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Geotechnical Study
Orem North 4
625 North 2800 West
Lindon, Utah

Project No. 240363G

June 17, 2024

Prepared For:

WICP
Attention: Mr. Mark Weldon
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ATTACHED FIGURES

APPENDIX A

1.0 SUMMARY

This entire report presents the results of Earthtec Engineering's completed geotechnical study for the Orem North 4 in Lindon, Utah. This summary provides a general synopsis of our recommendations and findings. Details of our findings, conclusions, and recommendations are provided within the body of this report.

- The native clay soils have a moderate potential for collapse (settlement) or expansion (heave) and a slight potential for compression under increased moisture contents and anticipated load conditions. (see Section 6).
- Conventional strip and spread footings may be used to support the structure, with foundations placed entirely on a minimum of 24 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils for structural loads up to 5,000 pounds per linear foot for bearing walls and up to 10,000 pounds for column loads and up to 400 pounds per square foot for floor slab. If loads exceed these see Section 10 for further recommendations.

Based on the results of our field exploration, laboratory testing, and engineering analyses, it is our opinion that the subject site may be suitable for the proposed development, provided the recommendations presented in this report are followed and implemented during design and construction.

Failure to consult with Earthtec Engineering (Earthtec) regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site. We also strongly recommend that Earthtec observes the building excavations to verify the adequacy of our recommendations presented herein, and that Earthtec performs materials testing and special inspections for this project to provide continuity during construction.

2.0 INTRODUCTION

The project is located at approximately 625 North 2800 West in Lindon, Utah. The general location of the site is shown on Figure No. 1, *Vicinity Map* and Figure No. 2, *Site Plan Showing Location of Borings,* at the end of this report. The purposes of this study are to evaluate the subsurface soil conditions at the site, assess the engineering characteristics of the subsurface soils, and provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, miscellaneous concrete flatwork, and asphalt paved parking and drive areas.

The scope of work completed for this study included field reconnaissance, subsurface exploration, field and laboratory soil testing, geotechnical engineering analysis, and the preparation of this report.

3.0 PROPOSED CONSTRUCTION

We understand that the proposed project, as described to us by Ms. Lauren Weldon with WICP, consists of developing the approximately 3.5-acre existing parking lot with 28- to 33-feet tall, 60,000 square feet, concrete tilt-up, slab-on-grade warehouse. We have based our recommendations in this report that the anticipated foundation loads for the proposed structure will not exceed 6,000 pounds per linear foot for bearing walls, 300,000 pounds for column loads, and 400 pounds per square foot for floor slabs. If structural loads are greater Earthtec should be notified so that we may review our recommendations and make modifications, if necessary.

In addition to the construction described above, we anticipate that utilities will be installed to service the proposed building, exterior concrete flatwork will be placed in the form of curb, gutter, sidewalks, driveways, and asphalt paved parking and drive areas will be constructed.

4.0 GENERAL SITE DESCRIPTION

4.1 Site Description

At the time of our subsurface exploration the site was a parking lot. The ground surface appears to be relatively flat; we anticipate less than 3 feet feet of cut and fill may be required for site grading. The lot was bounded on the north and east by commercial properties, on the south by 600 North Street, and on the west by 2800 West Street.

4.2 Geologic Setting

The subject property is located in the northern portion of Utah Valley near the eastern shore of Utah Lake. Utah Valley is a deep, sediment-filled basin that is part of the Basin and Range Physiographic Province. The valley was formed by extensional tectonic processes during the Tertiary and Quaternary geologic time periods. The valley is bordered by the Wasatch Mountain Range on the east and the Lake Mountains on the west. Much of northwestern Utah, including Utah Valley, was previously covered by the Pleistocene age Lake Bonneville. Utah Lake, which currently covers much of the western portion of the valley, is a remnant of this ancient freshwater lake. The surficial geology of much of the eastern margin of the valley has been mapped by *Constenius, 2011*[1]. The surficial geology at the location of the subject site and adjacent properties is mapped as “Younger alluvial-fan deposits (Holocene and upper Pleistocene), mostly sand, silt, and gravel that is poorly stratified and poorly sorted; deposited at drainage mouths” (Map Unit Qafy). However, a geologic hazard study was not performed for the subject site during this study.

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[1] Constenius, K.N., Clark, D.L., King, J.K., Ehler, J.B., 2011, Interim Geologic Map of the Provo Quadrangle, Utah, Wasatch and Salt Lake Counties, Utah; U.S. Geological Survey, Open-File 586DM, Scale 1: 62,500

5.0 SUBSURFACE EXPLORATION

5.1 Soil Exploration

Under the direction of a qualified member of our geotechnical staff, subsurface explorations were conducted at the site on May 22, 2024, by the boring of five (5) borings to depths of 21½ to 51½ feet below the existing ground surface using a a truck-mounted hydraulic drill rig. The approximate locations of the borings are shown on Figure No. 2, *Site Plan Showing Location of Borings*. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 7, *Boring Log* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units; the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 8, *Legend*.

Samples of the subsurface soils were collected in the borings at depth intervals of approximately 2½ to 5 feet. Relatively undisturbed samples were collected by pushing thin-walled “Shelby” tubes into undisturbed soils below the augers. Relatively undisturbed samples were also collected with a 1.9 inch inside diameter Modified California sampler. Disturbed samples were collected with a 1⅜ inch inside diameter split spoon sampler. The split spoon sampler was driven 18 inches into undisturbed soil with a 140-pound hammer free-falling through a distance of 30 inches. The blows required to drive the sampler through the final 12 inches of penetration is called the “N-value” or “blow count,” and is recorded as “blows per foot” on the attached boring logs at the respective sample depths. The blow count provides a reasonable indication of the in-place relative density of sandy soils but provides only a limited indication of the relative stiffness of cohesive (clayey) materials, since the penetration resistance for these soils is a function of the moisture content.

