SIEGFRIED

January 22, 2024

To: Gemma Biscocho, PE
City of Stockton
Municipal Utilities Department
2500 Navy Drive
Stockton, CA 95206

RE: FEASIBILITY MEMO
PROPOSED NORTHEAST RESERVOIR & PUMP STATION PROJECT (UH24006)
MORADA BASIN SITE, MORADA LANE
STOCKTON, CA

Dear Gemma,

We have completed our topographic survey, which is attached at Appendix A, as well as our geotechnical report, which is attached as Appendix B, for the new improvements planned for proposed Northeast Reservoir & Pump Station Project (UH24006), Morada Basin Site, located on Morada Lane. The purpose of our efforts was to explore the subsurface soil and groundwater conditions, and the existing topography at the site to determine the viability of the site to accept the proposed water tank improvements. Based on our study, the site conditions are suitable for design and construction of the subject project. We encountered roughly 9 feet of undocumented fill that will add some construction costs. The anticipated load conditions by the tank itself and the liquid contents will present significantly large loads however with proper ground improvements the soil can bear the loading pressures.

PART 1. INTRODUCTION

1.1. PROJECT DESCRIPTION

The project site is located on a City of Stockton owned site known as the Morada Basin in Stockton, California. The project includes a proposed 4 MG water storage tank and 12 mgd pump station. The proposed 4MG tank is expected to have a diameter of 120 plus feet depending on height. Alternatively, twin, 2MG tanks may be considered to provide redundancy and a lower roof profile. We understand the City of Stockton may also want to increase the capacity of the basin by enlarging it to the north. This would require excavation of the existing material sloped at 3:1 (horizontal to vertical) slopes. This would reduce the footprint of the available space needed for sizing of the tanks.

In this phase of the project, the planned pump station, tank sizing, and locations have not been determined; therefore, exact load conditions are not known. An approximate layout has been provided in Appendix A overlaid on the topographic survey. For this study, we assume twin, 2MG tanks will be constructed of steel with footprints as large as 100 feet in diameter. A third tank has been shown for expansion in the future. We anticipate the steel tank shell will be supported with a concrete ring foundation and the liquid supported over a steel plate over sand and aggregate base. We also assume the pump station will be lightly loaded and constructed of either concrete masonry units or wood over shallow foundations and a concrete slab on grade floor.

1.2. SITE CONDITIONS

The site to be developed is located along Morada Lane at the existing detention basin site located approximately 2300 feet west of the intersection of Morada Lane and Holman Road in Stockton, California as shown on Plate 1. The site is generally bounded by Morada Lane on the north, Mosher Creek and associated levee system on the east, the existing Morada detention basin to the south, and a railroad embankment to the west. An existing emergency radio tower and ancillary structure is located on the southeast corner of the site. Current topography shown in Appendix A performed by Siegfried indicates the surface elevation of the site ranges from approximately +30 feet near the northern entry to the site and central portion of the site to +39 feet on the southwest corner. An asphalt concrete paved access road occupies the north, east, and west side of the site.

1.3. FLOOD PLAIN AND THE SJAFCA BASIN

The record drawings dated April 1, 1999 were made available for review for construction of the Mosher Creek Detention Basins 1 and 2 project. Sheet 10 indicated an original pre-construction existing grade of about +26 feet in the area of the proposed tanks and a finished fill grade +35.5. This indicates upwards of about 9½ feet of fill was placed on the site with the fill material coming from the existing basin to the south. See Appendix A for the topographic survey.

The FEMA Flood Insurance Rate Map (FIRM) Map Number 06077C0320F indicates the entire parcel is mapped as a Special Flood Hazard Area as Zone AH with an elevation of 29. Zone AH indicates 1 to 3 feet of flooding.

PART 2. GEOTECHNICAL FINDINGS

The geotechnical report attached as Appendix B indicates that the soils are typical for the area and are typical “poorly drained” soils, and the parcel is not within an Earthquake Fault Zone. In general, the site expansive soils have the potential to impact the development where fluctuations in the moisture contents can cause unacceptable shrinkage and/or swell beneath buildings and/or flatwork. Controlling the moisture change will be critical according to the geotechnical report.

Up to 9 to 10 feet of fill from prior construction of the basin is present beneath the potential tank locations, see Appendix A. Such fill may cause undesirable settlement unless they are mitigated by ground improvement. Two options were presented in Section 4.2 of the Geotechnical Report. Option 1 is to remove and recompact the soil and option 2 is to utilize ground improvements such as rammed aggregate piers.

With proper soil preparation Section 5 of the geotechnical report identified two options for improving the ground to support the water tanks and the accessory buildings. If the loose soil is over excavated and recompacted in accordance with Section 5.1 the soils can achieve a bearing pressure of 3,000psf and if rammed aggregate piles are utilized per Section 5.2 a bearing pressure of 5,000psf can be achieved. Given these bearing pressures and the likely tanks loads presented in Section 3.1.1 of this report, Section 4.1.1 of the Geotechnical report cautions of total and differential settlement with non-ground improved soil are upwards of approximately 3 inches and 1½ to 2 inches, respectively.

PART 3. DESIGN CONSIDERATIONS AND FEASIBILITY

Based on our findings, we conclude the following items should be considered during design and construction:

3.1. DESIGN CONSIDERATIONS

3.1.1. Load Conditions and Configuration of the Tank Size and Layout

The load conditions of the proposed tanks desired will impose large loads for the planned diameters and projected foundations. We anticipate the tank shells will be designed with steel walls and roof supported on a concrete ring foundation. The water may be supported on a steel plate over a layer of sand and road base within the concrete ring foundation. For a 2MG water tank having a diameter of 100-feet, a ground pressure ranging from approximately 2,000 to 2,500 psf is estimated depending on the configuration of the floor plate and the height of the tank. Wall loads from a steel shell and wall could range from 1 to 2 kips per foot with a footing approximately 18 inches wide yielding a bearing pressure of less than 1,500psf, depending on the shell thickness and steel used. For the purposes of this memo and the geotechnical report, we assume the design ground pressure exerted is about 2,400 psf and wall loads are less than 1,500psf. We assume a 37-foot-tall tank with two feet of freeboard allowance to reach the full 2MG ± capacity. Larger tanks with a higher volume capacity may require a larger diameter to control the desired height. This may also influence the design ground pressure and tank shell wall loads assumed. Given the settlement potential flexible connections should also be used. It is assumed that the interior of the tank will be a sand layer underlain by aggregate base.

3.1.2. 12mgd pump station

The pump station is anticipated to light to moderately loaded and can be generally constructed using shallow spread foundations over recompacted subgrade. See the attached geotechnical report in Appendix B for more information on subgrade requirements.

3.1.3. Flood Plain

Given the 100-year flooding indicated on the FEMA maps and the 200-year flood inundation depths it is suggested that the tanks and the pump station be elevated to an elevation at or above 34.00. Per the topography in Appendix A, 1 to 4 feet of fill may be required however any basin expansion will create the required fill.

3.1.4. Basin Expansion

We understand the basin may be expanded northward by SJAFCA into the footprint of the existing open area planned for the tanks. Consideration should be given to expansion near the existing communication tower such that the excavation does not encroach and influence the tower's foundation. Additionally, the top of the slope of the at the basin expansion should be at least one ring diameter away from the proposed face of the tank in the closest dimension to avoid surcharging the slope.

3.2. FEASIBILITY

Based on our understanding of the project requirements and our survey and geotechnical findings, we conclude the project is feasible for design and construction.

If additional information is needed or if there are inquiries in this memo, please do not hesitate to contact me.

Sincerely,

Paul J. Schneider, P.E., QSD/QSP
President | Managing Principal
SIEGFRIED

APPENDIX A – Topographic Survey and Site Plan
APPENDIX B – Geotechnical Report

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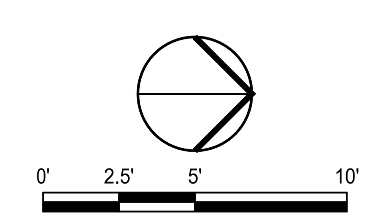
APPENDIX A - TOPOGRAPHIC SURVEY AND SITE PLAN



Know what's **below.**
Call before you dig.

BENCH MARK:

BRASS DISK MARKING COS MONUMENT STAMPED "4N-5" IN MONUMENT BOX ON THE SOUTH SIDE OF MORADA LN. APPROXIMATELY 200' WEST OF THE S.P.R.R. TRACKS/ERM 239

ELEVATION: 29.88

REGISTERED PROFESSIONAL ENGINEER
PAUL J. SCHNEIDER
No. 62498
Exp. 09/30/25
CIVIL
STATE OF CALIFORNIA

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NORTHEAST RESERVOIR & PUMP STATION PROJECT (UH24006)

TOPOGRAPHIC EXHIBIT

MUNICIPAL UTILITIES DEPARTMENT
CITY OF STOCKTON, CALIFORNIA

Revision No.	Description	Date	By	Apprvd. By

SCALE	AS SHOWN
DESIGNED BY	PJS
DRAWN BY	MWK
CHECKED BY	PJS
RECORD DWGS.	

APPROVED BY: ______ DATE

DEPUTY MUD DIRECTOR
STOCKTON, CALIFORNIA

SHEET NO. C1.0

UH24006
-
PROJECT NO.

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APPENDIX B - GEOTECHNICAL REPORT

GEOTECHNICAL REPORT
PROPOSED NORTHEAST RESERVOIR & PUMP STATION PROJECT (UH24006)
MORADA BASIN SITE, MORADA LANE
STOCKTON, CA

Prepared for City of Stockton
Municipal Utilities Department

December 21, 2023
Updated January 22, 2024

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SIEGFRIED

December 21, 2023
Updated January 22, 2024

To: Gemma Biscocho, PE
City of Stockton
Municipal Utilities Department
2500 Navy Drive
Stockton, CA 95206

RE: GEOTECHNICAL REPORT
PROPOSED NORTHEAST RESERVOIR & PUMP STATION PROJECT (UH24006)
MORADA BASIN SITE, MORADA LANE
STOCKTON, CA

Dear Gemma,

We have completed our geotechnical report for the new improvements planned for proposed Northeast Reservoir & Pump Station Project (UH24006), Morada Basin Site, located on Morada Lane in Stockton, California. The purpose of our study was to explore the subsurface soil and groundwater conditions at the site to provide geotechnical engineering recommendations related to foundation design and earthwork construction.

Based on our study, the site conditions are suitable for design and construction of the subject project from a geotechnical engineering perspective. We encountered undocumented fill from prior construction of the basin and organics near the surface of the site. The anticipated load conditions by the tank itself and the liquid contents will present significantly large loads. The presence of these soils and load conditions could cause undesirable settlement to foundations and slabs if not addressed during design and construction. We make specific design and construction recommendations to address the adverse effects of these conditions in the following report.

We appreciate the opportunity to collaborate with you on this project. If additional information is needed or if there are inquiries in this report, please do not hesitate to contact me.

Sincerely,

REGISTERED PROFESSIONAL ENGINEER
BRADFORD LEE QUON
GE 2841
EXP. 6/30/2024
GEOTECHNICAL
STATE OF CALIFORNIA

Bradford Quon, GE
Geotechnical Manager | Principal
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PART 1. INTRODUCTION

We have completed our geotechnical report for the new improvements planned for proposed Northeast Reservoir & Pump Station Project (UH24006), Morada Basin Site, located on Morada Lane in Stockton, California. The purpose of our study was to explore the subsurface soil and groundwater conditions at the site to provide geotechnical engineering recommendations related to foundation design and earthwork construction. The vicinity of the project is shown on Plate 1, Site Location Map.

1.1. PROJECT DESCRIPTION

The project site is located on a City of Stockton owned site known as the Morada Basin in Stockton, California. The project includes a proposed 4 MG water storage tank and 12 mgd pump station. The proposed 4MG tank is expected to have a diameter of 100 feet. Alternatively, twin 2MG tanks may be considered to provide redundancy. We understand the City may also want to increase the capacity of the basin by enlarging it to the north. This would require excavation of the existing material sloped at 3:1 (horizontal to vertical) slopes. This would reduce the footprint of the available space needed for sizing the tanks. Other improvements on the project would consist of:

- Buried wet and dry utilities
- Landscaping
- Parking lot expansion and reconstruction consisting of asphalt concrete and rigid concrete paving

In this phase of the project, the planned pump station, tank sizing, and locations have not been determined; therefore, load conditions are not known. For this study, we assume twin, 2MG tanks will be constructed of steel and located side by side will be used. We anticipate the steel tank shell will be supported with a concrete ring foundation and the liquid supported over a steel plate over aggregate base. We also assume the pump station will be lightly loaded and constructed of either concrete masonry units or wood over shallow foundations and a concrete slab on grade floor.

1.2. SCOPE OF SERVICES

Our authorized scope of services was outlined in our proposal dated April 27, 2023, and authorized with City of Stockton Standard Agreement 424000083 dated September 13, 2023. The scope of services generally included the following:

- Field exploration consisting of a series of drilled Cone Penetration Test (CPT) probes including shallow hand augers near the surface adjacent to the CPT.
- Geotechnical testing to evaluate relevant index properties, corrosivity, and R value.
- Geotechnical engineering analysis to formulate conclusions and recommendations related to foundation design and earthwork construction.

1.3. SITE CONDITIONS

The site to be developed is located along Morada Lane at the existing detention basin site located approximately 2300 feet west of the intersection of Morada Lane and Holman Road in Stockton, California as shown on Plate 1. The site is bounded by Morada Lane on the north, Mosher Creek and associated levee system on the east, the existing Morada detention basin to the south, and a railroad embankment to the west. The site is currently blanketed in mowed, dry weeds and some trees sporadically located across the site. An existing tower and ancillary structure are located on the southeast corner of the site. Current topography provided by Siegfried indicates the surface elevation of the site ranges from approximately +30 feet near the northern entry to the site and central portion of the site to +39 feet on the southwest corner. An asphalt concrete paved access road occupies the north, east, and west side of the site.

We reviewed historic aerial images provided at https://historicaerials.com from 1957, 1967, 1982, 1984, 1993, 1998, 2002, 2005, 2009, 2010, 2012, 2014, 2016, 2018, and 2020.

- The 1957 through 1993 images showed the site as agricultural land.
- The 1982 image showed the area westerly of the railroad as being developed.
- The 1998 image showed the site activity for grading of the San Joaquin Flood Control Agency (SJFCA) Flood Protection Restoration Project for the Mosher Creek Detention Basins.
- The 2002 image showed the completed basin.
- The 2005 through 2020 images showed site being relatively unchanged except for the tower and ancillary structure constructed in the 2012 image.

1.4. FLOOD PROTECTION RESTORATION PROJECT – MOSHER CREEK DETENTION BASINS 1 AND 2

The record drawings dated April 1, 1999, were made available for review for construction of the Mosher Creek Detention Basins 1 and 2 project. Sheets 9 and 10 of 34 indicated the invert to the basin ranged from Elevation -4 feet on the south and +4 feet on the north. Sheet 10 indicated an existing grade of about +26 feet around the proposed tanks and with a finished grade at the top of the fill of +35.5. This indicates upwards of about 9½ feet of fill was placed on the site with the fill material coming from the existing basin to the south.

PART 2. ENGINEERING GEOLOGY AND SEISMIC HAZARDS (GEOHAZARDS)

2.1. SITE CHARACTERIZATION

2.1.1. Local Geologic Conditions

Wagner, Jennings, Bedrossian, and Bortugno (1991) mapped the near surface deposits as Quaternary Modesto Formation, Lower member, (Late Pleistocene), map symbol, Qm_2. This formation is commonly stratified alluvium of flood basins, lower fans, and interdistributary fan areas. Soils formed on these deposits are typically Stockton Urban land complex. These soils are typically "poorly drained."

2.1.2. Geologic Hazard Zones

Geologic ground failures can occur within earthquake hazard zones. The California Geological Survey (CGS) Earthquake Zones of Required Investigation (https://maps.conservation.ca.gov) indicates the parcels to be developed:

- The parcel is NOT WITHIN an Earthquake Fault Zone
- The parcel has not been evaluated by CGS for liquefaction hazards
- The parcel has not been evaluated by CGS for seismic landslide concerns

2.2. GEOLOGIC HAZARDS

2.2.1. Expansive Soils

Expansive soils have the potential to impact the development where fluctuations in the moisture contents can cause unacceptable shrinkage and/or swell beneath buildings and/or flatwork. Controlling the moisture change will reduce this shrink-swell capability. Expansive soils are defined as having a Plasticity Index (PI) greater than 15 and an Expansion Index (EI) greater than 20. The near surface clay fill soils on the site were tested to have a PI of 14 and 16 indicating a very low potential for expansion, thus we consider the expansive soils **to be a design consideration.**

2.2.2. Weak/Soft Compressible Soils

Weak and soft, compressible soils are identified as having a very soft consistency. The near surface soils are very stiff to hard cohesive soils. On this basis, weak/soft compressive soils are **not a design consideration.**

2.2.3. Corrosive Soils

We tested a bulk sample of soil for pH, minimum resistivity, chloride and sulfate presence, redox potential, and sulfides. The results are summarized in Table 2.1.

Table 2.1: Soil Corrosivity						
	CT643	CT643	CT422m	CT417	ASTM G200m	AWWA C105/A25.5
Sample Location	Soil pH	Min. Resistivity Ohm-cm (x1000)	Chloride ppm (%)	Sulfate ppm (%)	Redox Potential (mv)	Sulfides Presence
Bulk 1-CPT-2	7.25	1.77	5.5 (0.00055%)	0.2 (0.0002%)	+ 153	negative

The Caltrans Corrosion Guidelines, Version 3.2 dated May 2021 considers a site to be corrosive if one or more of the following conditions exist:

Chloride concentration is 500 ppm or greater, sulfate concentration is 1500 ppm or greater, or the pH is 5.5 or less. Based on the Caltrans methodology, the site evaluated is **not considered corrosive.**

2.2.4. Flooding

The FEMA Flood Insurance Rate Map (FIRM) Map Number 06077C0320F indicates the entire parcel is mapped as a Special Flood Hazard Area as Zone AH. The potential for flooding is **a design consideration for this project.**

2.2.5. Radon-222 gas

Radon is produced naturally as Radon-222 in gas form. Radon is a byproduct of the natural decay of uranium that is present in small quantities in several rock types such as granitic rocks of the Sierra Nevada and sediment derived rocks in the Sacramento Valley. Radon is soluble and can be transported in groundwater. When water-containing radon is exposed to air (by pumping or through a tap), radon can diffuse into the air where it can be inhaled. The U.S. Environmental Protection Agency (EPA) (https://www.epa.gov/sites/default/files/2018-12/documents/radon-zones-map.pdf) lists San Joaquin County in Zone 3, the lowest potential radon hazard (less than 2 pCi/L) (U.S. EPA, n.d.). **Based on the zone assignment, we conclude that naturally occurring radon would not be considered a health hazard for this project.**

2.2.6. Naturally Occurring Asbestos

Naturally Occurring Asbestos (NOA) is hazardous to humans. Asbestos included six regulated naturally occurring minerals (actinolite, amosite, anthophyllite, chrysotile, crocidolite, and tremolite). In California, asbestos minerals are most associated with ultramafic rocks and their derivatives, including Serpentine rock. Ultramafic rock are igneous rocks composed mainly of iron-magnesium silicates minerals hat crystallize deep in the earth's interior. By the time they are exposed at the Earth's surface, ultramafic rocks have typically undergone metamorphism, a process in which the mineralogy or the rock changes in response to the changing chemical and physical conditions. Asbestos is classified as a known human cancer-causing substance by local, State, and Federal health agencies and is known to cause chronic respiratory diseases. Asbestos fibers may be released into the air because of activities which disturb NOA-containing rocks or soils. Asbestos minerals can fragment into small fibers that readily suspend in the air and are of a size visible only under a microscope. Breathing these small fiber fragments may result in an increased risk of respiratory disease or cancer in exposed individuals.

The Department of Toxic Substances Control (DTSC) has developed the Interim Guidance, Naturally Occurring Asbestos at School Sites, revised 9/24/2004. The guidance document provides a four-step process to assist school districts and their consultants in conducting environmental assessments, investigations, and response actions (if needed) at new or expanding school sites with potential NOA. Step 1 is the potential identification of NOA through the performance of a Phase I Environmental Site Assessment (Phase I ESA). If NOA is potentially identified, environmental sampling and analysis will be needed as part of the development of a Preliminary Environmental Assessment (PEA.) The guidance document continues to a mitigation phase and long-term operation and maintenance of the site.

Based on the review of the geologic maps, no ultramafic rocks are mapped near the property. We conclude that NOA is **not a design consideration.**

2.2.7. Hydrocollapse

Hydrocollapse occurs when loose, dry, sandy soils become saturated and settle. These materials are typically located in arid climates where wind and temperature have the greatest impact. The collapsible soils are prevalent in the Southern California area and in high desert areas. Loose granular soils were not encountered at the site; thus, we **consider a low potential for hydrocollapse and not to be a design consideration.**

2.3. SEISMIC HAZARDS

2.3.1. Historical Seismicity

The site is located within a moderate seismic region with many of the active faults located greater than about 20 miles west of the project site within the San Francisco Bay Area. The California Earthquake Authority also notes there is a 76% likelihood of one or more M7.0+ earthquakes affecting Northern California in a 30 year-period, beginning in 2014. Toppozada, et. al., (2000) mapped the epicenters of and areas damaged by Magnitude (M) ≥ 5 Earthquakes. The mapping showed one significant earthquake located at the southwest corner of the county with a magnitude (M) 6.0 in 1866. This event was felt in Stockton, California.

The Unified States Geological Survey (USGS) Earthquake Hazard Toolbox maintains an interactive online portal at https://earthquake.usgs.gov/nshmp to disaggregate the nearest earthquake faults that contribute the most towards the earthquake hazard. For this site, the disaggregate earthquake has a mean magnitude (M) 6.34 occurring at a radius of 23.15 km (14.4 miles) west of the site. Table 2.2 provides the closest faults, distance from the site, and the magnitude it can generate.

Table 2.2: Holocene faults, distance from site, and magnitude			
Fault Name (UCERF[1] Fault Model 3.2)	Distance, km (miles)	Direction from Site	Magnitude (M)
Greenville (north)	51.07 (31.7)	Southwest	7.16
San Andreas (Peninsula)	110.44 (68.6)	Southwest	8.11
Great Valley 6 (Midland)	35.05 (21.8)	South	7.29
Calaveras (north)	68.84 (42.8)	Southwest	7.39
Hayward (south)	78.32 (48.7)	West	7.49
Fault Name (UCERF Fault Model 3.1)	Distance, km (miles)	Direction from Site	Magnitude (M)
Mount Diablo (south)	45.89 (28.5)	West	7.07
San Andreas (Peninsula)	110.44 (68.6)	Southwest	8.11
Mount Diablo (north)	50.11 (31.1)	West	7.30
Calaveras (north)	68.84 (42.8)	Southwest	7.38
Great Valley 6 (Midland)	31.43 (19.5)	South	6.87
Hayward (south)	78.32 (48.7)	West	7.48

[1]UCERF is the third Uniform California Earthquake Rupture Forecast that provides authoritative estimates of the magnitude, location, and likelihood of earthquake fault rupture throughout the state.

2.3.2. Fault Rupture

Fault rupture is a failure mechanism where the surface of the earth breaks along a fault. An active fault is defined as a fault that has ruptured in the last 11,000 years. There are no known active faults that trend and align towards the project site and the site is not located within an Alquist-Priolo Earthquake Fault Zone (formerly known as a Special Studies Zone). Therefore, we consider the potential for fault rupture at the site as negligible and **not a design consideration.**

2.3.3. Strong Ground Motion

For seismic design, mapped based spectral accelerations may be used provided the allowable exceptions are implemented in the project.

2.3.4. Liquefaction

Liquefaction is a phenomenon when saturated loose granular soils lose their strength and fail during a seismic event from an earthquake. The granular soils are typically clean and poorly graded. Groundwater was encountered at depths of approximately 35 feet bgs in the CPT probes. The deeper CPT probes primarily encountered cohesive lean clay and sandy lean clay soils and dense to very dense silty and clayey sand to the maximum depths explored.

The computed liquefaction potential index indicated a low risk for liquefaction. Further, given Pleistocene aged material, we judge the potential for liquefaction at the site as negligible and **not a design consideration.**

2.3.5. Landsliding and Slope Stability

Landslides tend to occur in weak soil and rock on sloping terrain. The parcel to be improved is level across the site, and factors of safety for the fill slope indicate stable conditions, thus we consider the potential for landslides and slope instability as negligible and **not a design consideration.**

2.3.6. Tsunami and Seiche Inundation

A tsunami is a wave, or series of waves, generated by an earthquake, landslide, volcanic eruption, or even large meteor hitting the ocean. The sea floor experiences significant upward movement resulting in a rise of water at the ocean surface. The mound water moves away from the center in all directions as a tsunami (CGS, Note 55). The San Francisco Bay and Pacific Ocean is over 50 miles west of the Stockton. We conclude the risk of tsunami is negligible and **not a design consideration.**

A seiche is a temporary disturbance or oscillation in the water level of a lake or partial enclosed body of water, especially one caused by changes in atmospheric pressure. There are no known lakes or partial enclosed bodies of water located within a ½ mile of the site. We conclude the risk to seiche is negligible and **not a design consideration.**

PART 3. FINDINGS

3.1. SUBSURFACE CONDITIONS

The subsurface soils consisted of material with a normalized soil behavior type (SBTn) described as very stiff/fine grained, medium dense to dense sand and silty sand to depths of approximately 10 feet below the existing ground surface (bgs). The total cone resistance (qt) and undrained shear strength (Su) in these soils average approximately 48 ton per square foot (tsf) and 3 tsf, respectively. These materials are interpreted as engineered fill from prior construction.

Underlying the engineered fill, we interpret the CPT probes as encountering native soil comprised of material with a SBTn as overconsolidated clay and silty clay. The total cone resistance (qt) and undrained shear strength (Su) in these soils average approximately 60 ton per square foot (tsf) and 4 tsf, respectively. Within the clay and silty clay layers, the CPT probes encountered silty sand and sandy silt layers with the total cone resistance (qt) and estimated N60 values averaging in these soils approximately 90 ton per square foot (tsf) and 30 blows, respectively. These materials were encountered to depths of approximately 40, 49, and 56 feet bgs in CPT-01, CPT-02, and CPT-03, respectively.

Underlying the clay and silty clay, we interpret the CPT probes as encountering very dense silty sand with N60 values averaging 50 and greater. The CPT probes were terminated in these highly resistant zones that peaked the limits of the CPT rig used at depths of approximately 43, 54, and 58 feet bgs. The total cone resistance (qt) and estimated N60 values averaging in these soils over 200 ton per square foot (tsf) and 50 and greater blows per foot, respectively.

3.2. GROUNDWATER CONDITIONS

Static groundwater was encountered during drilling of the CPT probes advanced for the project as shown in the Table 3.1.

Table 3.1: Measured Groundwater Depths Below Ground Surface (bgs)

Boring	Depth, bgs (ft)	Comments
CPT-01	44	Measured prior to backfill
CPT-02	52	Measured prior to backfill
CPT-03	~35	PPT measured at 50 and 54 ft bgs
CPT-03	42	Measured prior to backfill

Variations in groundwater levels may occur due to variations in ground surface topography, subsurface geologic conditions and structure, seasonal rainfall, local irrigation practices, new construction, and/or other factors beyond our control.

The California Department of Water Resources maintains a database of groundwater levels from well sites drilled in the vicinity for the Sustainable Groundwater Management Act (SGMA). The website https://storymaps.arcgis.com lists the following wells in proximity to the site with the corresponding depth to groundwater.

Table 3.2: Groundwater Levels from DWR Wells

Well Site	Distance and Direction	Ground Elevation (ft)	Measured Depth to Water (ft)	Last Measurement Date
380458N1212637W001	½ mile NE	35.55	79	6/20/22
380292N1212843W001	½ mile SW	28	56.4	6/24/22

Based on the groundwater levels encountered during this study and the data reviewed from the available DWR wells, groundwater is not expected in the upper 35 feet of the surface and **not expected to be a design consideration.**

PART 4. CONCLUSIONS

Based on our understanding of the project and our findings, we conclude the project is feasible for design and construction from a geotechnical engineering perspective. Based on our findings, we conclude the following items should be addressed during design and construction:

4.1. PROJECT DEFINABLE FEATURES

4.1.1. Load Conditions and Configuration of the Tank Size and Layout

The load conditions of the proposed tanks desired will impose large loads for the planned diameters and projected foundations. We anticipate the tank shells will be designed with steel walls and roof supported on a concrete ring foundation. The water may be supported on a steel plate over a layer of sand and road base within the concrete ring foundation. For a given 2MG water tank having a 100-foot diameter, a ground pressure ranging from 2000 to 2500 psf is estimated depending on the configuration of the plate and the height of the tank. Wall loads from a steel shell and wall could range from 1 to 2 kips per foot depending on the shell thickness and steel used. For purposes of this report, we assume a design ground pressure exerted is about 2400 psf and wall loads are 2 kips per lineal foot for the given configuration presented in this paragraph. We assume a 37-foot-tall tank with two feet of freeboard allowance to reach the full 2MG ± capacity. Larger tanks with a higher volume capacity may require a larger diameter to control the desired height. This may also influence the design ground pressure and tank shell wall loads assumed. Total and differential settlement given assumed configuration discussed in this paragraph with non-ground improved soil are upwards of approximately 3 inches and 1½ to 2 inches, respectively, given the data collected. ***We should be retained to review the final tank configurations and layout and perform a settlement analysis that verifies conditions deeper than that explored. Flexible connections should also be used. The interior of the tank should also be supported on a minimum 3-foot-thick layer of aggregate base placed and compacted as recommended in this report.***

4.1.2. 12mgd pump station

The pump station is anticipated to light to moderately loaded and can be constructed using shallow spread foundations over recompacted subgrade.

4.1.3. Basin Expansion

We understand the basin is desired to be expanded northward into the footprint of the existing pad. This will require large excavations with export of material offsite. The limits of expansion were not defined but based on the CPT probes, the basin is generally stable with 3 horizontal to 1 vertical (3:1) side slopes. Consideration should be given to expansion near the existing communication tower such that the excavation does not encroach and influence the tower's foundation. No documentation was available to verify the foundation configuration. Additionally, the top of the slope at the basin expansion should be at least one ring diameter away from the proposed face of the tank in the closest dimension to avoid surcharging the slope. ***The existing tower's as-built foundation plan should be reviewed during the design process to verify the type and extent of foundation.***

4.2. UNDOCUMENTED FILL

The presence of up to 9 to 10 feet of fill from prior construction of the basin is present beneath. No documentation was available to verify the placement and condition of fill so for the purposes of this report, we consider this undocumented fill. Such fill may cause undesirable settlement unless they are mitigated by ground improvement.

- Option 1 – Remove and Recompact
    - Within the tank footprints and 20 feet beyond in all directions, we recommend that undocumented fill be completely overexcavated and recompacted to provide an engineered fill for foundation support and use of shallow spread foundations.
- Option 2 – Rammed Aggregate Piers
    - Alternatively, the undocumented fill may remain in place and the subgrade be improved with rammed aggregate piers. Rammed Aggregate Pier® (Geopier®) designed and constructed to about 10 to 15 feet deep may be considered to control and limit settlements. This will allow for use of shallow spread foundations bearing over RAP utilizing a higher allowable bearing capacity than would be with native soils recompacted in place. This option typically requires a specialty contractor to collaborate with the design team, provide a design, and then install the foundation elements. The RAP elements can be used for ground improvements beneath foundation elements and be used for slab support.
- Option 3 – Remove and Recompact for Pump Station and other Non-structural improvements
    - Within the pump station footprint and 5 feet beyond, we recommend the soil 5 feet beyond the exterior foundations be removed to a depth of 5 feet below the existing site grades, or to at least 2 feet below the bottom of the foundation's elevations, whichever is deeper, and recompacted as engineered fill. Refer to Section 5.11.
- For lightly loaded, nonstructural elements such as trash enclosures, exterior flatwork, and pavements overexcavation is not necessary. However, the contractor should adhere to the grading requirements presented in Section 5.11.

4.3. EXPANSIVE SOILS

Expansive soils have the potential to shrink and swell due to fluctuations in the moisture content. This is prevalent especially when expansive soils are left untreated at the surface and may potentially cause undesirable movement and distress within flatwork areas or foundations. The materials are considered to have a low to moderate plasticity based on the PI of 14 and 16. The fine-grained portion of the soils are considered expansive, however, there are significant fractions retained that classify the soil as a clayey sand. We anticipate during rough and finish grading, expansive soils will be addressed; where exposed these soils should comply to the moisture conditioning and compaction requirements recommended in this report. This would require site expansive soils to be moisture conditioned to at least 2 percent above the optimum moisture content and compacted to a minimum of 95 percent relative compaction based on the ASTM D1557 test method beneath the tank footprint. **It is essential that the moisture content be maintained until it is covered by the next layer of engineered fill, baserock, flatwork, or other material.**

For specific earthwork recommendations, refer to Section 5.11 through 5.13.

4.4. OTHER CONCLUSIONS

Organics present near the surface should be stripped and disposed offsite. For acceptance purposes, they should have a maximum organic content of 3 percent per ASTM D2974. The contractor should consider the requirements needed to achieve maximum organic content of 3 percent which may necessitate discing or deeper stripping and removal. We anticipate that organics will be addressed during site grading. Due to the flood zone mapped, the proposed tank(s) and pump station should be placed above the base flood elevation.

A sample was tested for pH, minimum resistivity, chloride, and sulfate presence. The sample was also tested for redox potential and the presence of sulfides. The test results on the single sample indicate that the site soil is not in a corrosive environment. Groundwater was encountered as shallow as about 35 feet bgs in the CPT probes. Based on the review of the existing available groundwater elevation data and that obtained from this study, we conclude that groundwater is not likely to impact design unless deep utilities are installed with excavations approaching depth.

PART 5. RECOMMENDATIONS

5.1. SHALLOW SPREAD FOUNDATIONS USING OPTION 1 – REMOVAL AND RECOMPACTION

5.1.1. Allowable Design Criteria

Shallow spread foundations may be incorporated for structure when designed according to the following parameters presented in Table 5.1 and loose fills are recompacted as engineered fill.

Table 5.1 – Shallow Foundation Design Criteria for Option 1 and 3 – Removal and Recompaction

Criteria	Variable	Design Criteria	Comments
Minimum Continuous Foundations Depth	D	24 inches	Note 1
Minimum Spread Foundations Depth	D	24 inches	Note 1
Minimum Width	B	12 inches	
Allowable Bearing Capacity	q_a	3,000 psf	Note 2 and 3
Estimated Total Settlement	S_{total}	1 inch	
Estimated Differential Settlement	S_{diff}	¾ inch	Based on Risk Category III
Allowable Passive Pressure	P_p	260 pcf	Note 5
Allowable Friction Factor	μ	0.40	Note 5

[1]Depth of footing is measured from the lowest ground elevation to the base of the footing and does not include under slab materials (i.e., capillary break gravel and sand, or aggregate base).
[2]Allowable bearing capacity may be increased at a rate of 20 percent for each additional foot of embedment to a maximum of twice the designated value. The allowable bearing capacity is a net value so the weight of the foundation extending below grade may be disregarded when computing dead loads. The allowable bearing capacity is based on a factor of safety of 3 and is applicable to dead plus live load combinations. This value may be increased by 1/3 for short-term loading due to wind or seismic forces.
[3]Based on footings bearing over a recompacted engineered fill as described in Section 4.2 (Options 1 or 3). Footings for non-structural uses such as for signs or trash enclosures, etc., do not require overexcavation but instead recompaction underneath footings per this report.
[4]Total settlement is anticipated to occur rapidly and should be essentially complete following initial application of the loads.
[5]Passive pressure and friction factor are allowable values based on a safety factor of 1.5. The upper 1 foot of soil should be neglected for passive pressure, unless it is confined by exterior slabs, slabs on grade, or pavements. The structural engineer should evaluate if additional safety factors are applicable. We note that passive pressure is typically neglected for tank ring foundations.

5.1.2. Lateral Resistance

Resistance to lateral loads may be provided from frictional forces between the bottom of the footing and the underlying soils, and by passive soil resistance against the sides of the foundations. If moisture barriers or other substances are placed beneath footings, the coefficient of friction can be significantly lower. The passive pressure should be neglected to a depth of 1 foot where the ground adjacent to the foundation is not covered by a slab or pavement. Lateral resistance parameters presented in Table 5.1 are allowable with a safety factor of 1.5 applied. We understand that passive pressure would be neglected for tank ring foundations. The project Structural Engineer should determine the appropriate factor of safety. We assume passive pressure and friction would occur simultaneously so may be combined without reduction.

