1
	DRAFTED	CP	
	PROJECT#	117-0524338	
	DATE	08-10-21	



LEGEND

- MW-2 Monitoring Well (Tetra Tech, 2021)
- Tt-2/MW-1 Monitoring Well (Tetra Tech, 2020)
- Tt-1/EW-1
- ← Groundwater Flow Direction
- Groundwater Level Contour Line (Feet Above Mean Sea Level)
- Approximate Limit of Proposed Underground Water Storage Reservoir



TITLE: GROUNDWATER LEVEL IN WELLS (OCTOBER 22, 2021)

LOCATION: Adventure Park Multi-Benefit Project
10130 S. Gunn Avenue, Whittier, California



TETRA TECH

APPROVED	DL	2
DRAFTED	CP	
PROJECT#	117-0524338	
DATE	11-15-21	

FIGURE

Figure 3
Groundwater Levels at the Site
Adventure Park, Whittier, CA

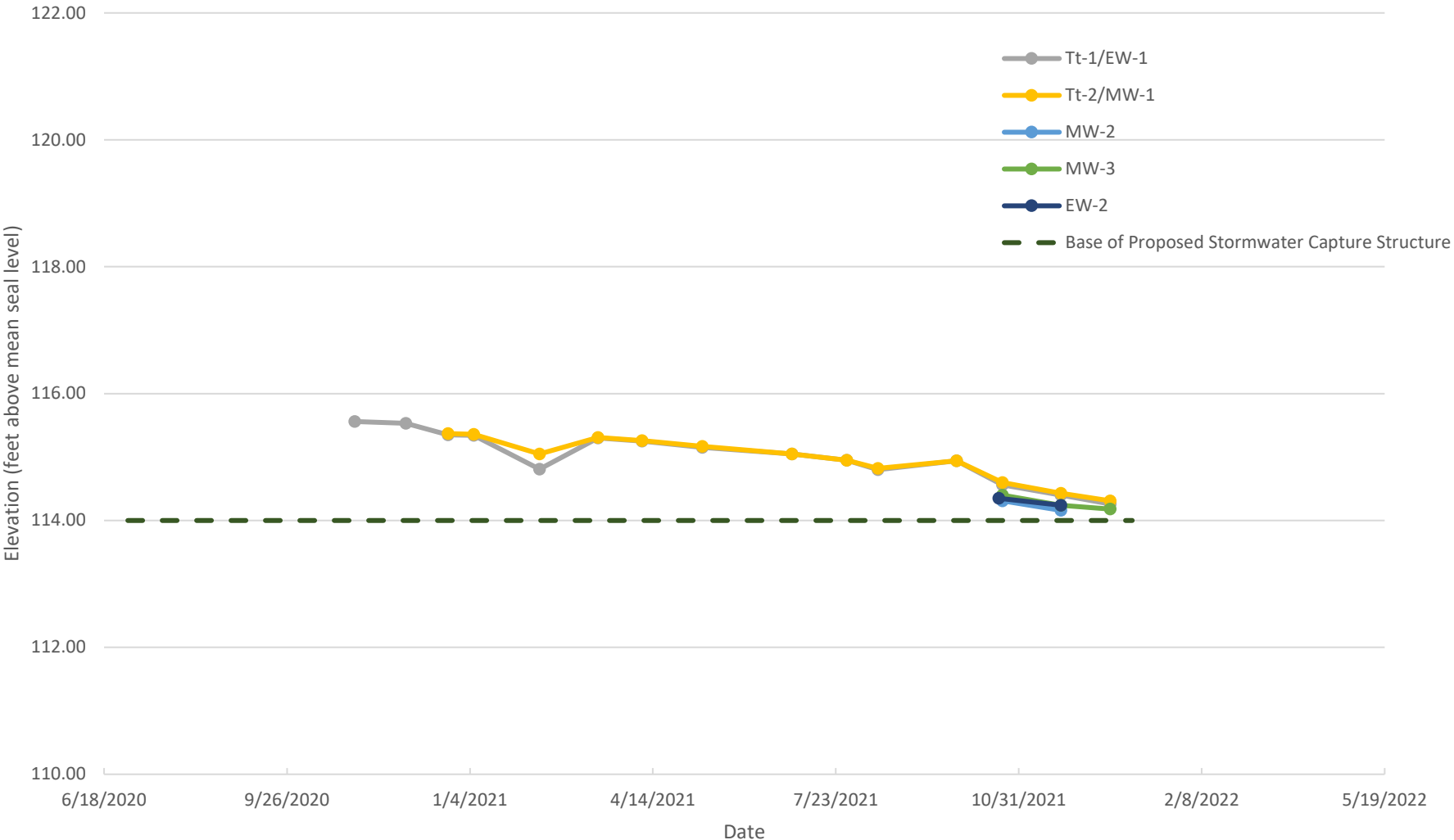
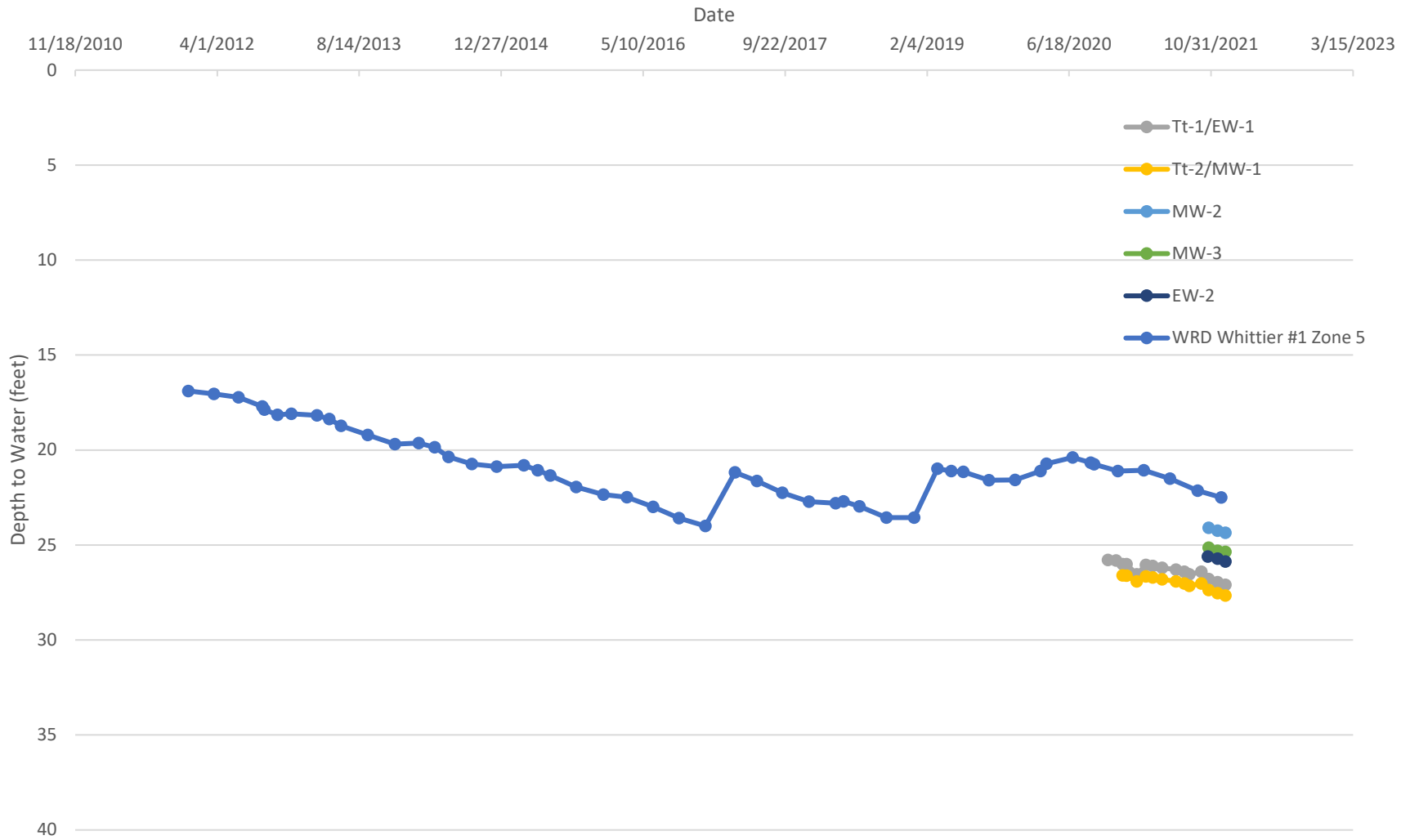