The soil samples collected were classified by visual examination in the field following the guidelines of the Unified Soil Classification System (USCS). The samples were transported to our Lindon, Utah laboratory where they will be retained for 30 days following the date of this report and then discarded, unless a written request for additional holding time is received prior to the 30-

6.0 LABORATORY TESTING

Representative soil samples collected during our field exploration were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Tests performed included natural moisture contents, dry density tests, liquid and plastic limits determinations, mechanical (partial) gradation analyses, and one-dimensional consolidation tests. The laboratory test results are also included on the attached *Boring Logs* at the respective sample depths, and on Figure Nos. 9 through 13, and *Consolidation-Swell Test.*

As part of the consolidation test procedure, water was added to the samples to assess moisture sensitivity when the samples were loaded to an equivalent pressure of approximately 1,000 psf.

The native clay soils have a moderate potential for collapse (settlement) or expansion (heave) and a slight potential for compressibility under increased moisture contents and anticipated load conditions.

A water-soluble sulfate test was performed on a representative sample obtained during our field exploration which indicated a value of 189 parts per million. Based on this result, the risk of sulfate attack to concrete appears to be “moderate” according to American Concrete Institute standards. Therefore, we recommend that Type II Portland cement may be used for concrete in contact with on-site soils. The results can be found in Appendix A.

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

On the surface of the site, we encountered fill which is estimated to extend about 1½ to 2½ feet in depth at the boring locations. Below the fill we encountered layers of clay and sand extending to depths of 21½ to 51½ feet below the existing ground surface. Graphical representations and detailed descriptions of the soils encountered are shown on Figure Nos. 3 through 7, *Boring Log* at the end of this report. Based on the blow counts obtained during field exploration, the clay soils ranged from soft to medum stiff in consistency and the sand soils had a relative density varying from very loose to loose.

It should be considered that a limited number of small diameter soil borings were used during the course of our subsurface exploration. Topsoil and fill material composition and contacts are difficult to determine from boring sampling. Variation in fill depths may occur at the site.

7.2 Collapsible/Expansive Soils

Collapsible soils are typically characterized by a pinhole structure and relatively low unit weights. Floor slabs, and roadways supported on these soils may be susceptible to large settlements and structural distress when wetted. Significantly collapsible soils were encountered in our explorations. In general, the development can be completed if special precautions are taken to minimize the potential for collapse of these soils. Collapsible soils are not suitable for support of foundations, floor slabs, and pavements. In areas where isolated open sidewalks, driveways, and pavements will be constructed, if properly prepared, the moisture sensitive soils may be allowed to remain in place if some settlement can be tolerated. In addition, measures to limit surface water from wetting supporting soils beneath floor slabs shall be implemented. These measures include maintaining positive surface drainage away from the structures, downspouts should discharge away from foundations or be conveyed to suitable locations down gradient from the structures, minimizing landscape irrigation adjacent to structures, and ensuring proper and adequate compaction of foundation wall backfill.

7.3 Groundwater Conditions

Groundwater was encountered at depths of approximately 8½ to 12 feet below the existing ground surface. In addition, we did observe oxidation or other indicators within the soils which could indicate possible past water or seepage levels at a depth of about 1½ feet below the existing ground surface. No artesian conditions were encountered during our explorations. Note that groundwater levels will fluctuate in response to the season, precipitation, snow melt, irrigation, and other on and off-site influences. Quantifying these fluctuations would require long term monitoring, which is beyond the scope of this study. The contractor should be prepared to dewater excavations as needed.

8.0 SITE GRADING

8.1 General Site Grading

All surface vegetation and unsuitable soils (such as topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, collapsible, and any other inapt materials) should be removed from below foundations, floor slabs, exterior concrete flatwork, and pavement areas. We encountered fill on the surface of the site. The fill (including soil with roots larger than about ¼ inch in diameter) should be completely removed, even if found to extend deeper, along with any other unsuitable soils that may be encountered. Over-excavations below footings and slabs also may be needed, as discussed in Section 10.0.

Fill placed over large areas, even if only a few feet in depth, can cause consolidation in the underlying native soils resulting in settlement of the fill. Because the site is relatively flat, we anticipate that less than 3 feet of grading fill will be placed. If more than 3 feet of grading fill will be placed above the existing surface (to raise site grades), Earthtec should be notified so that we may provide additional recommendations, if required. Such recommendations will likely include placing the fill several weeks (or possibly more) prior to construction to allow settlement to occur.

8.2 Temporary Excavations

Temporary excavations that are less than 4 feet in depth and above groundwater should have side slopes no steeper than ½H:1V (Horizontal:Vertical). Temporary excavations where water is encountered in the upper 4 feet or that extend deeper than 4 feet below site grades should be sloped or braced in accordance with OSHA[2] requirements for Type C soils.

8.3 Fill Material Composition

The existing granular fill soils within the upper 2 feet appear to be suitable for use as placed and compacted engineered fill provided the material meets the requirements for structural fill and any existing debris are removed prior to use. Excavated soils, including clay, may be stockpiled for

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[2] OSHA Health and Safety Standards, Final Rule, CFR 29, part 1926.

use as fill in landscape areas.

Structural fill is defined as imported fill material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements, etc. Gradation requirements stated below shall be verified in intervals not exceeding 1,000 tons. We recommend that imported structural fill consist of sandy/gravelly soils meeting the following requirements in the table below:

Table 1: Imported Structural Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
4 inches	100
3/4 inches	70 – 100
No. 4	40 – 80
No. 40	15 – 50
No. 200	0 – 20
Liquid Limit	35 maximum
Plasticity Index	15 maximum

Engineered fill is defined as reworked granular (sands or gravels), native material that will ultimately be subjected to any kind of structural loading, such as those imposed by footings, floor slabs, pavements. Native clay and silt soils are not suitable for use as engineered fill. We recommend that a professional engineer or geologist verify that the engineered fill to be used on this project meets the requirements. Engineered fill should be clear of all organics, have a maximum particle size of 4 inches, less than 70 percent retained on the ¾-seive, a maximum Liquid Limit of 35, and a maximum Plasticity Index of 15.