5.1.3. Seismic Ties

As outlined in CBC 1809A.13, where a structure is assigned to Seismic Design Category D, E, or F, individual spread footings founded as Site Class E or F shall be interconnected by ties. Unless it is demonstrated that equivalent restraint is provided by reinforced concrete beams within slabs on grade or reinforced concrete slabs on grade, ties shall be capable of carrying, in tension or compression, a force equal to the lesser of the product of the larger footing design gravity load times the seismic coefficient, S_{DS}, divided by 10 and 25 percent of the smaller footing design gravity load.

5.1.4. Construction Considerations

Foundation excavations should be firm, neat, and clean of debris, loose or soft soil, or water prior to placing any reinforcement. All footings excavations should be observed by the project Geotechnical Engineer or their designated representative just prior to placing reinforcing steel or concrete to verify the recommendations presented herein are implemented during construction.

Additionally, footings may experience an overall loss of bearing capacity or an increased potential for settlement when located near existing or future utility trenches. Further, stresses imposed by the footings on the utility lines may cause cracking, collapse, and/or a loss of serviceability. To reduce this risk, open or backfilled trenches parallel with a footing shall not be below a plane having a downward slope of 2 horizontal to 1 vertical (2:1) slope from a line 9 inches above the bottom edge of the footing and not closer than 18 inches from the face of the footing. When pipes cross under footings, the footings shall be specially designed. This may require encasement of the pipe with lean concrete. Pipe sleeves shall be provided where pipes cross through footings or footing walls and sleeve clearances shall provide for possible footing settlement but not less than 1 inch all around the pipe.

5.2. SHALLOW SPREAD FOUNDATIONS USING OPTION 2 – AGGREGATE PIERS (GEOPIERS)

Shallow spread foundations may be incorporated for structure when designed according to the following parameters presented in Table 5.2. This option considers remedial site grading to achieve the pad grade, constructing a minimum 12-inch-thick working platform comprised of aggregate base, then constructing Geopier elements. Geopiers reinforce subgrade to provide settlement control for shallow foundations while providing an increased allowable bearing capacity. Geopiers are designed and constructed by an installer licensed by Geopier Foundation Company. If this option is selected, the specialty contractor must be engaged early in the design process and will require a foundation plan to base their design.

Table 5.2 – Shallow Foundation Design Criteria for Option 2 – Aggregate Piers (or Geopier)			
Criteria	Variable	Design Criteria	Comments
Continuous Foundations Depth	D	24 inches	Note 1
Spread Foundations Depth	D	24 inches	Note 1
Minimum Width	B	12 inches	
Allowable Bearing Capacity	q_a	5,000 psf	Note 2 and 3
Estimated Total Settlement	S_{total}	Provided by Geopier	Note 4
Estimated Differential Settlement	S_{diff}	Provided by Geopier	Based on Risk Category III
Allowable Passive Pressure	P_p	Provided by Geopier	Note 5
Allowable Friction Factor	μ	Provided by Geopier	Note 5

[1]Depth of footing is measured from the lowest ground elevation to the base of the footing and does not include underslab materials (i.e., capillary break gravel and sand, or aggregate base).
[2]Allowable bearing capacity may be increased at a rate of 20 percent for each additional foot of embedment to a maximum of three times the designated value. The allowable bearing capacity is a net value so the weight of the foundation extending below grade may be disregarded when computing dead loads. The allowable bearing capacity is based on a factor of safety of 3 and is applicable to dead plus live load combinations. This value may be increased by 1/3 for short-term loading due to wind or seismic forces.
[3]Based on footings bearing over aggregate piers or geopiers. Footings for non-structural uses such as for signs or trash enclosures, etc., do not require overexcavation or geopiers but instead recompaction underneath footings per this report.
[4]Total settlement is anticipated to occur rapidly and should be essentially complete following initial application of the loads.
[5]Passive pressure and friction factor are allowable values based on a safety factor of 1.5. No other safety factors should be applied to the values presented. The upper 1 foot of soil should be neglected for passive pressure, unless it is confined by exterior slabs, slabs on grade, or pavements. We understand that passive pressure would be neglected for tank ring foundations.

5.3. RETAINING WALLS

We recommend retaining structures be designed for active pressures (i.e., cantilever conditions) or at-rest pressure if it is braced at the top (as in a roof connection) presented in Table 5.3.

5.3.1. Active and At-Rest Pressure

Table 5.3 – Lateral Earth Pressures			
Condition	Lateral Earth Pressure	Drained Case[1,3]	Undrained Case[2,3]
Active Case	P_a	37	---
At – Rest Case	P_o	56	---
Seismic Increment	P_{AE}	Not applicable	

[1]Drained case assumes fully drained conditions and level backfill. Undrained cases assume hydrostatic conditions.
[2]Undrained cases assume hydrostatic conditions based on buoyant unit weights of soil.
[3]Lateral earth pressures are presented as ultimate.

No additional surcharge stresses were included in the pressures noted above. Surcharge pressures will depend on the load conditions (i.e., equipment and construction loads such as material or soil stockpiles, and distance from wall where load is applied, etc.) If specific surcharge pressures need to be considered, additional analysis will be required with the load conditions given.

In general, walls subject to surcharge loads should be designed for an additional uniform lateral load pressure equal to one-third the anticipated surcharge loads for unrestrained walls and one-half the anticipated surcharge loads for restrained walls. The project engineer should be consulted with to confirm applicable values.

5.3.2. Seismic Design for Retaining Walls

Section 1807A.2.2 of the 2022 California Building Code notes for structures assigned to Seismic Design Category D, E or F, the design of retaining wall supporting more than 6 feet of backfill height shall incorporate the additional seismic lateral earth pressure. Lew, et. al., (2010) evaluated seismic pressures exerted on deep basement buildings and concluded that the seismic increment of earth pressure may be neglected if the maximum ground acceleration is 0.4g or less and walls retaining 12 feet and less designed with a safety factor of at least 1.5. The maximum ground acceleration, PGAm, for the site is 0.37. On this basis, seismic increments are not necessary.

5.3.3. Wall Drainage

Where retaining walls are designed to be drained, drainage may be provided using a 4-inch-diameter perforated pipe embedded in Caltrans Class 2 permeable material, or free-draining gravel surrounded by synthetic filter fabric. The thickness of the drain blanket should be at least 12 inches. As an alternative, prefabricated synthetic wall drain panels can be used. The drain blanket should extend from the bottom of the wall to about one foot below the finished grades at the top of the wall. The upper one foot of wall backfill should consist of onsite compacted clayey soils. Drainage should be collected by a perforated pipe and directed to an outlet approved by the Civil Engineer. Subdrain pipe, drain blanket and synthetic filter fabric should meet the minimum requirements presented herein. Clay soils should not be incorporated into retaining wall fills.

5.4. SEISMIC DESIGN CRITERIA

The structural engineer should confirm the design of the proposed improvements is in accordance with the requirements of governing jurisdictions and applicable building codes in addition to the appropriate values to use for this structure. Map-based design criteria presented in this section are based on entering the site coordinates (latitude and longitude), the risk category, and the Site Class. Based on the data from the soil borings from the interpreted blow counts and the shear wave velocities determined from the seismic cone penetration testing, we determined the site may be classified as Site Class D.

Table 5.4 presents the seismic design parameters for the site in accordance with the 2022 CBC and ASCE7-16 guidelines using the SEAOC/OSHPD Seismic Design Maps Tool.

Table 5.5 – Seismic Design Criteria per 2022 California Building Code and ASCE 7-16		
Reference	**Seismic Parameter**	**Value**
Google Earth	Latitude	38.036057
Google Earth	Longitude	-121.277747
Table 20.3-1	Site Class	D
Table 1.5-1	Risk Category	III
Table 11.4-1	Site Coefficient for Short Period, F_A	1.265
Table 11.4-2	Site Coefficient for Long Period, F_v	2.062*
Figure 22-7	Peak Ground Acceleration, PGA	0.28g
Table 11.8-1	Site Amplification Factor, F_{PGA}	1.32
Equation 11.8-1	Peak Ground Acceleration, PGA_M	0.369g
Figure 22-1	Mapped MCE_R Spectral Response Acceleration at 0.2-second period, S_s	0.669g
Figure 22-2	Mapped MCE_R Spectral Response Acceleration at 1.0-second period, S_1	0.269g
Equation 11.4-1	Site-Adjusted MCE_R Spectral Acceleration at 0.2-second period, S_{MS}	0.846g
Equation 11.4-2	Site-Adjusted MCE_R Spectral Acceleration at 1.0-second period, S_{M1}	0.832g**
Equation 11.4-3	Design Spectral Response Acceleration at 0.2-second period, S_{DS}	0.564g
Equation 11.4-4	Design Spectral Response Acceleration at 1.0-second period, S_{D1}	0.555g
Table 11.6-1	Seismic Design Category for Short Period Response Acceleration	D
Table 11.6-2	Seismic Design Category for 1-s Period Response Acceleration	D
	Long-period transition, T_L	12 sec
	Short-period transition, $T_S = S_{D1}/S_{DS}$	0.984 sec

[1]A site-specific response spectra and ground motion study was not performed for this study. The structural engineer should confirm the appropriate values for use on the project during foundation design. If a site-specific hazard analysis is required, please contact our firm.

*F_v was determined per ASCE 7-16, Supplement 3,Table 11.4-2, assuming the exceptions allowed by Section 11.4.8 are implemented.

**S_{M1} was determined per ASCE 7-16, Supplement 3, and increased by 50% for all applications of S_{M1} in the Standard.

5.5. CORROSIVITY

The American Concrete Institute (ACI) 318 code, Table 19.3.2.1 is reproduced in Table 5.6 and indicates the requirements for concrete by exposure class. Refer to the commentary in the referenced ACI for additional comments and notes included in the table.

Table 5.6: Soil Corrosivity

Exposure Class	Maximum w/cm	Minimum f'c, psi	Cementitious Materials - Types			Calcium Chloride Admixture
			ASTM C150	ASTM C595	ASTM C1157	
S0	N/A	2500	N. T. R.[1]	N. T. R.	N. T. R.	N. R.[2]
S1	0.50	4000	II	Types with (MS) designation	MS	N. R.
S2	0.45	4500	V	Types with (HS) designation	HS	Not permitted
S3 – Option 1	0.45	4500	V plus pozzolan or slag cement	Types with (HS) designation plus pozzolan or slag cement	HS plus pozzolan or slag cement	Not permitted
S3 – Option 2	0.40	5000	V	Types with (HS) designation	HS	Not permitted

[1] N. T. R. – No Type Restriction
[2] N. R. – No Restriction

Table 5.7: Corrosivity Scale by AWWA[1] C-105 Standard

Soil Parameter Resistivity (ohm-cm)	Assigned Points		Soil Parameter pH	Assigned Points
< 700	10		0-2	5
700-1000	8		2-4	3
1000-1200	5		4-6.5	0
1200-1500	2		6.5-7.5	0
1500-2000	1		7.5-8.5	0
>2000	0		>8.5	3
Soil Parameter Redox Potential	**Assigned Points**		**Soil Parameter Sulfides**	**Assigned Points**
>100	0		Positive	3.5
50-100	3.5		Trace	2
0-50	4		Negative	0
<0	5			
Soil Parameter - Moisture			**Assigned Points**	
Poor drainage, continuously wet			2	
Fair drainage, generally moist			1	
Good drainage, generally dry			0	

[1]American Water Works Association (AWWA)

Based on the testing performed, the soils evaluated would classify as a Class "S0" where there are no type restrictions for the cementitious materials used.

For cast iron alloy pipes, the American Water Works Association (AWWA) developed a numerical soil corrosivity scale to identify the severity by assigning points for different variables such as the resistivity, pH, Redox Potential, Sulfides, and Moisture. The AWWA C-105-point standard is reproduced for reference in Table 5.7.

Based on the corrosivity test performed and our assumption of "fair drainage, generally moist" conditions, we assign a point value of less than 10, indicating a low corrosive rating for the site. When total points on the AWWA scale are at least 10, the soil is classified as corrosive to cast and ductile iron pipes and use of cathodic protection is often recommended.

The results provided were based on a single sample tested on the site. Other soil on the site may be corrosive. We do not practice Corrosion Engineering and a complete assessment of the corrosion potential of the site soil was not within our scope. For long term, specific corrosion control design recommendations, we recommend a California-registered Corrosion Engineer evaluate the corrosion potential of the soil on buried concrete structures, steel pipe coated with cement mortar, and ferrous metals.

5.6. EXTERIOR FLATWORK

Exterior flatwork for pedestrian traffic should be at least 4 inches thick. The flatwork should be underlain by a base with thickness of at least 6 inches or whichever thickness is required in the local jurisdiction. The base materials should be placed over a subgrade prepared in accordance with the recommendations of this report. For shrinkage control, we recommend the slabs be reinforced with minimum No. 4 bars at 18 inch-centers, both ways, centered on "dobies" or similar supports at middepth throughout the slab, and, due to the expansive site soils, bars should continue through joints. However, the slabs should not be pinned to the building walls. The civil engineer should determine the final slab thickness, reinforcing, and joint spacing based upon the anticipated loads.

5.7. FLEXIBLE AND RIGID PAVEMENTS

5.7.1. Flexible (Asphalt Concrete) Pavements

Asphalt and base course materials should meet the requirements of the *Caltrans Standard Specifications, latest edition*. Pavement sections per the empirical methods presented in the California Highway Design Manual are shown below and include lime treated subgrade to address the expansive soils present at the site. To account for potential variability in the subgrade soils, pavement sections are based on an assumed subgrade R-value equal to 20.

Table 5.8 – Recommended Flexible (Asphalt Concrete) Pavement Sections

Traffic Index[1]	Asphalt Concrete[2] (in)	Class 2 Aggregate Base (in)	Geogrid	Lime Treated Subgrade (in)	Total Section (in)
5	3	8	---	---	11
6	3 ½	10	---	---	13½
7	4	12	---	---	16
8	5	14	---	---	19

[1]Traffic Indices were assumed.
[2]Asphalt concrete sections include a 0.2 safety factor.

If adverse conditions are encountered during the preparation of subgrade materials, special construction methods may need to be employed. Subgrade materials should be processed to a minimum depth of 12 inches below the Class II aggregate base and compacted to a minimum 95 percent of ASTM D1557 laboratory maximum dry density at or near the optimum moisture content. Class II Aggregate Base material should be compacted to 95 percent of ASTM D1557 laboratory maximum dry density at or near optimum moisture content. The base should meet the quality requirements outlined in Section 26 of the Caltrans Standard Specifications.

The pavement section is intended as a minimum. Positive site drainage should always be maintained. Water should not be allowed to pond or seep into the ground. If the average daily traffic (ADT) increases beyond that intended, as reflected by the assumed traffic designation, increased maintenance could be required for the pavement section. The project Civil Engineer should determine the Traffic Index appropriate for the project.

5.7.2. Rigid (Portland Cement Concrete) Pavements

Where rigidity of pavement is desired for areas designed for, high volume vehicular traffic, heavy maintenance or equipment traffic, entry driveways or trash enclosure slabs, we recommend using Portland cement concrete paving. The rigid concrete pavement section presented in Table 5.9 is based on a composite subgrade modulus of 150 pci, for light, moderate, and heavy-duty sections, respectively. The composite subgrade modulus considers the lime treated subgrade and a specified thickness of aggregate base. The concrete thickness is based on a minimum concrete modulus of rupture of 550 psi. In addition, the driveway slabs should be designed with thickened edges at least twice the slab thickness. The design professional should confirm the design, applicable traffic classification, and thickness of rigid pavement slabs.

Table 5.9: Recommended Rigid (Portland Cement Concrete) Pavement Sections

Traffic Classification[1]	Rigid Concrete (in)	Class 2 Aggregate Base (in)	Total Section (in)	Notes
Light – ADTT[2] = 3	4½	6	10½	Note 3, 4, 5
Moderate – ADTT = 10	5	6	11	Note 3, 4, 5
Heavy – ADDT = 100	6	6	12	Note 3, 4, 5

[1]Classification per the American Concrete Pavement Association based on Portland Cement Association (PCA) EB109P, 1984 .
[2]ADTT is the Average Daily Truck Traffic for both lanes of travel, over all lanes of traffic, and includes trucks with six tires or more (excluding panel and pickup trucks and other four tire vehicles).
[3]Dowels are not recommended unless rigid concrete pavement is greater than 6 inches
[4]Concrete thickness is based on 30-year design life WITH concrete curb and gutter or concrete shoulders. Add one inch thickness to concrete if based on 30-year design life WITHOUT concrete curb and gutter or concrete shoulders. A concrete modulus of rupture of 600 psi (minimum) is assumed.
[5]Based on a firm and unyielding subgrade where the upper 12 inches are compacted as recommended in this report for pavement subgrade.

5.7.3. Construction Considerations for Pavements

Additional requirements and/or assumptions for pavements are outlined below:

- Baserock materials used should comply with the requirements outlined in Section 26 of the State Standard Specifications. We strongly recommend that baserock be a virgin, crushed aggregate product.
- Baserock should be firm and stable prior to placing asphalt and compacted to a minimum of 95 percent based on the ASTM D 1557 test method.

- Subgrade beneath paved areas shall be compacted to a minimum of 95 percent based on the ASTM D 1557 test method.
- Proof rolling of subgrade and of baserock with fully loaded water truck, or equivalent, should be performed under observation of our field representatives to detect for any instabilities of pavement subgrade and baserock following final grading. Proof rolling of subgrade should occur immediately (i.e., less than 24 hours) before placement of baserock. Baserock should be proofrolled immediately prior to placement of tack coat.
- Subgrade preparation is performed as outlined in the Earthwork sections of this report.

5.8. EARTHWORK

5.8.1. Site Preparation

Prior to any site grading, the existing concrete slabs, foundations, pavements and underlying base, and surficial deleterious materials from previous use should be demolished and removed outside of the construction limits. These materials should not be incorporated into any structural fills. Vegetation and organics within grading limits should be stripped and removed offsite. The stripping should be performed to provide a subgrade with organic content less than 3 percent of organics and to the satisfaction of the geotechnical representative. Trees and their root foundation should be removed entirely. No measurements were made on the root layers but based on the dense growth of the vegetation brush and trees throughout, it is anticipated that excavation and removal of the brush and/or trees will create large void spaces and disturb the existing ground. The cavities created by complete removals of the root balls from the brush and trees should be replaced with compacted engineered fill.

5.8.2. Site Grading

Prior to placing any fills, the exposed subgrade should be scarified 12 inches, moisture conditioned and mechanically compacted. Once the exposed subgrade is moisture conditioned and compacted, the new fill meeting the requirements of in this report should be moisture conditioned and placed horizontally in 8-inch maximum lifts, then compacted. Moisture content and the level of compaction will vary according to the definable feature. The acceptance criteria are presented in Section 5.13.

5.8.3. Engineered Fill

Imported engineered fill may be used and should be free of organic or other deleterious debris, non-plastic, and less than 3 inches in maximum dimension. Onsite soil may be used as engineered fill material provided it is processed and compacted as recommended in this report. Expansive soils should not be allowed within the upper 12 inches of building pads. Specific requirements for engineered fill including the applicable test procedures to verify suitability are presented in Table 5.10.

Table 5.10 – Materials for Engineered Fill (Imported)		
Gradation		
Sieve Size	Percent Passing	Test Procedures
3 inches	100	ASTM[1] D6913 or ASTM D1140
¾ inch	80-100	ASTM[1] D6913 or ASTM D1140
No. 4	40-70	ASTM[1] D6913 or ASTM D1140
No. 200	More than 10	ASTM[1] D6913 or ASTM D1140
Test	Criteria	Test Procedure
Liquid Limit	Less than 40	ASTM D4318
Plasticity Index	Less than 15	ASTM D4318
Swell Test	Less than 4%	
Organic Content	Less than 3%	ASTM D2974
Expansion Index	Less than 20	ASTM D4829
Sand Equivalent	Greater than 10	CT[2]217

Notes
[1] ASTM = American Society for Testing and Materials Standards
[2] CT = California Test Method

If fill is to be imported from off-site, it should meet the requirements of engineered fill above and be non-corrosive and free of deleterious material. Any imported fill should be sampled by the project Geotechnical Engineer prior to being imported to evaluate its suitability for its intended use and to perform confirmatory testing listed above, if necessary.

5.8.4. Wet Weather and/or Unstable Soil Conditions

The in-situ moisture content of the site soil may increase after extended periods of rainfall. Soil subgrades may become saturated due to exposure to wet weather conditions. When wet soils are encountered, they should be remediated by aeration, removing and replacing with drier material, and/or chemically treated with lime or cement combinations. We should be contacted if these conditions are encountered.

5.8.5. Rat Slab for Foundation Working Surfaces

An alternative for aeration or removal of wet soils and replacement with engineered fill for mat foundations may consist of construction of a lean concrete slab at least 2 inches thick placed over a subgrade prepared in accordance with this report. The lean concrete slab should have a minimum compressive strength of 1000 psi. This slab would provide a dry working surface for construction of foundations.

5.9. EXCAVATIONS

5.9.1. Temporary Excavations and Excitability

Pipelines, excavation, and earthwork following removal of paving and/or flatwork within trench zones can be performed with the typical conventional excavating and filling machines generally in use for such projects Soil on trench walls or bottoms should not be allowed to dessicate (dry out) or become saturated due to inclement weather. Ultimately, it is the Contractor's responsibility for implementing means and methods to protect exposed soil on the trench walls or bottom of excavations. If materials become saturated and cause sliding, toppling, subsidence and bulging, or heaving or squeezing conditions as defined by OSHA, remedial actions will be required to address the conditions. The Contractor and/or Geotechnical Engineer, or his representative shall periodically review the near-surface and subsurface materials when the conditions are encountered. As the site has variable materials, excavations should be addressed on an individual basis to meet the requirements established by OSHA. Temporary excavations may require shoring to meet these requirements.

5.9.2. General Considerations for Temporary Shoring (if needed)

During construction, the Contractor is responsible for maintaining safe excavations in accordance with OSHA guidelines. Where temporary shoring and internal bracing is used, it should be designed by a registered design professional experienced in shoring design.

A monitoring program should be implemented by the Contractor and set on existing permanent benchmarks or survey points as well as the installed shoring system to evaluate if any movement is occurring as the excavation continues. The instrumentation used, monitoring program workplan, and readings of survey points should be documented, submitted, and reviewed by the project team.

5.9.3. Bedding and Backfill Materials for Utility Trenches

Trench bedding and backfill should meet the meet stricter requirements outlined in the local jurisdictional requirements and the recommendations presented herein.

Trench backfills fall within two categories typically characterized as pipe zone backfill and trench zone backfill. The pipe zone backfill refers to the material in the immediate vicinity of the pipe and is often termed “shading.” Trench zone backfill refers to the material between the pipe zone backfill and the finished subgrade.

We do not recommend using coarse-grained sand and/or gravel for either pipe or trench zone backfill unless they are separated from the native soils by a non-woven geotextile fabric equivalent to Mirafi® 140N. This is due to the potential for soil migration into the comparatively large void spaces in these types of materials which will, over time, result in ground settlement.

5.9.4. Pipe Zone Materials

Pipe zone backfill should be placed loosely and then thoroughly tamped by hand-working the soil beneath the pipe’s spring line using shovels and by walking on three-inch loose lifts. It should extend to at least one foot above the crown of the pipe. We recommend against ponding or jetting or using mechanical compactors to densify pipe-zone backfill but requests for use in specific situations may be referred to the geotechnical engineer for consideration.

Piping with sensitive coatings should be designed to ensure that the outside dimension of the insulation or other coating is buried deeply enough below the road’s subgrade elevation and covered with appropriate thickness of shading that will protect the coating from construction damage. Pipes and their insulation should be located deeper than a foot below top of road subgrade/ underside of aggregate base course zone to minimize the possibility of insulation and pipe damage and/or corrosion when the road subgrade is scarified prior to compaction. Conflicts between these recommendations and the backfill requirements of pipe manufacturers should be referred to the project civil engineer for resolution.

Pipes should be encapsulated with clean sand at least 6 inches in each direction from the bottom of the trench to over the pipe.

5.9.5. Trench Zone Materials

The trench zone should be backfilled with onsite soil placed and compacted as recommended for engineered fill. As stated above, pipe manufacturers or design professionals may require special backfill materials. We recommend that the geotechnical engineer be included in the consideration of alternate backfill materials. Mechanical compaction is recommended; ponding or jetting of backfill should be avoided.

Based on the materials encountered during our investigation and the results of the laboratory test program performed on selected samples, the native materials are suitable for use as backfill materials in the trench areas. However, consideration should be given if earthwork activities occur during the wet winter or early spring seasons where it is possible that moisture conditions could increase prior to trench excavations or earthwork which could render the materials difficult to compact. Consideration should be given for drying, mixing, and/or importing drier material or chemically treating the soil to facilitate compaction and meeting the requirements of engineered fill herein.

5.9.6. Protection of Existing Foundations and Buried Utilities

Where excavations are made next to foundations or buried utilities, the excavations should not be allowed to encroach to within a line projected downward at a slope of 2 horizontal to 1 vertical from a point 9 inches above the bottom of the foundation as outlined in CBC 1809.14. Each case may be specific, but the registered design professional shall determine the requirements for support and protection of the existing foundation and prepare site-specific plans, details, and sequence of work. Typical support means and methods may include underpinning, bracing, excavation retention systems, or other means. Where pipes cross under footings or encroach within the near surface of fills, the footings shall be specially designed. The existing utilities shall be protected. Pipe sleeves shall be provided where pipes cross through footings or footing walls and sleeve clearances shall provide for possible footing settlement but not less than 1 inch all around the pipe.

5.10. COMPACTION AND MOISTURE CONDITIONING SUMMARY

Site subgrade prior to placing fill, engineered fill and trench backfill, and pavement section materials meeting the criteria presented above should be placed in uniform, horizontal, loose lifts not exceeding 8 inches, and moisture conditioned and mechanically compacted as noted in Table 5.11. Jetting should not be allowed.

Table 5.11 – Compaction and Moisture Conditioning Summary

Area to be Compacted	Minimum Relative Compaction (RC) [1, 3]	Moisture Content[2] Required
Non-Expansive Engineered fill or Import	≥95%	0 to 3% > optimum moisture
Subgrade prior to placing fill	≥95%	0 to 3% > optimum moisture
Expansive soils (in place compaction, if encountered)	≥90%[6]	Min 2% > optimum moisture
Trench backfill[6]	≥90%	Min 3% > optimum moisture
Upper 12 inches of Trench backfill in paved areas	≥95%	0 to 3% > optimum moisture
Lime Treatment as Engineered Fill (if used)	≥95%[4]	Min 3% > optimum moisture[4]
Lime Treatment as Pavement Subgrade (if used)	≥95%[4]	Min 3% > optimum moisture[4]
Upper 12 inches of pavement subgrade	≥95%	0 to 3% > optimum moisture
Aggregate Baserock for pavement[5] section	≥95%	0 to 3% > optimum moisture
Aggregate Baserock for tank[7] section	≥95%	0 to 3% > optimum moisture

[1]Minimum relative compaction is a ratio of the in place dry density and the maximum dry density determined by the ASTM D1557 test method
[2]Moisture content is determined by ASTM D1557 for optimum moisture content and D6938 for field determination by nuclear gauge. **Moisture content shall be maintained in its tested state until it is covered with the next lift of engineered fill, aggregate base, or flatwork. It shall not be allowed to dessicate or dry to below the moisture content requirements shown.**
[3]In place dry density and moisture content can be determined by nuclear methods (ASTM D6938).
[4]Optimum moisture content and maximum density determined by California Test Methods.
[5]The compaction requirement for aggregate baserock applies to both flexible (asphalt) and rigid (concrete) pavements.
[6]Fills greater than 5 feet should be compacted to a minimum of 95 percent for the entire depth.
[7]Minimum 3 feet of aggregate base required beneath tank pads.

5.11. DRAINAGE

To minimize moisture intrusion into foundation and slab subgrades, we recommend the ground surface slope away from the building pad and pavement areas in accordance with jurisdictional and/or local Building Code requirements toward the appropriate drop inlets or other surface drainage devices. These grades should be maintained for the life of the project. Building pads should also be designed such that the lowest adjacent grade surrounding the building is at or below the elevation of the building pad surface (at or below the bottom of the capillary break material beneath the floor slab. Landscaping after construction should not promote ponding of water adjacent to the structures.

5.12. ADDITIONAL BORINGS AND STUDIES

The proposed CPT probes did not achieve the target depth intended to at least 100 feet bgs because the highly resistant materials encountered at depth limited further advancement with the hydraulic equipment utilized. We therefore recommend a drilled soil boring advanced within the planned tank footprints to evaluate the subsurface conditions in the lower zones of influence to depth of at least 100 feet bgs. We also recommend the tanks be estimated for potential total and differential settlement when the tank configuration and load conditions are determined.

5.13. SOILS SPECIAL INSPECTION

Special inspection and tests of soils should be performed per Table 1705.6 of the 2022 California Building Code at a minimum. Specifically, these requirements include the special inspector to:

1. Periodically verify materials below shallow foundations are adequate to achieve the design bearing capacity.
2. Periodically verify excavations are extended to proper depth and have reached proper material.
3. Periodically perform classification and testing of compacted fill materials.
4. Continuously verify use of proper materials, densities and lift thicknesses during placement and compaction of fill.
5. Periodically inspect subgrade and verify the site has been prepared properly prior to placement of compacted fill.

As a guide, the areas noted should be tested at the minimum frequencies below or modified accordingly to the project geotechnical engineer during construction. It is essential the project geotechnical engineer be engaged early in the project and to attend any pre-construction (preparatory) meetings related to earthwork and/or foundation construction.

Table 5.12 – Minimum Testing Summary	
Area to be Compacted	**Min. Frequency of In-Place Density / Moisture Content**
Non-Expansive Engineered fill (Import)	1 per 600 cy or lift
Subgrade prior to placing fill	1 per 5000 sf
Expansive soils (in place compaction, if encountered)	1 per 600 cy or lift
Trench backfill[6]	1 per 50 to 100 lf of trench per lift
Upper 12 inches of Trench backfill in paved areas	1 per 50 to 100 lf of trench per lift
Lime Treatment as Engineered Fill (if used)	1 per 3000 sf
Lime Treatment as Pavement Subgrade (if used)	1 per 3000 sf
Upper 12 inches of pavement subgrade	1 per 5000 sf
Aggregate Baserock	1 per 5000 sf
Hot Mix Asphalt (HMA) compaction	1 per 50 tons placed

PART 6. ADDITIONAL SERVICES

6.1. MODIFICATIONS TO THE GEOTECHNICAL ENGINEERING REPORT

The building layout, load conditions, and/or design elevations were based on correspondence with the project team during preparation of this report. If the building layout, load conditions, and/or design elevations exceed what was initially assumed and stated in this report, additional services and fee may be required to review the updated information and to perform additional analysis as necessary for the new design concepts. An Addendum to this report may be prepared and submitted to document the findings and provide updated recommendations, if needed.

6.2. PLAN AND SPECIFICATIONS REVIEW

It is essential that we perform a general review of the plans and specifications to evaluate if the recommendations contained in this report were properly interpreted and incorporated into the project documents. We will not be responsible for any misinterpretation of our recommendations if we are not retained to perform this task.

6.3. GEOTECHNICAL ENGINEER OF RECORD DURING CONSTRUCTION PHASE

To provide continuity of service into the construction phase, it is essential that we be retained as Geotechnical Engineer of Record through project closeout. The purpose of this task is to verify the geotechnical aspects of design and construction are implemented as recommended in this report during the construction phase. This is also a recommended practice promoted by the California Geotechnical Engineering Association (CalGeo).

PART 7. LIMITATIONS

We based our conclusions and recommendations based on our understanding of the proposed project development and improvements, data derived from our field explorations and laboratory testing, interpretations of available published data, and our geotechnical engineering analysis. The reported locations of the field explorations were determined by pacing from available landmarks; survey of the field explorations was not included in this scope. It is possible that actual subsurface conditions can vary between points of exploration. Similarly, load conditions may vary from what we have assumed during our analysis. If this is found to be the case, we should be notified and requested to review the changes and provide modifications to our conclusions and recommendations if needed.

We prepared this report in general accordance with the generally accepted geotechnical engineering practice as it exists in the project vicinity at the time the work was performed. No warranty, express or implied, is made. This report may be used by the Client and its design consultants, for the purpose stated for this project site for up to two years from the date of this report. If construction is delayed, or if land use, or other factors modify the site and subsurface conditions, additional field work may be needed (i.e., additional borings and/or laboratory testing) and an updated report issued. We shall be released from any liability resulting from misuse of the report by the authorized party. The Client agrees to defend, indemnify, and hold harmless Siegfried from any claim or liability associated with such unauthorized use or non-compliance with the requirements outlined herein.

PART 8. REFERENCES

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PLATES

F:\23PROJECTS\23095 CITY OF STOCKTON MORADA WATER TANK\PLANS AND GRAPHICS\EXHIBITS\GEOTECH EXHIBITS\23095 MORADA WATER TANK - SITE LOCATION MAP.DWG 12/21/2023 2:10

SITE LOCATION MAP

MORADA WATER TANK

2960 E MORADA LN, STOCKTON, CA 95212

DATE	12/21/23
DESIGN	BLQ
DRAWN	AA
JOB NO.	23095

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SCALE:	1" = 1000'
PLATE	1

EXPLORATION LOCATION MAP

MORADA WATER TANK

2960 E MORADA LN, STOCKTON, CA 95212

DATE	12/20/23
DESIGN	BLQ
DRAWN	AA
JOB NO.	23095

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SCALE: 1" = 100'

PLATE 2

F:\23PROJECTS\23095 CITY OF STOCKTON MORADA WATER TANK\PLANS AND GRAPHICS\EXHIBITS\GEOTECH EXHIBITS\23095 MORADA WATER TANK – EXPLORATION LOCATION MAP.DWG 12/20/

APPENDIX A
FIELD EXPLORATION

Prior to initiating our field exploration, the planned exploration locations were checked for underground utilities by contacting Underground Service Alert (USA) which located underground and aboveground utilities within the vicinity of our proposed explorations. Based on the planned depths of the explorations and review of the available data regarding depth to groundwater, it was determined drilling permits with the San Joaquin County Environmental Health Department would be required for both the CPTs.

The CPT probes were advanced on October 27, 2023. The locations CPT probes are shown on Plate 2.

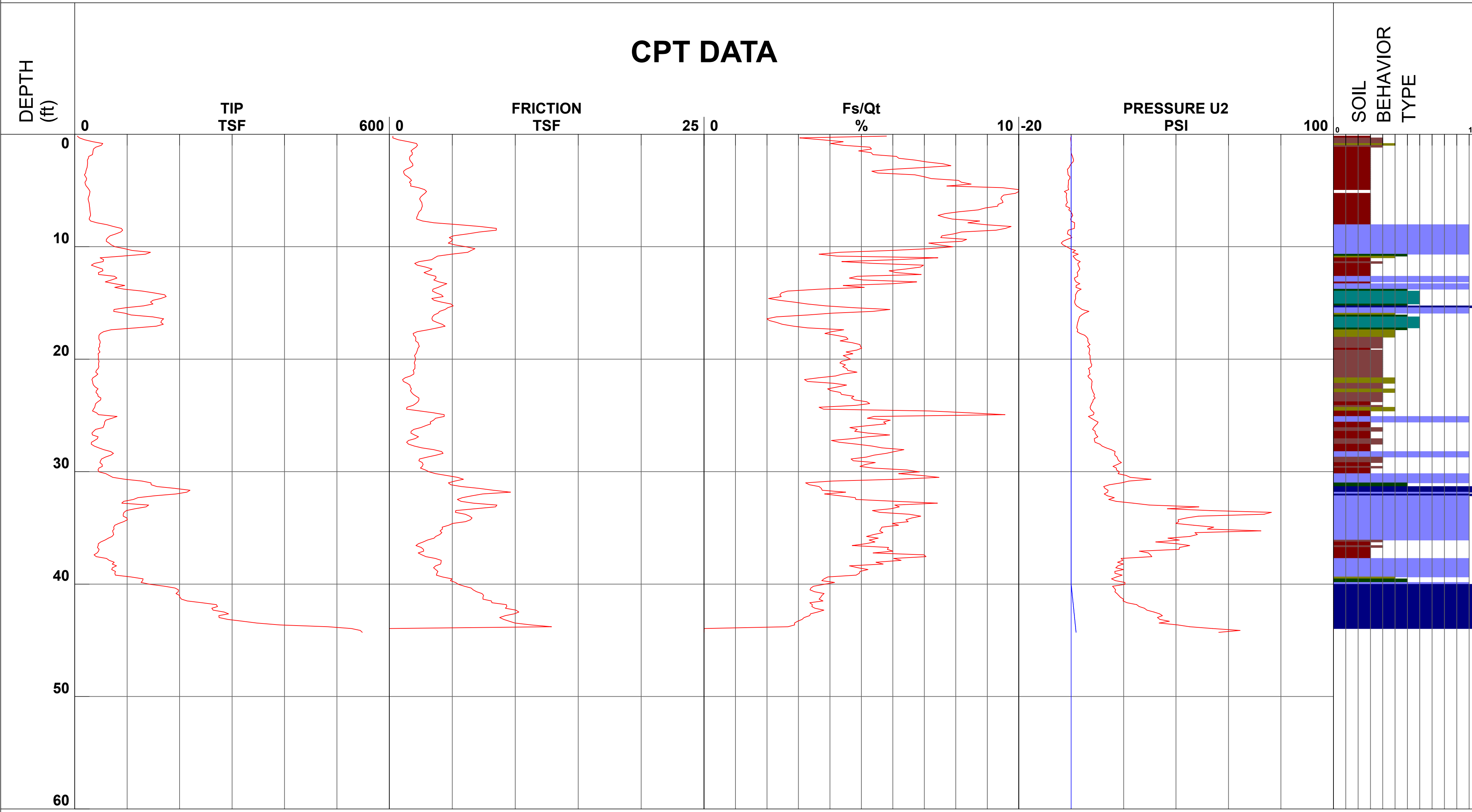
<u>CPT Probes</u>
Three (3) Cone Penetration Test (CPT) probes identified as CPT-01 through CPT-03 were advanced to depths of approximately 44 to 54 feet bgs, respectively. Target depths were intended initially to achieve upwards of 100 feet bgs; however, resistant materials encountered at depth limited the further advancement of the CPT probes, so they were terminated before the intended target depth.