Figure 4
10-Year Historical Groundwater Levels in Whittier
Adventure Park, Whittier, CA



APPENDIX A

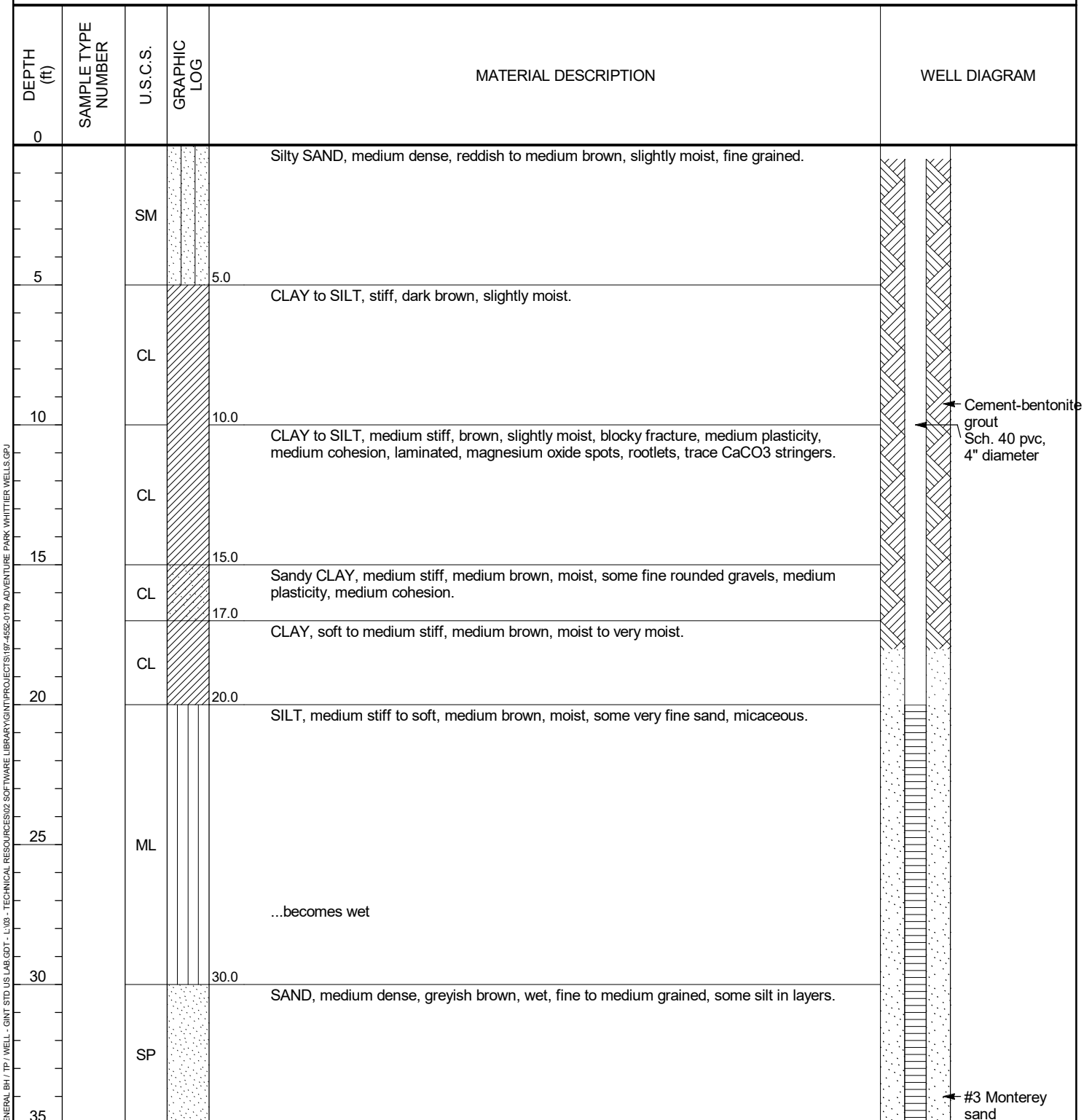


Tetra Tech
21700 Copley Drive, #200
Diamond Bar, CA 91765
(909) 860-7777

WELL Tt-1/EW-1

Sheet 1 of 2

PROJECT NAME Adventure Park **CLIENT** Waterth **GROUND ELEVATION** Not surveyed
PROJECT NUMBER TET20-179E **PROJECT LOCATION** Whittier, CA **GROUNDWATER DEPTH** Not encountered
DATES DRILLED 11/2/2020 -11/2/2020 **DRILLING CONTRACTOR** ABC Liovin **BOREHOLE DEPTH** 50 ft
LOGGED/CHECKED BY SMS/ **DRILLING METHOD** Hollow Stem Auger **BOREHOLE DIAMETER** 10 in
COORDINATES _____ **HAMMER DATA** 140 Lbs, 30" drop **BACKFILL** Well components
LOCATION DESCRIPTION South end of park, north of walking path, 15 feet west of Tt-2



GENERAL BH / TP / WELL - GINT STD US LAB.GDT - L\08 - TECHNICAL RESOURCES\02 SOFTWARE LIBRARY\GINT\PROJECTS\197-4552-0179 ADVENTURE PARK WHITTIER WELLS.GPJ

(Continued Next Page)

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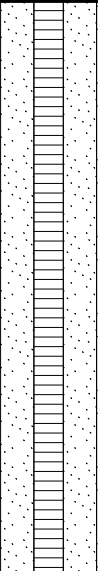


Tetra Tech
 21700 Copley Drive, #200
 Diamond Bar, CA 91765
 (909) 860-7777

WELL Tt-1/EW-1

Sheet 2 of 2

PROJECT NAME Adventure Park CLIENT Watearth GROUND ELEVATION Not surveyed
 PROJECT NUMBER TET20-179E PROJECT LOCATION Whittier, CA GROUNDWATER DEPTH Not encountered

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
35					
40		SP		SAND, medium dense, greyish brown, wet, fine to medium grained, some silt in layers. (continued)	
45					
50					

Sch. 40 pvc,
 4" diameter,
 0.02" slotted
 screen.