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable but would likely make compaction more difficult and/or significantly reduce the possibility of successful compaction testing. Consequently, stricter quality control measures than normally used may be required, such as using thinner lifts and increased or full-time observation of fill placement.

We recommend that utility trenches below any structural load be backfilled using structural fill or engineered fill. Local governments or utility companies required specification for backfill should be followed unless our recommendations stricter.

If native soil is used as fill material, the contractor should be aware that native clay and silt soils (as observed in the explorations) may be time consuming to compact due to potential difficulties in controlling the moisture content needed to obtain optimum compaction and changes proctor values.

If required (i.e. fill in submerged areas), we recommend that free draining granular material (clean sand and/or gravel) meet the following requirements in the table below:

Table 2: Free-Draining Fill Recommendations

Sieve Size/Other	Percent Passing (by weight)
3 inches	100
No. 10	0 – 25
No. 40	0 – 15
No. 200	0 – 5
Plasticity Index	Non-plastic

Three-inch minus washed rock (sometimes called river rock or drain rock) and pea gravel materials usually meet these requirements and may be used as free draining fill. If free draining fill will be placed adjacent to soil containing a significant amount of sand or silt/clay, precautions should be taken to prevent the migration of fine soil into the free draining fill. Such precautions should include either placing a filter fabric between the free draining fill and the adjacent soil material, or using a well-graded, clean filtering material approved by the geotechnical engineer.

8.4 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness prior to compaction of 4 inches for hand operated equipment, 6 inches for most “trench compactors” and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557:

- In landscape and other areas not below structurally loaded areas: 90%
- Less than 5 feet of fill below structurally loaded areas: 95%
- 5 feet or greater of fill below structurally loaded areas: 98%

Generally, placing and compacting fill at moisture contents within ±2 percent of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content deviates from optimum the more difficult it will be to achieve the required compaction.

Fill should be tested frequently during placement, and we recommend early testing to demonstrate that placement and compaction methods are achieving the required compaction. For mass grading or building pads a minimum of one test per 5,000 square feet per lift, with a minimum of 2 tests per lift. For trenches one test per 100 linear feet per lift is required. The contractor is responsible to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

8.5 Stabilization Recommendations

Near surface layers of clay and silt soils may rut and pump during grading and construction. The likelihood of rutting and/or pumping, and the depth of disturbance, is proportional to the moisture content in the soil, the load applied to the ground surface, and the frequency of the load.

Consequently, rutting and pumping can be minimized by avoiding concentrated traffic, minimizing the load applied to the ground surface by using lighter equipment, partially loaded equipment, tracked equipment, by working in dry times of the year, and/or by providing a working surface for equipment.

During grading the soil in any obvious soft spots should be removed and replaced with granular material. If rutting or pumping occurs traffic should be stopped in the area of concern. The soil in rutted areas should be removed and replaced with granular material. In areas where pumping occurs the soil should either be allowed to sit until pore pressures dissipate (several hours to several days) and the soil firms up or be removed and replaced with granular material. Typically, we recommend removal to a minimum depth of 24 inches.

For granular material, we recommend using angular well-graded gravel, such as pit run, or crushed rock with a maximum particle size of four inches. We suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor. A finer granular material such as sand, gravelly sand, sandy gravel or road base may also be used. Materials which are more angular and coarse may require thinner lifts in order to achieve compaction. We recommend that the fines content (percent passing the No. 200 sieve) be less than 15%, the liquid limit be less than 35, and the plasticity index be less than 15.

Using a geosynthetic fabric, such as Mirafi 600X or equivalent, may also reduce the amount of material required and avoid mixing of the granular material and the subgrade. If a fabric is used, following removal of disturbed soils and water, the fabric should be placed over the bottom and up the sides of the excavation a minimum of 24 inches. The fabric should be placed in accordance with the manufacturer’s recommendations, including proper overlaps. The granular material should then be placed over the fabric in compacted lifts. Again, we suggest that the initial lift be approximately 12 inches thick and be compacted with a static roller-type compactor.

9.0 SEISMIC AND GEOLOGIC CONSIDERATIONS

9.1 Seismic Design

The State of Utah has adopted the 2021 International Building Code (IBC) for seismic design and the structure should be designed in accordance with Chapter 16 of the IBC. We encountered some potentially liquefiable soil layers, but for structures having fundamental periods of vibration equal to or less than 0.5s, site-response analysis is not required to determine spectral accelerations for liquefiable soils as per ASCE 7-16 Section 20.3.1.1 Exception. We recommend using Site Class E for design.

The site is located at approximately 40.348 degrees latitude and -111.773 degrees longitude. Using Site Class E, the design spectral response acceleration parameters are given below.

Table 3: Design Accelerations

S_S	F_a	S_{MS}	S_{DS}
1.298 g	1.2	1.558 g	1.038 g
S_1	F_v	S_{M1}	S_{D1}
0.472 g	1.5	0.708 g	0.472 g

9.2 Faulting

The subject property is located within the Intermountain Seismic Belt where the potential for active faulting and related earthquakes is present. Based upon published geologic maps[3], no active faults traverse through or immediately adjacent to the site and the site is not located within local fault study zones. The nearest mapped fault trace is the Provo Section of part of a group of faults beneath Utah Lake located about 1¾ miles west of the site.

9.3 Liquefaction Potential

According to current liquefaction maps[4] for Utah County, the site is located within an area designated as "High" in liquefaction potential. Liquefaction can occur when saturated subsurface soils below groundwater lose their inter-granular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. Loose, saturated sands are most susceptible to liquefaction, but some loose, saturated gravels and relatively sensitive silt to low-plasticity silty clay soils can also liquefy during a seismic event. Subsurface soils encountered were composed of saturated clay and silt soils.