The CPT hydraulically advances a 15 cm^2 cone where the tip resistance and the sleeve resistance are measured. The tip resistance and sleeve resistance are normalized to correlate with other engineering parameters such as density, undrained shear strength (for clays), friction angle (for sands), and estimations of the N_{60} and $(N_1)_{60}$ Seismic shear wave velocity measurements were performed for use in determining the Site Classification. Pore pressure dissipation tests were be performed in sand layers as appropriate. The CPT provides a continuous profile of the engineering parameters and is repeatable in the data collection. The CPT was useful for computing the potential for liquefaction. In this analysis, a net area ratio of 0.8 was used. The CPT logs are presented in this Appendix.

Siegfried Engineering

Project	Morada Water Tank Study	Operator	JM-FA	Filename	SDF(426).cpt
Job Number	23095-5001	Cone Number	DDG1587	GPS	
Hole Number	CPT-01	Date and Time	23095-5001	Maximum Depth	44.29 ft
EST GW Depth During Test		40.00 ft			

Net Area Ratio .8



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Morada Water Tank Study

Project ID: Siegfried Engineering
Data File: SDF(426).cpt
CPT Date: 10/27/2023 12:13:12 PM
GW During Test: 40 ft

Sounding ID: CPT-01
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
0.33	9.0	14.4	-	9.0	0.3	-0.2	3.0	3	silty CLAY to CLAY	115	1.5	10	6	4	-	-	0.6	9.9	50	0.005	2.87	15
0.49	19.2	30.7	-	19.2	0.7	-0.1	3.8	4	clayy SILT to silty CLAY	115	2.0	15	10	8	-	-	1.4	9.9	39	0.070	2.67	15
0.66	34.4	55.1	165.4	34.4	1.5	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	28	17	14	-	-	2.4	9.9	33	0.070	2.54	15
0.82	53.5	85.8	193.6	53.5	2.2	0.0	4.0	4	clayy SILT to silty CLAY	115	2.0	43	27	20	-	-	3.8	9.9	26	0.070	2.39	15
0.98	50.7	81.3	199.1	50.7	2.2	0.0	4.4	4	clayy SILT to silty CLAY	115	2.0	41	25	19	-	-	3.6	9.9	28	0.070	2.43	15
1.15	40.0	64.2	197.4	40.0	2.1	0.0	5.3	4	clayy SILT to silty CLAY	115	2.0	32	20	16	-	-	2.8	9.9	33	0.070	2.56	15
1.31	35.6	57.1	188.0	35.6	1.9	-0.1	5.3	4	clayy SILT to silty CLAY	115	2.0	29	18	15	-	-	2.5	9.9	35	0.070	2.59	15
1.48	35.0	56.1	177.7	35.0	1.7	-0.1	4.9	4	clayy SILT to silty CLAY	115	2.0	28	17	14	-	-	2.5	9.9	34	0.070	2.57	15
1.64	34.3	55.1	-	34.3	1.8	0.0	5.3	4	clayy SILT to silty CLAY	115	2.0	28	17	14	-	-	2.4	9.9	36	0.070	2.60	15
1.80	34.0	54.5	-	34.0	1.8	0.2	5.4	4	clayy SILT to silty CLAY	115	2.0	27	17	14	-	-	2.4	9.9	36	0.070	2.61	15
1.97	26.8	43.0	-	26.8	1.6	0.5	6.1	3	silty CLAY to CLAY	115	1.5	29	18	12	-	-	1.9	9.9	42	0.005	2.72	15
2.13	25.8	41.4	-	25.9	1.6	0.7	6.2	3	silty CLAY to CLAY	115	1.5	28	17	11	-	-	1.8	9.9	42	0.005	2.74	15
2.30	24.3	39.0	-	24.3	1.6	0.9	6.7	3	silty CLAY to CLAY	115	1.5	26	16	11	-	-	1.7	9.9	45	0.005	2.78	15
2.46	24.4	39.1	-	24.4	1.7	0.7	7.1	3	silty CLAY to CLAY	115	1.5	26	16	11	-	-	1.7	9.9	46	0.005	2.80	15
2.62	24.4	39.1	-	24.4	1.9	0.0	7.6	3	silty CLAY to CLAY	115	1.5	26	16	11	-	-	1.7	9.9	47	0.005	2.82	15
2.79	23.9	38.3	-	23.8	1.9	-0.4	7.9	3	silty CLAY to CLAY	115	1.5	26	16	11	-	-	1.7	9.9	48	0.005	2.84	15
2.95	23.6	37.8	-	23.6	1.6	-0.8	7.0	3	silty CLAY to CLAY	115	1.5	25	16	11	-	-	1.7	9.9	46	0.005	2.81	15
3.12	22.3	35.8	-	22.3	1.3	-1.4	6.0	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.6	9.9	44	0.005	2.77	15
3.28	21.2	33.9	-	21.1	1.1	-1.3	5.4	3	silty CLAY to CLAY	115	1.5	23	14	9	-	-	1.5	9.9	43	0.005	2.75	15
3.45	20.9	33.6	-	20.9	1.2	-1.2	5.6	3	silty CLAY to CLAY	115	1.5	22	14	9	-	-	1.5	9.9	44	0.005	2.77	15
3.61	18.3	29.4	-	18.3	1.2	-1.2	6.8	3	silty CLAY to CLAY	115	1.5	20	12	9	-	-	1.3	9.9	50	0.005	2.87	15
3.77	20.7	33.2	-	20.7	1.4	-0.5	7.1	3	silty CLAY to CLAY	115	1.5	22	14	10	-	-	1.4	9.9	49	0.005	2.85	15
3.94	22.7	36.3	-	22.6	1.6	-0.5	7.3	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.6	9.9	48	0.005	2.83	15
4.10	21.7	34.8	-	21.7	1.8	-1.0	8.2	3	silty CLAY to CLAY	115	1.5	23	14	10	-	-	1.5	9.9	51	0.005	2.88	15
4.27	19.4	31.2	-	19.4	1.6	-1.0	8.3	3	silty CLAY to CLAY	115	1.5	21	13	9	-	-	1.4	9.9	53	0.005	2.92	15
4.43	20.2	32.4	-	20.2	1.7	-1.1	8.6	3	silty CLAY to CLAY	115	1.5	22	13	10	-	-	1.4	9.9	53	0.005	2.92	15
4.59	21.9	35.1	-	21.9	1.7	-1.2	7.8	3	silty CLAY to CLAY	115	1.5	23	15	10	-	-	1.5	9.9	50	0.005	2.86	15
4.76	24.5	39.4	-	24.5	2.3	-1.2	9.6	3	silty CLAY to CLAY	115	1.5	26	16	12	-	-	1.7	9.9	52	0.005	2.90	15
4.92	27.1	43.4	-	27.0	2.8	-1.0	9.9	3	silty CLAY to CLAY	115	1.5	29	18	13	-	-	1.9	9.9	51	0.005	2.88	15
5.09	29.1	46.7	-	29.1	3.0	-2.5	9.9	3	silty CLAY to CLAY	115	1.5	31	19	14	-	-	2.0	9.9	49	0.005	2.86	15
5.25	28.5	45.8	-	28.5	2.8	-1.7	9.9	3	silty CLAY to CLAY	115	1.5	31	19	13	-	-	2.0	9.9	50	0.005	2.86	15
5.41	27.8	44.6	-	27.7	2.6	-1.8	9.6	3	silty CLAY to CLAY	115	1.5	30	19	13	-	-	1.9	9.9	50	0.005	2.86	15
5.58	26.3	42.2	-	26.3	2.5	-1.9	9.6	3	silty CLAY to CLAY	115	1.5	28	18	13	-	-	1.8	9.9	50	0.005	2.87	15
5.74	25.5	40.9	-	25.5	2.4	-1.7	9.6	3	silty CLAY to CLAY	115	1.5	27	17	12	-	-	1.8	9.9	51	0.005	2.88	15
5.91	26.1	41.9	-	26.1	2.5	-1.7	9.6	3	silty CLAY to CLAY	115	1.5	28	17	12	-	-	1.8	9.9	51	0.005	2.88	15
6.07	27.2	43.5	-	27.1	2.6	-1.4	9.6	3	silty CLAY to CLAY	115	1.5	29	18	13	-	-	1.9	9.9	50	0.005	2.87	15
6.23	27.8	44.6	-	27.8	2.6	-1.9	9.5	3	silty CLAY to CLAY	115	1.5	30	19	13	-	-	1.9	9.9	49	0.005	2.86	15
6.40	28.1	45.0	-	28.0	2.6	-1.9	9.5	3	silty CLAY to CLAY	115	1.5	30	19	13	-	-	2.0	9.9	49	0.005	2.85	15
6.56	28.7	46.0	-	28.7	2.6	-0.5	9.1	3	silty CLAY to CLAY	115	1.5	31	19	13	-	-	2.0	9.9	48	0.005	2.83	15
6.73	28.9	46.4	-	28.9	2.5	-0.9	8.8	3	silty CLAY to CLAY	115	1.5	31	19	13	-	-	2.0	9.9	47	0.005	2.82	15
6.89	29.2	46.9	-	29.2	2.4	-0.1	8.2	3	silty CLAY to CLAY	115	1.5	31	19	13	-	-	2.0	9.9	46	0.005	2.80	15
7.05	29.9	48.0	-	29.9	2.3	0.3	7.8	3	silty CLAY to CLAY	115	1.5	32	20	13	-	-	2.1	9.9	44	0.005	2.77	15
7.22	30.1	48.3	-	30.1	2.2	0.6	7.5	3	silty CLAY to CLAY	115	1.5	32	20	13	-	-	2.1	9.9	44	0.005	2.76	15
7.38	28.5	45.7	-	28.5	2.2	0.1	7.7	3	silty CLAY to CLAY	115	1.5	30	19	13	-	-	2.0	9.9	45	0.005	2.78	15
7.55	27.5	44.1	-	27.5	2.2	-0.2	8.0	3	silty CLAY to CLAY	115	1.5	29	18	13	-	-	1.9	9.9	46	0.005	2.81	15
7.71	30.1	48.3	-	30.1	2.6	0.0	8.9	3	silty CLAY to CLAY	115	1.5	32	20	14	-	-	2.1	9.9	47	0.005	2.81	15
7.87	42.2	67.8	-	42.3	3.5	1.3	8.5	9	very stiff fine SOIL	120	1.0	68	42	18	-	-	1.5	9.9	41	0.250	2.70	30
8.04	61.5	98.7	-	61.6	5.5	1.3	9.0	9	very stiff fine SOIL	120	1.0	99	62	26	-	-	2.2	9.9	37	0.250	2.63	30
8.20	73.7	118.2	-	73.7	7.2	1.3	9.8	9	very stiff fine SOIL	120	1.0	100	74	30	-	-	2.6	9.9	36	0.250	2.62	30
8.37	88.9	124.3	412.6	88.9	8.5	1.2	9.6	9	very stiff fine SOIL	120	1.0	100	89	32	-	-	3.1	9.9	35	0.250	2.60	30
8.53	91.5	126.7	408.5	91.5	8.5	-1.1	9.3	9	very stiff fine SOIL	120	1.0	100	92	32	-	-	3.2	9.9	35	0.250	2.58	30
8.69	87.7	120.2	364.1	87.7	7.2	-1.3	8.2	9	very stiff fine SOIL	120	1.0	100	88	30	-	-	3.1	9.9	33	0.250	2.55	30
8.86	78.4	106.4	333.8	78.3	6.2	-1.4	8.0	9	very stiff fine SOIL	120	1.0	100	78	27	-	-	2.8	9.9	34	0.250	2.57	30
9.02	67.5	90.7	297.0	67.5	5.1	-0.2	7.6	9	very stiff fine SOIL	120	1.0	91	67	23	-	-	2.4	9.9	35	0.250	2.59	30
9.19	63.2	96.6	306.4	63.2	4.8	0.3	7.6	9	very stiff fine SOIL	120	1.0	97	63	24	-	-	2.2	9.9	34	0.250	2.57	30
9.35	60.3	96.7	-	60.3	5.0	-1.5	8.4	9	very stiff fine SOIL	120	1.0	97	60	25	-	-	2.1	9.9	36	0.250	2.61	30
9.51	60.0	96.3	-	60.0	4.9	-3.1	8.3	9	very stiff fine SOIL	120	1.0	96	60	25	-	-	2.1	9.9	36	0.250	2.61	30
9.68	65.5	84.9	276.8	65.4	4.7	-3.8	7.2	9	very stiff fine SOIL	120	1.0	85	65	22	-	-	2.3	9.9	35	0.250	2.59	30
9.84	69.6	89.5	292.8	69.5	5.2	-3.1	7.5	9	very stiff fine SOIL	120	1.0	89	70	23	-	-	2.4	9.9	35	0.250	2.59	30
10.01	77.1	98.2	319.1	77.0	6.1	-1.7	8.0	9	very stiff fine SOIL	120	1.0	98	77	25	-	-	2.7	9.9	35	0.250	2.59	30
10.17	95.4	120.6	333.0	95.4	6.8	-0.4	7.2	9	very stiff fine SOIL	120	1.0	100	95	29	-	-	3.3	9.9	31	0.250	2.50	30
10.34	109.5	137.3	318.0	109.5	6.5	1.7	6.0	9	very stiff fine SOIL	120	1.0	100	100	32	-	-	3.8	9.9	26	0.250	2.40	30
10.50	144.5	179.7	308.6	144.5	6.2	0.6	4.3	9	very stiff fine SOIL	120	1.0	100	100	39	-	-	5.1	9.9	20	0.250	2.22	30
10.66	135.0	166.5	269.3	135.0	4.9	2.7	3.7	8	stiff SAND to clayy SAND	115	5.0	33	27	35	84	44	-	-	18	0.250	2.18	16
10.83	90.9	111.3	229.9	91.0	3.8	0.7	4.2	9	very stiff fine SOIL	120	1.0	100	91	25	-	-	3.2	9.9	24	0.250	2.33	30
10.99	48.4	75.7	-	48.4	3.6	1.2	7.5	9	very stiff fine SOIL	120	1.0	76	48	20	-	-	1.7	9.9	37	0.250	2.64	30
11.16	55.1	73.3	232.9	55.1	3.4	1.9	6.2	9	very stiff fine SOIL	120	1.0	73	55	18	-	-	1.9	9.9	34	0.250	2.58	30
11.32	54.1	64.8	179.5	54.2	2.4	3.5	4.4	4	clayy SILT to silty CLAY	115	2.0	32	27	16	-	-	3.8	9.9	31	0.070	2.50	15
11.48	37.5	56.0	-	37.5	2.0	2.6	5.5	4	clayy SILT to silty CLAY	115	2.0	28	19	14	-	-	2.6	9.9	36	0.070	2.61	15
11.65	31.8	46.9	-	31.8	2.2	2.6	7.1	3	silty CLAY to CLAY	115	1.5	31	21	13	-	-	2.2	9.9	43	0.005	2.75	15
11.81	41.9	61.0	-	42.0	2.9	3.0	7.0	3	silty CLAY to CLAY	115	1.5	41	28	16	-	-	2.9	9.9	39	0.005	2.67	15
11.98	52.8	66.9	-	52.9	3.4	3.3	6.5	9	very stiff fine SOIL	120	1.0	67	53	17	-	-	1.8	9.9	36	0.250	2.62	30
12.14	53.7	67.3	218.8	53.8	3.2	2.8	6.0	9	very stiff fine SOIL	120	1.0	67	54	17	-	-	1.9	9.9	35	0.250	2.59	30
12.30	45.1	62.9	-	45.1	2.8	2.3	6.2	3	silty CLAY to CLAY	115	1.5	42	30	16	-	-	3.1	9.9	36	0.005	2.62	15
12.47	45.3	62.4	-	45.4	3.1	2.5	7.0	9	very stiff fine SOIL	120	1.0	62	45	16	-	-	1.6	9.9	39	0.250	2.66	30
12.63	75.8	85.8	218.8	75.8	3.7	2.5	4.9	9	very stiff fine SOIL	120	1.0	86	76	20	-	-	2.7	9.9	29	0.250	2.45	30
12.80	80.4	90.4	217.6	80.4	3.7	1.2	4.7	9	very stiff fine SOIL	120	1.0	90	80	21	-	-	2.8	9.9	27	0.250	2.42	30
12.96	69.7	77.9	213.9	69.8	3.5	1.4	5.1	4	clayy SILT to silty CLAY	115	2.0	39	35	19	-	-	4.9	9.9	30	0.070	2.50	15
13.12	58.4	76.4	-	58.4	3.9	1.9	6.8	9	very stiff fine SOIL	120	1.0	76	58	19	-	-	2.0	9.9	35	0.250	2.60	30
13.29	75.9	83.8	246.6	76.0	4.6	3.3	6.1	9	very stiff fine SOIL	120	1.0	84	76	21	-	-	2.7	9.9	32	0.250	2.53	30
13.45	95.3	104.5	228.6	95.3	4.2	1.9	4.5	9	very stiff fine SOIL	120	1.0	100	95	24	-	-	3.3	9.9	25	0.250	2.37	30
13.62	76.2	83.0	221.6	76.2	3.9	1.8	5.1	9	very stiff fine SOIL	120	1.0	83	76	20	-	-	2.7	9.9	30	0.250	2.48	30
13.78	94.1	102.0	202.8	94.2	3.5	3.8	3.7	5	silty SAND to sandy SILT	120	3.0	34	31	23	68	41	-	-	23	0.200	2.31	16
13.94	128.8	138.6	206.0	128.8	3.4	2.4	2.7	5	silty SAND to sandy SILT	120	3.0	46	43	29	78	43	-	-	16	0.200	2.12	16
14.11	151.0	161.5	221.4	151.0	3.7	2.1	2.5	5	silty SAND to sandy SILT	120	3.0	54	50	32	83	44	-	-	14	0.200	2.05	16
14.27	171.3	182.2	239.2	171.4	4.1	1.7	2.4	5	silty SAND to sandy SILT	120	3.0	61	57	36	87	44	-	-	13	0.200	2.01	16
14.44	174.5	184.5	243.0	174.5	4.3	1.7	2.5	5	silty SAND to sandy SILT	120	3.0	62	58	36	87	44	-	-	13	0.200	2.01	16
14.60	164.3	172.7	217.9	164.3	3.4	1.7	2.1	6	clean SAND to silty SAND	125	5.0	35	33	34	85	44	-	-	12	0.350	1.97	16
14.76	149.1	155.8	213.3	149.1	3.6	1.5	2.4	5	silty SAND to sandy SILT	120	3.0	52	50	31	82	43	-	-	14	0.200	2.05	16
14.93	144.4	150.1	224.1	144.4	4.1	1.3	2.9	5	silty SAND to sandy SILT	120	3.0	50	48	31	80	43	-	-	16	0.200	2.12	16
15.09	149.1	154.1	243.2	149.2	4.9	1.5	3.3	5	silty SAND to sandy SILT	120	3.0	51	50	32	81	43	-	-	18	0.200	2.16	16
15.26	131.1	134.7	244.1	131.1	5.1	2.1	3.9	8	stiff SAND to clayy SAND	115	5.0	27	26	29	77	43	-	-	21	0.250	2.25	16
15.42	98.0	100.2	233.3	98.0	4.6	3.1	4.8	9	very stiff fine SOIL	120	1.0	100	98	23	-	-	3.4	9.9	27	0.250	2.40	30

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Siegfried Engineering
Data File: SDF(426).cpt
CPT Date: 10/27/2023 12:13:12 PM
GW During Test: 40 ft

Sounding ID: CPT-01
Project No: 23095-5001
Cone/Rig: DDG1587

Depth ft	qc PS tsf	* qc1n PS -	q1ncs PS -	* qt PS tsf	Slv Stss tsf	pore prss (psi)	Frct Rato %	* Mat Typ Zon	* Material Behavior Description	Unit Wght pcf	Qc to N	* SPT R-N1 60%	SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	Und Shr tsf	OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
15.58	74.9	76.2	233.1	75.0	4.4	4.2	6.0	9	very stiff fine SOIL	120	1.0	76	75	19	-	-	2.6	9.9	33	0.250	2.55	30
15.75	74.4	75.3	218.3	74.6	4.0	6.8	5.4	4	clayy SILT to silty CLAY	115	2.0	38	37	19	-	-	5.2	9.9	32	0.070	2.53	15
15.91	95.2	95.8	208.0	95.3	3.9	5.1	4.1	4	clayy SILT to silty CLAY	115	2.0	48	48	22	-	-	6.7	9.9	25	0.070	2.36	15
16.08	107.6	107.7	197.1	107.7	3.5	4.0	3.3	5	silty SAND to sandy SILT	120	3.0	36	36	24	69	41	-	-	21	0.200	2.26	16
16.24	149.0	148.4	203.4	149.0	3.4	3.2	2.3	5	silty SAND to sandy SILT	120	3.0	49	50	30	80	43	-	-	14	0.200	2.05	16
16.40	169.4	167.8	211.6	169.4	3.4	2.9	2.0	6	clean SAND to silty SAND	125	5.0	34	34	33	84	43	-	-	12	0.350	1.97	16
16.57	165.8	163.4	210.2	165.8	3.4	2.7	2.1	5	silty SAND to sandy SILT	120	3.0	54	55	32	83	43	-	-	13	0.200	1.99	16
16.73	164.3	161.2	215.6	164.4	3.8	2.5	2.3	5	silty SAND to sandy SILT	120	3.0	54	55	32	83	43	-	-	14	0.200	2.03	16
16.90	168.9	164.8	225.5	168.9	4.2	2.3	2.5	5	silty SAND to sandy SILT	120	3.0	55	56	33	83	43	-	-	14	0.200	2.05	16
17.06	155.6	151.1	224.8	155.7	4.4	2.2	2.9	5	silty SAND to sandy SILT	120	3.0	50	52	31	81	43	-	-	16	0.200	2.12	16
17.23	116.6	112.7	201.7	116.7	3.8	2.1	3.3	5	silty SAND to sandy SILT	120	3.0	38	39	24	71	41	-	-	21	0.200	2.25	16
17.39	69.4	66.7	184.0	69.4	3.1	2.5	4.5	4	clayy SILT to silty CLAY	115	2.0	33	35	16	-	-	4.8	9.9	31	0.070	2.50	15
17.55	54.9	52.5	157.0	54.9	2.2	2.3	4.1	4	clayy SILT to silty CLAY	115	2.0	26	27	13	-	-	3.8	9.9	33	0.070	2.54	15
17.72	49.1	46.8	145.0	49.2	1.9	3.4	3.9	4	clayy SILT to silty CLAY	115	2.0	23	25	12	-	-	3.4	9.9	34	0.070	2.56	15
17.88	46.1	44.0	-	46.2	1.9	5.2	4.3	4	clayy SILT to silty CLAY	115	2.0	22	23	11	-	-	3.2	9.9	36	0.070	2.61	15
18.05	46.1	43.6	-	46.2	2.1	5.9	4.6	4	clayy SILT to silty CLAY	115	2.0	22	23	11	-	-	3.2	9.9	37	0.070	2.63	15
18.21	46.0	43.1	-	46.1	2.1	6.4	4.7	4	clayy SILT to silty CLAY	115	2.0	22	23	11	-	-	3.2	9.9	37	0.070	2.64	15
18.37	48.1	44.7	-	48.2	2.1	6.3	4.4	4	clayy SILT to silty CLAY	115	2.0	22	24	11	-	-	3.3	9.9	36	0.070	2.61	15
18.54	48.5	44.7	-	48.6	2.3	6.6	4.8	4	clayy SILT to silty CLAY	115	2.0	22	24	12	-	-	3.4	9.9	37	0.070	2.64	15
18.70	47.0	42.9	-	47.2	2.3	7.2	5.1	3	silty CLAY to CLAY	115	1.5	29	31	11	-	-	3.2	9.9	39	0.005	2.67	15
18.87	47.8	43.2	-	47.9	2.4	6.3	5.1	3	silty CLAY to CLAY	115	1.5	29	32	11	-	-	3.3	9.9	39	0.005	2.67	15
19.03	45.4	40.7	-	45.6	2.3	6.9	5.1	3	silty CLAY to CLAY	115	1.5	27	30	11	-	-	3.1	9.9	40	0.005	2.69	15
19.19	45.9	40.8	-	46.0	2.2	7.1	5.0	3	silty CLAY to CLAY	115	1.5	27	31	11	-	-	3.2	9.9	39	0.005	2.68	15
19.36	48.1	42.5	-	48.3	2.2	6.9	4.6	4	clayy SILT to silty CLAY	115	2.0	21	24	11	-	-	3.3	9.9	37	0.070	2.64	15
19.52	44.6	39.1	-	44.8	2.1	6.8	4.9	3	silty CLAY to CLAY	115	1.5	26	30	10	-	-	3.1	9.9	40	0.005	2.68	15
19.69	45.2	39.2	-	45.3	2.0	7.2	4.5	4	clayy SILT to silty CLAY	115	2.0	20	23	10	-	-	3.1	9.9	38	0.070	2.66	15
19.85	45.2	38.9	-	45.3	2.1	7.2	4.7	4	clayy SILT to silty CLAY	115	2.0	19	23	10	-	-	3.1	9.9	39	0.070	2.67	15
20.01	44.8	38.3	-	44.9	2.1	7.2	4.8	3	silty CLAY to CLAY	115	1.5	26	30	10	-	-	3.1	9.9	40	0.005	2.69	15
20.18	46.4	39.3	-	46.5	2.0	7.5	4.5	4	clayy SILT to silty CLAY	115	2.0	20	23	10	-	-	3.2	9.9	38	0.070	2.66	15
20.34	45.7	38.4	-	45.9	2.0	7.5	4.4	4	clayy SILT to silty CLAY	115	2.0	19	23	10	-	-	3.1	9.9	38	0.070	2.66	15
20.51	45.3	37.7	-	45.4	2.0	7.8	4.6	4	clayy SILT to silty CLAY	115	2.0	19	23	10	-	-	3.1	9.9	39	0.070	2.68	15
20.67	46.0	38.0	-	46.1	2.0	7.7	4.5	4	clayy SILT to silty CLAY	115	2.0	19	23	10	-	-	3.2	9.9	39	0.070	2.67	15
20.83	44.7	36.7	-	44.8	2.0	6.6	4.7	3	silty CLAY to CLAY	115	1.5	24	30	10	-	-	3.1	9.9	40	0.005	2.69	15
21.00	41.3	33.7	-	41.5	1.9	7.0	4.7	3	silty CLAY to CLAY	115	1.5	22	28	9	-	-	2.8	9.9	42	0.005	2.72	15
21.16	40.1	32.4	-	40.2	1.9	6.9	5.0	3	silty CLAY to CLAY	115	1.5	22	27	9	-	-	2.7	9.9	43	0.005	2.75	15
21.33	44.0	35.3	-	44.1	1.9	7.3	4.5	4	clayy SILT to silty CLAY	115	2.0	18	22	9	-	-	3.0	9.9	40	0.070	2.70	15
21.49	40.1	31.9	-	40.2	1.7	6.4	4.3	4	clayy SILT to silty CLAY	115	2.0	16	20	9	-	-	2.7	9.9	41	0.070	2.71	15
21.65	34.6	27.3	-	34.7	1.3	6.8	3.8	4	clayy SILT to silty CLAY	115	2.0	14	17	7	-	-	2.4	8.7	42	0.070	2.73	15
21.82	32.8	25.7	-	32.9	1.0	7.6	3.3	4	clayy SILT to silty CLAY	115	2.0	13	16	7	-	-	2.2	8.2	41	0.070	2.71	15
21.98	34.1	26.6	-	34.3	1.1	8.0	3.4	4	clayy SILT to silty CLAY	115	2.0	13	17	7	-	-	2.3	8.4	41	0.070	2.71	15
22.15	34.4	26.6	-	34.5	1.4	7.9	4.3	3	silty CLAY to CLAY	115	1.5	18	23	7	-	-	2.3	8.4	44	0.005	2.77	15
22.31	35.9	27.6	-	36.1	1.6	7.8	4.7	3	silty CLAY to CLAY	115	1.5	18	24	8	-	-	2.4	8.8	45	0.005	2.79	15
22.47	39.2	29.9	-	39.4	1.7	7.7	4.4	3	silty CLAY to CLAY	115	1.5	20	26	8	-	-	2.7	9.5	43	0.005	2.74	15
22.64	44.5	33.7	-	44.7	1.7	7.9	4.0	4	clayy SILT to silty CLAY	115	2.0	17	22	9	-	-	3.1	9.9	39	0.070	2.68	15
22.80	41.4	31.1	-	41.5	1.7	8.2	4.2	4	clayy SILT to silty CLAY	115	2.0	16	21	8	-	-	2.8	9.9	41	0.070	2.71	15
22.97	40.5	30.2	-	40.7	1.8	8.4	4.5	3	silty CLAY to CLAY	115	1.5	20	27	8	-	-	2.8	9.6	43	0.005	2.74	15
23.13	43.8	32.5	-	44.0	1.9	8.8	4.5	3	silty CLAY to CLAY	115	1.5	22	29	9	-	-	3.0	9.9	42	0.005	2.72	15
23.30	44.6	32.8	-	44.8	2.1	8.6	4.9	3	silty CLAY to CLAY	115	1.5	22	30	9	-	-	3.1	9.9	43	0.005	2.74	15
23.46	50.0	36.5	-	50.2	2.3	9.2	4.8	3	silty CLAY to CLAY	115	1.5	24	33	10	-	-	3.4	9.9	41	0.005	2.70	15
23.62	49.3	35.8	-	49.5	2.4	8.4	4.9	3	silty CLAY to CLAY	115	1.5	24	33	10	-	-	3.4	9.9	41	0.005	2.72	15
23.79	44.0	31.7	-	44.1	2.3	8.2	5.3	3	silty CLAY to CLAY	115	1.5	21	29	9	-	-	3.0	9.9	45	0.005	2.78	15
23.95	40.0	28.6	-	40.1	2.1	7.8	5.5	3	silty CLAY to CLAY	115	1.5	19	27	8	-	-	2.7	9.1	47	0.005	2.82	15
24.12	39.0	27.7	-	39.1	1.9	7.5	5.0	3	silty CLAY to CLAY	115	1.5	18	26	8	-	-	2.7	8.8	46	0.005	2.80	15
24.28	38.2	27.0	-	38.4	1.4	7.2	3.8	4	clayy SILT to silty CLAY	115	2.0	13	19	7	-	-	2.6	8.6	42	0.070	2.73	15
24.44	35.8	25.1	-	35.9	1.4	7.4	4.0	4	clayy SILT to silty CLAY	115	2.0	13	18	7	-	-	2.4	8.0	44	0.070	2.77	15
24.61	33.9	23.6	-	34.1	2.4	8.0	7.5	3	silty CLAY to CLAY	115	1.5	16	23	7	-	-	2.3	7.5	57	0.005	2.98	15
24.77	41.6	28.8	-	41.8	3.5	8.7	8.7	3	silty CLAY to CLAY	115	1.5	19	28	9	-	-	2.8	9.2	56	0.005	2.96	15
24.94	45.5	31.3	-	45.7	4.4	8.5	9.9	3	silty CLAY to CLAY	115	1.5	21	30	10	-	-	3.1	9.9	57	0.005	2.98	15
25.10	80.7	55.2	-	80.9	4.4	6.6	5.5	4	clayy SILT to silty CLAY	115	2.0	28	40	14	-	-	5.6	9.9	36	0.070	2.62	15
25.26	70.8	48.0	-	70.9	3.7	7.6	5.3	3	silty CLAY to CLAY	115	1.5	32	47	13	-	-	4.9	9.9	38	0.005	2.65	15
25.43	59.2	39.9	-	59.4	3.5	8.9	6.1	3	silty CLAY to CLAY	115	1.5	27	39	11	-	-	4.1	9.9	43	0.005	2.75	15
25.59	56.9	38.2	-	57.1	3.2	10.3	5.9	3	silty CLAY to CLAY	115	1.5	25	38	11	-	-	3.9	9.9	43	0.005	2.75	15
25.76	56.7	37.8	-	56.9	3.3	9.9	5.9	3	silty CLAY to CLAY	115	1.5	25	38	10	-	-	3.9	9.9	44	0.005	2.76	15
25.92	55.5	36.8	-	55.7	2.9	9.2	5.3	3	silty CLAY to CLAY	115	1.5	25	37	10	-	-	3.8	9.9	42	0.005	2.73	15
26.08	53.8	35.4	-	54.0	2.5	8.6	4.8	3	silty CLAY to CLAY	115	1.5	24	36	10	-	-	3.7	9.9	41	0.005	2.71	15
26.25	40.1	26.2	-	40.2	2.0	8.2	5.1	3	silty CLAY to CLAY	115	1.5	17	27	8	-	-	2.7	8.3	47	0.005	2.83	15
26.41	36.0	23.4	-	36.2	1.7	9.2	5.0	3	silty CLAY to CLAY	115	1.5	16	24	7	-	-	2.4	7.4	49	0.005	2.86	15
26.58	32.8	21.2	-	33.0	1.7	9.2	5.5	3	silty CLAY to CLAY	115	1.5	14	22	6	-	-	2.2	6.7	53	0.005	2.92	15
26.74	33.9	21.8	-	34.1	2.0	9.6	6.2	3	silty CLAY to CLAY	115	1.5	15	23	7	-	-	2.3	6.8	55	0.005	2.95	15
26.90	44.5	28.4	-	44.7	2.3	10.2	5.4	3	silty CLAY to CLAY	115	1.5	19	30	8	-	-	3.0	9.0	47	0.005	2.82	15
27.07	43.4	27.5	-	43.6	2.0	8.8	4.9	3	silty CLAY to CLAY	115	1.5	18	29	8	-	-	3.0	8.7	46	0.005	2.80	15
27.23	37.7	23.8	-	37.9	1.5	8.9	4.2	3	silty CLAY to CLAY	115	1.5	16	25	7	-	-	2.6	7.5	46	0.005	2.81	15
27.40	31.9	20.0	-	32.1	1.4	9.1	4.5	3	silty CLAY to CLAY	115	1.5	13	21	6	-	-	2.1	6.3	51	0.005	2.88	15
27.56	31.3	19.5	-	31.5	1.5	11.0	5.1	3	silty CLAY to CLAY	115	1.5	13	21	6	-	-	2.1	6.1	54	0.005	2.93	15
27.72	37.2	23.0	-	37.4	2.0	11.8	5.6	3	silty CLAY to CLAY	115	1.5	15	25	7	-	-	2.5	7.3	52	0.005	2.90	15
27.89	45.8	28.2	-	46.0	2.6	13.3	5.9	3	silty CLAY to CLAY	115	1.5	19	31	8	-	-	3.1	9.0	49	0.005	2.85	15
28.05	55.4	33.9	-	55.7	3.5	15.3	6.5	3	silty CLAY to CLAY	115	1.5	23	37	10	-	-	3.8	9.9	47	0.005	2.82	15
28.22	68.6	41.8	-	68.9	4.2	16.8	6.2	3	silty CLAY to CLAY	115	1.5	28	46	11	-	-	4.7	9.9	43	0.005	2.74	15
28.38	73.8	44.7	-	74.1	4.3	16.6	5.9	3	silty CLAY to CLAY	115	1.5	30	49	12	-	-	5.1	9.9	41	0.005	2.71	15
28.54	69.0	41.5	-	69.3	3.7	16.6	5.5	3	silty CLAY to CLAY	115	1.5	28	46	11	-	-	4.8	9.9	41	0.005	2.71	15
28.71	58.6	35.1	-	59.0	3.0	17.5	5.3	3	silty CLAY to CLAY	115	1.5	23	39	10	-	-	4.0	9.9	43	0.005	2.75	15
28.87	51.2	30.5	-	51.6	2.4	17.8	4.8	3	silty CLAY to CLAY	115	1.5	20	34	8	-	-	3.5	9.7	44	0.005	2.76	15
29.04	49.3	29.2	-	49.7	2.3	18.1	4.9	3	silty CLAY to CLAY	115	1.5	19	33	8	-	-	3.4	9.3	45	0.005	2.78	15
29.20	47.9	28.2	-	48.3	2.6	19.1	5.6	3	silty CLAY to CLAY	115	1.5	19	32	8	-	-	3.3	9.0	48	0.005	2.83	15
29.36	52.2	30.6	-	52.6	2.7	17.7	5.3	3	silty CLAY to CLAY	115	1.5	20	35	9	-	-	3.6	9.8	45	0.005	2.79	15
29.53	52.7	30.7	-	53.0	2.6	15.9	5.1	3	silty CLAY to CLAY	115	1.5	20	35	9	-	-	3.6	9.8	45	0.005	2.78	15
29.69	46.0	26.6	-	46.3	2.5	17.2	5.6	3	silty CLAY to CLAY	115	1.5	18	31	8	-	-	3.1	8.5	49	0.005	2.85	15
29.86	44.4	25.6	-	44.8	2.9	17.3	6.7	3	silty CLAY to CLAY	115	1.5	17	30	8	-	-	3.0	8.1	53	0.005	2.92	15
30.02	46.3	26.5	-	46.6	3.2	18.4	7.1	3	silty CLAY to CLAY	115	1.5	18	31	8	-	-	3.1	8.4	54	0.005	2.92	15
30.19	59.3	33.8	-	59.7	3.7	17.9	6.4	3	silty CLAY to CLAY	115	1.5	23	40	10	-	-	4.1	9.9	47	0.005	2.81	15
30.35	65.7	37.2	-	66.1	4.5	21.0	7.1	3	silty CLAY to CLAY	115	1.5	25	44	11	-	-	4.5	9.9	47	0.005	2.82	15
30.51	72.5	40.8	-	72.9	5.4	22.6	7.7	3	silty CLAY to CLAY	115	1.5	27	48	12	-	-	5.0	9.9	47	0.005	2.81	15
30.68	95.6	53.6	-	96.2	5.9	30.5	6.3	3	silty CLAY to CLAY	115	1.5	36	64	14	-	-	6.6	9.9	39	0.005	2.67	15
30.84	128.2	93.0	206.0	128.6	5.2	22.0	4.1	4	clayy SILT to silty CLAY	115	2.0	46	64	21	-	-	8.9	9.9	25	0.070	2.38	15