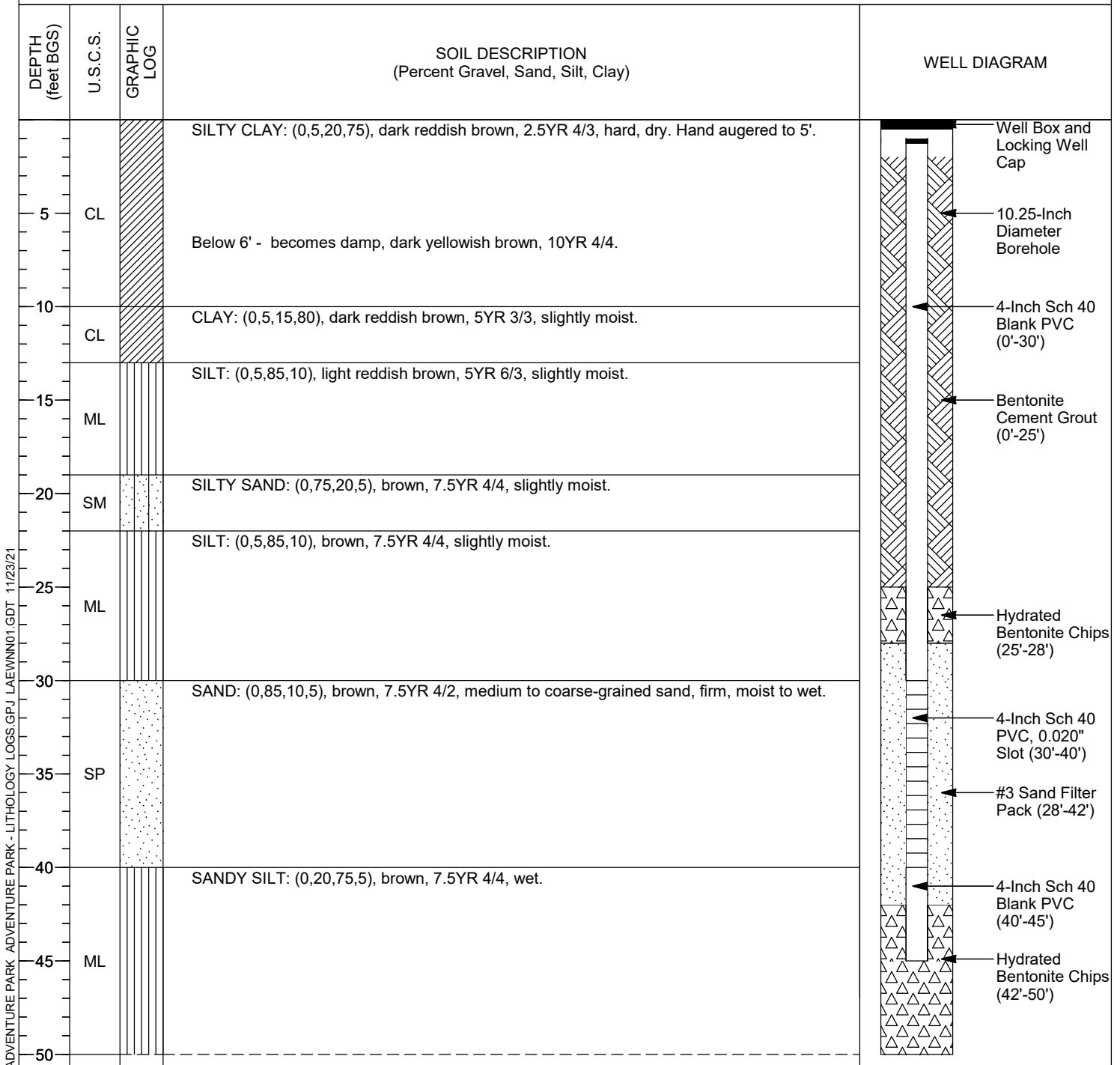
Total Depth: 50 feet below existing grade.
 Groundwater encountered at 27 feet at time of drilling.
 No caving.
 Boring backfilled with well. Bottom of borehole at 50.0 feet.

GENERAL BH / TP / WELL - GINT STD US LAB GDT - L\03 - TECHNICAL RESOURCES\02 SOFTWARE LIBRARY\GINT\PROJECTS\197-4552-0179 ADVENTURE PARK WHITTIER WELLS.GPJ



Soil Boring / Well Construction Log

PROJECT NUMBER	117-0524338	WELL IDENTIFICATION	EW-2
PROJECT NAME	Adventure Park	DATE BOREHOLE DRILLING BEGAN	10/13/2021
LOCATION	Whittier, CA	DATE BOREHOLE DRILLING ENDED	10/13/2021
DRILLING METHOD	Hollow Stem Auger	NORTHING / EASTING (feet)	1801548.829 / 6551300.323
DRILLING COMPANY	BC2 Environmental	TOC ELEVATION (feet, MSL)	139.96
LOGGED BY	Tony Mickelson	BOREHOLE DEPTH (feet)	50
REVIEWED BY	Don Lee		