As part of this study, the potential for liquefaction to occur in the soils we encountered was assessed using Youd *et al*[5] and Boulanger & Idriss[6]. Potential liquefaction-induced movements were evaluated using Tokimatsu & Seed[7] and Youd, Hansen & Bartlett[8]. Our analysis indicates that approximately up to 2¾ inches of liquefaction-induced settlement and possibly up to 1¼ feet of lateral spreading could occur during a moderate to large earthquake event. The liquefaction potential at the site can be mitigated using one of the following alternatives:

- Install a gravel/geogrid raft system beneath the building so that the building will react as a cohesive unit. This may result in some tilting of the building due to differential liquefaction-

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[3] U.S. Geological Survey, Quaternary Fault and Fold Database of the United States, November 3, 2010.

[4] Christenson, G.E., Shaw, L.M., 2008, Liquefaction Special Study Areas, Wasatch and Nearby Areas, Utah; Utah Geological Survey, Map to Circular 106, Scale 1:250,000

[5] Youd, T.L. (Chair), Idriss, I.M. (Co-Chair), and 20 other authors, 2001, Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, October 2001, p. 817-833.

[6] Boulanger, R.W. and Idriss, I.M., 2006, Liquefaction Susceptibility Criteria for Silts and Clays, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, November 2006, p. 1413-1426.

[7] Tokimatsu, K. and Seed, H.B., 1987, Evaluation of Settlements in Sands due to Earthquake Shaking, Journal of Geotechnical Engineering, ASCE, p. 861-878.

[8] Youd, T.L., Hansen, C.M. and Bartlett, S.F., 2002, Revised Multilinear Regression Equations for Prediction of Lateral Spread Displacement, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, December 2002, p. 1007-1017.

induced movements. The building may also move laterally due to lateral spreading.

- Connect/tie all footings together using reinforced grade beams and connect reinforced slabs to the footings so that the building will react as a cohesive unit. This may result in some tilting of the building due to differential liquefaction-induced movements. The building may also move laterally due to lateral spreading.

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered during our field exploration, the results of laboratory testing of samples of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions and assumptions related to foundations are significantly different, Earthtec should be notified so that we can re-evaluate our design parameters and estimates (higher loads may cause more settlement), and to provide additional recommendations if necessary.

Conventional strip and spread footings may be used to support the proposed structures after appropriate removals as outlined in Section 8.1. Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, organic soils, frozen soil, or in ponded water. If foundation soils become disturbed during construction, they should be removed or compacted.

10.2 Strip/Spread Footings

We recommend that conventional strip and spread foundations be constructed entirely on a minimum of 24 inches of properly placed, compacted, and tested structural fill extending to undisturbed native soils for structural loads up to 5,000 pounds per linear foot for bearing walls and up to 10,000 pounds for column loads and up to 400 pounds per square foot for floor slab. If loads exceed 5,000 pounds per linear foot for bearing walls or 10,000 pounds for column loads specified structural fill depths are below. If loads exceed 6,000 pounds per linear foot for bearing walls or 80,000 pounds for column loads, we recommend using an alternative foundation system, such as rammed aggregate piers. The structural fill should extend a minimum of 5 feet beyond the outer edge of the footings.

Table 4: Depth of Structural Fill

Structural Load – Strip (klf)	Structural Load - Spread (kips)	Depth of Structural Fill (in)	Maximum Allowable Bearing Pressure (psf)
Up to 5	Up to 10	24	2000
5 – 6	10 – 20	36	2000
---	20– 35	48	2000
---	35 – 50	60	2000
---	50 – 70	72	2500
---	70 – 80	84	2500

For foundation design we recommend the following:

- Footings founded on a minimum of 24 inches of structural fill extending to undisturbed native soil may be designed using a maximum allowable bearing capacity of 2,000 pounds per square foot. The values for vertical foundation pressure can be increased by one-third for wind and seismic conditions per Section 1806 when used with the Alternative Basic Load Combinations found in Section 1605.2 of the 2021 International Building Code.
- Continuous and spot footings should be uniformly loaded and should have a minimum width of 20 and 30 inches, respectively.
- Exterior footings should be placed below frost depth which is determined by local building codes. In general, 30 inches of cover is adequate for most sites; however local code should be verified by the end design professional. Interior footings, not subject to frost (heated structures), should extend at least 18 inches below the lowest adjacent grade.
- Foundation walls and footings should be properly reinforced to resist all vertical and lateral loads and differential settlement.
- The bottom of footing excavations should be compacted with at least 4 passes of an approved non-vibratory roller prior to erection of forms or placement of structural fill to densify soils that may have been loosened during excavation and to identify soft spots. If soft areas are encountered, they should be stabilized as recommended in Section 8.5.
- Footing excavations should be observed by the geotechnical engineer prior to beginning fill placement or footing construction if fill is not required to evaluate whether suitable bearing soils have been exposed and whether excavation bottoms are free of loose or disturbed soils.
- Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill is required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings on both sides.

10.3 Estimated Settlements

If the proposed foundations are properly designed and constructed using the parameters provided above, we estimate that total settlements should not exceed one inch and differential settlements should be one-half of the total settlement over a 25-foot length of continuous foundation, for nonearthquake conditions. Additional settlement could occur during a seismic event due to ground shaking, if more than 3 feet of grading fill is placed above the existing ground surface, if loading conditions are greater than anticipated in Section 2, and/or if foundation soils are allowed to become wetted.

10.4 Lateral Load Resistance

Lateral loads are typically resisted by friction between the underlying soil and footing bottoms. Resistance to sliding may incorporate the friction acting along the base of foundations, which may be computed using a coefficient of friction of soils against concrete of 0.35 for structural fill meeting the recommendations presented herein. The values for lateral resistance can be increased by one-third for wind and seismic conditions per Section 1806 when used with the Alternative Basic Load Combinations found in Section 1605.3.2 of the 2021 International Building Code.