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Morada Water Tank Study

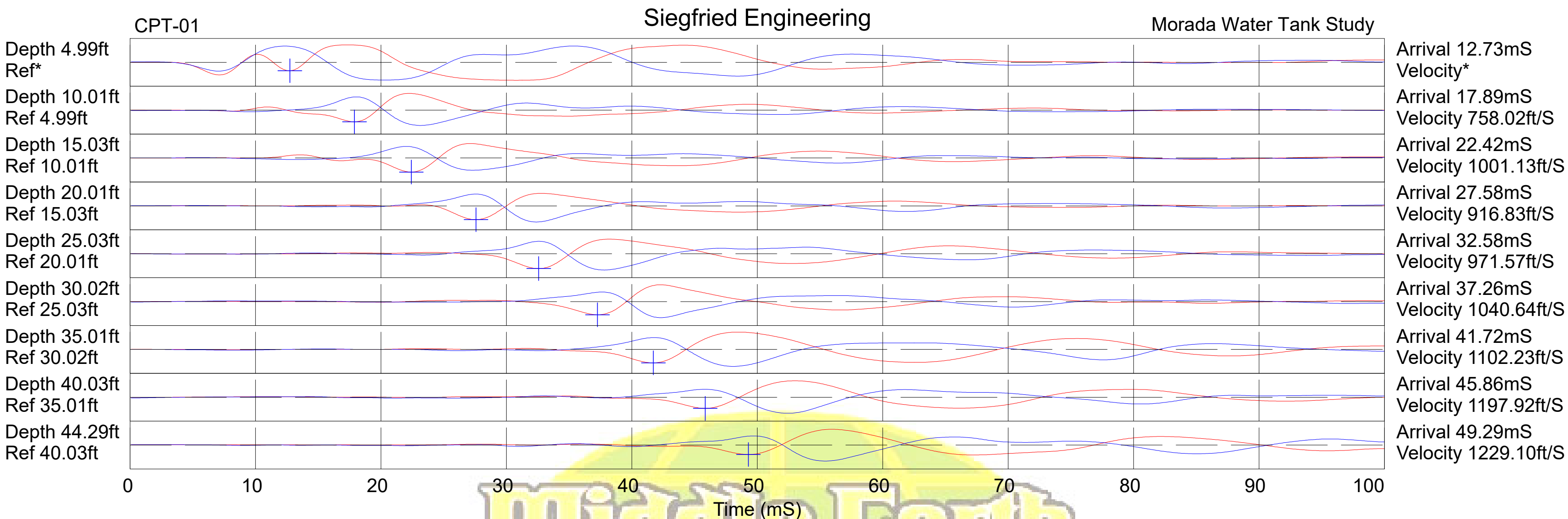
Project ID: Siegfried Engineering
Data File: SDF(426).cpt
CPT Date: 10/27/2023 12:13:12 PM
GW During Test: 40 ft

Sounding ID: CPT-01
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
31.01	145.4	105.1	192.9	145.7	4.7	19.1	3.3	5	silty SAND to sandy SILT	120	3.0	35	48	23	69	39	-	-	21	0.200	2.26	16
31.17	145.7	105.1	196.8	146.0	4.9	14.6	3.4	5	silty SAND to sandy SILT	120	3.0	35	49	23	69	39	-	-	22	0.200	2.28	16
31.33	156.6	112.6	214.2	156.8	5.7	12.4	3.7	5	silty SAND to sandy SILT	120	3.0	38	52	25	71	40	-	-	22	0.200	2.29	16
31.50	190.5	136.7	241.9	190.7	7.1	12.9	3.8	8	stiff SAND to clayy SAND	115	5.0	27	38	30	77	41	-	-	20	0.250	2.24	16
31.66	219.9	157.4	264.4	220.2	8.3	14.1	3.8	8	stiff SAND to clayy SAND	115	5.0	31	44	34	82	41	-	-	19	0.250	2.21	16
31.83	213.9	152.7	286.9	214.1	9.6	13.9	4.5	9	very stiff fine SOIL	120	1.0	100	100	34	-	-	7.5	9.9	22	0.250	2.28	30
31.99	193.4	137.6	246.5	193.6	7.4	12.6	3.9	8	stiff SAND to clayy SAND	115	5.0	28	39	30	78	41	-	-	21	0.250	2.25	16
32.15	152.8	108.5	230.8	153.1	6.6	13.8	4.4	9	very stiff fine SOIL	120	1.0	100	100	25	-	-	5.3	9.9	24	0.250	2.35	30
32.32	120.7	85.5	218.3	121.0	5.8	16.4	4.9	4	clayy SILT to silty CLAY	115	2.0	43	60	20	-	-	8.4	9.9	29	0.070	2.46	15
32.48	111.9	79.1	210.7	112.2	5.4	14.3	4.9	4	clayy SILT to silty CLAY	115	2.0	40	56	19	-	-	7.8	9.9	30	0.070	2.48	15
32.65	93.3	49.1	-	93.6	5.7	17.2	6.2	3	silty CLAY to CLAY	115	1.5	33	62	13	-	-	6.5	9.9	40	0.005	2.69	15
32.81	89.8	47.0	-	90.2	6.7	23.6	7.6	3	silty CLAY to CLAY	115	1.5	31	60	13	-	-	6.2	9.9	44	0.005	2.77	15
32.97	140.9	98.8	271.3	141.5	8.5	29.8	6.1	9	very stiff fine SOIL	120	1.0	99	100	24	-	-	4.9	9.9	30	0.250	2.50	30
33.14	136.1	95.2	270.2	137.0	8.4	48.7	6.3	9	very stiff fine SOIL	120	1.0	95	100	23	-	-	4.7	9.9	31	0.250	2.51	30
33.30	114.9	59.3	-	115.6	6.8	36.7	6.0	3	silty CLAY to CLAY	115	1.5	40	77	15	-	-	8.0	9.9	37	0.005	2.63	15
33.47	98.6	50.6	-	99.6	5.3	52.8	5.5	3	silty CLAY to CLAY	115	1.5	34	66	13	-	-	6.8	9.9	37	0.005	2.64	15
33.63	94.0	48.0	-	95.5	5.2	76.4	5.7	3	silty CLAY to CLAY	115	1.5	32	63	13	-	-	6.5	9.9	39	0.005	2.67	15
33.79	92.5	47.0	-	93.9	6.0	73.5	6.7	3	silty CLAY to CLAY	115	1.5	31	62	13	-	-	6.4	9.9	42	0.005	2.73	15
33.96	92.6	46.9	-	93.5	6.4	48.5	7.0	3	silty CLAY to CLAY	115	1.5	31	62	13	-	-	6.4	9.9	43	0.005	2.75	15
34.12	99.4	50.1	-	100.3	6.6	43.9	6.7	3	silty CLAY to CLAY	115	1.5	33	66	14	-	-	6.9	9.9	41	0.005	2.71	15
34.29	100.4	50.3	-	101.2	6.4	40.8	6.5	3	silty CLAY to CLAY	115	1.5	34	67	14	-	-	7.0	9.9	41	0.005	2.70	15
34.45	93.3	46.5	-	94.1	6.1	41.0	6.6	3	silty CLAY to CLAY	115	1.5	31	62	13	-	-	6.5	9.9	42	0.005	2.73	15
34.61	84.0	41.7	-	84.7	5.0	39.9	6.1	3	silty CLAY to CLAY	115	1.5	28	56	11	-	-	5.8	9.9	42	0.005	2.74	15
34.78	76.3	37.7	-	77.2	4.7	46.7	6.3	3	silty CLAY to CLAY	115	1.5	25	51	11	-	-	5.2	9.9	45	0.005	2.78	15
34.94	74.2	36.5	-	75.3	4.2	54.4	5.8	3	silty CLAY to CLAY	115	1.5	24	49	10	-	-	5.1	9.9	44	0.005	2.76	15
35.11	74.9	36.7	-	75.9	4.2	52.0	5.8	3	silty CLAY to CLAY	115	1.5	24	50	10	-	-	5.1	9.9	44	0.005	2.76	15
35.27	72.2	35.2	-	73.6	4.0	72.4	5.7	3	silty CLAY to CLAY	115	1.5	23	48	10	-	-	5.0	9.9	44	0.005	2.77	15
35.43	73.3	35.6	-	74.2	4.2	47.2	5.8	3	silty CLAY to CLAY	115	1.5	24	49	10	-	-	5.0	9.9	44	0.005	2.77	15
35.60	74.3	35.9	-	75.2	4.0	48.1	5.5	3	silty CLAY to CLAY	115	1.5	24	50	10	-	-	5.1	9.9	43	0.005	2.75	15
35.76	71.2	34.2	-	72.1	3.7	45.2	5.3	3	silty CLAY to CLAY	115	1.5	23	47	9	-	-	4.9	9.9	43	0.005	2.75	15
35.93	64.2	30.7	-	64.9	3.6	36.9	5.7	3	silty CLAY to CLAY	115	1.5	20	43	9	-	-	4.4	9.8	47	0.005	2.81	15
36.09	57.7	27.5	-	58.5	3.0	41.3	5.4	3	silty CLAY to CLAY	115	1.5	18	38	8	-	-	3.9	8.7	48	0.005	2.83	15
36.26	49.5	23.5	-	50.2	2.7	32.2	5.7	3	silty CLAY to CLAY	115	1.5	16	33	7	-	-	3.4	7.4	52	0.005	2.90	15
36.42	45.0	21.2	-	45.8	2.3	40.2	5.4	3	silty CLAY to CLAY	115	1.5	14	30	6	-	-	3.0	6.7	53	0.005	2.91	15
36.58	44.8	21.1	-	45.7	2.1	45.2	4.9	3	silty CLAY to CLAY	115	1.5	14	30	6	-	-	3.0	6.6	51	0.005	2.89	15
36.75	43.2	20.2	-	44.0	2.5	41.3	6.2	3	silty CLAY to CLAY	115	1.5	13	29	6	-	-	2.9	6.3	56	0.005	2.97	15
36.91	46.5	21.7	-	47.3	2.7	41.2	6.1	3	silty CLAY to CLAY	115	1.5	14	31	7	-	-	3.1	6.8	55	0.005	2.94	15
37.08	45.4	21.1	-	45.9	2.7	26.0	6.3	3	silty CLAY to CLAY	115	1.5	14	30	7	-	-	3.1	6.6	56	0.005	2.96	15
37.24	42.6	19.7	-	43.2	2.3	29.4	5.7	3	silty CLAY to CLAY	115	1.5	13	28	6	-	-	2.9	6.2	55	0.005	2.95	15
37.40	37.0	17.0	-	37.6	2.6	30.2	7.4	3	silty CLAY to CLAY	115	1.5	11	25	6	-	-	2.5	5.3	64	0.005	3.08	15
37.57	41.2	18.9	-	41.8	2.9	30.7	7.4	3	silty CLAY to CLAY	115	1.5	13	27	6	-	-	2.8	5.9	62	0.005	3.05	15
37.73	60.6	27.7	-	61.0	3.7	19.0	6.3	3	silty CLAY to CLAY	115	1.5	18	40	8	-	-	4.1	8.8	50	0.005	2.87	15
37.90	65.7	29.8	-	66.1	4.1	19.7	6.5	3	silty CLAY to CLAY	115	1.5	20	44	9	-	-	4.5	9.5	49	0.005	2.86	15
38.06	75.2	34.0	-	75.5	4.1	17.7	5.6	3	silty CLAY to CLAY	115	1.5	23	50	10	-	-	5.2	9.9	44	0.005	2.77	15
38.22	71.5	32.2	-	71.9	4.1	19.9	5.9	3	silty CLAY to CLAY	115	1.5	21	48	9	-	-	4.9	9.9	46	0.005	2.80	15
38.39	79.5	35.7	-	79.9	3.7	17.8	4.8	3	silty CLAY to CLAY	115	1.5	24	53	10	-	-	5.5	9.9	41	0.005	2.71	15
38.55	71.9	32.1	-	72.3	3.5	17.0	5.0	3	silty CLAY to CLAY	115	1.5	21	48	9	-	-	4.9	9.9	44	0.005	2.76	15
38.72	70.5	31.4	-	70.9	3.7	19.9	5.4	3	silty CLAY to CLAY	115	1.5	21	47	9	-	-	4.8	9.9	45	0.005	2.79	15
38.88	77.8	34.4	-	78.1	3.9	16.6	5.1	3	silty CLAY to CLAY	115	1.5	23	52	9	-	-	5.3	9.9	43	0.005	2.74	15
39.04	76.6	33.8	-	76.9	3.8	16.7	5.1	3	silty CLAY to CLAY	115	1.5	23	51	9	-	-	5.3	9.9	43	0.005	2.74	15
39.21	77.4	34.0	-	77.8	3.7	19.4	5.0	3	silty CLAY to CLAY	115	1.5	23	52	9	-	-	5.3	9.9	42	0.005	2.74	15
39.37	107.1	68.8	175.2	107.5	4.2	17.3	4.0	4	clayy SILT to silty CLAY	115	2.0	34	54	16	-	-	7.4	9.9	29	0.070	2.45	15
39.54	130.5	83.6	188.5	130.8	5.0	15.4	3.9	4	clayy SILT to silty CLAY	115	2.0	42	65	19	-	-	9.1	9.9	26	0.070	2.39	15
39.70	129.5	82.9	185.6	129.9	4.8	16.9	3.8	4	clayy SILT to silty CLAY	115	2.0	41	65	19	-	-	9.0	9.9	26	0.070	2.38	15
39.86	126.5	80.7	194.8	126.9	5.2	20.5	4.2	4	clayy SILT to silty CLAY	115	2.0	40	63	19	-	-	8.8	9.9	27	0.070	2.42	15
40.03	143.8	91.7	197.3	144.2	5.5	20.5	3.9	4	clayy SILT to silty CLAY	115	2.0	46	72	21	-	-	10.0	9.9	25	0.070	2.36	15
40.19	171.4	109.2	205.3	171.7	6.0	15.8	3.5	5	silty SAND to sandy SILT	120	3.0	36	57	24	70	39	-	-	22	0.200	2.28	16
40.36	191.3	121.8	215.5	191.7	6.5	16.4	3.4	5	silty SAND to sandy SILT	120	3.0	41	64	26	74	39	-	-	20	0.200	2.24	16
40.52	197.8	125.8	218.5	198.2	6.7	16.9	3.4	5	silty SAND to sandy SILT	120	3.0	42	66	27	75	40	-	-	20	0.200	2.23	16
40.68	197.3	125.3	223.1	197.6	6.9	16.7	3.6	5	silty SAND to sandy SILT	120	3.0	42	66	27	74	40	-	-	20	0.200	2.24	16
40.85	192.9	122.4	230.2	193.3	7.4	17.4	3.9	8	stiff SAND to clayy SAND	115	5.0	24	39	27	74	39	-	-	22	0.250	2.28	16
41.01	199.7	126.6	232.4	200.0	7.5	18.1	3.8	8	stiff SAND to clayy SAND	115	5.0	25	40	28	75	40	-	-	21	0.250	2.26	16
41.18	200.5	127.0	231.5	200.8	7.4	18.8	3.8	8	stiff SAND to clayy SAND	115	5.0	25	40	28	75	40	-	-	21	0.250	2.26	16
41.34	203.5	128.8	231.4	203.9	7.4	19.9	3.7	8	stiff SAND to clayy SAND	115	5.0	26	41	28	75	40	-	-	21	0.250	2.25	16
41.50	214.6	135.7	242.9	215.0	8.1	19.8	3.8	8	stiff SAND to clayy SAND	115	5.0	27	43	29	77	40	-	-	21	0.250	2.25	16
41.67	242.5	153.2	245.9	242.9	8.1	21.3	3.4	8	stiff SAND to clayy SAND	115	5.0	31	49	32	81	41	-	-	18	0.250	2.17	16
41.83	270.2	170.5	266.5	270.7	9.3	25.0	3.5	8	stiff SAND to clayy SAND	115	5.0	34	54	36	85	41	-	-	18	0.250	2.15	16
42.00	272.2	171.6	267.1	272.7	9.3	25.9	3.5	8	stiff SAND to clayy SAND	115	5.0	34	54	36	85	41	-	-	17	0.250	2.15	16
42.16	261.4	164.6	263.6	261.9	9.2	27.9	3.6	8	stiff SAND to clayy SAND	115	5.0	33	52	35	83	41	-	-	18	0.250	2.17	16
42.32	264.0	166.1	275.8	264.5	10.0	28.9	3.8	8	stiff SAND to clayy SAND	115	5.0	33	53	35	84	41	-	-	19	0.250	2.20	16
42.49	284.9	179.1	281.7	285.5	10.3	31.6	3.6	8	stiff SAND to clayy SAND	115	5.0	36	57	37	86	41	-	-	18	0.250	2.16	16
42.65	293.2	184.2	278.2	293.8	9.9	33.7	3.4	8	stiff SAND to clayy SAND	115	5.0	37	59	38	87	42	-	-	17	0.250	2.13	16
42.82	274.8	172.5	265.3	275.5	9.2	34.8	3.4	8	stiff SAND to clayy SAND	115	5.0	34	55	36	85	41	-	-	17	0.250	2.14	16
42.98	275.3	172.6	258.9	275.9	8.8	32.9	3.2	8	stiff SAND to clayy SAND	115	5.0	35	55	36	85	41	-	-	17	0.250	2.12	16
43.15	292.2	183.1	266.6	292.8	9.1	33.8	3.1	8	stiff SAND to clayy SAND	115	5.0	37	58	37	87	42	-	-	16	0.250	2.10	16
43.31	320.6	200.7	278.7	321.3	9.5	37.4	3.0	8	stiff SAND to clayy SAND	115	5.0	40	64	40	90	42	-	-	15	0.250	2.06	16
43.47	347.1	217.1	291.0	347.8	10.0	33.6	2.9	8	stiff SAND to clayy SAND	115	5.0	43	69	43	93	42	-	-	14	0.250	2.03	16
43.64	391.4	244.5	318.3	392.2	11.3	40.7	2.9	8	stiff SAND to clayy SAND	115	5.0	49	78	48	95	43	-	-	13	0.250	2.00	16
43.80	482.9	301.5	365.6	483.8	12.9	45.2	2.7	8	stiff SAND to clayy SAND	115	5.0	60	97	58	95	44	-	-	11	0.250	1.92	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing



Hammer to Rod String Distance (ft): 5.83

* = Not Determined

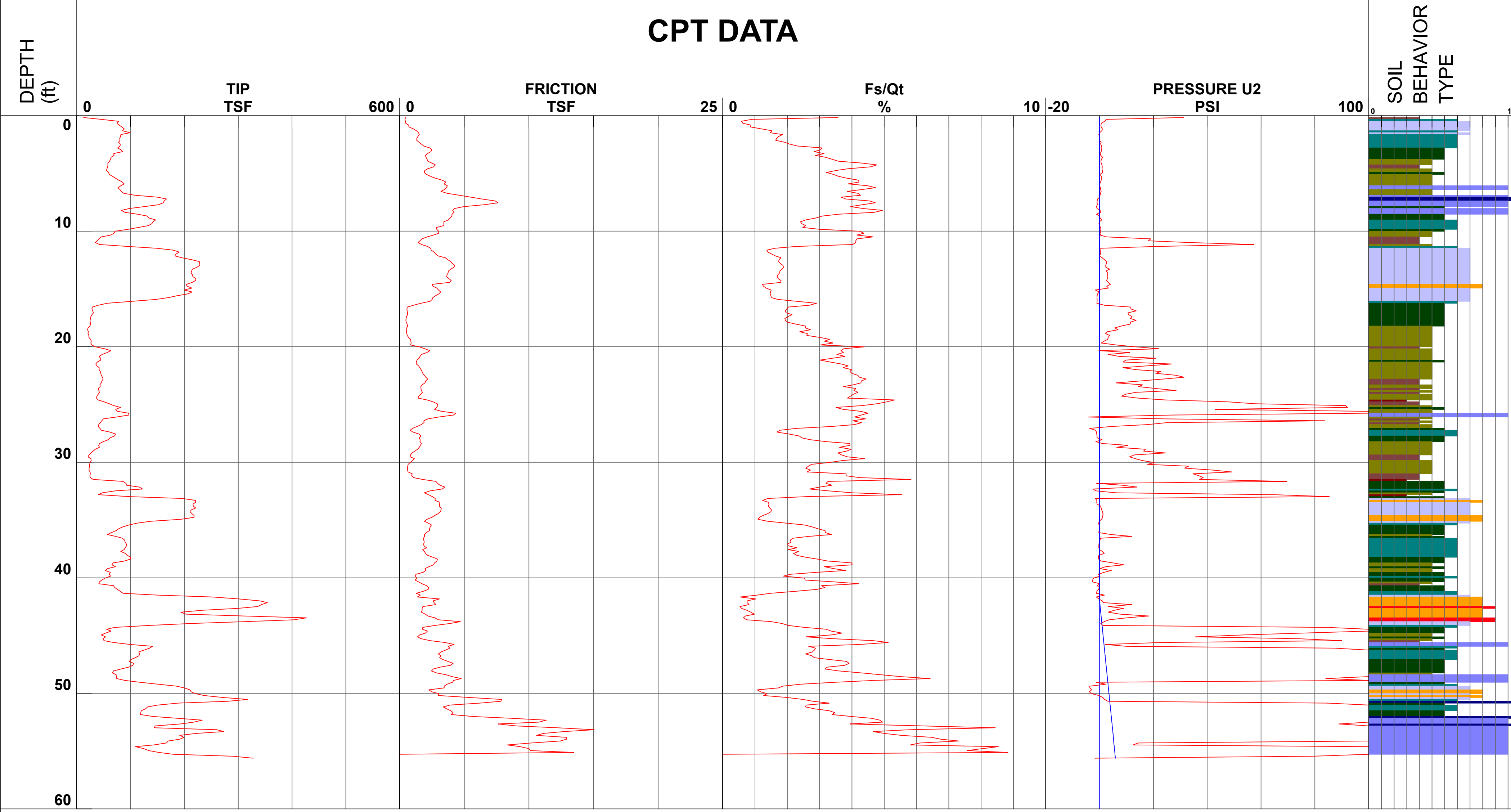
COMMENT:

Siegfried Engineering

Project	Morada Water Tank Study	Operator	JM-FA	Filename	SDF(422).cpt
Job Number	23095-5001	Cone Number	DDG1587	GPS	
Hole Number	CPT-02	Date and Time	23095-5001	Maximum Depth	55.61 ft
EST GW Depth During Test		42.00 ft			

Net Area Ratio .8

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Project ID: Siegfried Engineering
Data File: SDF(422).cpt
CPT Date: 10/27/2023 8:19:17 AM
GW During Test: 42 ft

Sounding ID: CPT-02
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
0.33	45.4	72.8	93.8	45.5	0.4	2.5	0.9	6	clean SAND to silty SAND	125	5.0	15	9	14	57	48	-	-	13	0.350	1.99	16
0.49	77.9	124.9	128.4	77.9	0.4	1.9	0.6	6	clean SAND to silty SAND	125	5.0	25	16	22	74	48	-	-	6	0.350	1.69	16
0.66	74.7	119.8	126.3	74.7	0.5	0.7	0.6	6	clean SAND to silty SAND	125	5.0	24	15	21	73	48	-	-	7	0.350	1.72	16
0.82	79.1	126.8	139.7	79.1	0.7	0.5	0.9	6	clean SAND to silty SAND	125	5.0	25	16	23	75	48	-	-	8	0.350	1.79	16
0.98	83.7	134.3	145.8	83.7	0.7	0.6	0.9	6	clean SAND to silty SAND	125	5.0	27	17	24	77	48	-	-	8	0.350	1.77	16
1.15	88.6	142.0	162.9	88.6	1.1	1.1	1.2	6	clean SAND to silty SAND	125	5.0	28	18	26	79	48	-	-	9	0.350	1.85	16
1.31	85.1	136.4	167.4	85.1	1.3	0.9	1.5	6	clean SAND to silty SAND	125	5.0	27	17	26	77	48	-	-	11	0.350	1.94	16
1.48	99.1	158.9	186.1	99.1	1.5	0.0	1.5	6	clean SAND to silty SAND	125	5.0	32	20	30	82	48	-	-	10	0.350	1.88	16
1.64	82.1	131.7	173.1	82.1	1.5	-0.2	1.9	5	silty SAND to sandy SILT	120	3.0	44	27	26	76	48	-	-	13	0.200	2.01	16
1.80	81.4	130.5	167.9	81.4	1.4	0.0	1.7	6	clean SAND to silty SAND	125	5.0	26	16	26	76	48	-	-	13	0.350	1.99	16
1.97	79.9	128.1	164.1	79.9	1.3	-0.1	1.7	6	clean SAND to silty SAND	125	5.0	26	16	25	75	48	-	-	13	0.350	1.98	16
2.13	80.4	128.9	164.0	80.4	1.3	0.0	1.6	6	clean SAND to silty SAND	125	5.0	26	16	25	75	48	-	-	12	0.350	1.98	16
2.30	77.8	124.7	168.4	77.8	1.5	0.6	1.9	5	silty SAND to sandy SILT	120	3.0	42	26	25	74	48	-	-	14	0.200	2.04	16
2.46	81.0	130.0	178.0	81.0	1.7	0.4	2.1	5	silty SAND to sandy SILT	120	3.0	43	27	26	76	48	-	-	14	0.200	2.05	16
2.62	80.4	128.9	184.8	80.4	1.9	0.8	2.3	5	silty SAND to sandy SILT	120	3.0	43	27	26	75	48	-	-	15	0.200	2.09	16
2.79	75.9	121.7	203.0	75.9	2.3	0.5	3.1	5	silty SAND to sandy SILT	120	3.0	41	25	26	73	48	-	-	19	0.200	2.20	16
2.95	82.3	132.1	211.5	82.4	2.5	0.8	3.0	5	silty SAND to sandy SILT	120	3.0	44	27	28	76	48	-	-	18	0.200	2.17	16
3.12	85.2	136.6	209.7	85.2	2.4	0.6	2.8	5	silty SAND to sandy SILT	120	3.0	46	28	28	77	48	-	-	17	0.200	2.14	16
3.28	68.7	110.2	193.5	68.7	2.2	0.2	3.1	5	silty SAND to sandy SILT	120	3.0	37	23	24	70	46	-	-	20	0.200	2.23	16
3.45	69.3	111.1	185.9	69.3	2.0	0.5	2.9	5	silty SAND to sandy SILT	120	3.0	37	23	24	70	46	-	-	19	0.200	2.20	16
3.61	63.9	102.5	187.1	63.9	2.0	1.1	3.2	5	silty SAND to sandy SILT	120	3.0	34	21	22	68	46	-	-	21	0.200	2.26	16
3.77	62.7	100.6	191.4	62.7	2.1	0.7	3.4	5	silty SAND to sandy SILT	120	3.0	34	21	22	67	45	-	-	22	0.200	2.29	16
3.94	61.0	97.9	194.5	61.0	2.2	0.5	3.6	5	silty SAND to sandy SILT	120	3.0	33	20	22	66	45	-	-	23	0.200	2.31	16
4.10	57.7	92.6	209.8	57.8	2.5	0.6	4.3	4	clayy SILT to silty CLAY	115	2.0	46	29	21	-	-	4.1	9.9	26	0.070	2.39	15
4.27	58.0	93.0	224.1	58.0	2.8	0.9	4.8	9	very stiff fine SOIL	120	1.0	93	58	22	-	-	2.0	9.9	27	0.250	2.42	30
4.43	57.4	92.1	217.7	57.4	2.6	1.0	4.6	9	very stiff fine SOIL	120	1.0	92	57	21	-	-	2.0	9.9	27	0.250	2.41	30
4.59	55.9	89.7	194.2	55.9	2.2	0.9	3.9	4	clayy SILT to silty CLAY	115	2.0	45	28	20	-	-	3.9	9.9	25	0.070	2.36	15
4.76	55.3	88.8	182.9	55.4	1.9	1.0	3.5	5	silty SAND to sandy SILT	120	3.0	30	18	20	63	44	-	-	24	0.200	2.33	16
4.92	59.4	95.3	181.0	59.5	1.9	1.1	3.2	5	silty SAND to sandy SILT	120	3.0	32	20	21	65	44	-	-	22	0.200	2.28	16
5.09	60.4	96.9	189.4	60.5	2.1	0.2	3.5	5	silty SAND to sandy SILT	120	3.0	32	20	22	66	44	-	-	23	0.200	2.30	16
5.25	66.4	106.5	204.0	66.4	2.4	0.7	3.6	5	silty SAND to sandy SILT	120	3.0	35	22	24	69	44	-	-	22	0.200	2.29	16
5.41	71.7	115.0	221.2	71.7	2.8	0.7	3.9	8	stiff SAND to clayy SAND	115	5.0	23	14	25	72	44	-	-	22	0.250	2.29	16
5.58	77.9	125.0	243.6	77.9	3.3	0.6	4.2	9	very stiff fine SOIL	120	1.0	100	78	28	-	-	2.7	9.9	23	0.250	2.30	30
5.74	84.8	135.9	257.0	84.8	3.6	0.4	4.2	9	very stiff fine SOIL	120	1.0	100	85	30	-	-	3.0	9.9	22	0.250	2.28	30
5.91	88.3	141.6	251.4	88.3	3.4	0.1	3.9	8	stiff SAND to clayy SAND	115	5.0	28	18	31	78	45	-	-	20	0.250	2.24	16
6.07	82.0	131.5	261.2	82.0	3.7	0.0	4.5	9	very stiff fine SOIL	120	1.0	100	82	29	-	-	2.9	9.9	23	0.250	2.31	30
6.23	76.5	121.0	257.1	76.5	3.6	0.3	4.8	9	very stiff fine SOIL	120	1.0	100	76	27	-	-	2.7	9.9	24	0.250	2.35	30
6.40	80.3	125.4	248.3	80.3	3.5	0.4	4.3	9	very stiff fine SOIL	120	1.0	100	80	28	-	-	2.8	9.9	23	0.250	2.31	30
6.56	82.7	127.5	235.4	82.7	3.2	0.6	3.9	8	stiff SAND to clayy SAND	115	5.0	25	17	28	75	44	-	-	21	0.250	2.27	16
6.73	87.6	133.5	253.4	87.6	3.7	0.3	4.2	9	very stiff fine SOIL	120	1.0	100	88	29	-	-	3.1	9.9	22	0.250	2.28	30
6.89	108.4	163.3	288.7	108.4	4.6	0.2	4.3	9	very stiff fine SOIL	120	1.0	100	100	35	-	-	3.8	9.9	20	0.250	2.24	30
7.05	149.7	222.9	328.3	149.7	5.5	0.1	3.7	8	stiff SAND to clayy SAND	115	5.0	45	30	46	93	47	-	-	16	0.250	2.11	16
7.22	166.8	245.6	357.6	166.8	6.3	-0.7	3.8	8	stiff SAND to clayy SAND	115	5.0	49	33	50	95	47	-	-	16	0.250	2.10	16
7.38	162.4	236.6	380.8	162.4	7.4	-0.9	4.6	9	very stiff fine SOIL	120	1.0	100	100	50	-	-	5.7	9.9	18	0.250	2.18	30
7.55	160.9	231.9	383.6	160.9	7.6	-0.9	4.7	9	very stiff fine SOIL	120	1.0	100	100	49	-	-	5.7	9.9	19	0.250	2.19	30
7.71	151.5	216.0	348.3	151.5	6.5	-0.8	4.3	9	very stiff fine SOIL	120	1.0	100	100	46	-	-	5.3	9.9	18	0.250	2.18	30
7.87	125.9	177.6	292.4	125.9	5.0	-1.2	4.0	8	stiff SAND to clayy SAND	115	5.0	36	25	38	86	45	-	-	19	0.250	2.19	16
8.04	97.4	136.1	261.7	97.4	4.2	-0.9	4.4	9	very stiff fine SOIL	120	1.0	100	97	30	-	-	3.4	9.9	22	0.250	2.29	30
8.20	82.9	114.6	256.8	82.9	4.1	0.2	5.0	9	very stiff fine SOIL	120	1.0	100	83	26	-	-	2.9	9.9	26	0.250	2.38	30
8.37	89.7	122.8	257.9	89.7	4.2	0.4	4.7	9	very stiff fine SOIL	120	1.0	100	90	28	-	-	3.2	9.9	24	0.250	2.34	30
8.53	112.6	152.7	252.8	112.6	4.0	-1.1	3.6	8	stiff SAND to clayy SAND	115	5.0	31	23	32	81	44	-	-	19	0.250	2.20	16
8.69	131.0	176.0	257.7	131.0	4.0	0.1	3.1	5	silty SAND to sandy SILT	120	3.0	59	44	36	86	45	-	-	16	0.200	2.10	16
8.86	134.4	179.0	253.1	134.4	3.9	0.2	2.9	5	silty SAND to sandy SILT	120	3.0	60	45	36	86	45	-	-	15	0.200	2.08	16
9.02	146.6	193.4	255.5	146.6	3.8	0.8	2.6	5	silty SAND to sandy SILT	120	3.0	64	49	38	89	45	-	-	13	0.200	2.02	16
9.19	141.9	185.5	242.2	141.9	3.4	-0.1	2.4	5	silty SAND to sandy SILT	120	3.0	62	47	36	87	45	-	-	13	0.200	2.00	16
9.35	139.6	180.9	239.3	139.6	3.4	-0.2	2.5	5	silty SAND to sandy SILT	120	3.0	60	47	36	87	45	-	-	13	0.200	2.02	16
9.51	133.2	171.1	234.2	133.2	3.4	0.0	2.6	5	silty SAND to sandy SILT	120	3.0	57	44	34	85	45	-	-	14	0.200	2.05	16
9.68	115.1	146.6	207.6	115.1	2.8	0.3	2.5	5	silty SAND to sandy SILT	120	3.0	49	38	30	80	44	-	-	15	0.200	2.08	16
9.84	95.6	120.8	200.1	95.6	2.9	0.5	3.0	5	silty SAND to sandy SILT	120	3.0	40	32	26	73	43	-	-	19	0.200	2.20	16
10.01	71.2	89.2	205.1	71.2	3.0	0.2	4.3	4	clayy SILT to silty CLAY	115	2.0	45	36	21	-	-	5.0	9.9	26	0.070	2.40	15
10.17	69.3	86.1	205.3	69.3	3.0	0.5	4.4	4	clayy SILT to silty CLAY	115	2.0	43	35	20	-	-	4.9	9.9	27	0.070	2.42	15
10.34	63.2	78.0	189.9	63.3	2.6	0.2	4.2	4	clayy SILT to silty CLAY	115	2.0	39	32	18	-	-	4.4	9.9	28	0.070	2.43	15
10.50	45.8	56.1	174.5	45.9	2.1	2.5	4.7	4	clayy SILT to silty CLAY	115	2.0	28	23	14	-	-	3.2	9.9	34	0.070	2.56	15
10.66	41.3	50.2	155.6	41.7	1.7	19.0	4.2	4	clayy SILT to silty CLAY	115	2.0	25	21	13	-	-	2.9	9.9	34	0.070	2.56	15
10.83	38.1	45.9	149.0	38.4	1.6	18.1	4.2	4	clayy SILT to silty CLAY	115	2.0	23	19	12	-	-	2.6	9.9	35	0.070	2.59	15
10.99	34.4	45.3	148.6	35.1	1.4	33.4	4.2	4	clayy SILT to silty CLAY	115	2.0	23	17	12	-	-	2.4	9.9	35	0.070	2.59	15
11.16	42.1	50.0	152.4	43.2	1.7	57.4	4.1	4	clayy SILT to silty CLAY	115	2.0	25	21	12	-	-	2.9	9.9	33	0.070	2.55	15
11.32	95.5	112.8	169.0	95.9	2.2	21.0	2.3	5	silty SAND to sandy SILT	120	3.0	38	32	23	71	42	-	-	17	0.200	2.12	16
11.48	149.3	175.0	205.5	149.3	2.4	0.0	1.6	6	clean SAND to silty SAND	125	5.0	35	30	33	85	44	-	-	10	0.350	1.88	16
11.65	179.5	208.8	228.0	179.5	2.4	0.3	1.4	6	clean SAND to silty SAND	125	5.0	42	36	38	91	45	-	-	8	0.350	1.78	16
11.81	190.3	219.8	239.2	190.3	2.7	0.3	1.4	6	clean SAND to silty SAND	125	5.0	44	38	40	93	45	-	-	8	0.350	1.77	16
11.98	184.2	211.2	235.7	184.2	2.8	0.4	1.5	6	clean SAND to silty SAND	125	5.0	42	37	39	92	45	-	-	8	0.350	1.81	16
12.14	182.4	207.7	236.3	182.4	3.0	-0.1	1.6	6	clean SAND to silty SAND	125	5.0	42	36	38	91	45	-	-	9	0.350	1.84	16
12.30	195.3	220.8	254.6	195.3	3.5	1.0	1.8	6	clean SAND to silty SAND	125	5.0	44	39	41	93	45	-	-	9	0.350	1.86	16
12.47	213.7	239.9	270.0	213.7	3.7	1.8	1.7	6	clean SAND to silty SAND	125	5.0	48	43	44	95	46	-	-	9	0.350	1.82	16
12.63	227.8	254.1	282.7	227.9	3.9	2.7	1.7	6	clean SAND to silty SAND	125	5.0	51	46	46	95	46	-	-	8	0.350	1.81	16
12.80	228.4	253.0	283.5	228.4	4.1	2.6	1.8	6	clean SAND to silty SAND	125	5.0	51	46	46	95	46	-	-	9	0.350	1.82	16
12.96	228.9	251.9	285.7	228.9	4.3	2.3	1.9	6	clean SAND to silty SAND	125	5.0	50	46	47	95	46	-	-	9	0.350	1.84	16
13.12	223.2	244.0	278.9	223.2	4.2	2.4	1.9	6	clean SAND to silty SAND	125	5.0	49	45	45	95	46	-	-	9	0.350	1.85	16
13.29	214.9	233.5	267.4	215.0	3.9	3.7	1.8	6	clean SAND to silty SAND	125	5.0	47	43	43	95	45	-	-	9	0.350	1.85	16
13.45	213.6	230.6	262.4	213.6	3.8	2.4	1.8	6	clean SAND to silty SAND	125	5.0	46	43	43	95	45	-	-	9	0.350	1.84	16
13.62	212.5	227.9	259.6	212.6	3.7	3.1	1.8	6	clean SAND to silty SAND	125	5.0	46	42	42	94	45	-	-	9	0.350	1.84	16
13.78	215.0	229.2	258.7	215.0	3.7	3.0	1.7	6	clean SAND to silty SAND	125	5.0	46	43	42	94	45	-	-	9	0.350	1.83	16
13.94	216.0	228.8	257.7	216.0	3.6	3.1	1.7	6	clean SAND to silty SAND	125	5.0	46	43	42	94	45	-	-	9	0.350	1.83	16
14.11	221.6	233.4	263.1	221.6	3.8	2.9	1.7	6	clean SAND to silty SAND	125	5.0	47	44	43	95	45	-	-	9	0.350	1.83	16
14.27	220.7	231.0	264.1	220.7	4.0	2.7	1.8	6	clean SAND to silty SAND	125	5.0	46	44	43	95	45	-	-	9	0.350	1.85	16
14.44	214.6	223.3	256.5	214.6	3.9	3.3	1.8	6	clean SAND to silty SAND	125	5.0	45	43	42	94	45	-	-	9	0.350	1.85	16
14.60	203.7	210.7	224.8	203.8	2.5	4.0	1.2	6	clean SAND to silty SAND	125	5.0	42	41	38	92	45	-	-	7	0.350	1.74	16
14.76	204.7	210.6	225.8	204.8	2.6	2.7	1.3	6	clean SAND to silty SAND	125	5.0	42	41	38	92	45	-	-	7	0.350	1.75	16
14.93	213.9	218.8	236.0	213.9	2.9	3.3	1.3	6	clean SAND to silty SAND	125	5.0	44	43	39	93	45	-	-	7	0.350	1.76	16
15.09	199.9	203.3	227.9	199.9	3.0	-1.5	1.5	6	clean SAND to silty SAND	125	5.0	41	40	37	90	44	-	-	9	0.350	1.82	16
15.26	214.2	216.6	239.3	214.2	3.2	-0.1	1.5	6	clean SAND to silty SAND	125	5.0	43	43	39	93	45	-	-	8	0.350	1.80	16
15.42	207.2	208.4	231.3	207.2	3.0	-0.7	1.5	6	clean SAND to silty SAND	125	5.0	42	41	38	91	45	-	-	8	0.350	1.80	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Morada Water Tank Study