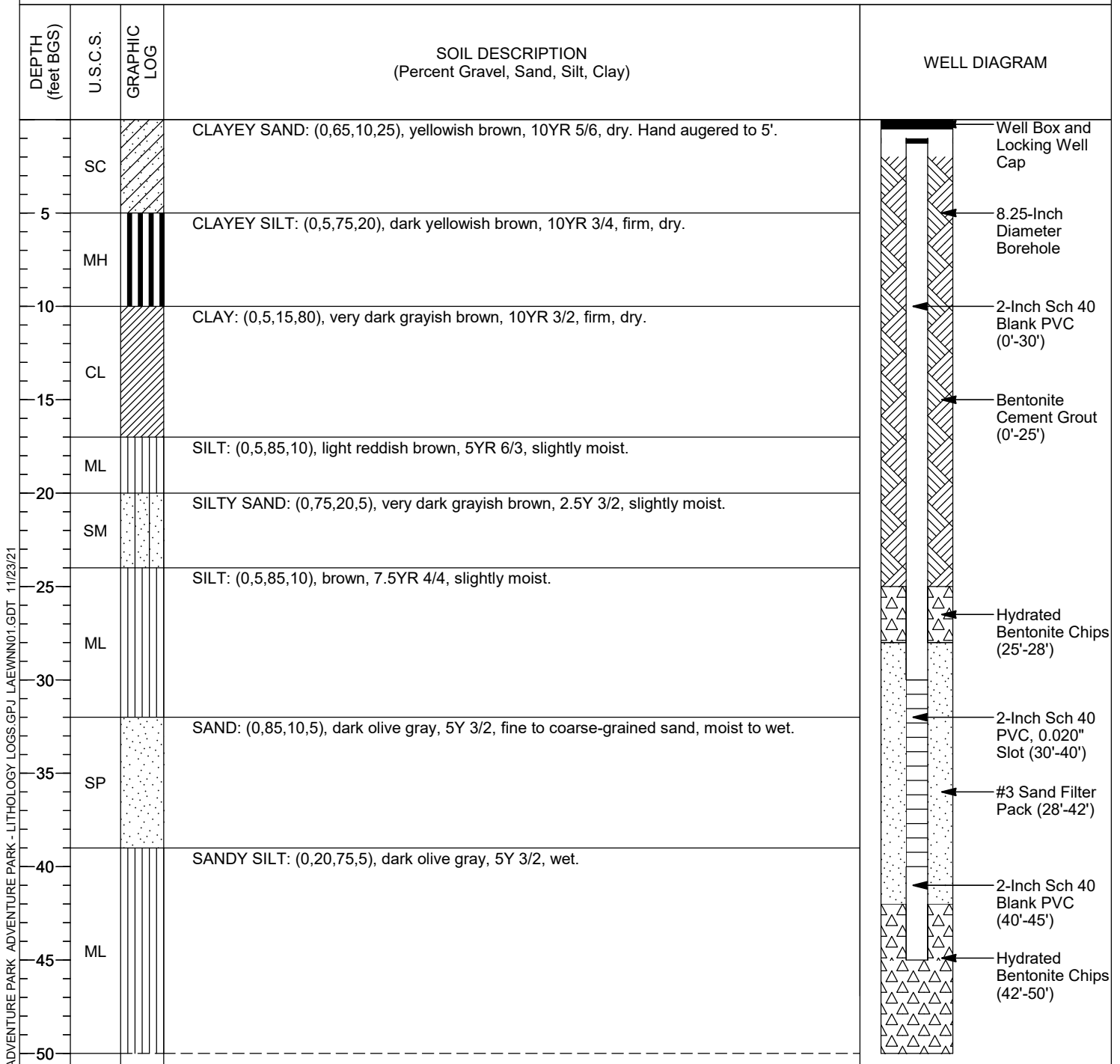


ADVENTURE PARK - ADVENTURE PARK - LITHOLOGY LOGS.GPJ LAEWNN01.GDT 11/23/21



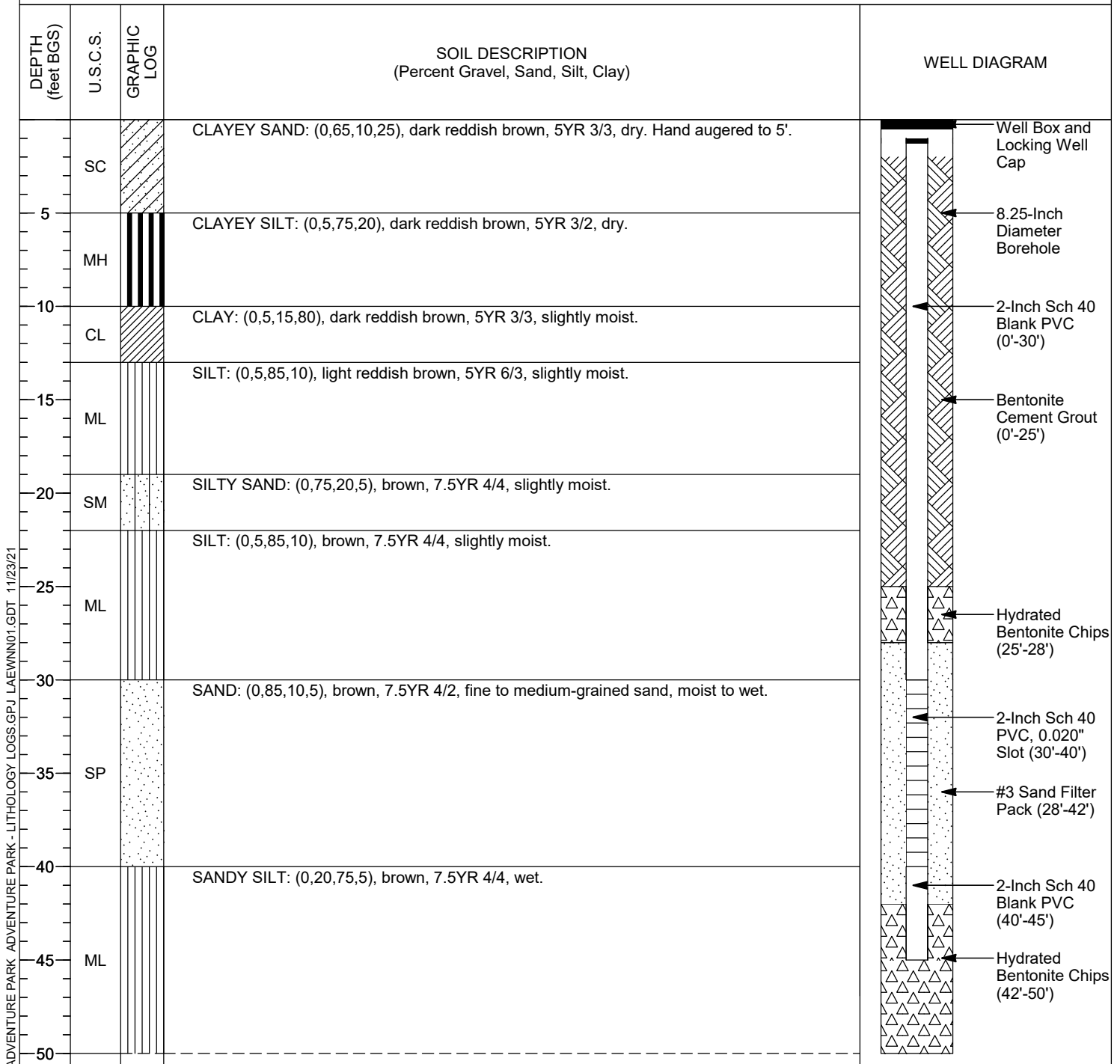
Soil Boring / Well Construction Log

PROJECT NUMBER 117-0524338 **WELL IDENTIFICATION** MW-2
PROJECT NAME Adventure Park **DATE BOREHOLE DRILLING BEGAN** 10/14/2021
LOCATION Whittier, CA **DATE BOREHOLE DRILLING ENDED** 10/14/2021
DRILLING METHOD Hollow Stem Auger **NORTHING / EASTING (feet)** 1801497.843 / 6551184.697
DRILLING COMPANY BC2 Environmental **TOC ELEVATION (feet, MSL)** 138.41
LOGGED BY Tony Mickelson **BOREHOLE DEPTH (feet)** 50
REVIEWED BY Don Lee