11.0 FLOOR SLABS AND FLATWORK

Concrete floor slabs and exterior flatwork may be supported on a minimum of 12 inches properly placed, compacted, and tested engineered fill or imported structural fill extending to undisturbed native soils after appropriate removals and grading as outlined in Section 8.1 are completed. We recommend placing a minimum of 4 inches of free-draining fill material (see Section 8.3) beneath floor slabs to facilitate construction, act as a capillary break, and aid in distributing floor loads. For exterior flatwork, we recommend placing a minimum of 4 inches of road-base material. Prior to placing the free-draining fill or road-base materials, the native sub-grade should be proof-rolled to identify soft spots, which should be stabilized as discussed above in Section 8.5.

For slab design, we recommend using a modulus of sub-grade reaction of 120 pounds per cubic inch. The thickness of slabs supported directly on the ground shall not be less than 3½ inches. A 6-mil polyethylene vapor retarder with joints lapped not less than 6 inches shall be placed between the ground surface and the concrete, as per Section 1907.1 of the 2021 International Building Code.

To help control normal shrinkage and stress cracking, we recommend that floor slabs have adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints, frequent crack control joints, and non-rigid attachment of the slabs to foundation and bearing walls. Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

12.0 DRAINAGE

12.1 Surface Drainage

Due to the collapse potential of native soils within the upper 15 feet, wetting of subsurface soils (including those below foundations) could result in adverse settlement. Accordingly, we recommend the following:

- The contractor should take precautions to prevent significant wetting of the soil at the base of the excavation. Such precautions may include: grading to prevent runoff from entering the excavation, excavating during normally dry times of the year, covering the base of the excavation if significant rain or snow is forecast, backfill at the earliest possible date, frame floors and/or the roof at the earliest possible date, other precautions that might become evident during construction.
- Adequate compaction of foundation wall backfill must be provided i.e. a minimum of 90% of ASTM D-1557. Water consolidation methods should not be used.
- The ground surface should be graded to drain away from the building in all directions. We recommend a minimum fall of 10 inches in the first 10 feet.
- Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from foundations, whichever is greater.
- Sprinkler nozzles should be aimed away, and all sprinkler components kept at least 10 feet, from foundation walls. A drip irrigation system may be utilized in landscaping areas within 10 feet of foundation walls to minimize water intrusion of foundation backfill. Also, sprinklers should not be placed at the top or on the face of slopes. Sprinkler systems should be designed with proper drainage and well maintained. Over-watering should be avoided.
- Any additional precautions which may become evident during construction.

12.2 Subsurface Drainage

Walls or portions thereof that retain earth and enclose interior spaces and floors below grade shall conform to Section 1805 of the 2021 International Building Code for damp proofing and water proofing.

13.0 PAVEMENT RECOMMENDATIONS

We understand that asphalt paved parking and drive areas will be constructed as part of the project. The native soils encountered beneath the fill during our field exploration were predominantly composed of clays. We estimate that a California Bearing Ratio (CBR) value of 3 is appropriate for these soils. Also, the near-surface native clay/silt soils are collapsible, and over-excavation may be needed to minimize the potential settlement heaving of pavements. If the fill is left beneath concrete flatwork and pavement areas, increased maintenance costs over time should be anticipated.

We anticipate that the traffic volume will be about 800 vehicles per day (2.4 ESAL/day) or less for the parking and drive areas, consisting of mostly cars and pickup trucks, with a daily delivery truck and a weekly garbage truck. Based on these traffic parameters, the estimated CBR given above, a 20-year life expectancy, and the procedures and typical design inputs outlined in the UDOT Pavement Design Manual (2008), we recommend the minimum asphalt pavement section presented below. The pavement section should meet the minimum values are required by the jurisdiction or the values below, whichever is greater.

Table 5: Pavement Section Recommendations

Asphalt Thickness (in)	**Compacted Aggregate Base Thickness (in)**	**Compacted Subbase Thickness (in)**
3	6	6*
3	10*	0

* Stabilization may be required

If the pavement will be required to support excessive construction traffic (such as dump trucks hauling soil to raise or lower the site), more than an occasional semi-tractor or fire truck, or more traffic than listed above, our office should be notified so that we can re-evaluate the pavement section recommendations. The following also apply:

- The subgrade should be prepared by proof rolling to a firm, non-yielding surface, with any identified soft areas stabilized as discussed above in Section 8.5.
- Site grading fills below the pavements should meet structural fill composition and placement recommendations per Sections 8.3 and 8.4 herein.
- Asphaltic concrete, aggregate base and sub-base material composition should meet local, APWA, or UDOT requirements. Gradation requirements and frequency shall be followed as required by local, APWA, or UDOT requirements, but not to exceed 500 tons.
- Aggregate base and sub-base is compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D 1557).
- The aggregate base shall have a CBR value to 70 percent or greater and the subbase shall have a CBR value of 10 percent or greater.
- Asphaltic concrete is compacted to local or UDOT requirements, or to at least 96 percent of the laboratory Marshall density (ASTM D 6927).

Due to high static loads imposed by trucks in loading and unloading areas and at dumpster locations, we recommend that a rigid pavement section for these areas of a minimum of six (6) inches of Portland Cement Concrete (PCC) over a minimum of twelve (12) inches of aggregate base material. The aggregate base material should meet local, APWA or UDOT requirements and should be compacted to local, APWA, or UDOT requirements, or to at least 95 percent of maximum dry density (ASTM D1557).

14.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The explorations may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the explorations may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, Earthtec should be advised immediately so that the appropriate modifications can be made.

The findings and recommendations presented in this geotechnical report were prepared in accordance with generally accepted geotechnical engineering principles and practice in this area of Utah at this time. No warranty or representation is intended in our proposals, contracts, letters, or reports. Failure to consult with Earthtec regarding any changes made during design and/or construction of the project from those discussed herein relieves Earthtec from any liability arising from changed conditions at the site.