Project ID: Siegfried Engineering
Data File: SDF(422).cpt
CPT Date: 10/27/2023 8:19:17 AM
GW During Test: 42 ft

Sounding ID: CPT-02
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
15.58	187.2	187.2	212.9	187.2	2.8	-0.9	1.5	6	clean SAND to silty SAND	125	5.0	37	37	35	88	44	-	-	9	0.350	1.84	16
15.75	170.4	169.5	197.3	170.4	2.6	-0.9	1.5	6	clean SAND to silty SAND	125	5.0	34	34	32	84	43	-	-	10	0.350	1.87	16
15.91	146.6	145.1	181.5	146.6	2.5	-0.9	1.7	6	clean SAND to silty SAND	125	5.0	29	29	28	79	43	-	-	12	0.350	1.96	16
16.08	102.9	101.2	159.5	102.8	2.4	-0.9	2.3	5	silty SAND to sandy SILT	120	3.0	34	34	21	67	41	-	-	18	0.200	2.16	16
16.24	56.7	55.5	133.4	56.7	1.6	-1.0	3.0	4	clayy SILT to silty CLAY	115	2.0	28	28	13	-	-	3.9	9.9	27	0.070	2.42	15
16.40	40.2	39.1	111.2	40.2	1.1	1.8	2.8	4	clayy SILT to silty CLAY	115	2.0	20	20	10	-	-	2.8	9.9	31	0.070	2.51	15
16.57	28.9	28.1	85.9	29.2	0.6	11.6	2.1	4	clayy SILT to silty CLAY	115	2.0	14	14	7	-	-	2.0	9.2	33	0.070	2.55	15
16.73	28.1	27.1	84.2	28.3	0.6	11.6	2.1	4	clayy SILT to silty CLAY	115	2.0	14	14	7	-	-	1.9	8.8	34	0.070	2.56	15
16.90	29.8	28.6	84.7	30.0	0.6	13.6	2.0	4	clayy SILT to silty CLAY	115	2.0	14	15	7	-	-	2.0	9.3	32	0.070	2.54	15
17.06	31.0	29.7	86.2	31.2	0.6	10.6	2.0	4	clayy SILT to silty CLAY	115	2.0	15	16	7	-	-	2.1	9.6	32	0.070	2.53	15
17.23	28.6	27.2	87.6	28.8	0.6	10.7	2.2	4	clayy SILT to silty CLAY	115	2.0	14	14	7	-	-	1.9	8.7	34	0.070	2.58	15
17.39	26.4	25.1	83.1	26.7	0.5	12.0	2.1	4	clayy SILT to silty CLAY	115	2.0	13	13	6	-	-	1.8	8.0	35	0.070	2.60	15
17.55	25.7	24.3	80.2	25.9	0.5	11.4	2.0	4	clayy SILT to silty CLAY	115	2.0	12	13	6	-	-	1.7	7.7	35	0.070	2.60	15
17.72	24.8	23.2	-	25.0	0.5	13.6	2.0	4	clayy SILT to silty CLAY	115	2.0	12	12	6	-	-	1.7	7.3	36	0.070	2.62	15
17.88	25.2	23.4	-	25.4	0.5	11.5	2.1	4	clayy SILT to silty CLAY	115	2.0	12	13	6	-	-	1.7	7.4	36	0.070	2.62	15
18.05	25.8	23.7	-	26.0	0.6	11.4	2.4	4	clayy SILT to silty CLAY	115	2.0	12	13	6	-	-	1.7	7.5	38	0.070	2.65	15
18.21	24.4	22.3	-	24.6	0.6	8.0	2.7	4	clayy SILT to silty CLAY	115	2.0	11	12	6	-	-	1.6	7.0	41	0.070	2.70	15
18.37	21.1	19.1	-	21.2	0.5	5.7	2.7	4	clayy SILT to silty CLAY	115	2.0	10	11	5	-	-	1.4	6.0	44	0.070	2.76	15
18.54	20.1	18.0	-	20.2	0.5	6.9	2.9	4	clayy SILT to silty CLAY	115	2.0	9	10	5	-	-	1.3	5.6	46	0.070	2.80	15
18.70	21.5	19.1	-	21.6	0.5	2.9	2.5	4	clayy SILT to silty CLAY	115	2.0	10	11	5	-	-	1.4	6.0	43	0.070	2.74	15
18.87	21.1	18.6	-	21.1	0.6	2.2	2.8	4	clayy SILT to silty CLAY	115	2.0	9	11	5	-	-	1.4	5.8	45	0.070	2.78	15
19.03	22.4	19.6	-	22.5	0.6	3.8	2.7	4	clayy SILT to silty CLAY	115	2.0	10	11	5	-	-	1.5	6.1	43	0.070	2.76	15
19.19	22.7	19.7	-	22.8	0.7	3.2	3.2	4	clayy SILT to silty CLAY	115	2.0	10	11	6	-	-	1.5	6.2	45	0.070	2.79	15
19.36	25.6	22.0	-	25.7	0.8	3.0	3.5	4	clayy SILT to silty CLAY	115	2.0	11	13	6	-	-	1.7	6.9	45	0.070	2.78	15
19.52	27.4	23.4	-	27.4	0.9	1.7	3.3	4	clayy SILT to silty CLAY	115	2.0	12	14	6	-	-	1.9	7.4	43	0.070	2.74	15
19.69	26.1	22.1	-	26.1	0.9	0.6	3.6	4	clayy SILT to silty CLAY	115	2.0	11	13	6	-	-	1.8	7.0	45	0.070	2.78	15
19.85	28.1	23.6	-	28.2	0.8	6.2	3.2	4	clayy SILT to silty CLAY	115	2.0	12	14	6	-	-	1.9	7.4	42	0.070	2.73	15
20.01	34.5	28.8	-	34.8	1.5	13.5	4.5	3	silty CLAY to CLAY	115	1.5	19	23	8	-	-	2.4	9.2	44	0.005	2.76	15
20.18	52.0	45.9	142.2	52.4	1.9	22.1	3.8	4	clayy SILT to silty CLAY	115	2.0	23	26	11	-	-	3.6	9.9	34	0.070	2.56	15
20.34	63.7	56.0	152.4	63.7	2.3	-0.2	3.7	4	clayy SILT to silty CLAY	115	2.0	28	32	14	-	-	4.4	9.9	30	0.070	2.49	15
20.51	56.3	49.4	146.3	56.5	2.1	11.2	3.8	4	clayy SILT to silty CLAY	115	2.0	25	28	12	-	-	3.9	9.9	32	0.070	2.54	15
20.67	47.5	38.4	-	47.6	1.7	3.2	3.6	4	clayy SILT to silty CLAY	115	2.0	19	24	10	-	-	3.3	9.9	35	0.070	2.60	15
20.83	41.6	33.3	-	41.7	1.6	7.3	3.9	4	clayy SILT to silty CLAY	115	2.0	17	21	9	-	-	2.8	9.9	39	0.070	2.67	15
21.00	44.2	35.2	-	44.6	1.5	20.8	3.5	4	clayy SILT to silty CLAY	115	2.0	18	22	9	-	-	3.0	9.9	36	0.070	2.62	15
21.16	44.7	38.6	118.0	44.9	1.3	9.7	3.1	4	clayy SILT to silty CLAY	115	2.0	19	22	10	-	-	3.1	9.9	33	0.070	2.55	15
21.33	38.5	30.2	-	38.7	1.3	8.7	3.4	4	clayy SILT to silty CLAY	115	2.0	15	19	8	-	-	2.6	9.6	39	0.070	2.67	15
21.49	35.3	27.4	-	35.8	1.3	26.8	3.8	4	clayy SILT to silty CLAY	115	2.0	14	18	7	-	-	2.4	8.7	42	0.070	2.73	15
21.65	37.4	28.9	-	37.8	1.5	17.7	4.0	4	clayy SILT to silty CLAY	115	2.0	14	19	8	-	-	2.6	9.2	42	0.070	2.73	15
21.82	41.8	32.0	-	42.0	1.6	8.7	3.9	4	clayy SILT to silty CLAY	115	2.0	16	21	9	-	-	2.9	9.9	39	0.070	2.68	15
21.98	41.5	31.6	-	41.8	1.7	13.5	4.1	4	clayy SILT to silty CLAY	115	2.0	16	21	9	-	-	2.8	9.9	41	0.070	2.70	15
22.15	43.7	33.0	-	44.1	1.7	22.8	4.1	4	clayy SILT to silty CLAY	115	2.0	17	22	9	-	-	3.0	9.9	40	0.070	2.68	15
22.31	44.8	33.6	-	45.2	1.8	20.9	4.1	4	clayy SILT to silty CLAY	115	2.0	17	22	9	-	-	3.1	9.9	40	0.070	2.68	15
22.47	45.6	34.0	-	46.1	1.9	28.4	4.3	4	clayy SILT to silty CLAY	115	2.0	17	23	9	-	-	3.1	9.9	40	0.070	2.69	15
22.64	47.7	35.3	-	48.3	2.0	31.4	4.4	4	clayy SILT to silty CLAY	115	2.0	18	24	9	-	-	3.3	9.9	40	0.070	2.68	15
22.80	49.0	36.0	-	49.5	2.2	23.4	4.6	4	clayy SILT to silty CLAY	115	2.0	18	25	10	-	-	3.4	9.9	40	0.070	2.69	15
22.97	46.9	34.2	-	47.2	2.0	15.3	4.4	4	clayy SILT to silty CLAY	115	2.0	17	23	9	-	-	3.2	9.9	40	0.070	2.70	15
23.13	45.7	33.2	-	45.9	2.0	6.1	4.4	4	clayy SILT to silty CLAY	115	2.0	17	23	9	-	-	3.1	9.9	41	0.070	2.71	15
23.30	43.1	31.0	-	43.4	1.7	16.1	4.2	4	clayy SILT to silty CLAY	115	2.0	16	22	8	-	-	2.9	9.9	41	0.070	2.71	15
23.46	43.7	31.3	-	44.0	1.6	14.3	3.9	4	clayy SILT to silty CLAY	115	2.0	16	22	8	-	-	3.0	9.9	40	0.070	2.69	15
23.62	40.0	28.4	-	40.5	1.7	20.9	4.3	3	silty CLAY to CLAY	115	1.5	19	27	8	-	-	2.7	9.1	43	0.005	2.75	15
23.79	41.1	29.0	-	41.6	1.7	28.4	4.2	3	silty CLAY to CLAY	115	1.5	19	27	8	-	-	2.8	9.2	42	0.005	2.74	15
23.95	42.1	29.5	-	42.4	1.8	13.5	4.3	3	silty CLAY to CLAY	115	1.5	20	28	8	-	-	2.9	9.4	43	0.005	2.74	15
24.12	40.2	28.0	-	40.4	1.6	9.8	4.2	3	silty CLAY to CLAY	115	1.5	19	27	8	-	-	2.7	8.9	43	0.005	2.75	15
24.28	37.4	25.9	-	37.6	1.5	8.2	4.1	3	silty CLAY to CLAY	115	1.5	17	25	7	-	-	2.5	8.2	44	0.005	2.77	15
24.44	36.7	25.2	-	37.0	1.4	14.2	4.0	3	silty CLAY to CLAY	115	1.5	17	24	7	-	-	2.5	8.0	44	0.005	2.77	15
24.61	39.8	27.2	-	40.3	2.1	24.3	5.5	3	silty CLAY to CLAY	115	1.5	18	27	8	-	-	2.7	8.6	48	0.005	2.84	15
24.77	50.5	34.3	-	51.4	2.6	47.4	5.2	3	silty CLAY to CLAY	115	1.5	23	34	9	-	-	3.5	9.9	43	0.005	2.75	15
24.94	60.7	40.9	-	61.9	2.9	57.7	4.9	3	silty CLAY to CLAY	115	1.5	27	40	11	-	-	4.2	9.9	39	0.005	2.67	15
25.10	68.6	45.9	-	70.4	3.0	91.4	4.4	4	clayy SILT to silty CLAY	115	2.0	23	34	12	-	-	4.7	9.9	36	0.070	2.60	15
25.26	81.4	64.5	158.6	83.2	2.9	92.1	3.6	4	clayy SILT to silty CLAY	115	2.0	32	41	15	-	-	5.6	9.9	28	0.070	2.43	15
25.43	72.4	57.2	155.9	73.2	2.7	42.9	3.8	4	clayy SILT to silty CLAY	115	2.0	29	36	14	-	-	5.0	9.9	30	0.070	2.49	15
25.59	75.7	59.6	172.0	78.0	3.2	115.0	4.4	4	clayy SILT to silty CLAY	115	2.0	30	38	15	-	-	5.2	9.9	32	0.070	2.52	15
25.76	96.4	75.7	197.4	98.7	4.3	120.5	4.6	4	clayy SILT to silty CLAY	115	2.0	38	48	18	-	-	6.7	9.9	29	0.070	2.47	15
25.92	97.1	76.0	192.4	97.6	4.2	27.2	4.4	4	clayy SILT to silty CLAY	115	2.0	38	49	18	-	-	6.8	9.9	29	0.070	2.45	15
26.08	74.2	57.9	165.2	74.1	3.0	-4.3	4.2	4	clayy SILT to silty CLAY	115	2.0	29	37	14	-	-	5.1	9.9	31	0.070	2.52	15
26.25	49.5	31.8	-	50.0	2.2	23.5	4.6	3	silty CLAY to CLAY	115	1.5	21	33	9	-	-	3.4	9.9	42	0.005	2.73	15
26.41	46.5	29.7	-	48.2	1.9	83.7	4.2	4	clayy SILT to silty CLAY	115	2.0	15	23	8	-	-	3.2	9.5	42	0.070	2.73	15
26.58	43.8	27.8	-	44.3	1.9	25.1	4.5	3	silty CLAY to CLAY	115	1.5	19	29	8	-	-	3.0	8.8	44	0.005	2.77	15
26.74	40.8	25.7	-	41.1	1.7	17.8	4.2	3	silty CLAY to CLAY	115	1.5	17	27	7	-	-	2.8	8.2	45	0.005	2.78	15
26.90	40.0	25.0	-	40.1	1.4	4.6	3.5	4	clayy SILT to silty CLAY	115	2.0	13	20	7	-	-	2.7	7.9	42	0.070	2.74	15
27.07	43.4	33.2	97.1	43.3	1.0	-3.6	2.4	4	clayy SILT to silty CLAY	115	2.0	17	22	8	-	-	3.0	8.6	32	0.070	2.53	15
27.23	45.8	35.0	87.5	45.7	0.8	-1.5	1.8	5	silty SAND to sandy SILT	120	3.0	12	15	8	32	33	-	-	28	0.200	2.44	16
27.40	61.7	47.0	95.1	61.6	1.0	-1.1	1.7	5	silty SAND to sandy SILT	120	3.0	16	21	11	42	35	-	-	23	0.200	2.32	16
27.56	72.5	55.0	111.8	72.5	1.5	-1.0	2.1	5	silty SAND to sandy SILT	120	3.0	18	24	12	47	36	-	-	23	0.200	2.33	16
27.72	69.9	53.0	118.2	69.9	1.7	-1.0	2.4	5	silty SAND to sandy SILT	120	3.0	18	23	12	46	36	-	-	26	0.200	2.38	16
27.89	61.9	46.7	114.1	61.9	1.5	-0.8	2.5	5	silty SAND to sandy SILT	120	3.0	16	21	11	42	35	-	-	28	0.200	2.43	16
28.05	58.6	44.1	117.7	58.6	1.6	0.9	2.8	4	clayy SILT to silty CLAY	115	2.0	22	29	11	-	-	4.0	9.9	30	0.070	2.48	15
28.22	49.3	29.4	-	49.2	1.6	-1.4	3.3	4	clayy SILT to silty CLAY	115	2.0	15	25	8	-	-	3.4	9.4	39	0.070	2.66	15
28.38	42.7	25.3	-	42.7	1.7	1.1	4.1	3	silty CLAY to CLAY	115	1.5	17	28	7	-	-	2.9	8.0	45	0.005	2.78	15
28.54	40.7	24.0	-	40.9	1.6	10.5	4.1	3	silty CLAY to CLAY	115	1.5	16	27	7	-	-	2.8	7.6	46	0.005	2.79	15
28.71	42.3	24.8	-	42.4	1.5	6.4	3.8	4	clayy SILT to silty CLAY	115	2.0	12	21	7	-	-	2.9	7.9	44	0.070	2.76	15
28.87	34.9	20.4	-	35.2	1.4	17.1	4.2	3	silty CLAY to CLAY	115	1.5	14	23	6	-	-	2.3	6.4	49	0.005	2.86	15
29.04	30.6	17.8	-	30.9	1.2	16.4	4.1	3	silty CLAY to CLAY	115	1.5	12	20	5	-	-	2.0	5.5	52	0.005	2.90	15
29.20	26.7	15.4	-	27.2	1.0	24.6	3.8	3	silty CLAY to CLAY	115	1.5	10	18	5	-	-	1.8	4.8	54	0.005	2.93	15
29.36	22.9	13.2	-	23.2	0.8	12.9	4.0	3	silty CLAY to CLAY	115	1.5	9	15	4	-	-	1.5	4.0	58	0.005	3.00	15
29.53	21.0	12.0	-	21.2	0.8	11.2	4.2	3	silty CLAY to CLAY	115	1.5	8	14	4	-	-	1.4	3.6	62	0.005	3.05	15
29.69	26.0	14.8	-	26.2	1.1	13.2	4.7	3	silty CLAY to CLAY	115	1.5	10	17	5	-	-	1.7	4.5	59	0.005	3.00	15
29.86	26.9	15.2	-	27.2	1.0	15.9	4.0	3	silty CLAY to CLAY	115	1.5	10	18	5	-	-	1.8	4.7	55	0.005	2.95	15
30.02	24.8	13.9	-	25.2	0.8	20.3	3.6	3	silty CLAY to CLAY	115	1.5	9	17	4	-	-	1.6	4.3	55	0.005	2.95	15
30.19	24.1	13.5	-	24.4	0.7	17.8	3.0	3	silty CLAY to CLAY	115	1.5	9	16	4	-	-	1.6	4.1	53	0.005	2.92	15
30.35	23.6	13.1	-	24.3	0.6	33.0	2.9	3	silty CLAY to CLAY	115	1.5	9	16	4	-	-	1.5	4.0	53	0.005	2.92	15
30.51	23.2	12.9	-	23.9	0.6	31.6	2.8	3	silty CLAY to CLAY	115	1.5	9	15	4	-	-	1.5	3.9	53	0.005	2.92	15
30.68	22.7	12.5	-	23.5	0.6	42.3	3.0	3	silty CLAY to CLAY	115	1.5	8	15	4	-	-	1.5	3.8	55	0.005	2.94	15
30.84	24.8	13.6	-	25.8	0.6	49.1	2.8	3	silty CLAY to CLAY	115	1.5	9	17	4	-	-	1.6	4.2	52	0.005	2.90	15

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Morada Water Tank Study

Project ID: Siegfried Engineering
Data File: SDF(422).cpt
CPT Date: 10/27/2023 8:19:17 AM
GW During Test: 42 ft

Sounding ID: CPT-02
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
31.01	25.4	13.8	-	26.1	1.0	34.7	4.1	3	silty CLAY to CLAY	115	1.5	9	17	4	-	-	1.7	4.2	58	0.005	2.99	15
31.17	24.4	13.2	-	25.1	0.9	36.9	4.1	3	silty CLAY to CLAY	115	1.5	9	16	4	-	-	1.6	4.0	59	0.005	3.01	15
31.33	25.3	13.6	-	26.0	1.1	38.5	4.6	3	silty CLAY to CLAY	115	1.5	9	17	4	-	-	1.7	4.2	60	0.005	3.02	15
31.50	30.6	16.4	-	31.4	1.8	37.2	6.2	3	silty CLAY to CLAY	115	1.5	11	20	5	-	-	2.0	5.1	61	0.005	3.04	15
31.66	86.0	61.1	149.1	87.4	2.8	69.6	3.3	4	clayy SILT to silty CLAY	115	2.0	31	43	14	-	-	5.9	9.9	28	0.070	2.43	15
31.83	91.7	64.9	151.5	91.7	2.9	-1.2	3.3	4	clayy SILT to silty CLAY	115	2.0	32	46	15	-	-	6.3	9.9	27	0.070	2.41	15
31.99	92.4	65.3	156.5	92.6	3.1	8.4	3.4	4	clayy SILT to silty CLAY	115	2.0	33	46	15	-	-	6.4	9.9	27	0.070	2.42	15
32.15	116.2	81.9	163.3	116.5	3.5	13.9	3.1	5	silty SAND to sandy SILT	120	3.0	27	39	18	60	38	-	-	23	0.200	2.31	16
32.32	122.4	86.0	158.0	122.4	3.3	-2.4	2.7	5	silty SAND to sandy SILT	120	3.0	29	41	19	62	38	-	-	21	0.200	2.26	16
32.48	71.7	50.3	137.7	71.7	2.3	-1.4	3.4	4	clayy SILT to silty CLAY	115	2.0	25	36	12	-	-	4.9	9.9	30	0.070	2.49	15
32.65	47.5	24.6	-	47.6	1.9	6.2	4.2	3	silty CLAY to CLAY	115	1.5	16	32	7	-	-	3.2	7.8	45	0.005	2.79	15
32.81	40.0	20.6	-	41.2	2.2	64.5	5.8	3	silty CLAY to CLAY	115	1.5	14	27	6	-	-	2.7	6.5	55	0.005	2.95	15
32.97	97.8	68.0	138.1	99.5	2.5	85.3	2.6	5	silty SAND to sandy SILT	120	3.0	23	33	15	54	37	-	-	23	0.200	2.32	16
33.14	196.4	136.3	164.3	196.4	2.8	-1.5	1.4	6	clean SAND to silty SAND	125	5.0	27	39	26	77	41	-	-	11	0.350	1.92	16
33.30	221.0	153.0	174.2	221.0	2.7	-1.0	1.2	6	clean SAND to silty SAND	125	5.0	31	44	28	81	41	-	-	9	0.350	1.84	16
33.47	220.8	152.5	179.0	220.8	3.1	-1.0	1.4	6	clean SAND to silty SAND	125	5.0	30	44	29	81	41	-	-	10	0.350	1.88	16
33.63	215.9	148.7	176.4	215.9	3.1	-0.9	1.4	6	clean SAND to silty SAND	125	5.0	30	43	28	80	41	-	-	10	0.350	1.90	16
33.79	216.5	148.8	175.9	216.6	3.1	0.4	1.4	6	clean SAND to silty SAND	125	5.0	30	43	28	80	41	-	-	10	0.350	1.89	16
33.96	221.1	151.5	179.6	221.1	3.2	0.6	1.5	6	clean SAND to silty SAND	125	5.0	30	44	29	81	41	-	-	10	0.350	1.90	16
34.12	212.8	145.4	175.7	212.8	3.2	0.8	1.5	6	clean SAND to silty SAND	125	5.0	29	43	28	79	41	-	-	11	0.350	1.92	16
34.29	210.5	143.5	173.5	210.5	3.1	1.1	1.5	6	clean SAND to silty SAND	125	5.0	29	42	27	79	41	-	-	11	0.350	1.92	16
34.45	214.0	145.5	172.3	214.1	3.0	1.3	1.4	6	clean SAND to silty SAND	125	5.0	29	43	27	79	41	-	-	10	0.350	1.89	16
34.61	218.2	148.0	170.0	218.2	2.7	1.2	1.3	6	clean SAND to silty SAND	125	5.0	30	44	28	80	41	-	-	9	0.350	1.85	16
34.78	218.0	147.5	166.3	218.0	2.5	1.1	1.1	6	clean SAND to silty SAND	125	5.0	29	44	27	80	41	-	-	9	0.350	1.83	16
34.94	193.2	130.4	149.8	193.2	2.1	0.7	1.1	6	clean SAND to silty SAND	125	5.0	26	39	24	76	40	-	-	9	0.350	1.86	16
35.11	137.6	92.6	125.5	137.6	1.9	-0.1	1.4	5	silty SAND to sandy SILT	120	3.0	31	46	18	64	38	-	-	14	0.200	2.04	16
35.27	112.6	75.6	127.4	112.6	2.2	-0.3	2.0	5	silty SAND to sandy SILT	120	3.0	25	38	16	58	37	-	-	19	0.200	2.21	16
35.43	97.3	65.2	134.0	97.3	2.5	-0.2	2.6	5	silty SAND to sandy SILT	120	3.0	22	32	15	53	36	-	-	24	0.200	2.33	16
35.60	85.3	57.1	132.7	85.3	2.4	0.1	2.8	5	silty SAND to sandy SILT	120	3.0	19	28	13	48	35	-	-	27	0.200	2.40	16
35.76	77.9	51.9	132.3	77.9	2.3	0.2	3.0	4	clayy SILT to silty CLAY	115	2.0	26	39	12	-	-	5.4	9.9	29	0.070	2.45	15
35.93	73.3	34.4	-	73.3	2.3	-0.2	3.3	4	clayy SILT to silty CLAY	115	2.0	17	37	9	-	-	5.0	9.9	36	0.070	2.61	15
36.09	64.6	30.2	-	64.6	2.1	-0.3	3.3	4	clayy SILT to silty CLAY	115	2.0	15	32	8	-	-	4.4	9.6	38	0.070	2.65	15
36.26	56.9	26.5	-	57.0	1.9	4.3	3.5	4	clayy SILT to silty CLAY	115	2.0	13	28	7	-	-	3.9	8.4	41	0.070	2.72	15
36.42	72.2	47.7	121.0	72.4	1.9	11.9	2.8	4	clayy SILT to silty CLAY	115	2.0	24	36	11	-	-	4.9	9.9	29	0.070	2.45	15
36.58	84.9	56.0	116.1	84.9	1.8	0.4	2.2	5	silty SAND to sandy SILT	120	3.0	19	28	13	48	35	-	-	24	0.200	2.34	16
36.75	89.0	58.6	116.2	89.0	1.9	0.1	2.1	5	silty SAND to sandy SILT	120	3.0	20	30	13	49	35	-	-	23	0.200	2.31	16
36.91	89.9	59.0	117.4	89.9	1.9	0.0	2.2	5	silty SAND to sandy SILT	120	3.0	20	30	13	50	35	-	-	23	0.200	2.31	16
37.08	92.2	60.4	115.6	92.2	1.9	-0.2	2.1	5	silty SAND to sandy SILT	120	3.0	20	31	13	50	36	-	-	22	0.200	2.29	16
37.24	92.6	60.5	116.2	92.6	1.9	-0.2	2.1	5	silty SAND to sandy SILT	120	3.0	20	31	13	50	36	-	-	22	0.200	2.29	16
37.40	90.1	58.8	122.0	90.1	2.1	-0.2	2.4	5	silty SAND to sandy SILT	120	3.0	20	30	13	49	35	-	-	24	0.200	2.34	16
37.57	87.9	57.2	113.3	87.9	1.8	0.0	2.1	5	silty SAND to sandy SILT	120	3.0	19	29	13	49	35	-	-	23	0.200	2.31	16
37.73	81.7	53.1	118.4	81.8	1.9	1.1	2.4	5	silty SAND to sandy SILT	120	3.0	18	27	12	46	35	-	-	26	0.200	2.38	16
37.90	90.7	58.7	119.2	90.7	2.0	1.7	2.3	5	silty SAND to sandy SILT	120	3.0	20	30	13	49	35	-	-	23	0.200	2.32	16
38.06	94.3	61.0	124.0	94.3	2.2	-0.2	2.4	5	silty SAND to sandy SILT	120	3.0	20	31	14	51	35	-	-	23	0.200	2.33	16
38.22	99.6	64.2	134.4	99.6	2.6	-0.4	2.6	5	silty SAND to sandy SILT	120	3.0	21	33	15	52	36	-	-	24	0.200	2.34	16
38.39	99.8	64.2	144.0	99.8	2.9	-0.3	3.0	5	silty SAND to sandy SILT	120	3.0	21	33	15	52	36	-	-	26	0.200	2.38	16
38.55	88.9	57.1	145.0	88.9	2.9	0.5	3.3	4	clayy SILT to silty CLAY	115	2.0	29	44	14	-	-	6.1	9.9	29	0.070	2.45	15
38.72	67.7	29.5	-	67.7	2.7	5.0	4.1	4	clayy SILT to silty CLAY	115	2.0	15	34	8	-	-	4.6	9.4	42	0.070	2.73	15
38.88	65.3	28.3	-	65.4	2.6	9.0	4.2	3	silty CLAY to CLAY	115	1.5	19	44	8	-	-	4.4	9.0	43	0.005	2.74	15
39.04	71.9	31.1	-	72.0	2.3	2.3	3.2	4	clayy SILT to silty CLAY	115	2.0	16	36	8	-	-	4.9	9.9	37	0.070	2.64	15
39.21	57.0	24.5	-	57.0	2.0	0.1	3.6	4	clayy SILT to silty CLAY	115	2.0	12	29	7	-	-	3.9	7.8	43	0.070	2.75	15
39.37	53.1	22.8	-	53.2	2.0	4.3	4.0	3	silty CLAY to CLAY	115	1.5	15	35	6	-	-	3.6	7.2	46	0.005	2.80	15
39.54	62.7	26.7	-	62.7	1.8	1.6	3.0	4	clayy SILT to silty CLAY	115	2.0	13	31	7	-	-	4.3	8.5	39	0.070	2.67	15
39.70	60.5	38.3	98.7	60.5	1.3	-0.5	2.2	5	silty SAND to sandy SILT	120	3.0	13	20	9	35	32	-	-	29	0.200	2.46	16
39.86	63.0	39.8	94.8	63.0	1.2	0.2	2.0	5	silty SAND to sandy SILT	120	3.0	13	21	9	37	33	-	-	27	0.200	2.42	16
40.03	52.9	22.3	-	52.9	1.3	-2.2	2.6	4	clayy SILT to silty CLAY	115	2.0	11	26	6	-	-	3.6	7.0	40	0.070	2.70	15
40.19	46.8	19.6	-	46.7	1.2	-2.6	2.7	4	clayy SILT to silty CLAY	115	2.0	10	23	5	-	-	3.1	6.2	43	0.070	2.75	15
40.36	42.3	17.7	-	42.3	1.5	-2.6	3.7	3	silty CLAY to CLAY	115	1.5	12	28	5	-	-	2.8	5.5	50	0.005	2.87	15
40.52	41.2	17.2	-	41.2	1.7	0.1	4.5	3	silty CLAY to CLAY	115	1.5	11	27	5	-	-	2.7	5.3	54	0.005	2.93	15
40.68	68.2	28.3	-	68.2	2.1	-0.9	3.2	4	clayy SILT to silty CLAY	115	2.0	14	34	7	-	-	4.7	9.0	39	0.070	2.66	15
40.85	70.7	29.2	-	70.7	2.2	0.0	3.3	4	clayy SILT to silty CLAY	115	2.0	15	35	8	-	-	4.8	9.3	39	0.070	2.66	15
41.01	75.6	31.2	-	75.6	2.2	-0.4	3.0	4	clayy SILT to silty CLAY	115	2.0	16	38	8	-	-	5.2	9.9	36	0.070	2.62	15
41.18	80.9	50.3	113.3	80.9	1.8	-1.0	2.3	5	silty SAND to sandy SILT	120	3.0	17	27	12	44	34	-	-	26	0.200	2.38	16
41.34	86.2	53.5	95.6	86.2	1.3	-1.1	1.5	5	silty SAND to sandy SILT	120	3.0	18	29	12	46	34	-	-	21	0.200	2.25	16
41.50	151.5	93.9	117.2	151.5	1.6	1.8	1.1	6	clean SAND to silty SAND	125	5.0	19	30	18	65	38	-	-	12	0.350	1.96	16
41.67	251.8	155.7	155.7	251.8	1.4	-1.2	0.5	6	clean SAND to silty SAND	125	5.0	31	50	27	82	41	-	-	5	0.350	1.60	16
41.83	301.8	186.2	196.0	301.8	3.1	-0.3	1.0	6	clean SAND to silty SAND	125	5.0	37	60	33	88	42	-	-	7	0.350	1.72	16
42.00	340.3	209.6	209.6	340.4	2.6	1.0	0.8	6	clean SAND to silty SAND	125	5.0	42	68	36	91	42	-	-	5	0.350	1.59	16
42.16	354.3	217.9	217.9	354.3	2.7	1.5	0.8	6	clean SAND to silty SAND	125	5.0	44	71	37	93	42	-	-	5	0.350	1.58	16
42.32	343.3	210.9	210.9	343.5	2.8	11.9	0.8	6	clean SAND to silty SAND	125	5.0	42	69	36	92	42	-	-	5	0.350	1.61	16
42.49	336.1	206.3	206.3	336.2	1.8	3.3	0.5	6	clean SAND to silty SAND	125	5.0	41	67	34	91	42	-	-	5	0.350	1.50	16
42.65	299.1	183.4	183.4	299.3	1.7	8.9	0.6	6	clean SAND to silty SAND	125	5.0	37	60	31	87	41	-	-	5	0.350	1.56	16
42.82	234.3	143.5	150.3	234.4	1.7	5.5	0.8	6	clean SAND to silty SAND	125	5.0	29	47	25	79	40	-	-	6	0.350	1.71	16
42.98	193.6	118.5	133.1	193.6	1.7	3.2	0.9	6	clean SAND to silty SAND	125	5.0	24	39	22	73	39	-	-	9	0.350	1.82	16
43.15	203.0	124.1	141.2	203.1	2.0	7.7	1.0	6	clean SAND to silty SAND	125	5.0	25	41	23	74	39	-	-	9	0.350	1.84	16
43.31	310.1	189.4	189.4	310.5	2.2	18.2	0.7	6	clean SAND to silty SAND	125	5.0	38	62	32	88	42	-	-	5	0.350	1.61	16
43.47	426.8	260.4	260.4	427.0	2.7	10.1	0.6	6	clean SAND to silty SAND	125	5.0	52	85	43	95	43	-	-	5	0.350	1.47	16
43.64	404.0	246.2	246.2	404.1	3.0	3.5	0.7	6	clean SAND to silty SAND	125	5.0	49	81	41	95	43	-	-	5	0.350	1.54	16
43.80	312.1	190.0	216.3	312.1	4.7	1.7	1.5	6	clean SAND to silty SAND	125	5.0	38	62	35	88	42	-	-	9	0.350	1.84	16
43.97	212.6	129.3	171.4	212.6	3.9	0.5	1.9	5	silty SAND to sandy SILT	120	3.0	43	71	26	75	40	-	-	13	0.200	2.02	16
44.13	134.0	81.4	134.6	134.0	2.7	1.2	2.1	5	silty SAND to sandy SILT	120	3.0	27	45	17	60	37	-	-	19	0.200	2.19	16
44.29	70.5	27.6	-	72.2	1.8	84.6	2.6	4	clayy SILT to silty CLAY	115	2.0	14	35	7	-	-	4.8	8.8	36	0.070	2.62	15
44.46	55.5	21.6	-	60.1	1.8	237.8	3.4	4	clayy SILT to silty CLAY	115	2.0	11	28	6	-	-	3.7	6.8	45	0.070	2.78	15
44.62	63.9	24.9	-	66.6	2.1	135.3	3.5	4	clayy SILT to silty CLAY	115	2.0	12	32	7	-	-	4.3	7.9	42	0.070	2.74	15
44.79	54.0	21.0	-	55.5	2.0	75.9	3.9	3	silty CLAY to CLAY	115	1.5	14	36	6	-	-	3.6	6.6	47	0.005	2.83	15
44.95	45.7	17.7	-	46.8	1.5	53.9	3.6	3	silty CLAY to CLAY	115	1.5	12	30	5	-	-	3.0	5.5	50	0.005	2.86	15
45.11	53.5	20.7	-	54.2	1.4	35.6	2.7	4	clayy SILT to silty CLAY	115	2.0	10	27	6	-	-	3.6	6.5	42	0.070	2.73	15
45.28	48.4	18.7	-	49.9	1.7	73.7	3.6	3	silty CLAY to CLAY	115	1.5	12	32	5	-	-	3.2	5.8	49	0.005	2.85	15
45.44	50.7	19.6	-	52.5	2.4	90.0	4.9	3	silty CLAY to CLAY	115	1.5	13	34	6	-	-	3.4	6.1	53	0.005	2.92	15
45.61	68.5	26.4	-	68.9	3.5	23.1	5.3	3	silty CLAY to CLAY	115	1.5	18	46	8	-	-	4.7	8.4	48	0.005	2.84	15
45.77	99.3	38.2	-	99.3	4.2	2.2	4.4	4	clayy SILT to silty CLAY	115	2.0	19	50	10	-	-	6.8	9.9	38	0.070	2.66	15
45.93	140.9	84.8	156.5	141.1	3.7	9.9	2.7	5	silty SAND to sandy SILT	120	3.0	28	47	19	62	37	-	-	21	0.200	2.27	16
46.10	135.3	81.4	159.5	137.0	3.9	87.3	2.9	5	silty SAND to sandy SILT	120	3.0	27	45	18	60	37	-	-	23	0.200	2.30	16
46.26	125.1	75.2	152.6	133.0	3.6	404.4	2.9	5	silty SAND to sandy SILT	120	3.0	25	42	17	58	36	-	-	23	0.200	2.32	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Morada Water Tank Study