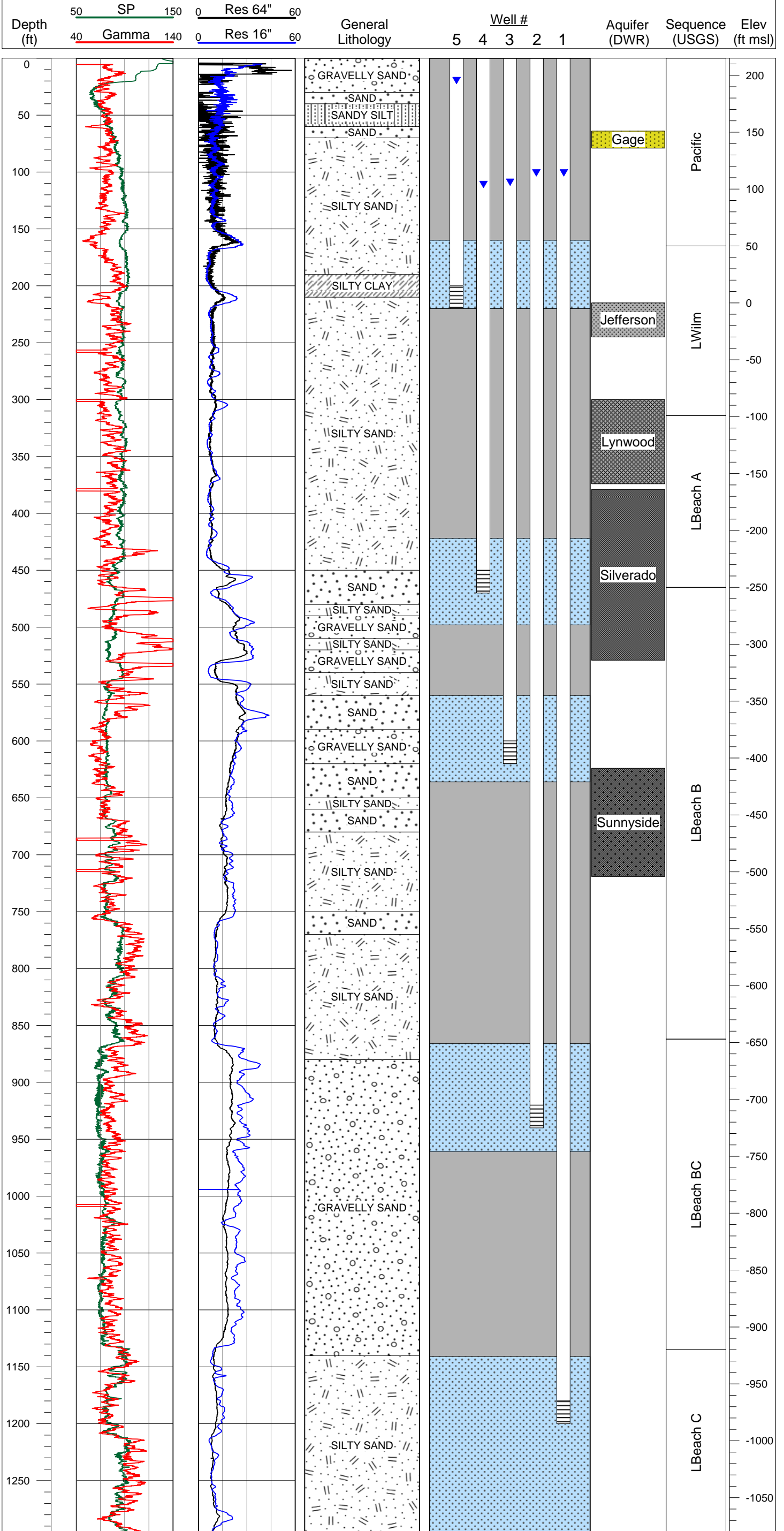


Soil Boring / Well Construction Log

PROJECT NUMBER	117-0524338	WELL IDENTIFICATION	MW-3
PROJECT NAME	Adventure Park	DATE BOREHOLE DRILLING BEGAN	10/13/2021
LOCATION	Whittier, CA	DATE BOREHOLE DRILLING ENDED	10/13/2021
DRILLING METHOD	Hollow Stem Auger	NORTHING / EASTING (feet)	1801556.412 / 6551307.165
DRILLING COMPANY	BC2 Environmental	TOC ELEVATION (feet, MSL)	139.54
LOGGED BY	Tony Mickelson	BOREHOLE DEPTH (feet)	50
REVIEWED BY	Don Lee		



WHITTIER #1



Date Completed: October 1999
 Borehole Depth: 1,298 ft
 Drilled/Constructed By: U.S.G.S.