This geotechnical report is based on relatively limited subsurface explorations and laboratory testing. Subsurface conditions may differ in some locations of the site from those described herein, which may require additional analyses and possibly modified recommendations. Thus, we strongly recommend consulting with Earthtec regarding any changes made during design and construction of the project from those discussed herein. Failure to consult with Earthtec regarding any such changes relieves Earthtec from any liability arising from changed conditions at the site.

To maintain continuity, Earthtec should also perform materials testing and special inspections for this project. The recommendations presented herein are based on the assumption that an adequate program of tests and observations will be followed during construction to verify compliance with our recommendations. We also assume that we will review the project plans and specifications to verify that our conclusions and recommendations are incorporated and remain appropriate (based on the actual design). Earthtec should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Earthtec also should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact Earthtec at your convenience.

Respectfully;

EARTHTEC ENGINEERING

PROFESSIONAL ENGINEER
No. 5567049-2202
TIMOTHY ALLAN MITCHELL
Electronically generated on
06/17/2024
STATE OF UTAH

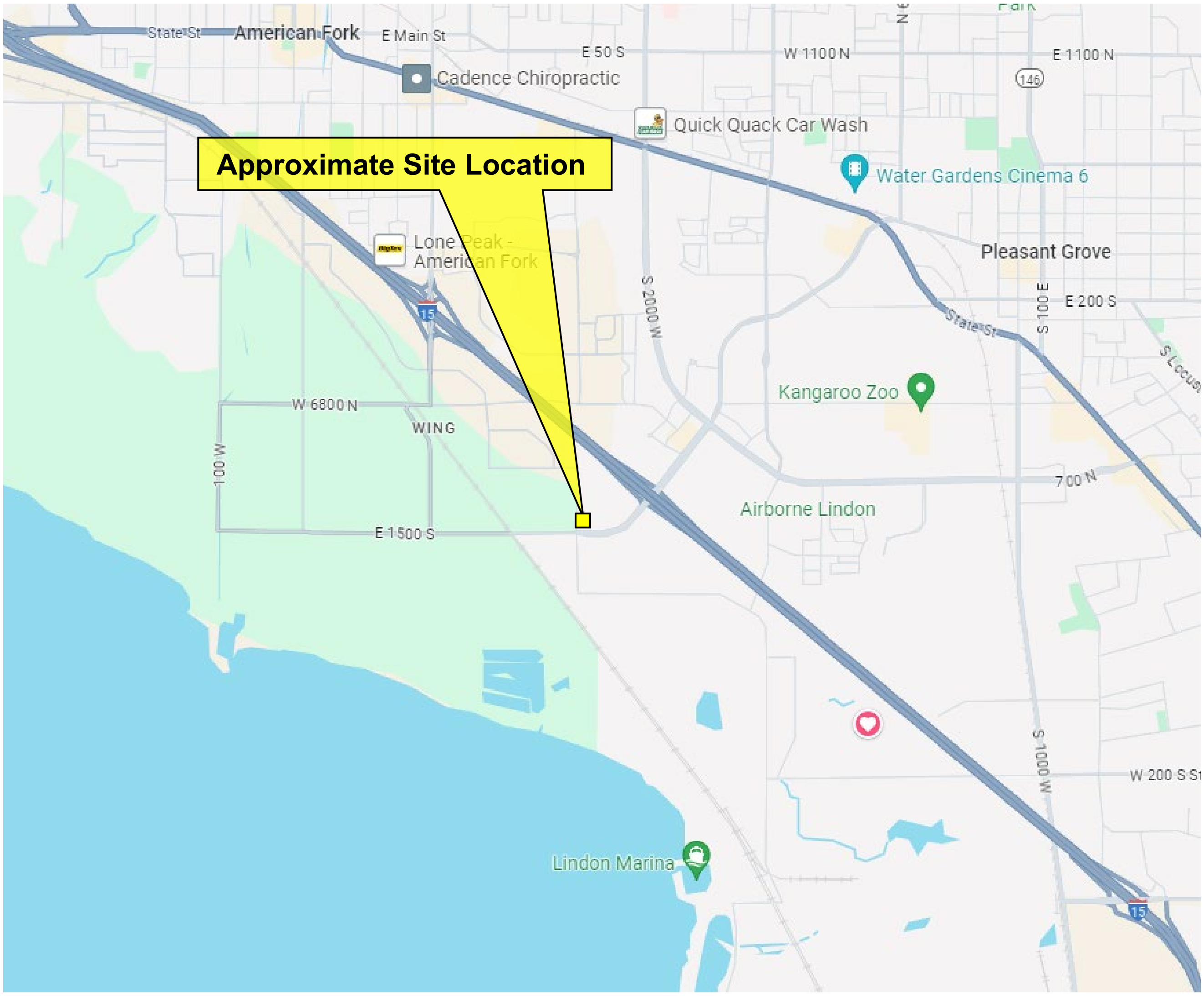
Frank F.

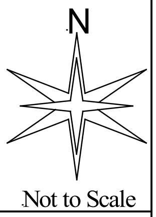
Frank Namdar, P.G., E.I.T.
Project Engineer