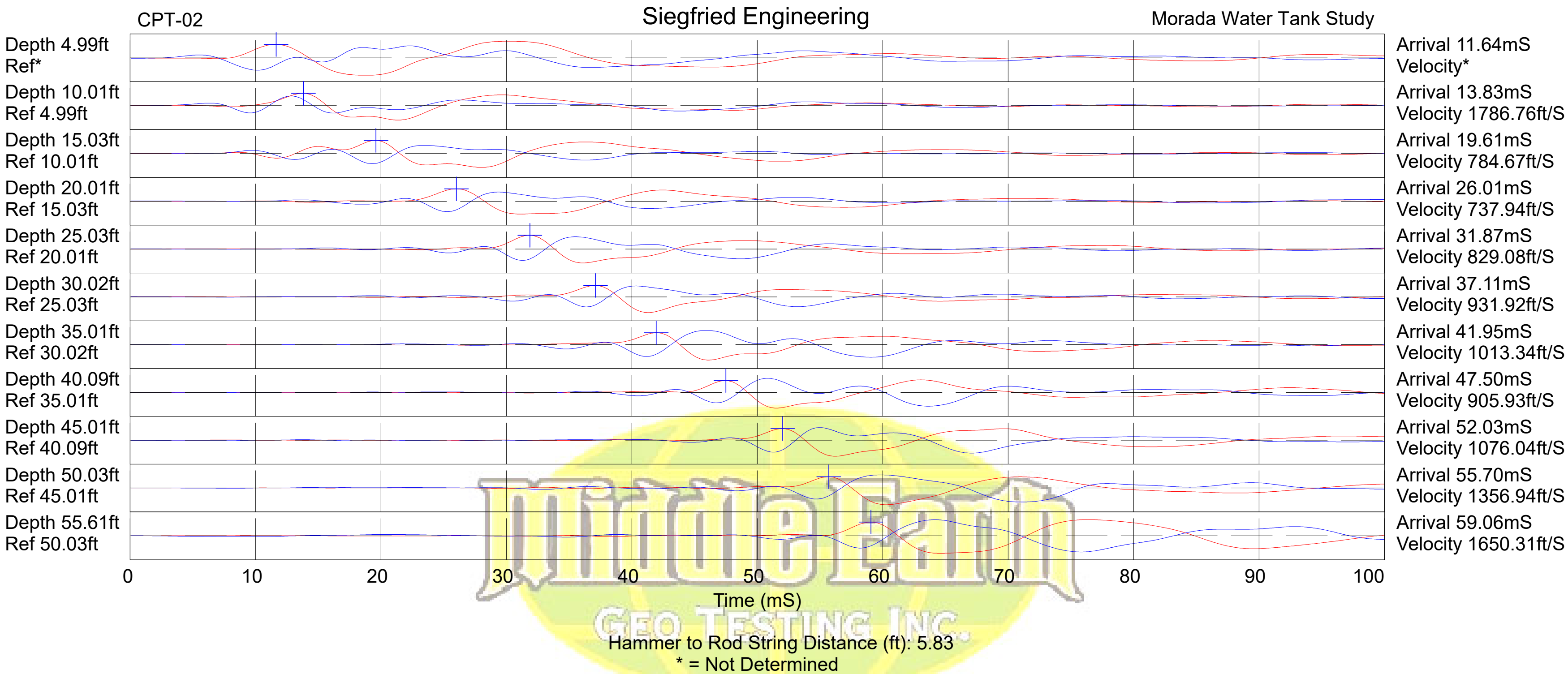
Project ID: Siegfried Engineering
Data File: SDF(422).cpt
CPT Date: 10/27/2023 8:19:17 AM
GW During Test: 42 ft

Sounding ID: CPT-02
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
46.43	115.3	69.2	145.1	125.5	3.2	519.8	2.8	5	silty SAND to sandy SILT	120	3.0	23	38	16	55	36	-	-	24	0.200	2.34	16
46.59	117.0	70.2	140.1	129.1	3.0	615.5	2.6	5	silty SAND to sandy SILT	120	3.0	23	39	16	55	36	-	-	23	0.200	2.31	16
46.75	115.6	69.3	144.7	126.8	3.2	571.9	2.8	5	silty SAND to sandy SILT	120	3.0	23	39	16	55	36	-	-	24	0.200	2.34	16
46.92	108.7	65.1	142.9	119.1	3.1	527.8	2.9	5	silty SAND to sandy SILT	120	3.0	22	36	15	53	35	-	-	25	0.200	2.37	16
47.08	100.8	60.3	150.6	109.3	3.3	431.9	3.4	4	clayy SILT to silty CLAY	115	2.0	30	50	14	-	-	6.9	9.9	28	0.070	2.44	15
47.25	97.5	37.0	-	106.9	3.7	475.3	3.9	4	clayy SILT to silty CLAY	115	2.0	18	49	10	-	-	6.7	9.9	37	0.070	2.64	15
47.41	105.8	40.0	-	111.0	4.1	263.1	4.0	4	clayy SILT to silty CLAY	115	2.0	20	53	10	-	-	7.3	9.9	36	0.070	2.62	15
47.57	104.1	39.3	-	107.2	3.9	158.4	3.9	4	clayy SILT to silty CLAY	115	2.0	20	52	10	-	-	7.2	9.9	36	0.070	2.61	15
47.74	96.5	57.5	145.7	100.5	3.1	204.0	3.3	4	clayy SILT to silty CLAY	115	2.0	29	48	14	-	-	6.6	9.9	29	0.070	2.45	15
47.90	82.3	31.0	-	85.9	2.6	188.7	3.3	4	clayy SILT to silty CLAY	115	2.0	16	41	8	-	-	5.6	9.9	38	0.070	2.64	15
48.07	68.3	25.8	-	72.5	2.5	214.7	3.8	4	clayy SILT to silty CLAY	115	2.0	13	34	7	-	-	4.6	8.1	43	0.070	2.75	15
48.23	66.4	25.1	-	71.2	2.9	243.3	4.5	3	silty CLAY to CLAY	115	1.5	17	44	7	-	-	4.5	7.9	46	0.005	2.81	15
48.39	73.3	27.7	-	76.0	3.6	136.7	5.1	3	silty CLAY to CLAY	115	1.5	18	49	8	-	-	5.0	8.7	46	0.005	2.81	15
48.56	73.7	27.8	-	76.1	4.1	121.6	5.7	3	silty CLAY to CLAY	115	1.5	19	49	8	-	-	5.0	8.7	49	0.005	2.84	15
48.72	74.3	28.0	-	75.9	4.8	84.0	6.7	3	silty CLAY to CLAY	115	1.5	19	50	8	-	-	5.1	8.8	51	0.005	2.89	15
48.89	89.1	33.6	-	91.6	4.2	128.9	4.8	3	silty CLAY to CLAY	115	1.5	22	59	9	-	-	6.1	9.9	42	0.005	2.73	15
49.05	117.1	69.4	164.9	117.1	4.1	-1.3	3.6	4	clayy SILT to silty CLAY	115	2.0	35	59	16	-	-	8.1	9.9	27	0.070	2.42	15
49.22	151.5	89.7	153.8	151.6	3.7	2.4	2.5	5	silty SAND to sandy SILT	120	3.0	30	51	19	63	37	-	-	20	0.200	2.22	16
49.38	185.7	109.8	154.6	185.6	3.4	-3.6	1.9	5	silty SAND to sandy SILT	120	3.0	37	62	22	70	38	-	-	15	0.200	2.07	16
49.54	199.8	118.1	158.1	199.7	3.4	-3.6	1.8	5	silty SAND to sandy SILT	120	3.0	39	67	23	72	39	-	-	14	0.200	2.03	16
49.71	210.4	124.3	144.1	210.4	2.3	-3.0	1.1	6	clean SAND to silty SAND	125	5.0	25	42	23	74	39	-	-	10	0.350	1.87	16
49.87	212.8	125.6	148.2	212.8	2.5	-3.8	1.2	6	clean SAND to silty SAND	125	5.0	25	43	24	75	39	-	-	10	0.350	1.89	16
50.04	220.6	130.0	158.0	220.6	3.0	-2.9	1.4	6	clean SAND to silty SAND	125	5.0	26	44	25	76	39	-	-	11	0.350	1.93	16
50.20	236.4	139.2	163.0	236.4	3.0	-0.2	1.3	6	clean SAND to silty SAND	125	5.0	28	47	26	78	40	-	-	10	0.350	1.88	16
50.36	270.9	159.4	203.8	270.9	5.4	1.2	2.0	5	silty SAND to sandy SILT	120	3.0	53	90	31	82	40	-	-	13	0.200	1.98	16
50.53	317.6	186.7	247.0	317.6	7.9	1.9	2.5	5	silty SAND to sandy SILT	120	3.0	62	100	37	88	41	-	-	13	0.200	2.02	16
50.69	281.2	165.1	237.3	281.2	7.8	3.1	2.8	5	silty SAND to sandy SILT	120	3.0	55	94	34	84	41	-	-	16	0.200	2.09	16
50.86	188.4	110.5	201.4	190.0	6.2	84.7	3.4	5	silty SAND to sandy SILT	120	3.0	37	63	24	70	38	-	-	21	0.200	2.26	16
51.02	150.8	88.4	157.8	156.0	3.9	264.3	2.6	5	silty SAND to sandy SILT	120	3.0	29	50	19	63	37	-	-	21	0.200	2.25	16
51.18	131.6	77.1	146.8	142.0	3.4	532.2	2.6	5	silty SAND to sandy SILT	120	3.0	26	44	17	58	36	-	-	22	0.200	2.29	16
51.35	127.8	74.8	152.9	138.8	3.6	562.7	2.9	5	silty SAND to sandy SILT	120	3.0	25	43	17	57	36	-	-	24	0.200	2.33	16
51.51	119.9	70.1	160.6	130.5	4.0	538.4	3.4	4	clayy SILT to silty CLAY	115	2.0	35	60	16	-	-	8.3	9.9	26	0.070	2.39	15
51.68	118.9	69.5	164.7	127.5	4.1	439.7	3.6	4	clayy SILT to silty CLAY	115	2.0	35	59	16	-	-	8.2	9.9	27	0.070	2.41	15
51.84	117.8	68.8	161.5	127.0	4.0	465.9	3.5	4	clayy SILT to silty CLAY	115	2.0	34	59	16	-	-	8.1	9.9	27	0.070	2.41	15
52.00	142.0	82.8	193.1	153.8	5.6	603.3	4.1	4	clayy SILT to silty CLAY	115	2.0	41	71	19	-	-	9.8	9.9	27	0.070	2.40	15
52.17	188.2	109.7	243.0	202.1	8.7	707.8	4.7	9	very stiff fine SOIL	120	1.0	100	100	25	-	-	6.6	9.9	25	0.250	2.38	30
52.33	233.3	135.8	281.6	237.2	11.3	199.4	4.9	9	very stiff fine SOIL	120	1.0	100	100	31	-	-	8.1	9.9	24	0.250	2.34	30
52.50	217.8	126.8	273.9	222.3	10.8	230.4	5.0	9	very stiff fine SOIL	120	1.0	100	100	29	-	-	7.6	9.9	25	0.250	2.36	30
52.66	192.5	111.9	224.0	194.3	7.6	88.9	4.0	9	very stiff fine SOIL	120	1.0	100	100	25	-	-	6.7	9.9	23	0.250	2.32	30
52.82	145.5	54.9	-	149.8	9.0	221.5	6.3	3	silty CLAY to CLAY	115	1.5	37	97	15	-	-	10.1	9.9	39	0.005	2.67	15
52.99	144.3	54.5	-	155.7	12.2	580.8	8.6	3	silty CLAY to CLAY	115	1.5	36	96	15	-	-	10.0	9.9	44	0.005	2.77	15
53.15	260.3	151.0	333.0	269.1	15.1	447.2	5.9	9	very stiff fine SOIL	120	1.0	100	100	35	-	-	9.1	9.9	25	0.250	2.37	30
53.32	273.4	158.5	299.9	276.7	12.7	165.0	4.7	9	very stiff fine SOIL	120	1.0	100	100	35	-	-	9.6	9.9	22	0.250	2.28	30
53.48	222.3	128.7	278.1	225.1	11.1	142.2	5.1	9	very stiff fine SOIL	120	1.0	100	100	29	-	-	7.8	9.9	25	0.250	2.36	30
53.64	191.4	110.7	273.0	202.6	10.6	572.8	5.6	9	very stiff fine SOIL	120	1.0	100	100	26	-	-	6.7	9.9	28	0.250	2.44	30
53.81	199.3	115.2	308.2	205.3	12.9	309.2	6.6	9	very stiff fine SOIL	120	1.0	100	100	28	-	-	6.9	9.9	30	0.250	2.48	30
53.97	191.5	72.3	-	193.9	12.9	119.9	6.9	9	very stiff fine SOIL	120	1.0	72	100	19	-	-	6.7	9.9	36	0.250	2.62	30
54.14	170.1	64.2	-	174.4	12.4	223.5	7.4	9	very stiff fine SOIL	120	1.0	64	100	17	-	-	5.9	9.9	39	0.250	2.68	30
54.30	166.8	62.9	-	167.0	10.2	14.3	6.2	3	silty CLAY to CLAY	115	1.5	42	100	16	-	-	11.6	9.9	36	0.005	2.62	15
54.46	143.3	54.1	-	143.5	8.3	12.5	6.0	3	silty CLAY to CLAY	115	1.5	36	96	14	-	-	9.9	9.9	38	0.005	2.65	15
54.63	109.2	41.2	-	115.0	9.3	293.9	8.8	3	silty CLAY to CLAY	115	1.5	27	73	12	-	-	7.5	9.9	49	0.005	2.86	15
54.79	124.3	46.9	-	130.2	10.0	299.1	8.3	3	silty CLAY to CLAY	115	1.5	31	83	13	-	-	8.6	9.9	46	0.005	2.80	15
54.96	133.9	50.5	-	139.8	10.1	305.0	7.8	3	silty CLAY to CLAY	115	1.5	34	89	14	-	-	9.3	9.9	44	0.005	2.76	15
55.12	152.6	57.6	-	159.8	13.5	368.8	9.0	3	silty CLAY to CLAY	115	1.5	38	100	16	-	-	10.6	9.9	44	0.005	2.77	15

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing


CPT-02
Siegfried Engineering
Morada Water Tank Study
Depth 4.99ft
Ref*
Arrival 11.64mS
Velocity*
Depth 10.01ft
Ref 4.99ft
Arrival 13.83mS
Velocity 1786.76ft/S
Depth 15.03ft
Ref 10.01ft
Arrival 19.61mS
Velocity 784.67ft/S
Depth 20.01ft
Ref 15.03ft
Arrival 26.01mS
Velocity 737.94ft/S
Depth 25.03ft
Ref 20.01ft
Arrival 31.87mS
Velocity 829.08ft/S
Depth 30.02ft
Ref 25.03ft
Arrival 37.11mS
Velocity 931.92ft/S
Depth 35.01ft
Ref 30.02ft
Arrival 41.95mS
Velocity 1013.34ft/S
Depth 40.09ft
Ref 35.01ft
Arrival 47.50mS
Velocity 905.93ft/S
Depth 45.01ft
Ref 40.09ft
Arrival 52.03mS
Velocity 1076.04ft/S
Depth 50.03ft
Ref 45.01ft
Arrival 55.70mS
Velocity 1356.94ft/S
Depth 55.61ft
Ref 50.03ft
Arrival 59.06mS
Velocity 1650.31ft/S
0
10
20
30
40
50
60
70
80
90
100
Time (mS)
Hammer to Rod String Distance (ft): 5.83
* = Not Determined

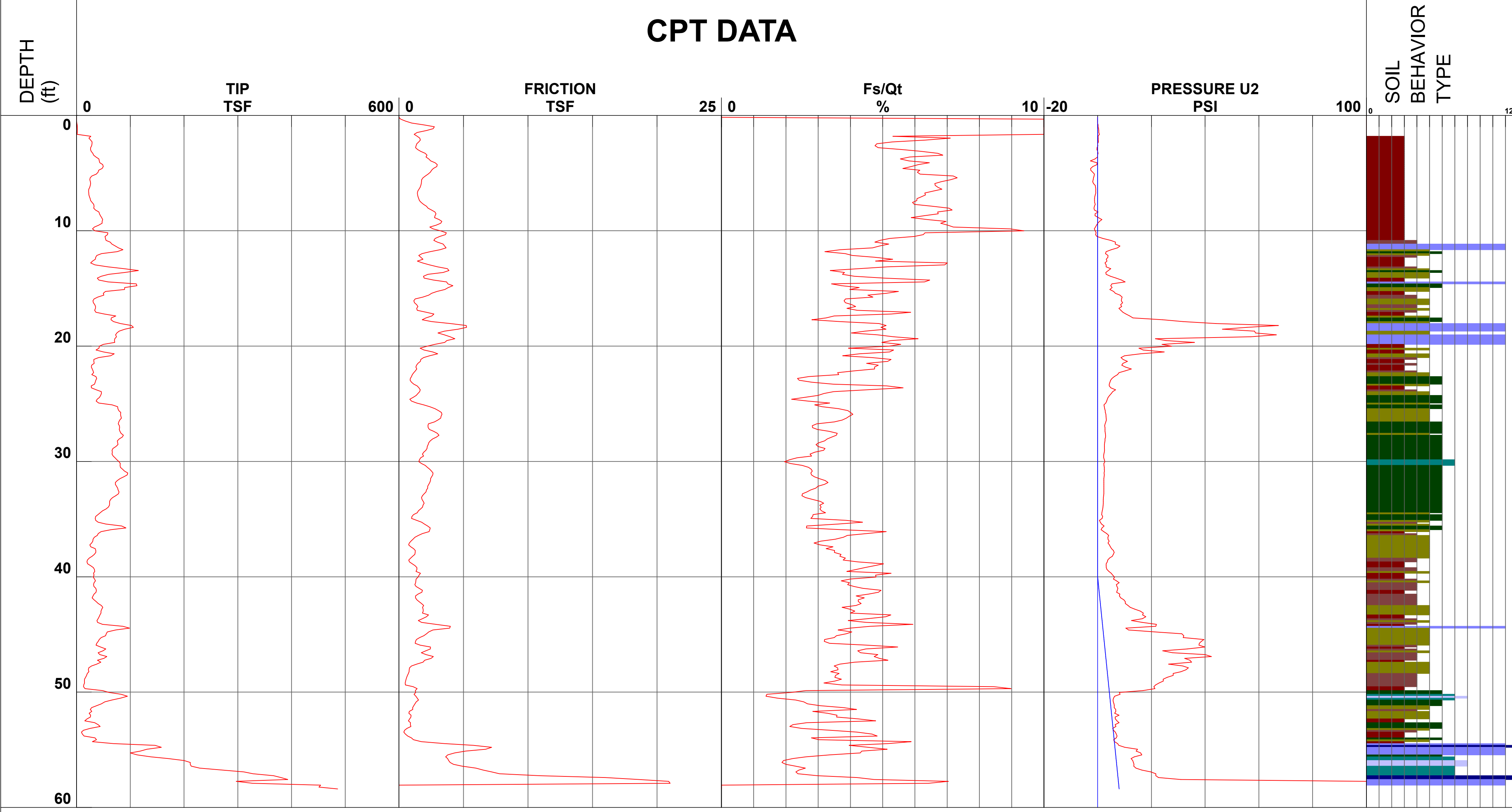
COMMENT:

Siegfried Engineering

Project	Morada Water Tank Study	Operator	JM-FA	Filename	SDF(425).cpt
Job Number	23095-5001	Cone Number	DDG1587	GPS	
Hole Number	CPT-03	Date and Time	23095-5001	Maximum Depth	58.40 ft
EST GW Depth During Test		40.00 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

Morada Water Tank Study

Project ID: Siegfried Engineering
Data File: SDF(425).cpt
CPT Date: 10/27/2023 10:16:48 AM
GW During Test: 40 ft

Sounding ID: CPT-03
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Ratio %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
0.33	1.1	0.0	-	1.1	0.1	0.0	9.9	2	Organic SOILS - Peats	100	1.0	0	1	1	-	-	0.1	9.9	95	0.100	5.82	10
0.49	1.1	0.1	-	1.1	0.5	0.0	9.9	2	Organic SOILS - Peats	100	1.0	0	1	1	-	-	0.1	9.9	95	0.100	5.18	10
0.66	1.1	0.5	-	1.1	1.0	0.0	9.9	2	Organic SOILS - Peats	100	1.0	0	1	2	-	-	0.1	9.9	95	0.100	4.44	10
0.82	1.1	1.8	-	1.1	1.9	0.2	9.9	2	Organic SOILS - Peats	100	1.0	2	1	1	-	-	0.1	8.7	95	0.100	3.92	10
0.98	1.2	1.9	-	1.2	2.7	0.2	9.9	2	Organic SOILS - Peats	100	1.0	2	1	1	-	-	0.1	7.7	95	0.100	3.90	10
1.15	1.5	2.4	-	1.5	2.6	0.3	9.9	2	Organic SOILS - Peats	100	1.0	2	1	2	-	-	0.2	8.2	95	0.100	3.82	10
1.31	1.5	2.4	-	1.5	2.1	0.4	9.9	2	Organic SOILS - Peats	100	1.0	2	2	2	-	-	0.2	7.3	95	0.100	3.81	10
1.48	1.2	1.9	-	1.2	1.4	0.4	9.9	2	Organic SOILS - Peats	100	1.0	2	1	1	-	-	0.1	5.0	95	0.100	3.91	10
1.64	1.1	1.6	-	1.1	1.2	0.7	9.9	2	Organic SOILS - Peats	100	1.0	2	1	1	-	-	0.1	4.1	95	0.100	3.99	10
1.80	26.5	42.5	-	26.5	1.4	0.2	5.3	3	silty CLAY to CLAY	115	1.5	28	18	11	-	-	1.9	9.9	39	0.005	2.68	15
1.97	22.8	36.5	-	22.8	1.6	0.2	7.1	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.6	9.9	47	0.005	2.82	15
2.13	26.2	42.1	-	26.2	1.7	0.2	6.4	3	silty CLAY to CLAY	115	1.5	28	17	12	-	-	1.8	9.9	43	0.005	2.74	15
2.30	28.9	46.3	-	28.9	1.5	0.3	5.3	3	silty CLAY to CLAY	115	1.5	31	19	12	-	-	2.0	9.9	38	0.005	2.66	15
2.46	28.7	46.1	-	28.7	1.4	0.0	4.8	4	clayy SILT to silty CLAY	115	2.0	23	14	12	-	-	2.0	9.9	37	0.070	2.63	15
2.62	28.0	44.9	-	28.0	1.3	0.1	4.8	4	clayy SILT to silty CLAY	115	2.0	22	14	12	-	-	2.0	9.9	37	0.070	2.63	15
2.79	26.2	42.0	-	26.2	1.3	-0.2	4.9	4	clayy SILT to silty CLAY	115	2.0	21	13	11	-	-	1.8	9.9	38	0.070	2.66	15
2.95	25.8	41.4	-	25.8	1.4	-0.3	5.6	3	silty CLAY to CLAY	115	1.5	28	17	11	-	-	1.8	9.9	41	0.005	2.71	15
3.12	27.2	43.6	-	27.2	1.7	0.0	6.2	3	silty CLAY to CLAY	115	1.5	29	18	12	-	-	1.9	9.9	42	0.005	2.72	15
3.28	30.2	48.4	-	30.2	2.0	0.1	6.7	3	silty CLAY to CLAY	115	1.5	32	20	13	-	-	2.1	9.9	41	0.005	2.72	15
3.45	31.8	50.9	-	31.8	2.2	-0.1	6.9	3	silty CLAY to CLAY	115	1.5	34	21	14	-	-	2.2	9.9	41	0.005	2.71	15
3.61	35.9	57.6	-	35.9	2.1	-0.1	5.9	3	silty CLAY to CLAY	115	1.5	38	24	15	-	-	2.5	9.9	37	0.005	2.62	15
3.77	41.6	66.7	208.2	41.6	2.3	-1.0	5.6	4	clayy SILT to silty CLAY	115	2.0	33	21	17	-	-	2.9	9.9	34	0.070	2.57	15
3.94	42.3	67.8	216.1	42.2	2.5	-2.7	5.8	9	very stiff fine SOIL	120	1.0	68	42	17	-	-	1.5	9.9	34	0.250	2.58	30
4.10	43.3	69.4	-	43.3	2.8	-0.3	6.5	9	very stiff fine SOIL	120	1.0	69	43	18	-	-	1.5	9.9	36	0.250	2.61	30
4.27	48.5	77.8	238.6	48.5	3.0	-0.2	6.1	9	very stiff fine SOIL	120	1.0	78	49	19	-	-	1.7	9.9	33	0.250	2.56	30
4.43	49.7	79.7	236.1	49.7	2.9	-1.8	5.9	9	very stiff fine SOIL	120	1.0	80	50	20	-	-	1.7	9.9	32	0.250	2.54	30
4.59	47.5	76.1	224.3	47.4	2.7	-2.6	5.7	9	very stiff fine SOIL	120	1.0	76	47	19	-	-	1.7	9.9	32	0.250	2.53	30
4.76	41.2	66.1	-	41.2	2.5	-2.6	6.2	9	very stiff fine SOIL	120	1.0	66	41	17	-	-	1.4	9.9	36	0.250	2.60	30
4.92	40.0	64.2	-	40.0	2.4	-1.9	6.1	9	very stiff fine SOIL	120	1.0	64	40	16	-	-	1.4	9.9	36	0.250	2.61	30
5.09	36.5	58.6	-	36.5	2.2	-1.2	6.2	3	silty CLAY to CLAY	115	1.5	39	24	15	-	-	2.6	9.9	37	0.005	2.64	15
5.25	28.5	45.8	-	28.5	2.1	-1.3	7.3	3	silty CLAY to CLAY	115	1.5	31	19	13	-	-	2.0	9.9	44	0.005	2.76	15
5.41	25.4	40.7	-	25.3	1.9	-1.6	7.4	3	silty CLAY to CLAY	115	1.5	27	17	12	-	-	1.8	9.9	46	0.005	2.80	15
5.58	24.7	39.6	-	24.6	1.8	-1.7	7.2	3	silty CLAY to CLAY	115	1.5	26	16	11	-	-	1.7	9.9	46	0.005	2.80	15
5.74	25.7	41.1	-	25.6	1.7	-1.8	6.9	3	silty CLAY to CLAY	115	1.5	27	17	12	-	-	1.8	9.9	45	0.005	2.78	15
5.91	26.0	41.7	-	26.0	1.7	-1.6	6.7	3	silty CLAY to CLAY	115	1.5	28	17	12	-	-	1.8	9.9	44	0.005	2.76	15
6.07	25.6	41.0	-	25.5	1.7	-0.9	6.7	3	silty CLAY to CLAY	115	1.5	27	17	11	-	-	1.8	9.9	44	0.005	2.77	15
6.23	24.4	39.1	-	24.4	1.6	-0.8	6.8	3	silty CLAY to CLAY	115	1.5	26	16	11	-	-	1.7	9.9	45	0.005	2.79	15
6.40	22.7	36.4	-	22.7	1.5	-0.7	6.9	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.6	9.9	47	0.005	2.81	15
6.56	22.3	35.7	-	22.2	1.5	-0.8	6.7	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.5	9.9	46	0.005	2.81	15
6.73	22.6	36.2	-	22.6	1.4	-0.7	6.4	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.6	9.9	45	0.005	2.79	15
6.89	22.8	36.6	-	22.8	1.4	-0.9	6.4	3	silty CLAY to CLAY	115	1.5	24	15	10	-	-	1.6	9.9	45	0.005	2.79	15
7.05	23.8	38.2	-	23.8	1.5	-1.1	6.3	3	silty CLAY to CLAY	115	1.5	25	16	11	-	-	1.7	9.9	44	0.005	2.77	15
7.22	25.3	40.5	-	25.2	1.5	-1.2	6.2	3	silty CLAY to CLAY	115	1.5	27	17	11	-	-	1.8	9.9	43	0.005	2.74	15
7.38	26.2	42.0	-	26.1	1.6	-1.2	6.2	3	silty CLAY to CLAY	115	1.5	28	17	11	-	-	1.8	9.9	42	0.005	2.73	15
7.55	29.0	46.5	-	28.9	1.7	-1.1	6.0	3	silty CLAY to CLAY	115	1.5	31	19	12	-	-	2.0	9.9	40	0.005	2.70	15
7.71	31.8	51.1	-	31.8	1.9	-0.9	6.1	3	silty CLAY to CLAY	115	1.5	34	21	14	-	-	2.2	9.9	39	0.005	2.67	15
7.87	32.6	52.3	-	32.6	2.1	-1.2	6.6	3	silty CLAY to CLAY	115	1.5	35	22	14	-	-	2.3	9.9	40	0.005	2.69	15
8.04	32.0	51.2	-	31.9	2.3	-1.4	7.2	3	silty CLAY to CLAY	115	1.5	34	21	14	-	-	2.2	9.9	42	0.005	2.72	15
8.20	35.2	56.4	-	35.2	2.5	-1.2	7.3	3	silty CLAY to CLAY	115	1.5	38	23	15	-	-	2.5	9.9	41	0.005	2.70	15
8.37	41.5	66.6	-	41.6	2.8	0.2	6.8	9	very stiff fine SOIL	120	1.0	67	42	17	-	-	1.5	9.9	37	0.250	2.63	30
8.53	42.7	68.5	-	42.7	2.9	-0.9	6.8	9	very stiff fine SOIL	120	1.0	68	43	18	-	-	1.5	9.9	37	0.250	2.63	30
8.69	44.3	71.0	234.0	44.3	2.8	-1.0	6.4	9	very stiff fine SOIL	120	1.0	71	44	18	-	-	1.5	9.9	35	0.250	2.59	30
8.86	46.8	64.2	213.3	46.8	2.8	0.3	6.0	4	clayy SILT to silty CLAY	115	2.0	32	23	16	-	-	3.3	9.9	35	0.070	2.60	15
9.02	48.6	76.5	244.9	48.6	3.1	1.6	6.5	9	very stiff fine SOIL	120	1.0	76	49	19	-	-	1.7	9.9	34	0.250	2.58	30
9.19	47.7	76.4	-	47.7	3.3	0.7	7.0	9	very stiff fine SOIL	120	1.0	76	48	20	-	-	1.7	9.9	36	0.250	2.61	30
9.35	47.5	76.2	-	47.5	3.2	0.1	6.9	9	very stiff fine SOIL	120	1.0	76	48	19	-	-	1.7	9.9	35	0.250	2.60	30
9.51	41.0	65.7	-	41.0	2.9	-0.4	7.1	9	very stiff fine SOIL	120	1.0	66	41	17	-	-	1.4	9.9	38	0.250	2.65	30
9.68	33.2	53.2	-	33.2	2.4	-0.8	7.3	3	silty CLAY to CLAY	115	1.5	35	22	14	-	-	2.3	9.9	42	0.005	2.72	15
9.84	29.5	47.4	-	29.5	2.6	-1.2	9.1	3	silty CLAY to CLAY	115	1.5	32	20	14	-	-	2.0	9.9	48	0.005	2.83	15
10.01	34.3	55.0	-	34.3	3.2	-0.9	9.5	3	silty CLAY to CLAY	115	1.5	37	23	16	-	-	2.4	9.9	46	0.005	2.80	15
10.17	58.1	74.3	239.3	58.1	3.7	-0.6	6.4	9	very stiff fine SOIL	120	1.0	74	58	19	-	-	2.0	9.9	35	0.250	2.58	30
10.34	57.5	72.9	235.9	57.5	3.6	-0.8	6.3	9	very stiff fine SOIL	120	1.0	73	58	18	-	-	2.0	9.9	35	0.250	2.59	30
10.50	52.7	66.2	218.8	52.7	3.1	-0.3	6.0	9	very stiff fine SOIL	120	1.0	66	53	17	-	-	1.8	9.9	35	0.250	2.60	30
10.66	53.8	67.0	202.5	53.8	2.8	1.9	5.3	4	clayy SILT to silty CLAY	115	2.0	33	27	17	-	-	3.8	9.9	33	0.070	2.55	15
10.83	54.8	67.8	196.3	54.9	2.7	4.8	5.0	4	clayy SILT to silty CLAY	115	2.0	34	27	17	-	-	3.8	9.9	32	0.070	2.52	15
10.99	62.5	76.7	204.2	62.6	3.0	6.6	4.8	4	clayy SILT to silty CLAY	115	2.0	38	31	18	-	-	4.4	9.9	30	0.070	2.48	15
11.16	65.8	80.2	220.1	65.9	3.4	6.5	5.2	9	very stiff fine SOIL	120	1.0	80	66	19	-	-	2.3	9.9	30	0.250	2.50	30
11.32	72.1	87.2	221.4	72.3	3.5	8.3	4.9	9	very stiff fine SOIL	120	1.0	87	72	21	-	-	2.5	9.9	29	0.250	2.45	30
11.48	78.0	93.6	223.3	78.2	3.7	7.4	4.7	9	very stiff fine SOIL	120	1.0	94	78	22	-	-	2.7	9.9	27	0.250	2.42	30
11.65	86.4	102.9	204.1	86.5	3.2	5.1	3.7	5	silty SAND to sandy SILT	120	3.0	34	29	23	68	42	-	-	23	0.200	2.31	16
11.81	75.7	89.4	175.5	75.7	2.4	3.1	3.2	5	silty SAND to sandy SILT	120	3.0	30	25	20	63	41	-	-	23	0.200	2.30	16
11.98	46.6	54.7	154.2	46.7	1.8	2.9	3.9	4	clayy SILT to silty CLAY	115	2.0	27	23	13	-	-	3.2	9.9	31	0.070	2.51	15
12.14	37.7	43.9	145.2	37.8	1.5	3.8	4.1	4	clayy SILT to silty CLAY	115	2.0	22	19	11	-	-	2.6	9.9	35	0.070	2.60	15
12.30	35.5	50.5	-	35.6	1.7	3.8	4.9	4	clayy SILT to silty CLAY	115	2.0	25	18	13	-	-	2.5	9.9	36	0.070	2.61	15
12.47	35.0	49.0	-	35.1	1.9	3.2	5.4	3	silty CLAY to CLAY	115	1.5	33	23	13	-	-	2.4	9.9	38	0.005	2.65	15
12.63	29.8	41.2	-	29.9	1.4	3.5	4.9	3	silty CLAY to CLAY	115	1.5	27	20	11	-	-	2.1	9.9	39	0.005	2.67	15
12.80	26.1	35.7	-	26.2	1.8	2.7	7.2	3	silty CLAY to CLAY	115	1.5	24	17	10	-	-	1.8	9.9	48	0.005	2.84	15
12.96	34.2	46.1	-	34.3	2.4	3.2	7.1	3	silty CLAY to CLAY	115	1.5	31	23	13	-	-	2.4	9.9	43	0.005	2.75	15
13.12	58.2	65.2	198.6	58.3	3.0	3.2	5.2	4	clayy SILT to silty CLAY	115	2.0	33	29	16	-	-	4.1	9.9	33	0.070	2.55	15
13.29	88.3	98.3	216.4	88.4	3.8	4.8	4.3	9	very stiff fine SOIL	120	1.0	98	88	23	-	-	3.1	9.9	25	0.250	2.37	30
13.45	114.9	127.1	219.1	115.0	3.9	4.0	3.4	5	silty SAND to sandy SILT	120	3.0	42	38	27	75	43	-	-	20	0.200	2.22	16
13.62	89.7	98.6	203.6	89.8	3.4	3.0	3.8	4	clayy SILT to silty CLAY	115	2.0	49	45	22	-	-	6.3	9.9	24	0.070	2.33	15
13.78	59.9	65.5	165.0	60.0	2.2	3.2	3.8	4	clayy SILT to silty CLAY	115	2.0	33	30	16	-	-	4.2	9.9	28	0.070	2.45	15
13.94	45.9	49.9	154.7	46.0	1.9	4.8	4.2	4	clayy SILT to silty CLAY	115	2.0	25	23	12	-	-	3.2	9.9	34	0.070	2.56	15
14.11	38.6	47.7	-	38.7	1.9	6.9	5.2	4	clayy SILT to silty CLAY	115	2.0	24	19	12	-	-	2.7	9.9	37	0.070	2.64	15
14.27	41.5	50.7	-	41.7	2.7	8.9	6.6	3	silty CLAY to CLAY	115	1.5	34	28	14	-	-	2.9	9.9	41	0.005	2.70	15
14.44	58.7	65.8	-	58.9	3.7	10.2	6.4	9	very stiff fine SOIL	120	1.0	66	59	17	-	-	2.0	9.9	36	0.250	2.62	30
14.60	111.1	117.9	211.1	111.2	3.8	5.3	3.4	5	silty SAND to sandy SILT	120	3.0	39	37	26	72	42	-	-	21	0.200	2.25	16
14.76	112.4	118.6	222.0	112.5	4.2	4.9	3.8	8	stiff SAND to clayy SAND	115	5.0	24	22	26	73	42	-	-	22	0.250	2.28	16
14.93	89.6	94.0	212.2	89.7	3.8	5.4	4.3	4	clayy SILT to silty CLAY	115	2.0	47	45	22	-	-	6.3	9.9	26	0.070	2.39	15
15.09	89.3	93.2	202.7	89.4	3.6	4.5	4.0	4	clayy SILT to silty CLAY	115	2.0	47	45	21	-	-	6.3	9.9	25	0.070	2.36	15
15.26	53.6	57.9	-	53.8	2.9	5.9	5.6	4	clayy SILT to silty CLAY	115	2.0	29	27	15	-	-	3.7	9.9	36	0.070	2.61	15
15.42	49.6	53.1	-	49.7	2.5	6.6	5.2	4	clayy SILT to silty CLAY	115	2.0	27	25	14	-	-	3.4	9.9	36	0.070	2.61	15