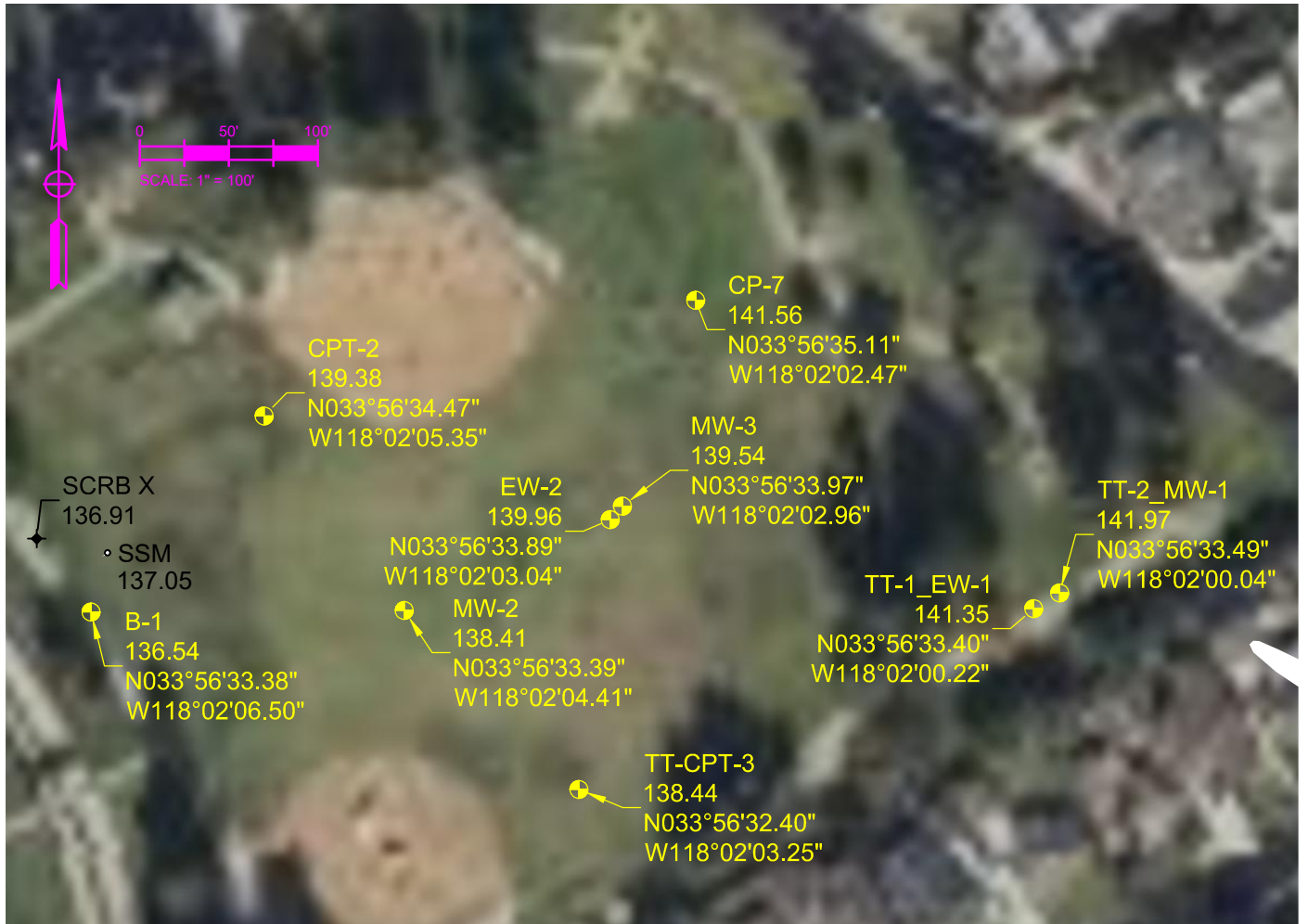
WRD-ID#: 101735 - 101739

▼ Water Level: 03/12/14

Well Log Revised: 10/26/18

APPENDIX B

10/28/2021 12:33:08 PM - O:\PROJECTS\IRVINE\1297\200-01297-17050\CAD\SURVEY\DWG\ADVENTURE PARK_21-10-26.DWG - ANAYA, DAVID



BASIS OF BEARINGS

THE COORDINATES AND BEARINGS SHOWN HEREON ARE BASED UPON THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83), ZONE 5 NAD83 (NSRS2007), CSRS EPOCH 2011.00 IN ACCORDANCE WITH THE CALIFORNIA PUBLIC RESOURCES CODE SECTIONS 8801-8819; SAID COORDINATES AND BEARINGS ARE BASED LOCALLY UPON FIELD-OBSERVED TIES TO A LINE BETWEEN THE SCRIPPS OPERATING PERMANENT ARRAY CENTER (SOPAC) STATION BKMS AND UNAVCO STATION RHCL BEING N45°10'47"E AS DERIVED FROM GEODETIC VALUES PUBLISHED BY THE CALIFORNIA SPATIAL REFERENCE CENTER (CSRC) AND/OR NATIONAL GEODETIC SURVEY (NGS), RESPECTIVELY.

BENCHMARK

LOS ANGELES DEPARTMENT OF PUBLIC WORKS
BM 0Y8220.

SPIKE FOUND IN NORTHERLY CURB ON MILLS AVENUE AT THE CENTER OF A CATCH BASIN 29.5 FEET NORTH OF THE CENTERLINE AND 52 FEET EAST OF CLOSE STREET CENTERLINE.

ELEVATION (FT) = 135.746

POINT DESCRIPTION

MONITORING WELL NAME
ELEVATION
LATITUDE
LONGITUDE

LEGEND

ALL MONITORING WELL CASINGS LOCATED USING CONVENTIONAL MEANS. SHOTS ON CASINGS MARKED ON MOST NORTHERLY POINT AND READINGS ARE SHOWN HEREON.



TETRA TECH

711 TANK FARM ROAD, SUITE 110
SAN LUIS OBISPO, CA 93401
TEL (805) 542-9052 FAX (805) 542-9254
www.tetrattech.com

MONITORING WELL LOCATIONS

ADVENTURE PARK

10130 S. GUNN AVE. WHITTIER, CALIFORNIA

SHEET 1 OF 1
DATE: 10-26-21
DRAWN BY: DA
CHKD BY: DH

ADVENTURE PARK

0	MW-2	MW-3	EW-2	TT-1_EW-1	TT-2_MW-1	B-1	CPT-2	TT-CPT-3	TT-CPT-7
NORTHING	1801497.843	1801556.412	1801548.829	1801498.875	1801507.684	1801496.988	1801607.041	1801397.38	1801671.962
EASTING	6551184.697	6551307.165	6551300.323	6551538.057	6551552.631	6551008.889	6551106.045	6551282.754	6551348.272
LAT	N33D56'33.39"	N33D56'33.97"	N33D56'33.89"	N33D56'33.40"	N33D56'33.49"	N33D56'33.38"	N33D56'34.47"	N33D56'32.40"	N33D56'35.11"
LONG	W118D02'04.41"	W118D02'02.96"	W118D02'03.04"	W118D02'00.22"	W118D02'00.04"	W118D02'06.50"	W118D02'05.35"	W118D02'03.25"	W118D02'02.47"
ELEVATION GROUND	139.01	140.38	140.29	141.87	142.11	136.54	139.38	138.44	141.56
Top of PVC well casing	138.41	139.54	139.96	141.35	141.97	N/A	N/A	N/A	N/A

Survey Report

Job name	ADVTR_PARK_05_102021
Creation date	11 Mar 2011
Version	Trimble General Survey 3.21
Distance Units	US survey feet
Angle units	Degrees
Pressure Units	mbar
Temperature Units	Celsius

Coordinate system (Job)

System	
Zone	
Datum	

Projection

Projection	Scale factor only
Scale	1.00000000
South azimuth (grid)	No
Grid coords	Increase North-East

Local site

Type	Grid
-------------	------

Datum transformation

Type	None
-------------	------

Collected Field Data

Feature library

Library name	TT-POINTS
Library File Name	TT-POINTS.fcx
Attribute Support	No

Corrections

South azimuth (grid)	No
Grid coords	Increase North-East
Magnetic declination	0°00'00"
Distances	Ground
Neighborhood adjustment	Off

Projection

Projection	Scale factor only
Scale	1.00000000

Local site

Type	Grid
-------------	------

Datum transformation

Type	None
-------------	------

Instrument

Instrument type	Trimble VX/S Series
EDM Refractive Index	274.1
EDM Carrier Wavelength	79.3
Horizontal circle mode	Set to azimuth
Horizontal Angle Precision	0°00'03"
Vertical Angle Precision	0°00'03"
EDM precision	3mm +2ppm
EDM constant	0mm
Backsight centering error	0.010

Instrument details

Model	S6 3" DR 300+
Serial number	92712141
Firmware version	R12.5.54
Horizontal collimation	0°00'00"
Vertical collimation	0°00'00"
Trunnion axis tilt correction	0°00'00"

Point	220	North	1801538.109	East	6550978.339	Elevation	136.906	Code	SCRB X
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Point	0120206	North	1801813.767	East	6551392.121	Elevation	142.730	Code	L&T
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Atmosphere

Pressure	1014.10mbar	Temperature	28.3°C	ppm	7.4				
Curvature correction	No	Refraction correction	No	Refraction const.					