Timothy A. Mitchell, P.E.
Vice President

VICINITY MAP

OREM NORTH 4
625 NORTH 2800 WEST
LINDON, UTAH





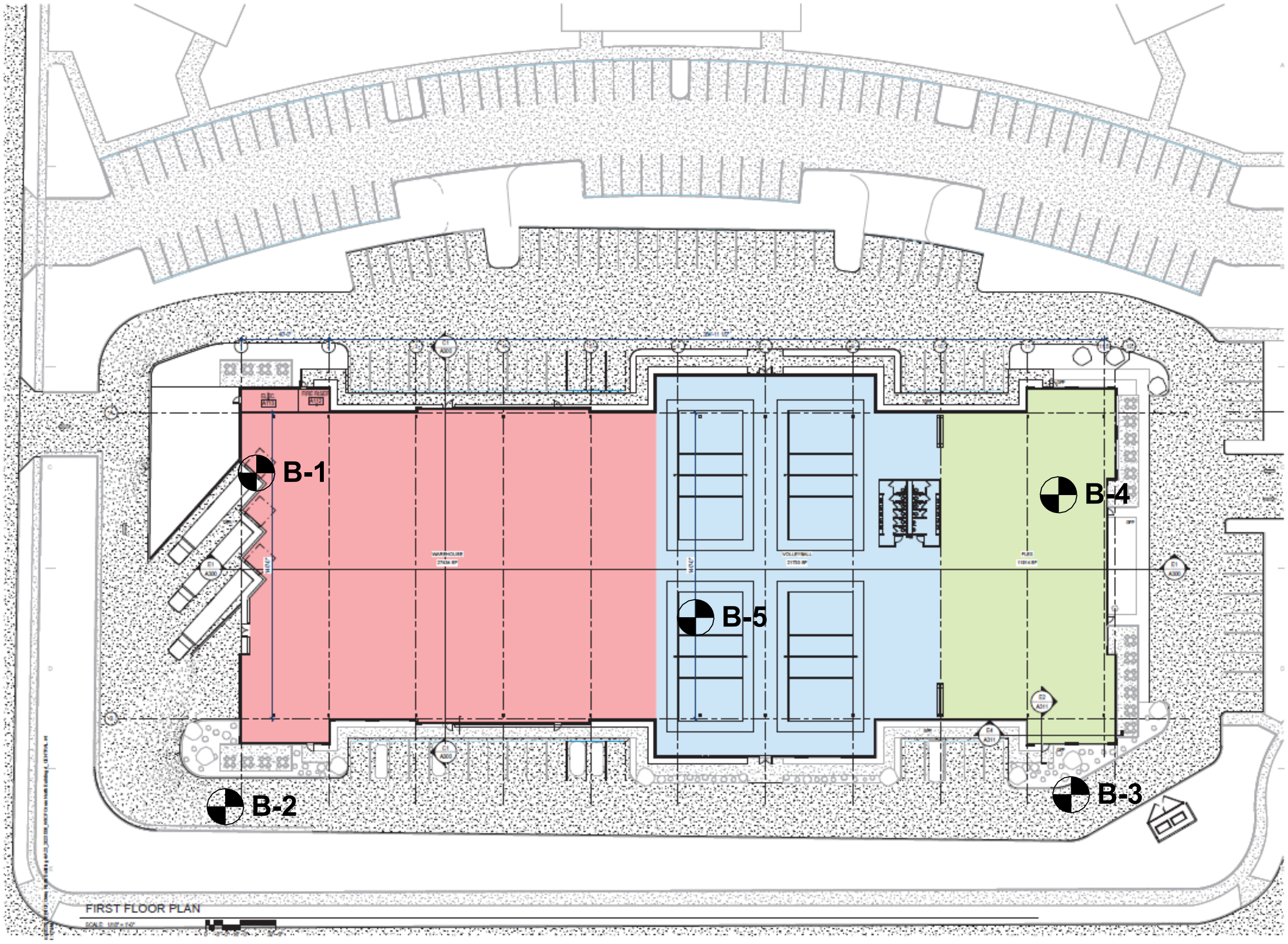
PROJECT NO.: 240363G

EARTHTEC ENGINEERING

FIGURE NO.: 1

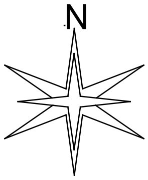
SITE PLAN SHOWING LOCATION OF BORINGS

OREM NORTH 4
625 NORTH 2800 WEST
LINDON, UTAH



*Site Plan provided by Client.

◐ **Approximate Boring Locations**



Not to Scale

PROJECT NO.: 240363G

FIGURE NO.: 2

BORING LOG

NO.: B-1

PROJECT: Orem North 4
CLIENT: WICP
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: Mobile CME-55
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 240363G
DATE: 05/22/24
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼: 8.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS								
					Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Test
0	■	ASPHALT	ASPHALT, 2"										
	▩	FILL	FILL; silty gravel with sand, slightly moist, gray										
3	▨		Lean CLAY with sand; soft to medium stiff, moist to wet, gray, 4 inch thick silty sand layer at 8½ feet below ground surface, iron oxide stain from 1.5 feet to 5 feet below ground surface	◣	7								SS
6	▨			▥		25	102	27	12	2	25	73	C
9	▨		▼	◣	5								
12	▨	CL		◣	4								
15	▨			◣	5								
18	▨												
21	▨			◣	6								
24			MAXIMUM DEPTH EXPLORED APPROXIMATELY 21½ FEET										
27													

Notes: Groundwater encountered at 8½ feet below ground surface.

Tests Key

CBR	=	California Bearing Ratio
C	=	Consolidation
R	=	Resistivity/Nitrates/PH
DS	=	Direct Shear
SS	=	Soluble Sulfates
UC	=	Unconfined Compressive Strength

PROJECT NO.: 240363G

FIGURE NO.: 3

BORING LOG

NO.: B-2

PROJECT: Orem North 4
CLIENT: WICP
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: Mobile CME-55
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 240363G
DATE: 05/22/24
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼: 12 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS								
					Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Test
0	■	ASPHALT	ASPHALT, 4"										
	▩	FILL	FILL; silty gravel with sand, slightly moist, gray										
3	▨	CL	Lean CLAY; stiff, slightly moist, black to gray, some organics	◣	14								
6	▥	ML	Sandy SILT; soft, moist, gray	◣	4	23		22	NP	2	39	59	
9	▨	CL	Lean CLAY with sand; medium stiff, moist to wet, brown, with sand at 10 feet below ground surface, iron oxide stain from 8 feet to 21.5 feet below ground surface	◣	5								
				▥		25	97	30	12	1	26	73	C
12		▼											
15				◣	6								
18													
21				◣	8								
			MAXIMUM DEPTH EXPLORED APPROXIMATELY 21½ FEET										
24													
27													