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Morada Water Tank Study

Project ID: Siegfried Engineering
Data File: SDF(425).cpt
CPT Date: 10/27/2023 10:16:48 AM
GW During Test: 40 ft

Sounding ID: CPT-03
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
15.58	50.7	52.0	166.8	50.8	2.3	8.3	4.6	4	clayy SILT to silty CLAY	115	2.0	26	25	13	-	-	3.5	9.9	34	0.070	2.58	15
15.75	39.4	43.6	-	39.6	1.9	9.1	4.8	4	clayy SILT to silty CLAY	115	2.0	22	20	11	-	-	2.7	9.9	38	0.070	2.65	15
15.91	32.7	35.8	-	32.9	1.3	8.9	4.0	4	clayy SILT to silty CLAY	115	2.0	18	16	9	-	-	2.2	9.9	38	0.070	2.65	15
16.08	30.3	32.9	-	30.5	1.2	8.8	3.9	4	clayy SILT to silty CLAY	115	2.0	16	15	9	-	-	2.1	9.9	39	0.070	2.67	15
16.24	31.3	33.6	-	31.5	1.2	9.3	4.0	4	clayy SILT to silty CLAY	115	2.0	17	16	9	-	-	2.1	9.9	39	0.070	2.67	15
16.40	33.8	35.9	-	34.0	1.4	8.6	4.2	4	clayy SILT to silty CLAY	115	2.0	18	17	9	-	-	2.3	9.9	39	0.070	2.66	15
16.57	35.3	37.1	-	35.5	1.5	8.9	4.3	4	clayy SILT to silty CLAY	115	2.0	19	18	10	-	-	2.4	9.9	38	0.070	2.66	15
16.73	35.1	36.6	-	35.3	1.4	7.9	4.0	4	clayy SILT to silty CLAY	115	2.0	18	18	10	-	-	2.4	9.9	38	0.070	2.65	15
16.90	33.5	34.6	-	33.7	1.4	8.7	4.3	4	clayy SILT to silty CLAY	115	2.0	17	17	9	-	-	2.3	9.9	40	0.070	2.69	15
17.06	36.1	36.8	-	36.3	2.1	9.4	6.0	3	silty CLAY to CLAY	115	1.5	25	24	10	-	-	2.5	9.9	44	0.005	2.77	15
17.23	51.3	51.9	-	51.5	2.7	10.5	5.4	4	clayy SILT to silty CLAY	115	2.0	26	26	13	-	-	3.6	9.9	37	0.070	2.63	15
17.39	72.9	70.9	164.7	73.2	2.5	11.9	3.5	4	clayy SILT to silty CLAY	115	2.0	35	36	16	-	-	5.1	9.9	27	0.070	2.40	15
17.55	64.6	62.5	149.2	64.9	2.1	13.1	3.3	4	clayy SILT to silty CLAY	115	2.0	31	32	15	-	-	4.5	9.9	27	0.070	2.42	15
17.72	64.1	61.7	137.0	64.5	1.8	24.2	2.8	5	silty SAND to sandy SILT	120	3.0	21	21	14	51	38	-	-	25	0.200	2.38	16
17.88	68.7	65.8	163.8	69.3	2.5	31.8	3.7	4	clayy SILT to silty CLAY	115	2.0	33	34	16	-	-	4.8	9.9	28	0.070	2.44	15
18.05	81.4	77.7	209.6	82.3	4.0	44.0	5.0	4	clayy SILT to silty CLAY	115	2.0	39	41	19	-	-	5.7	9.9	30	0.070	2.49	15
18.21	102.1	97.0	240.3	103.4	5.2	67.3	5.2	9	very stiff fine SOIL	120	1.0	97	100	23	-	-	3.6	9.9	28	0.250	2.44	30
18.37	105.8	100.1	239.5	106.9	5.2	55.6	5.0	9	very stiff fine SOIL	120	1.0	100	100	23	-	-	3.7	9.9	27	0.250	2.42	30
18.54	90.0	84.6	224.4	90.9	4.6	46.4	5.2	9	very stiff fine SOIL	120	1.0	85	90	20	-	-	3.1	9.9	30	0.250	2.48	30
18.70	79.2	74.2	193.8	80.3	3.5	58.4	4.5	4	clayy SILT to silty CLAY	115	2.0	37	40	18	-	-	5.5	9.9	29	0.070	2.47	15
18.87	74.9	69.9	177.7	76.1	3.0	58.7	4.1	4	clayy SILT to silty CLAY	115	2.0	35	37	17	-	-	5.2	9.9	29	0.070	2.45	15
19.03	72.6	67.4	194.8	73.9	3.5	66.5	4.9	4	clayy SILT to silty CLAY	115	2.0	34	36	17	-	-	5.0	9.9	32	0.070	2.52	15
19.19	74.4	68.8	208.8	75.5	4.0	56.9	5.4	4	clayy SILT to silty CLAY	115	2.0	34	37	17	-	-	5.2	9.9	33	0.070	2.55	15
19.36	71.1	63.9	-	71.5	4.3	21.5	6.2	9	very stiff fine SOIL	120	1.0	64	71	16	-	-	2.5	9.9	36	0.250	2.62	30
19.52	70.4	64.6	200.9	70.9	3.7	25.4	5.3	4	clayy SILT to silty CLAY	115	2.0	32	35	16	-	-	4.9	9.9	34	0.070	2.56	15
19.69	71.2	65.0	194.9	71.9	3.5	36.0	5.1	4	clayy SILT to silty CLAY	115	2.0	33	36	16	-	-	5.0	9.9	33	0.070	2.54	15
19.85	49.9	43.7	-	50.3	2.8	24.0	5.7	3	silty CLAY to CLAY	115	1.5	29	33	12	-	-	3.4	9.9	40	0.005	2.70	15
20.01	42.1	36.6	-	42.6	2.2	27.6	5.3	3	silty CLAY to CLAY	115	1.5	24	28	10	-	-	2.9	9.9	42	0.005	2.73	15
20.18	41.8	36.0	-	42.1	1.6	15.4	4.0	4	clayy SILT to silty CLAY	115	2.0	18	21	9	-	-	2.9	9.9	38	0.070	2.66	15
20.34	36.1	30.9	-	36.5	1.9	17.0	5.5	3	silty CLAY to CLAY	115	1.5	21	24	9	-	-	2.5	9.9	46	0.005	2.80	15
20.51	50.2	42.6	-	50.7	2.6	24.8	5.3	3	silty CLAY to CLAY	115	1.5	28	33	11	-	-	3.5	9.9	40	0.005	2.69	15
20.67	70.1	62.4	175.0	70.4	3.0	16.0	4.4	4	clayy SILT to silty CLAY	115	2.0	31	35	15	-	-	4.9	9.9	31	0.070	2.51	15
20.83	63.3	56.2	155.0	63.5	2.4	10.0	3.8	4	clayy SILT to silty CLAY	115	2.0	28	32	14	-	-	4.4	9.9	31	0.070	2.50	15
21.00	40.8	33.8	-	40.9	1.9	8.7	4.8	3	silty CLAY to CLAY	115	1.5	23	27	9	-	-	2.8	9.9	42	0.005	2.73	15
21.16	32.2	26.4	-	32.3	1.7	9.5	5.5	3	silty CLAY to CLAY	115	1.5	18	21	8	-	-	2.2	8.4	49	0.005	2.85	15
21.33	32.2	26.2	-	32.4	1.7	11.1	5.4	3	silty CLAY to CLAY	115	1.5	17	21	8	-	-	2.2	8.3	48	0.005	2.84	15
21.49	32.8	26.5	-	32.9	1.5	9.4	4.7	3	silty CLAY to CLAY	115	1.5	18	22	8	-	-	2.2	8.4	46	0.005	2.80	15
21.65	28.0	22.5	-	28.2	1.4	9.0	5.1	3	silty CLAY to CLAY	115	1.5	15	19	7	-	-	1.9	7.1	51	0.005	2.88	15
21.82	27.5	21.9	-	27.7	1.3	10.3	5.0	3	silty CLAY to CLAY	115	1.5	15	18	7	-	-	1.9	6.9	51	0.005	2.88	15
21.98	29.0	23.0	-	29.3	1.4	12.5	5.0	3	silty CLAY to CLAY	115	1.5	15	19	7	-	-	2.0	7.2	50	0.005	2.86	15
22.15	30.7	24.1	-	30.9	1.3	10.3	4.3	3	silty CLAY to CLAY	115	1.5	16	20	7	-	-	2.1	7.6	46	0.005	2.81	15
22.31	31.7	24.7	-	31.9	1.1	8.0	3.8	4	clayy SILT to silty CLAY	115	2.0	12	16	7	-	-	2.2	7.8	44	0.070	2.76	15
22.47	28.4	22.0	-	28.5	1.0	7.4	3.8	3	silty CLAY to CLAY	115	1.5	15	19	6	-	-	1.9	6.9	46	0.005	2.80	15
22.64	36.1	27.7	-	36.2	1.0	6.2	2.8	4	clayy SILT to silty CLAY	115	2.0	14	18	7	-	-	2.5	8.8	37	0.070	2.64	15
22.80	37.4	31.7	97.0	37.5	0.9	5.4	2.4	4	clayy SILT to silty CLAY	115	2.0	16	19	8	-	-	2.6	9.1	33	0.070	2.55	15
22.97	35.9	27.1	-	36.0	0.9	4.8	2.5	4	clayy SILT to silty CLAY	115	2.0	14	18	7	-	-	2.4	8.6	36	0.070	2.61	15
23.13	34.7	26.1	-	34.8	1.0	4.6	2.9	4	clayy SILT to silty CLAY	115	2.0	13	17	7	-	-	2.4	8.3	39	0.070	2.67	15
23.30	33.3	24.9	-	33.4	1.2	4.3	3.6	4	clayy SILT to silty CLAY	115	2.0	12	17	7	-	-	2.3	7.9	43	0.070	2.75	15
23.46	27.3	20.2	-	27.4	1.4	4.3	5.4	3	silty CLAY to CLAY	115	1.5	13	18	6	-	-	1.8	6.4	54	0.005	2.93	15
23.62	27.6	20.3	-	27.7	1.6	4.9	5.9	3	silty CLAY to CLAY	115	1.5	14	18	6	-	-	1.9	6.4	56	0.005	2.96	15
23.79	36.6	26.7	-	36.7	1.6	6.7	4.7	3	silty CLAY to CLAY	115	1.5	18	24	8	-	-	2.5	8.5	46	0.005	2.80	15
23.95	46.1	33.5	-	46.2	1.6	5.6	3.6	4	clayy SILT to silty CLAY	115	2.0	17	23	9	-	-	3.2	9.9	37	0.070	2.64	15
24.12	46.2	33.3	-	46.3	1.5	5.1	3.3	4	clayy SILT to silty CLAY	115	2.0	17	23	9	-	-	3.2	9.9	36	0.070	2.62	15
24.28	44.8	32.1	-	44.8	1.3	4.4	3.1	4	clayy SILT to silty CLAY	115	2.0	16	22	8	-	-	3.1	9.9	36	0.070	2.61	15
24.44	42.5	34.9	104.9	42.6	1.1	3.9	2.7	4	clayy SILT to silty CLAY	115	2.0	17	21	9	-	-	2.9	9.7	33	0.070	2.55	15
24.61	38.4	31.4	92.9	38.5	0.8	3.6	2.3	4	clayy SILT to silty CLAY	115	2.0	16	19	8	-	-	2.6	8.6	32	0.070	2.54	15
24.77	36.5	25.6	-	36.5	1.0	3.4	2.8	4	clayy SILT to silty CLAY	115	2.0	13	18	7	-	-	2.5	8.1	39	0.070	2.66	15
24.94	41.0	28.6	-	41.0	1.4	3.0	3.5	4	clayy SILT to silty CLAY	115	2.0	14	20	8	-	-	2.8	9.1	40	0.070	2.69	15
25.10	66.2	53.5	131.5	66.3	1.9	2.4	3.0	4	clayy SILT to silty CLAY	115	2.0	27	33	13	-	-	4.6	9.9	28	0.070	2.43	15
25.26	76.4	61.5	145.5	76.4	2.4	2.5	3.2	4	clayy SILT to silty CLAY	115	2.0	31	38	14	-	-	5.3	9.9	27	0.070	2.41	15
25.43	76.8	61.7	158.5	76.9	2.8	2.6	3.7	4	clayy SILT to silty CLAY	115	2.0	31	38	15	-	-	5.3	9.9	29	0.070	2.46	15
25.59	78.4	62.8	167.0	78.5	3.1	2.8	4.0	4	clayy SILT to silty CLAY	115	2.0	31	39	15	-	-	5.4	9.9	30	0.070	2.48	15
25.76	82.3	65.6	172.4	82.3	3.3	2.9	4.1	4	clayy SILT to silty CLAY	115	2.0	33	41	16	-	-	5.7	9.9	29	0.070	2.47	15
25.92	81.7	65.0	173.5	81.8	3.3	3.1	4.2	4	clayy SILT to silty CLAY	115	2.0	32	41	16	-	-	5.7	9.9	30	0.070	2.48	15
26.08	82.4	65.3	171.2	82.4	3.3	3.1	4.0	4	clayy SILT to silty CLAY	115	2.0	33	41	16	-	-	5.7	9.9	29	0.070	2.47	15
26.25	83.5	66.0	169.7	83.5	3.2	3.2	3.9	4	clayy SILT to silty CLAY	115	2.0	33	42	16	-	-	5.8	9.9	29	0.070	2.46	15
26.41	80.3	63.3	163.3	80.4	3.0	3.3	3.8	4	clayy SILT to silty CLAY	115	2.0	32	40	15	-	-	5.6	9.9	29	0.070	2.46	15
26.58	78.5	61.7	155.4	78.6	2.7	3.0	3.6	4	clayy SILT to silty CLAY	115	2.0	31	39	15	-	-	5.4	9.9	28	0.070	2.45	15
26.74	77.4	60.6	140.3	77.4	2.3	2.8	3.0	4	clayy SILT to silty CLAY	115	2.0	30	39	14	-	-	5.4	9.9	26	0.070	2.40	15
26.90	79.5	62.1	138.3	79.6	2.2	2.6	2.9	5	silty SAND to sandy SILT	120	3.0	21	27	14	51	37	-	-	26	0.200	2.38	16
27.07	80.1	62.4	138.7	80.2	2.3	2.7	2.9	5	silty SAND to sandy SILT	120	3.0	21	27	14	51	37	-	-	26	0.200	2.38	16
27.23	79.3	61.5	141.9	79.4	2.4	2.7	3.0	4	clayy SILT to silty CLAY	115	2.0	31	40	14	-	-	5.5	9.9	26	0.070	2.40	15
27.40	80.6	62.3	152.1	80.6	2.7	2.7	3.4	4	clayy SILT to silty CLAY	115	2.0	31	40	15	-	-	5.6	9.9	28	0.070	2.43	15
27.56	82.7	63.8	160.0	82.7	3.0	2.9	3.7	4	clayy SILT to silty CLAY	115	2.0	32	41	15	-	-	5.7	9.9	28	0.070	2.45	15
27.72	87.0	66.9	162.7	87.1	3.1	3.0	3.6	4	clayy SILT to silty CLAY	115	2.0	33	44	16	-	-	6.0	9.9	28	0.070	2.43	15
27.89	85.0	65.2	157.3	85.1	2.9	3.0	3.5	4	clayy SILT to silty CLAY	115	2.0	33	43	15	-	-	5.9	9.9	27	0.070	2.42	15
28.05	79.4	60.7	148.9	79.4	2.6	2.7	3.4	4	clayy SILT to silty CLAY	115	2.0	30	40	14	-	-	5.5	9.9	28	0.070	2.43	15
28.22	75.8	57.8	143.7	75.8	2.4	2.7	3.3	4	clayy SILT to silty CLAY	115	2.0	29	38	14	-	-	5.2	9.9	28	0.070	2.44	15
28.38	76.4	58.1	139.7	76.5	2.3	2.6	3.1	4	clayy SILT to silty CLAY	115	2.0	29	38	14	-	-	5.3	9.9	27	0.070	2.42	15
28.54	77.0	58.4	137.6	77.1	2.3	2.5	3.0	4	clayy SILT to silty CLAY	115	2.0	29	39	14	-	-	5.3	9.9	27	0.070	2.41	15
28.71	73.1	55.2	136.1	73.1	2.2	2.5	3.1	4	clayy SILT to silty CLAY	115	2.0	28	37	13	-	-	5.0	9.9	28	0.070	2.44	15
28.87	67.6	51.0	136.8	67.7	2.2	2.5	3.3	4	clayy SILT to silty CLAY	115	2.0	25	34	12	-	-	4.7	9.9	30	0.070	2.48	15
29.04	66.0	49.6	134.2	66.1	2.1	2.6	3.2	4	clayy SILT to silty CLAY	115	2.0	25	33	12	-	-	4.5	9.9	30	0.070	2.49	15
29.20	66.5	49.8	128.1	66.5	1.9	2.5	3.0	4	clayy SILT to silty CLAY	115	2.0	25	33	12	-	-	4.6	9.9	29	0.070	2.46	15
29.36	66.0	49.3	124.0	66.0	1.8	2.3	2.8	4	clayy SILT to silty CLAY	115	2.0	25	33	12	-	-	4.5	9.9	28	0.070	2.45	15
29.53	68.1	50.7	126.6	68.1	1.9	2.2	2.9	4	clayy SILT to silty CLAY	115	2.0	25	34	12	-	-	4.7	9.9	28	0.070	2.44	15
29.69	71.6	53.2	117.7	71.6	1.7	2.3	2.4	5	silty SAND to sandy SILT	120	3.0	18	24	12	46	36	-	-	25	0.200	2.38	16
29.86	74.8	55.5	113.8	74.9	1.6	2.5	2.2	5	silty SAND to sandy SILT	120	3.0	18	25	12	48	36	-	-	24	0.200	2.33	16
30.02	79.0	58.3	112.0	79.0	1.5	2.7	2.0	5	silty SAND to sandy SILT	120	3.0	19	26	13	49	36	-	-	22	0.200	2.29	16
30.19	81.4	60.0	118.6	81.4	1.7	2.3	2.2	5	silty SAND to sandy SILT	120	3.0	20	27	13	50	36	-	-	23	0.200	2.31	16
30.35	81.0	59.5	127.6	81.1	2.0	2.4	2.6	5	silty SAND to sandy SILT	120	3.0	20	27	14	50	36	-	-	25	0.200	2.36	16
30.51	81.6	59.8	133.1	81.6	2.2	2.5	2.8	5	silty SAND to sandy SILT	120	3.0	20	27	14	50	36	-	-	26	0.200	2.38	16
30.68	85.6	62.5	138.1	85.7	2.4	2.5	2.8	5	silty SAND to sandy SILT	120	3.0	21	29	14	52	36	-	-	25	0.200	2.37	16
30.84	89.3	65.1	141.4	89.3	2.5	2.5	2.9	5	silty SAND to sandy SILT	120	3.0	22	30	15	53	37	-	-	25	0.200	2.36	16

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

Project ID: Siegfried Engineering
Data File: SDF(425).cpt
CPT Date: 10/27/2023 10:16:48 AM
GW During Test: 40 ft

Page: 3
Sounding ID: CPT-03
Project No: 23095-5001
Cone/Rig: DDG1587

. Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk -
31.01	95.3	69.2	144.2	95.3	2.6	2.4	2.8	5	silty SAND to sandy SILT	120	3.0	23	32	16	55	37	-	-	24	0.200	2.34	16
31.17	94.1	68.2	143.7	94.1	2.6	2.4	2.8	5	silty SAND to sandy SILT	120	3.0	23	31	15	54	37	-	-	24	0.200	2.35	16
31.33	87.9	63.5	141.5	87.9	2.5	2.4	2.9	5	silty SAND to sandy SILT	120	3.0	21	29	15	52	36	-	-	26	0.200	2.38	16
31.50	81.0	58.3	140.3	81.0	2.5	2.3	3.1	4	clayy SILT to silty CLAY	115	2.0	29	40	14	-	-	5.6	9.9	27	0.070	2.42	15
31.66	75.9	54.5	140.9	75.9	2.4	2.3	3.3	4	clayy SILT to silty CLAY	115	2.0	27	38	13	-	-	5.2	9.9	29	0.070	2.46	15
31.83	72.1	51.7	140.0	72.2	2.4	2.3	3.4	4	clayy SILT to silty CLAY	115	2.0	26	36	12	-	-	5.0	9.9	30	0.070	2.49	15
31.99	72.2	51.6	137.3	72.2	2.3	2.3	3.3	4	clayy SILT to silty CLAY	115	2.0	26	36	12	-	-	5.0	9.9	30	0.070	2.48	15
32.15	74.4	53.1	134.0	74.4	2.2	2.3	3.1	4	clayy SILT to silty CLAY	115	2.0	27	37	13	-	-	5.1	9.9	28	0.070	2.45	15
32.32	76.3	54.3	133.5	76.4	2.2	2.3	3.0	4	clayy SILT to silty CLAY	115	2.0	27	38	13	-	-	5.3	9.9	28	0.070	2.43	15
32.48	77.2	54.8	130.0	77.2	2.1	2.3	2.8	4	clayy SILT to silty CLAY	115	2.0	27	39	13	-	-	5.3	9.9	27	0.070	2.42	15
32.65	79.0	55.9	128.2	79.0	2.1	2.3	2.7	5	silty SAND to sandy SILT	120	3.0	19	26	13	48	36	-	-	26	0.200	2.40	16
32.81	78.0	55.1	123.8	78.0	2.0	2.3	2.6	5	silty SAND to sandy SILT	120	3.0	18	26	13	47	35	-	-	26	0.200	2.38	16
32.97	72.7	51.2	119.9	72.7	1.8	2.2	2.6	5	silty SAND to sandy SILT	120	3.0	17	24	12	45	35	-	-	27	0.200	2.41	16
33.14	67.0	47.0	118.6	67.0	1.7	2.1	2.7	4	clayy SILT to silty CLAY	115	2.0	24	33	11	-	-	4.6	9.9	28	0.070	2.45	15
33.30	63.1	44.2	121.1	63.1	1.8	2.1	2.9	4	clayy SILT to silty CLAY	115	2.0	22	32	11	-	-	4.3	9.9	30	0.070	2.49	15
33.47	61.5	31.9	-	61.6	1.9	2.1	3.2	4	clayy SILT to silty CLAY	115	2.0	16	31	8	-	-	4.2	9.9	36	0.070	2.62	15
33.63	61.4	31.6	-	61.4	1.9	2.1	3.3	4	clayy SILT to silty CLAY	115	2.0	16	31	8	-	-	4.2	9.9	37	0.070	2.64	15
33.79	61.2	31.4	-	61.2	1.9	2.0	3.1	4	clayy SILT to silty CLAY	115	2.0	16	31	8	-	-	4.2	9.9	37	0.070	2.63	15
33.96	59.1	30.2	-	59.2	1.8	1.9	3.2	4	clayy SILT to silty CLAY	115	2.0	15	30	8	-	-	4.0	9.6	38	0.070	2.64	15
34.12	54.8	27.8	-	54.8	1.7	1.9	3.2	4	clayy SILT to silty CLAY	115	2.0	14	27	7	-	-	3.7	8.9	39	0.070	2.67	15
34.29	48.3	24.4	-	48.4	1.5	1.7	3.2	4	clayy SILT to silty CLAY	115	2.0	12	24	7	-	-	3.3	7.7	42	0.070	2.72	15
34.45	43.9	22.1	-	43.9	1.4	1.6	3.4	4	clayy SILT to silty CLAY	115	2.0	11	22	6	-	-	3.0	7.0	44	0.070	2.77	15
34.61	39.7	19.9	-	39.8	1.1	1.5	3.0	4	clayy SILT to silty CLAY	115	2.0	10	20	6	-	-	2.7	6.2	44	0.070	2.77	15
34.78	35.5	17.7	-	35.5	1.0	1.8	3.0	4	clayy SILT to silty CLAY	115	2.0	9	18	5	-	-	2.4	5.5	47	0.070	2.82	15
34.94	34.8	17.3	-	34.8	1.0	1.7	2.9	4	clayy SILT to silty CLAY	115	2.0	9	17	5	-	-	2.3	5.4	47	0.070	2.82	15
35.11	35.6	17.6	-	35.6	1.4	0.7	4.1	3	silty CLAY to CLAY	115	1.5	12	24	5	-	-	2.4	5.5	52	0.005	2.90	15
35.27	40.1	19.7	-	40.1	1.8	1.0	4.6	3	silty CLAY to CLAY	115	1.5	13	27	6	-	-	2.7	6.2	52	0.005	2.89	15
35.43	54.3	26.6	-	54.3	2.0	1.5	3.8	4	clayy SILT to silty CLAY	115	2.0	13	27	7	-	-	3.7	8.4	42	0.070	2.73	15
35.60	83.8	56.8	129.1	83.8	2.2	2.4	2.7	5	silty SAND to sandy SILT	120	3.0	19	28	13	48	35	-	-	26	0.200	2.39	16
35.76	91.8	62.1	133.9	91.9	2.4	1.6	2.7	5	silty SAND to sandy SILT	120	3.0	21	31	14	51	36	-	-	25	0.200	2.36	16
35.93	64.2	31.0	-	64.3	2.4	1.3	3.8	4	clayy SILT to silty CLAY	115	2.0	15	32	8	-	-	4.4	9.9	40	0.070	2.69	15
36.09	45.7	21.9	-	45.7	2.3	2.3	5.4	3	silty CLAY to CLAY	115	1.5	15	30	7	-	-	3.1	6.9	52	0.005	2.90	15
36.26	40.4	19.3	-	40.4	1.8	3.4	4.7	3	silty CLAY to CLAY	115	1.5	13	27	6	-	-	2.7	6.0	53	0.005	2.91	15
36.42	38.6	18.3	-	38.6	1.5	4.1	4.1	3	silty CLAY to CLAY	115	1.5	12	26	5	-	-	2.6	5.7	51	0.005	2.89	15
36.58	32.9	15.6	-	33.0	1.2	3.8	4.0	3	silty CLAY to CLAY	115	1.5	10	22	5	-	-	2.2	4.8	55	0.005	2.94	15
36.75	30.7	14.5	-	30.7	1.1	3.9	3.8	3	silty CLAY to CLAY	115	1.5	10	20	4	-	-	2.0	4.4	55	0.005	2.95	15
36.91	30.1	14.1	-	30.2	0.9	4.3	3.3	3	silty CLAY to CLAY	115	1.5	9	20	4	-	-	2.0	4.3	54	0.005	2.93	15
37.08	28.1	13.1	-	28.2	0.8	3.9	3.1	3	silty CLAY to CLAY	115	1.5	9	19	4	-	-	1.8	4.0	54	0.005	2.94	15
37.24	24.6	11.5	-	24.7	0.8	4.4	3.3	3	silty CLAY to CLAY	115	1.5	8	16	4	-	-	1.6	3.5	59	0.005	3.01	15
37.40	26.3	12.2	-	26.4	0.9	4.7	3.8	3	silty CLAY to CLAY	115	1.5	8	18	4	-	-	1.7	3.7	59	0.005	3.01	15
37.57	34.7	16.0	-	34.8	1.1	5.2	3.5	3	silty CLAY to CLAY	115	1.5	11	23	5	-	-	2.3	5.0	51	0.005	2.89	15
37.73	35.9	16.5	-	36.0	1.3	5.8	3.7	3	silty CLAY to CLAY	115	1.5	11	24	5	-	-	2.4	5.1	52	0.005	2.90	15
37.90	35.9	16.4	-	36.0	1.3	6.1	3.7	3	silty CLAY to CLAY	115	1.5	11	24	5	-	-	2.4	5.1	52	0.005	2.90	15
38.06	33.0	15.0	-	33.1	1.2	5.8	4.0	3	silty CLAY to CLAY	115	1.5	10	22	5	-	-	2.2	4.6	55	0.005	2.95	15
38.22	28.9	13.1	-	29.0	1.1	5.5	4.0	3	silty CLAY to CLAY	115	1.5	9	19	4	-	-	1.9	4.0	59	0.005	3.00	15
38.39	23.5	10.6	-	23.6	0.9	4.4	4.2	3	silty CLAY to CLAY	115	1.5	7	16	4	-	-	1.5	3.2	65	0.005	3.10	15
38.55	20.2	9.1	-	20.2	0.8	3.7	4.2	3	silty CLAY to CLAY	115	1.5	6	13	3	-	-	1.3	2.7	70	0.005	3.16	15
38.72	19.2	8.6	-	19.3	0.8	3.6	4.8	3	silty CLAY to CLAY	115	1.5	6	13	3	-	-	1.2	2.5	74	0.005	3.21	15
38.88	20.6	9.2	-	20.6	1.0	3.2	5.6	3	silty CLAY to CLAY	115	1.5	6	14	3	-	-	1.3	2.7	75	0.005	3.23	15
39.04	26.2	11.6	-	26.3	1.2	3.2	5.2	3	silty CLAY to CLAY	115	1.5	8	17	4	-	-	1.7	3.5	67	0.005	3.12	15
39.21	31.3	13.8	-	31.3	1.4	3.2	4.8	3	silty CLAY to CLAY	115	1.5	9	21	4	-	-	2.0	4.2	61	0.005	3.03	15
39.37	33.2	14.6	-	33.3	1.4	3.4	4.5	3	silty CLAY to CLAY	115	1.5	10	22	5	-	-	2.2	4.5	58	0.005	2.99	15
39.54	33.9	14.8	-	34.0	1.3	4.2	4.2	3	silty CLAY to CLAY	115	1.5	10	23	5	-	-	2.2	4.6	56	0.005	2.97	15
39.70	31.6	13.8	-	31.7	1.7	5.0	5.7	3	silty CLAY to CLAY	115	1.5	9	21	5	-	-	2.1	4.2	64	0.005	3.08	15
39.86	32.7	14.2	-	32.8	1.6	5.6	5.1	3	silty CLAY to CLAY	115	1.5	9	22	5	-	-	2.1	4.4	61	0.005	3.04	15
40.03	30.9	13.4	-	31.0	1.5	6.3	5.2	3	silty CLAY to CLAY	115	1.5	9	21	4	-	-	2.0	4.1	63	0.005	3.06	15
40.19	33.3	14.4	-	33.4	1.3	5.8	4.3	3	silty CLAY to CLAY	115	1.5	10	22	5	-	-	2.2	4.4	58	0.005	2.99	15
40.36	35.2	15.2	-	35.3	1.3	7.0	4.0	3	silty CLAY to CLAY	115	1.5	10	23	5	-	-	2.3	4.7	55	0.005	2.95	15
40.52	32.6	14.1	-	32.7	1.3	8.0	4.3	3	silty CLAY to CLAY	115	1.5	9	22	4	-	-	2.1	4.3	58	0.005	2.99	15
40.68	31.4	13.5	-	31.6	1.2	7.0	4.2	3	silty CLAY to CLAY	115	1.5	9	21	4	-	-	2.1	4.1	59	0.005	3.01	15
40.85	32.4	13.9	-	32.5	1.3	7.2	4.4	3	silty CLAY to CLAY	115	1.5	9	22	4	-	-	2.1	4.3	59	0.005	3.01	15
41.01	35.7	15.3	-	35.9	1.6	7.5	4.7	3	silty CLAY to CLAY	115	1.5	10	24	5	-	-	2.4	4.7	58	0.005	2.99	15
41.18	36.8	15.8	-	36.9	1.8	7.3	5.3	3	silty CLAY to CLAY	115	1.5	11	25	5	-	-	2.4	4.9	59	0.005	3.01	15
41.34	36.3	15.5	-	36.4	1.8	7.1	5.2	3	silty CLAY to CLAY	115	1.5	10	24	5	-	-	2.4	4.8	59	0.005	3.01	15
41.50	32.4	13.8	-	32.6	1.5	8.2	4.9	3	silty CLAY to CLAY	115	1.5	9	22	5	-	-	2.1	4.2	61	0.005	3.04	15
41.67	30.7	13.1	-	30.9	1.3	8.1	4.5	3	silty CLAY to CLAY	115	1.5	9	20	4	-	-	2.0	4.0	61	0.005	3.04	15
41.83	28.9	12.3	-	29.1	1.3	8.6	4.8	3	silty CLAY to CLAY	115	1.5	8	19	4	-	-	1.9	3.7	64	0.005	3.08	15
42.00	32.7	13.9	-	32.9	1.4	9.7	4.6	3	silty CLAY to CLAY	115	1.5	9	22	4	-	-	2.1	4.2	60	0.005	3.02	15
42.16	36.4	15.4	-	36.6	1.5	10.3	4.5	3	silty CLAY to CLAY	115	1.5	10	24	5	-	-	2.4	4.7	57	0.005	2.98	15
42.32	40.2	17.0	-	40.4	1.7	10.3	4.6	3	silty CLAY to CLAY	115	1.5	11	27	5	-	-	2.7	5.3	55	0.005	2.95	15
42.49	46.0	19.4	-	46.2	1.9	11.3	4.4	3	silty CLAY to CLAY	115	1.5	13	31	6	-	-	3.1	6.1	51	0.005	2.89	15
42.65	48.8	20.6	-	49.1	1.8	12.1	3.9	3	silty CLAY to CLAY	115	1.5	14	33	6	-	-	3.3	6.4	48	0.005	2.84	15
42.82	47.0	19.8	-	47.3	1.9	13.8	4.2	3	silty CLAY to CLAY	115	1.5	13	31	6	-	-	3.2	6.2	50	0.005	2.87	15
42.98	45.5	19.1	-	45.8	1.9	15.9	4.4	3	silty CLAY to CLAY	115	1.5	13	30	6	-	-	3.0	6.0	51	0.005	2.89	15
43.15	45.4	19.0	-	45.7	1.8	17.0	4.2	3	silty CLAY to CLAY	115	1.5	13	30	6	-	-	3.0	5.9	51	0.005	2.88	15
43.31	43.6	18.2	-	43.9	2.3	16.7	5.6	3	silty CLAY to CLAY	115	1.5	12	29	6	-	-	2.9	5.7	57	0.005	2.98	15
43.47	41.9	17.5	-	42.2	2.1	17.9	5.4	3	silty CLAY to CLAY	115	1.5	12	28	6	-	-	2.8	5.4	57	0.005	2.98	15
43.64	40.2	16.7	-	40.5	1.8	16.7	4.8	3	silty CLAY to CLAY	115	1.5	11	27	5	-	-	2.7	5.2	56	0.005	2.97	15
43.80	37.9	15.8	-	38.2	1.5	12.6	4.2	3	silty CLAY to CLAY	115	1.5	11	25	5	-	-	2.5	4.9	55	0.005	2.95	15
43.97	38.9	16.2	-	39.2	1.7	16.5	4.8	3	silty CLAY to CLAY	115	1.5	11	26	5	-	-	2.6	5.0	57	0.005	2.98	15
44.13	48.1	19.9	-	48.5	2.9	21.9	6.3	3	silty CLAY to CLAY	115	1.5	13	32	6	-	-	3.2	6.2	57	0.005	2.98	15
44.29	86.2	35.7	-	86.6	4.0	21.7	4.8	3	silty CLAY to CLAY	115	1.5	24	57	10	-	-	5.9	9.9	41	0.005	2.71	15
44.46	98.5	40.7	-	98.7	3.9	10.5	4.1	4	clayy SILT to silty CLAY	115	2.0	20	49	10	-	-	6.8	9.9	36	0.070	2.62	15
44.62	72.7	30.0	-	72.9	2.6	11.5	3.7	4	clayy SILT to silty CLAY	115	2.0	15	36	8	-	-	5.0	9.5	40	0.070	2.69	15
44.79	57.0	23.5	-	57.4	2.3	21.3	4.2	3	silty CLAY to CLAY	115	1.5	16	38	7	-	-	3.9	7.4	47	0.005	2.81	15
44.95	55.3	22.7	-	55.9	2.1	31.3	4.1	3	silty CLAY to CLAY	115	1.5	15	37	6	-	-	3.7	7.1	47	0.005	2.81	15
45.11	53.9	22.1	-	54.5	1.9	32.1	3.7	3	silty CLAY to CLAY	115	1.5	15	36	6	-	-	3.6	6.9	46	0.005	2.80	15
45.28	45.9	18.8	-	46.5	1.6	31.8	3.7	3	silty CLAY to CLAY	115	1.5	13	31	5	-	-	3.1	5.9	49	0.005	2.85	15
45.44	42.3	17.3	-	43.1	1.4	39.6	3.4	3	silty CLAY to CLAY	115	1.5	12	28	5	-	-	2.8	5.4	50	0.005	2.86	15
45.61	40.3	16.4	-	41.0	1.3	38.6	3.4	3	silty CLAY to CLAY	115	1.5	11	27	5	-	-	2.7	5.1	51	0.005	2.88	15
45.77	37.5	15.3	-	38.3	1.3	37.8	3.6	3	silty CLAY to CLAY	115	1.5	10	25	5	-	-	2.5	4.7	53	0.005	2.92	15
45.93	36.2	14.7	-	36.9	1.6	37.7	4.9	3	silty CLAY to CLAY	115	1.5	10	24	5	-	-	2.4	4.5	60	0.005	3.02	15
46.10	44.7	18.1	-	45.4	2.4	39.9	5.8	3	silty CLAY to CLAY	115	1.5	12	30	6	-	-	3.0	5.6	58	0.005	2.99	15
46.26	54.3	22.0	-	55.0	2.4	33.3	4.7	3	silty CLAY to CLAY	115	1.5	15	36	6	-	-	3.7	6.9	50	0.005	2.86	15