Station setup

Station	220	Instrument height	5.209	Station type	Station setup	Scale factor	1.00000000	Std Error	?
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Orientation

Station	220	Backsight point	0120206	F1 Orientation correction	0°00'00"	F2 Orientation correction	?	Orient. Std Err	?
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Point (B.S.)	0120206	HA	56°19'44"	VA	89°18'51"	SD	497.287	Code	L&T
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.240	Prism constant	-30.0mm						
Deltas	0120206	Azimuth	?	H.Dist	0.038	V.Dist	-0.096		
Point	700	HA	56°19'47"	VA	89°18'53"	SD	497.288	Code	PT 120206
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.011		
Target height	5.240	Prism constant	-30.0mm						

Orientation

Station	220	Backsight point	0120206	F1 Orientation correction	0°00'00"	F2 Orientation correction	-0°00'01"	Orient. Std Err	?
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Point (B.S.)	0120206	HA	56°19'44"	VA	89°18'53"	SD	497.285	Code	L&T
Std Errors		HA	0°00'01"	VA	0°00'02"	SD	0.005		
Target height	5.240	Prism constant	-30.0mm						
Point	240	HA	65°31'52"	VA	89°21'28"	SD	317.725	Code	SET SCR X
Std Errors		HA	0°00'02"	VA	0°00'01"	SD	0.005		
Target height	5.100	Prism constant	-30.0mm						
Point (B.S.)	0120206	HA	236°19'45"	VA	270°41'05"	SD	497.285	Code	L&T
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.240	Prism	-30.0mm						

		constant							
Point	240	HA	245°31'54"	VA	270°38'28"	SD	317.726	Code	SET SCR X
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.100	Prism constant	-30.0mm						

Orientation

Station	220	Backsight point	0120206	F1 Orientation correction	0°00'00"	F2 Orientation correction	0°00'01"	Orient. Std Err	?
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Point (B.S.)	0120206	HA	56°19'44"	VA	89°18'54"	SD	497.285	Code	L&T
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.240	Prism constant	-30.0mm						

Point	240	HA	65°31'48"	VA	89°21'29"	SD	317.726	Code	SET SCR X
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.100	Prism constant	-30.0mm						

Point (B.S.)	0120206	HA	236°19'43"	VA	270°41'02"	SD	497.284	Code	L&T
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.240	Prism constant	-30.0mm						

Point	240	HA	245°31'47"	VA	270°38'31"	SD	317.726	Code	SET SCR X
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.100	Prism constant	-30.0mm						

Orientation

Station	220	Backsight point	0120206	F1 Orientation correction	0°00'00"	F2 Orientation correction	0°00'00"	Orient. Std Err	?
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Point (B.S.)	0120206	HA	56°19'44"	VA	89°18'52"	SD	497.286	Code	L&T
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.240	Prism constant	-30.0mm						

Point	240	HA	65°31'50"	VA	89°21'28"	SD	317.727	Code	SET SCR X
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.100	Prism constant	-30.0mm						

Point (B.S.)	0120206	HA	236°19'43"	VA	270°41'04"	SD	497.284	Code	L&T
Std Errors		HA	0°00'02"	VA	0°00'01"	SD	0.005		
Target height	5.240	Prism	-30.0mm						

Point	240	HA	245°31'52"	VA	270°38'29"	SD	317.725	Code	SET SCR X
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.100	Prism constant	-30.0mm						
Point (MTA)	0120206	HA	0°00'00"	VA	89°18'55"	SD	497.285	Code	L&T
Std Errors		HA	0°00'00"	VA	0°00'01"	SD	0.001		
Target height	5.240	Prism constant	-30.0mm						
Point (MTA)	240	HA	9°12'07"	VA	89°21'30"	SD	317.726	Code	SET SCR X
Std Errors		HA	0°00'02"	VA	0°00'00"	SD	0.001		
Target height	5.100	Prism constant	-30.0mm						

Residuals (Rounds)

Point	0120206	Round	1	ΔHA	0°00'00"	ΔVA	-0°00'01"	ΔSD	0.000
Point	240	Round	1	ΔHA	0°00'01"	ΔVA	-0°00'01"	ΔSD	-0.001
Point	0120206	Round	1	ΔHA	0°00'00"	ΔVA	-0°00'00"	ΔSD	0.000
Point	240	Round	1	ΔHA	0°00'02"	ΔVA	0°00'02"	ΔSD	0.000
Point	0120206	Round	2	ΔHA	0°00'00"	ΔVA	-0°00'00"	ΔSD	0.000
Point	240	Round	2	ΔHA	-0°00'02"	ΔVA	-0°00'01"	ΔSD	0.000
Point	0120206	Round	2	ΔHA	0°00'00"	ΔVA	0°00'03"	ΔSD	-0.001
Point	240	Round	2	ΔHA	-0°00'02"	ΔVA	-0°00'00"	ΔSD	0.000
Point	0120206	Round	3	ΔHA	0°00'00"	ΔVA	-0°00'03"	ΔSD	0.001
Point	240	Round	3	ΔHA	-0°00'00"	ΔVA	-0°00'02"	ΔSD	0.001
Point	0120206	Round	3	ΔHA	0°00'00"	ΔVA	0°00'01"	ΔSD	-0.001
Point	240	Round	3	ΔHA	0°00'02"	ΔVA	0°00'02"	ΔSD	0.000
Point	50000	HA	101°14'03"	VA	90°05'17"	SD	40.503	Code	SSM
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50001	HA	88°05'35"	VA	89°29'36"	SD	322.140	Code	MW-2
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.000	Prism constant	10.0mm						
Point	50002	HA	86°48'51"	VA	89°34'44"	SD	329.309	Code	MW-2
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.000	Prism constant	10.0mm						
Point	50003	HA	86°58'25"	VA	89°25'37"	SD	329.508	Code	GS

Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.011		
Target height	5.000	Prism constant	10.0mm						
Point	50004	HA	86°41'31"	VA	89°26'07"	SD	328.974	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.011		
Target height	5.000	Prism constant	10.0mm						
Point	50005	HA	86°53'58"	VA	89°25'51"	SD	328.291	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50006	HA	88°01'38"	VA	89°26'04"	SD	323.068	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50007	HA	87°56'26"	VA	89°25'51"	SD	321.923	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50008	HA	88°09'26"	VA	89°26'16"	SD	320.907	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50009	HA	101°16'54"	VA	89°28'51"	SD	210.965	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50010	HA	101°06'14"	VA	89°28'41"	SD	209.141	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50011	HA	100°47'24"	VA	89°28'53"	SD	210.173	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50012	HA	101°25'53"	VA	89°29'30"	SD	210.137	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50013	HA	61°38'28"	VA	89°06'21"	SD	145.106	Code	GS AT CPT-2
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism	10.0mm						

		constant							
Point	50014	HA	143°23'27"	VA	90°38'29"	SD	51.197	Code	GS AT B-1
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50015	HA	114°48'39"	VA	89°46'24"	SD	335.338	Code	GS AT TT-CPT-3
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.011		
Target height	5.000	Prism constant	10.0mm						

Instrument

Instrument type	Trimble VX/S Series
EDM Refractive Index	274.1
EDM Carrier Wavelength	79.3
Horizontal circle mode	Set to azimuth
Horizontal Angle Precision	0°00'03"
Vertical Angle Precision	0°00'03"
EDM precision	3mm +2ppm
EDM constant	0mm
Backsight centering error	0.010

Instrument details

Model	S6 3" DR 300+
Serial number	92712141
Firmware version	R12.5.54
Horizontal collimation	0°00'00"
Vertical collimation	0°00'00"
Trunnion axis tilt correction	0°00'00"

Atmosphere

Pressure	1013.30mbar	Temperature	28.3°C	ppm	7.6				
Curvature correction	No	Refraction correction	No	Refraction const.					

Station setup

Station	240	Instrument height	5.274	Station type	Station setup	Scale factor	1.00000000	Std Error	?
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Orientation

Station	240	Backsight point	220	F1 Orientation correction	0°00'00"	F2 Orientation correction	?	Orient. Std Err	?
Point (B.S.)	220	HA	245°31'51"	VA	90°42'23"	SD	317.736	Code	SCRB X
Std Errors		HA	0°00'01"	VA	0°00'02"	SD	0.005		
Target height	5.050	Prism constant	-30.0mm						
Deltas	220	Azimuth	?	H.Dist	-0.006	V.Dist	0.025		
Point	701	HA	40°51'31"	VA	89°20'05"	SD	190.629	Code	PT 700
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.240	Prism constant	-30.0mm						
Point	50016	HA	88°22'21"	VA	89°29'31"	SD	80.852	Code	GS AT CP-7
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	702	HA	96°02'56"	VA	89°33'27"	SD	344.916	Code	PT 0120207
Std Errors		HA	0°00'01"	VA	0°00'02"	SD	0.005		
Target height	5.000	Prism constant	10.0mm						
Point	50017	HA	119°35'38"	VA	89°48'16"	SD	327.963	Code	TT-2_MW-1
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.000	Prism constant	10.0mm						
Point	50018	HA	122°15'17"	VA	89°54'38"	SD	319.984	Code	TT-1_EW-1
Std Errors		HA	0°00'01"	VA	0°00'01"	SD	0.005		
Target height	5.000	Prism constant	10.0mm						
Point	50019	HA	122°16'23"	VA	89°49'23"	SD	320.022	Code	TOP LID
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50020	HA	119°36'18"	VA	89°46'15"	SD	327.945	Code	TOP LID
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						
Point	50021	HA	119°45'57"	VA	89°46'45"	SD	327.429	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						

Point	50022	HA	122°06'19"	VA	89°49'04"	SD	320.621	Code	GS
Std Errors		HA	0°00'03"	VA	0°00'03"	SD	0.010		
Target height	5.000	Prism constant	10.0mm						

Reduced points

Point	220	North	1801538.109	East	6550978.339	Elevation	136.906	Code	SCRB X
Point	0120206	North	1801813.767	East	6551392.121	Elevation	142.730	Code	L&T
Point	700	North	1801813.740	East	6551392.094	Elevation	142.820	Code	PT 120206
Point	240	North	1801669.665	East	6551267.422	Elevation	140.573	Code	SET SCR X
Point	50000	North	1801530.212	East	6551018.098	Elevation	137.053	Code	SSM
Point	50001	North	1801548.829	East	6551300.323	Elevation	139.964	Code	EW-2 MW-2
Point	50002	North	1801556.412	East	6551307.165	Elevation	139.536	Code	MW-3 MW-2
Point	50003	North	1801555.506	East	6551307.406	Elevation	140.411	Code	GS
Point	50004	North	1801557.093	East	6551306.784	Elevation	140.357	Code	GS
Point	50005	North	1801555.867	East	6551306.168	Elevation	140.376	Code	GS
Point	50006	North	1801549.231	East	6551301.235	Elevation	140.304	Code	GS
Point	50007	North	1801549.679	East	6551300.073	Elevation	140.314	Code	GS
Point	50008	North	1801548.429	East	6551299.100	Elevation	140.265	Code	GS
Point	50009	North	1801496.832	East	6551185.253	Elevation	139.027	Code	GS
Point	50010	North	1801497.826	East	6551183.590	Elevation	139.020	Code	GS
Point	50011	North	1801498.758	East	6551184.822	Elevation	139.017	Code	GS
Point	50012	North	1801496.455	East	6551184.333	Elevation	138.980	Code	GS
Point	50013	North	1801607.041	East	6551106.045	Elevation	139.380	Code	GS AT CPT-2
Point	50014	North	1801496.988	East	6551008.889	Elevation	136.541	Code	GS AT B-1
Point	50015	North	1801397.380	East	6551282.754	Elevation	138.442	Code	GS AT TT-CPT-3
Point	701	North	1801813.759	East	6551392.058	Elevation	142.819	Code	PT 700
Point	50016	North	1801671.962	East	6551348.272	Elevation	141.564	Code	GS AT CP-7
Point	702	North	1801633.316	East	6551610.443	Elevation	143.511	Code	PT 0120207
Point	50017	North	1801507.684	East	6551552.631	Elevation	141.966	Code	TT-2_MW-1
Point	50018	North	1801498.875	East	6551538.057	Elevation	141.347	Code	TT-1_EW-1
Point	50019	North	1801498.769	East	6551538.033	Elevation	141.834	Code	TOP LID
Point	50020	North	1801507.638	East	6551552.583	Elevation	142.159	Code	TOP LID
Point	50021	North	1801507.095	East	6551551.679	Elevation	142.109	Code	GS
Point	50022	North	1801499.244	East	6551539.040	Elevation	141.866	Code	GS