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Morada Water Tank Study

Project ID: Siegfried Engineering
Data File: SDF(425).cpt
CPT Date: 10/27/2023 10:16:48 AM
GW During Test: 40 ft

Sounding ID: CPT-03
Project No: 23095-5001
Cone/Rig: DDG1587

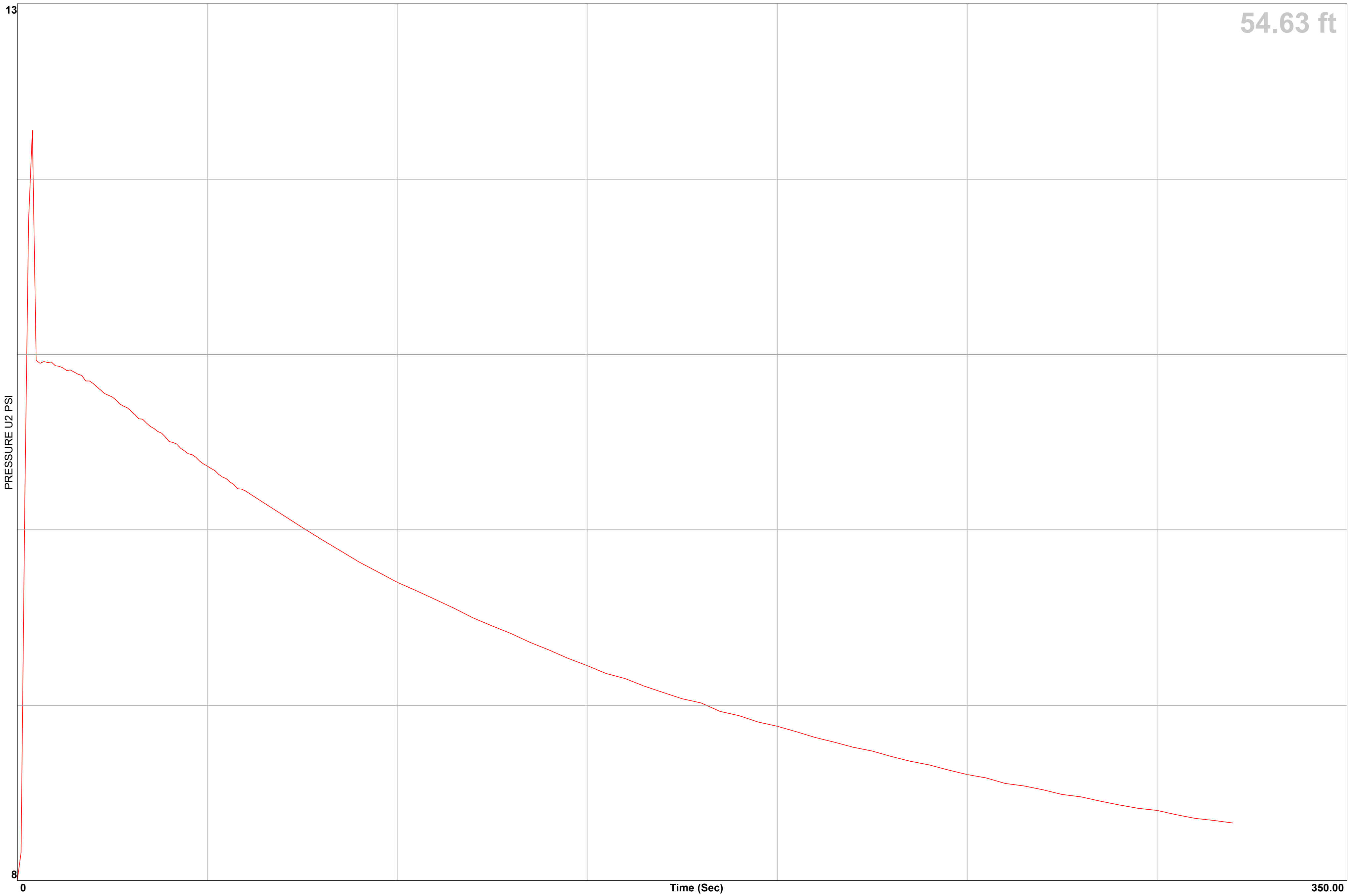
. . Depth ft	. qc PS tsf	* qc1n PS -	. q1ncs PS -	* qt PS tsf	. Slv Stss tsf	. pore prss (psi)	. Frct Rato %	* Mat Typ Zon	* Material Behavior Description	. Unit Wght pcf	. Qc to N	* SPT R-N1 60%	. SPT R-N 60%	* SPT IcN1 60%	* Rel Den %	* Ftn Ang deg	. Und Shr tsf	. OCR - -	* Fin Ic %	* D50 - mm	* Ic SBT Indx	* Nk - -
46.43	49.2	19.9	-	49.7	2.1	24.2	4.5	3	silty CLAY to CLAY	115	1.5	13	33	6	-	-	3.3	6.2	51	0.005	2.88	15
46.59	40.1	16.2	-	40.7	1.7	27.9	4.6	3	silty CLAY to CLAY	115	1.5	11	27	5	-	-	2.7	5.0	56	0.005	2.97	15
46.75	43.2	17.4	-	44.0	2.1	39.9	5.2	3	silty CLAY to CLAY	115	1.5	12	29	5	-	-	2.9	5.4	57	0.005	2.97	15
46.92	56.4	22.7	-	57.2	2.7	42.3	5.0	3	silty CLAY to CLAY	115	1.5	15	38	7	-	-	3.8	7.1	50	0.005	2.87	15
47.08	50.7	20.4	-	51.3	2.5	32.4	5.2	3	silty CLAY to CLAY	115	1.5	14	34	6	-	-	3.4	6.4	53	0.005	2.92	15
47.25	38.6	15.5	-	39.3	2.0	34.3	5.6	3	silty CLAY to CLAY	115	1.5	10	26	5	-	-	2.6	4.8	61	0.005	3.03	15
47.41	45.2	18.1	-	45.9	1.9	35.0	4.4	3	silty CLAY to CLAY	115	1.5	12	30	5	-	-	3.0	5.6	53	0.005	2.91	15
47.57	37.4	14.9	-	37.9	1.4	26.4	4.0	3	silty CLAY to CLAY	115	1.5	10	25	5	-	-	2.5	4.6	55	0.005	2.95	15
47.74	27.7	11.1	-	28.4	1.0	31.7	3.9	3	silty CLAY to CLAY	115	1.5	7	18	4	-	-	1.8	3.3	63	0.005	3.06	15
47.90	22.6	9.0	-	23.3	0.8	33.7	4.1	3	silty CLAY to CLAY	115	1.5	6	15	3	-	-	1.4	2.6	70	0.005	3.16	15
48.07	22.0	8.7	-	22.6	0.8	32.8	4.1	3	silty CLAY to CLAY	115	1.5	6	15	3	-	-	1.4	2.5	71	0.005	3.17	15
48.23	23.0	9.1	-	23.6	0.8	31.0	3.9	3	silty CLAY to CLAY	115	1.5	6	15	3	-	-	1.4	2.6	68	0.005	3.14	15
48.39	20.0	7.9	-	20.5	0.7	28.1	4.2	3	silty CLAY to CLAY	115	1.5	5	13	3	-	-	1.2	2.2	75	0.005	3.22	15
48.56	18.5	7.3	-	19.1	0.7	28.1	4.2	3	silty CLAY to CLAY	115	1.5	5	12	3	-	-	1.1	2.1	77	0.005	3.25	15
48.72	16.8	6.6	-	17.3	0.6	25.9	4.2	3	silty CLAY to CLAY	115	1.5	4	11	3	-	-	1.0	1.8	80	0.005	3.29	15
48.89	14.8	5.8	-	15.2	0.5	24.4	4.6	3	silty CLAY to CLAY	115	1.5	4	10	2	-	-	0.9	1.6	87	0.005	3.37	15
49.05	14.6	5.7	-	15.1	0.5	24.4	4.4	3	silty CLAY to CLAY	115	1.5	4	10	2	-	-	0.9	1.5	87	0.005	3.37	15
49.22	14.9	5.8	-	15.3	0.5	22.8	3.9	3	silty CLAY to CLAY	115	1.5	4	10	2	-	-	0.9	1.6	84	0.005	3.33	15
49.38	13.3	5.2	-	13.8	0.5	21.6	4.7	3	silty CLAY to CLAY	115	1.5	3	9	2	-	-	0.8	1.4	92	0.005	3.43	15
49.54	12.9	5.0	-	13.3	1.1	20.9	9.9	2	Organic SOILS - Peats	100	1.0	5	13	3	-	-	1.1	1.3	95	0.100	3.63	10
49.71	15.6	6.1	-	16.1	1.4	21.3	9.9	2	Organic SOILS - Peats	100	1.0	6	16	3	-	-	1.4	1.7	95	0.100	3.55	10
49.87	48.3	18.8	-	48.6	1.3	16.8	2.8	4	clayy SILT to silty CLAY	115	2.0	9	24	5	-	-	3.2	5.8	45	0.070	2.78	15
50.04	60.1	23.4	-	60.2	1.3	8.1	2.3	4	clayy SILT to silty CLAY	115	2.0	12	30	6	-	-	4.1	7.4	37	0.070	2.64	15
50.20	82.9	50.2	91.6	83.0	1.2	8.3	1.5	5	silty SAND to sandy SILT	120	3.0	17	28	11	44	34	-	-	21	0.200	2.26	16
50.36	94.8	57.4	96.3	94.9	1.3	6.3	1.4	5	silty SAND to sandy SILT	120	3.0	19	32	12	49	35	-	-	19	0.200	2.20	16
50.53	81.6	49.3	99.8	81.7	1.4	5.9	1.8	5	silty SAND to sandy SILT	120	3.0	16	27	11	44	34	-	-	23	0.200	2.32	16
50.69	65.8	25.5	-	65.9	1.5	5.7	2.4	4	clayy SILT to silty CLAY	115	2.0	13	33	7	-	-	4.5	8.0	37	0.070	2.63	15
50.86	52.4	20.2	-	52.5	1.3	5.8	2.7	4	clayy SILT to silty CLAY	115	2.0	10	26	6	-	-	3.5	6.3	43	0.070	2.74	15
51.02	46.2	17.8	-	46.3	1.2	6.1	2.8	4	clayy SILT to silty CLAY	115	2.0	9	23	5	-	-	3.1	5.5	46	0.070	2.80	15
51.18	37.5	14.4	-	37.6	1.1	6.2	3.3	3	silty CLAY to CLAY	115	1.5	10	25	4	-	-	2.5	4.4	53	0.005	2.92	15
51.35	28.1	10.8	-	28.2	1.1	6.2	4.2	3	silty CLAY to CLAY	115	1.5	7	19	4	-	-	1.8	3.2	65	0.005	3.10	15
51.51	25.5	9.8	-	25.7	1.1	6.7	4.7	3	silty CLAY to CLAY	115	1.5	7	17	3	-	-	1.6	2.9	70	0.005	3.16	15
51.68	28.4	10.9	-	28.5	0.8	6.8	3.2	3	silty CLAY to CLAY	115	1.5	7	19	4	-	-	1.8	3.2	60	0.005	3.02	15
51.84	23.4	8.9	-	23.5	0.8	6.3	3.8	3	silty CLAY to CLAY	115	1.5	6	16	3	-	-	1.5	2.6	69	0.005	3.14	15
52.00	26.2	10.0	-	26.3	0.9	8.0	4.0	3	silty CLAY to CLAY	115	1.5	7	17	3	-	-	1.7	2.9	67	0.005	3.12	15
52.17	25.7	9.8	-	25.9	0.9	6.5	4.0	3	silty CLAY to CLAY	115	1.5	7	17	3	-	-	1.6	2.9	67	0.005	3.12	15
52.33	19.4	7.4	-	19.5	0.8	6.6	5.0	3	silty CLAY to CLAY	115	1.5	5	13	3	-	-	1.2	2.1	81	0.005	3.29	15
52.50	15.2	5.8	-	15.4	0.7	7.2	6.0	3	silty CLAY to CLAY	115	1.5	4	10	3	-	-	0.9	1.5	93	0.005	3.44	15
52.66	33.7	12.8	-	33.8	0.9	8.0	2.9	3	silty CLAY to CLAY	115	1.5	9	22	4	-	-	2.2	3.8	54	0.005	2.94	15
52.82	39.9	15.1	-	40.0	0.9	6.5	2.4	4	clayy SILT to silty CLAY	115	2.0	8	20	4	-	-	2.6	4.6	47	0.070	2.82	15
52.99	43.9	16.6	-	44.0	0.9	6.8	2.3	4	clayy SILT to silty CLAY	115	2.0	8	22	5	-	-	2.9	5.1	44	0.070	2.77	15
53.15	24.8	9.4	-	24.9	0.6	5.6	2.8	3	silty CLAY to CLAY	115	1.5	6	17	3	-	-	1.6	2.7	62	0.005	3.05	15
53.32	12.8	4.8	-	13.0	0.4	5.9	4.4	3	silty CLAY to CLAY	115	1.5	3	9	2	-	-	0.7	1.2	94	0.005	3.45	15
53.48	8.9	3.4	-	9.0	0.4	6.6	6.4	2	Organic SOILS - Peats	100	1.0	3	9	2	-	-	0.7	0.7	95	0.100	3.73	10
53.64	10.7	4.0	-	10.8	0.5	6.9	6.6	2	Organic SOILS - Peats	100	1.0	4	11	2	-	-	0.8	0.9	95	0.100	3.64	10
53.81	13.9	5.3	-	14.1	0.7	7.2	6.2	3	silty CLAY to CLAY	115	1.5	4	9	2	-	-	0.8	1.3	95	0.005	3.50	15
53.97	34.3	12.9	-	34.4	1.0	6.9	3.1	3	silty CLAY to CLAY	115	1.5	9	23	4	-	-	2.2	3.9	55	0.005	2.94	15
54.14	37.1	14.0	-	37.2	1.1	6.0	3.3	3	silty CLAY to CLAY	115	1.5	9	25	4	-	-	2.4	4.2	54	0.005	2.93	15
54.30	29.3	11.0	-	29.4	1.7	6.3	6.6	3	silty CLAY to CLAY	115	1.5	7	20	4	-	-	1.9	3.2	74	0.005	3.21	15
54.46	68.9	26.0	-	69.1	3.6	7.5	5.4	3	silty CLAY to CLAY	115	1.5	17	46	8	-	-	4.7	8.1	49	0.005	2.85	15
54.63	145.9	86.5	196.9	146.1	5.8	7.8	4.0	4	clayy SILT to silty CLAY	115	2.0	43	73	20	-	-	10.1	9.9	26	0.070	2.39	15
54.79	157.8	93.5	222.2	158.0	7.2	10.1	4.6	9	very stiff fine SOIL	120	1.0	93	100	22	-	-	5.5	9.9	27	0.250	2.42	30
54.96	130.7	49.3	-	130.9	6.7	14.8	5.3	4	clayy SILT to silty CLAY	115	2.0	25	65	13	-	-	9.0	9.9	37	0.070	2.64	15
55.12	118.6	44.7	-	118.8	5.2	14.4	4.5	4	clayy SILT to silty CLAY	115	2.0	22	59	12	-	-	8.2	9.9	36	0.070	2.62	15
55.28	100.1	37.8	-	100.4	4.3	16.0	4.4	4	clayy SILT to silty CLAY	115	2.0	19	50	10	-	-	6.9	9.9	39	0.070	2.67	15
55.45	112.9	66.7	158.7	113.2	3.8	16.4	3.4	4	clayy SILT to silty CLAY	115	2.0	33	56	16	-	-	7.8	9.9	27	0.070	2.42	15
55.61	138.3	81.6	152.7	138.6	3.6	13.6	2.7	5	silty SAND to sandy SILT	120	3.0	27	46	18	60	37	-	-	22	0.200	2.28	16
55.78	170.5	100.5	157.6	170.8	3.8	12.4	2.3	5	silty SAND to sandy SILT	120	3.0	34	57	21	67	38	-	-	18	0.200	2.16	16
55.94	199.9	117.7	164.1	200.2	3.8	13.1	2.0	5	silty SAND to sandy SILT	120	3.0	39	67	24	72	39	-	-	15	0.200	2.06	16
56.11	211.7	124.6	168.7	211.9	4.0	13.3	1.9	5	silty SAND to sandy SILT	120	3.0	42	71	25	74	39	-	-	14	0.200	2.04	16
56.27	211.6	124.4	172.3	211.8	4.2	13.5	2.0	5	silty SAND to sandy SILT	120	3.0	41	71	25	74	39	-	-	15	0.200	2.06	16
56.43	213.5	125.4	182.9	213.8	4.9	13.5	2.3	5	silty SAND to sandy SILT	120	3.0	42	71	26	74	39	-	-	16	0.200	2.10	16
56.60	228.9	134.4	201.6	229.2	6.0	14.2	2.6	5	silty SAND to sandy SILT	120	3.0	45	76	28	77	40	-	-	17	0.200	2.12	16
56.76	271.4	159.1	218.1	271.7	6.5	16.5	2.4	5	silty SAND to sandy SILT	120	3.0	53	90	32	82	40	-	-	14	0.200	2.05	16
56.93	311.5	182.5	236.8	311.8	7.2	19.8	2.3	5	silty SAND to sandy SILT	120	3.0	61	100	36	87	41	-	-	13	0.200	2.00	16
57.09	328.3	192.2	248.3	328.7	7.8	21.7	2.4	5	silty SAND to sandy SILT	120	3.0	64	100	38	89	41	-	-	13	0.200	1.99	16
57.25	366.8	214.5	292.8	367.2	10.9	21.6	3.0	8	stiff SAND to clayy SAND	115	5.0	43	73	43	92	42	-	-	14	0.250	2.05	16
57.42	380.2	222.2	351.8	380.7	16.0	22.6	4.2	9	very stiff fine SOIL	120	1.0	100	100	47	-	-	13.3	9.9	18	0.250	2.16	30
57.58	392.9	229.4	382.9	393.5	18.6	30.9	4.8	9	very stiff fine SOIL	120	1.0	100	100	49	-	-	13.8	9.9	19	0.250	2.20	30
57.75	297.1	173.3	410.0	299.8	20.9	135.2	7.1	9	very stiff fine SOIL	120	1.0	100	100	40	-	-	10.4	9.9	27	0.250	2.41	30
57.91	327.6	191.0	409.2	337.2	21.0	489.5	6.5	9	very stiff fine SOIL	120	1.0	100	100	43	-	-	11.5	9.9	25	0.250	2.36	30

* Indicates the parameter was calculated using the normalized point stress.
The parameters listed above were determined using empirical correlations.
A Professional Engineer must determine their suitability for analysis and design.

Middle Earth Geo Testing

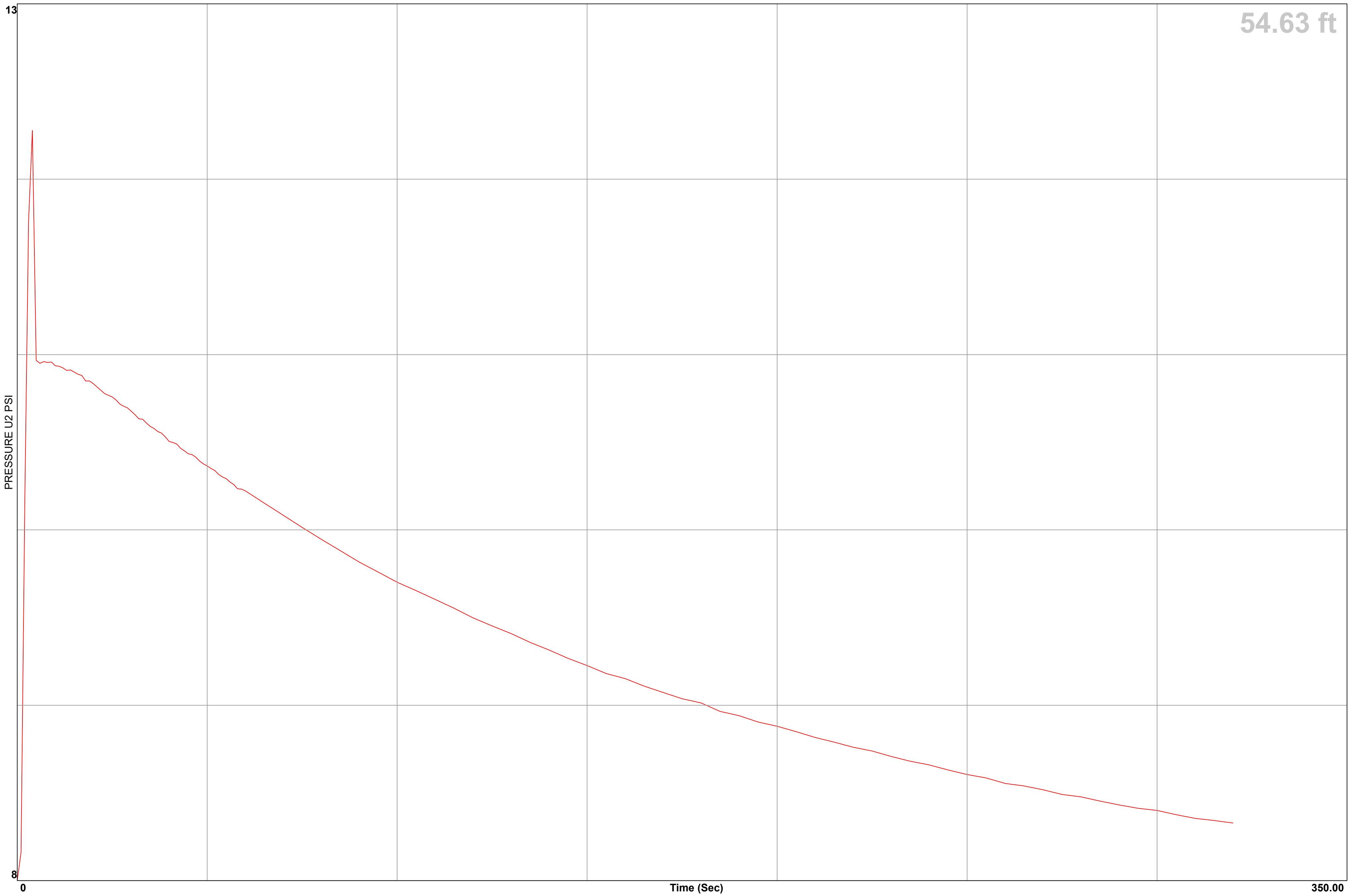
Siegfried Engineering

Location	Morada Water Tank Study	Operator	JM-FA		
Job Number	23095-5001	Cone Number	DDG1587	GPS	
Hole Number	CPT-03	Date and Time	10/27/2023 10:16:48 AM		
Equilized Pressure	8.3	EST GW Depth During Test	35.4		



Siegfried Engineering

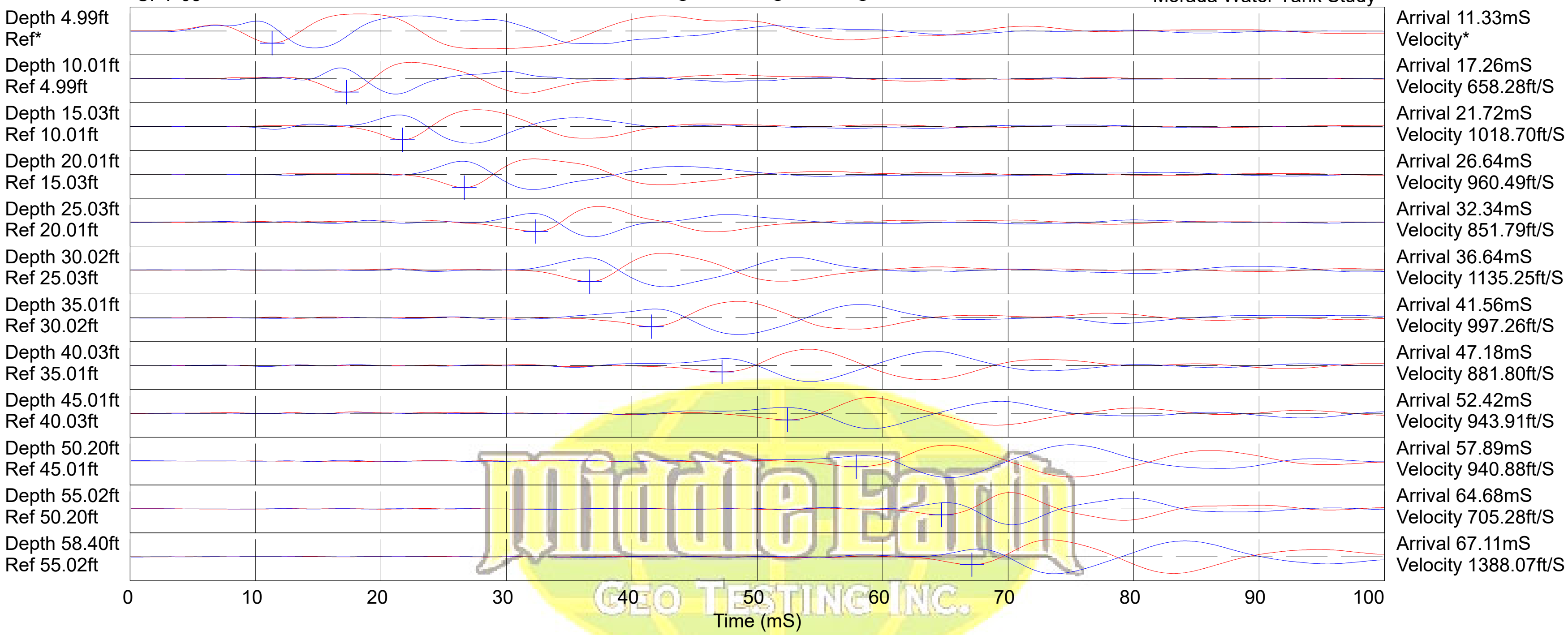
Location	Morada Water Tank Study	Operator	JM-FA		
Job Number	23095-5001	Cone Number	DDG1587	GPS	
Hole Number	CPT-03	Date and Time	10/27/2023 10:16:48 AM		
Equilized Pressure	8.3	EST GW Depth During Test	35.8		



CPT-03

Siegfried Engineering

Morada Water Tank Study



Hammer to Rod String Distance (ft): 5.83

* = Not Determined

COMMENT:

APPENDIX B
LABORATORY TESTING

Laboratory testing was performed to quantify and evaluate the geotechnical characteristics of the soil samples obtained at the site. The following laboratory tests were performed on selected samples from the borings:

- Moisture Content (ASTM D 2216)
- Dry Density (ASTM D 2937)
- Atterberg Limits (ASTM D 4318)
- Particle Size Distribution (ASTM D 6913)
- R-Value (ASTM D 2844/CT301)
- Expansion Index (ASTM D 4829)
- Unconfined Compressive Strength (ASTM D 2166)
- pH and Electrical Resistivity (CT643)
- Sulfate and Chloride Content (CT417 and CT422)
- Redox Potential (ASTM G 200m)
- Sulfides (AWWA C105/A25.5)

Tests were performed by Siegfried and Sunland Analytical.

The results of the tests performed above are discussed in the Subsurface Conditions section of the report (Section 3.1). They are also presented on the boring logs provided in Appendix A, and as summaries and reports provided in Appendix B.

SIEGFRIED

Geotechnical Materials Testing Summary

Tested in General Accordance with ASTM D1140, D2487, D2974, D4318, D6913, and D7263.

Project Name: City of Stockton Morada Water Tank

Project Number: 23095-5001

Project Location: Stockton, CA

					ASTM D2216	ASTM D7263		ASTM D4318		ASTM D1140/D6913			ASTM D2487	
Sample Date	Location ID	Depth Top (ft)	Depth Base (ft)	Color	Moisture (%)	Wet Density (pcf)	Dry Density (pcf)	Liquid Limit	Plasticity Index	Gravel (%)	Sand (%)	Fines (%)	USCS Group Symbol	USCS Description
10/27/2023	CPT-1 Bulk	0.0	2.0	Brown	---	---	---	36	16	29	33	38	SC	Clayey Sand with Gravel
10/27/2023	CPT-3 Bulk	0.0	2.0	Brown	---	---	---	32	14	22	39	39	SC	Clayey Sand with Gravel

STOCKTON
3428 Brookside Rd.
Stockton, CA 95219
t: 209.943.2021

SAN JOSE
111 N. Market St., #300
San Jose, CA 95113
t: 408.754.2021

SACRAMENTO
1164 National Drive #20
Sacramento, CA 95834
t: 916.520.2777

MODESTO
101 Sycamore Ave, #100
Modesto, CA 95354
t: 209.762.3580

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 12/01/2023
Date Submitted 11/27/2023

To: Charley Scott
Siegfried-Stockton
3428 Brookside Rd.
Stockton, CA 95219

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 23095 Site ID : BULK CPT-2.
Thank you for your business.

* For future reference to this analysis please use SUN # 91044-188767.

EVALUATION FOR SOIL CORROSION

Soil pH	7.25		
Moisture	6.6 %		
Minimum Resistivity	1.77	ohm-cm (x1000)	
Chloride	5.5 ppm	00.00055 %	
Sulfate	0.2 ppm	00.00002 %	
Redox Potential	(+) 153	mv	
Sulfides	Presence - NEGATIVE		

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m
Redox Potential ASTM G-200m, Sulfides AWWA C105/A25.5

End of Report