Notes: Groundwater encountered at 12 feet below ground surface.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 240363G

FIGURE NO.: 4

BORING LOG

NO.: B-3

PROJECT: Orem North 4
CLIENT: WICP
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: Mobile CME-55
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 240363G
DATE: 05/22/24
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼: 8.5 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Test
0		ASPHALT	ASPHALT, 2"										
		FILL	FILL; silty gravel with sand, slightly moist, gray										
3		CL	Lean CLAY; soft to medium stiff, moist to wet, brown, gray and black, some iron oxide from 1.5 feet to 15 feet below ground surface		8								
6						25	98	44	21	2	11	87	C
9					3								
12					4								
15					3								
18													
21		ML	SILT with sand; soft, wet, grayish brown, some iron oxide stain		3	31		23	NP	0	16	84	
24			MAXIMUM DEPTH EXPLORED APPROXIMATELY 21½ FEET										
27													

Notes: Groundwater encountered at 8½ feet below ground surface.

Tests Key

CBR	=	California Bearing Ratio
C	=	Consolidation
R	=	Resistivity/Nitrates/PH
DS	=	Direct Shear
SS	=	Soluble Sulfates
UC	=	Unconfined Compressive Strength

LOG OF TESTHOLE 240363.GPJ EARTHTEC.GDT 6/17/24

PROJECT NO.: 240363G

EARTHTEC ENGINEERING

FIGURE NO.: 5

BORING LOG

NO.: B-4

PROJECT: Orem North 4
CLIENT: WICP
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: Mobile CME-55
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 240363G
DATE: 05/22/24
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼: 9 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Test
0	▬	ASPHALT	ASPHALT, 3"										
	▩	FILL	FILL; silty gravel with sand, slightly moist, gray										
	▨	CL	Lean CLAY; soft to medium stiff, slightly moist to wet, brown, gray and black										
3				◤	6								
6				◤	2								
9			▼	◤	5								
12				◤	3								
15				‖		24	93	44	22	0	3	97	C
18													
21	▒	SM	Silty SAND; very loose, wet, brown and gray	◤	3								
			MAXIMUM DEPTH EXPLORED APPROXIMATELY 21½ FEET										
24													
27													

Notes: Groundwater encountered at 9 feet below ground surface.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

BORING LOG

NO.: B-5

PROJECT: Orem North 4
CLIENT: WICP
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: Mobile CME-55
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 240363G
DATE: 05/22/24
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼: 9 ft.

					TEST RESULTS								
Depth (Ft.)	Graphic Log	USCS	Description	Samples	Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Test
0	■	ASPHALT	ASPHALT, 2"										
	▩	FILL	FILL; silty gravel with sand, slightly moist, gray										
	▥		SILT with sand; soft, moist, grayish brown, iron oxide stain										
3	▥			⧗	4	23	99	22	NP	2	21	77	C
6	▥			⧗	1								
9	▥	ML	▼	⧗	1								
12	▥			⧗	0	40		12	NP	2	23	75	
15	▨		Sandy Lean CLAY; soft to very stiff, moist to wet; gray	⧗	4								
18	▨												
21	▨	CL		⧗	3	30		28	10	0	30	70	
24	▨												
27	▨			◣	21								

Notes: Groundwater encountered at 9 feet below ground surface.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 240363G

FIGURE NO.: 7a

BORING LOG

NO.: B-5

PROJECT: Orem North 4
CLIENT: WICP
LOCATION: See Figure 2
OPERATOR: Great Basin Drilling
EQUIPMENT: Mobile CME-55
DEPTH TO WATER; INITIAL ▽:

PROJECT NO.: 240363G
DATE: 05/22/24
ELEVATION: Not Determined
LOGGED BY: F. Namdar
AT COMPLETION ▼: 9 ft.

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS								
					Blows per foot	Water Cont. (%)	Dry Dens. (pcf)	LL	PI	Gravel (%)	Sand (%)	Fines (%)	Other Test
27	▨	CL	Sandy Lean CLAY; soft to very stiff, moist to wet; gray										
30	▥	CL-ML	Silty CLAY, stiff, wet, gray	◣	14	27		27	7	1	2	97	
33													
36				◣	13								
39													
	▨	CL	Lean CLAY; medium stiff, wet; gray	◣	6	38		41	21	0	1	99	
42													
45				◣	5								
48													
51				◣	4	47		45	24	0	1	99	
			MAXIMUM DEPTH EXPLORED APPROXIMATELY 51½ FEET										
54													

Notes: Groundwater encountered at 9 feet below ground surface.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity/Nitrates/PH
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 240363G

EARTHTEC ENGINEERING

FIGURE NO.: 7b

LEGEND

PROJECT: Orem North 4
CLIENT: WICP
DATE: 05/22/24
LOGGED BY: F. Namdar

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS				USCS SYMBOL	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)	⁘	GW	Well Graded Gravel, May Contain Sand, Very Little Fines
			⁘	GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)	⁘	GM	Silty Gravel, May Contain Sand
			▨	GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)	⁙	SW	Well Graded Sand, May Contain Gravel, Very Little Fines
			⁙	SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)	▥	SM	Silty Sand, May Contain Gravel
			▨	SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		▨	CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
			▥	ML	Silt, Inorganic, May Contain Gravel and/or Sand
			▤	OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)		▨	CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
			▥	MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
			≋	OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS			⁂	PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

◩ SPLIT SPOON SAMPLER (1 3/8 inch inside diameter)
⧗ MODIFIED CALIFORNIA SAMPLER (2 inch outside diameter)
▥ SHELBY TUBE (3 inch outside diameter)
◨ BLOCK SAMPLE
☒ BAG/BULK SAMPLE

WATER SYMBOLS

▽ Water level encountered during field exploration

▼ Water level encountered at completion of field exploration

NOTES:

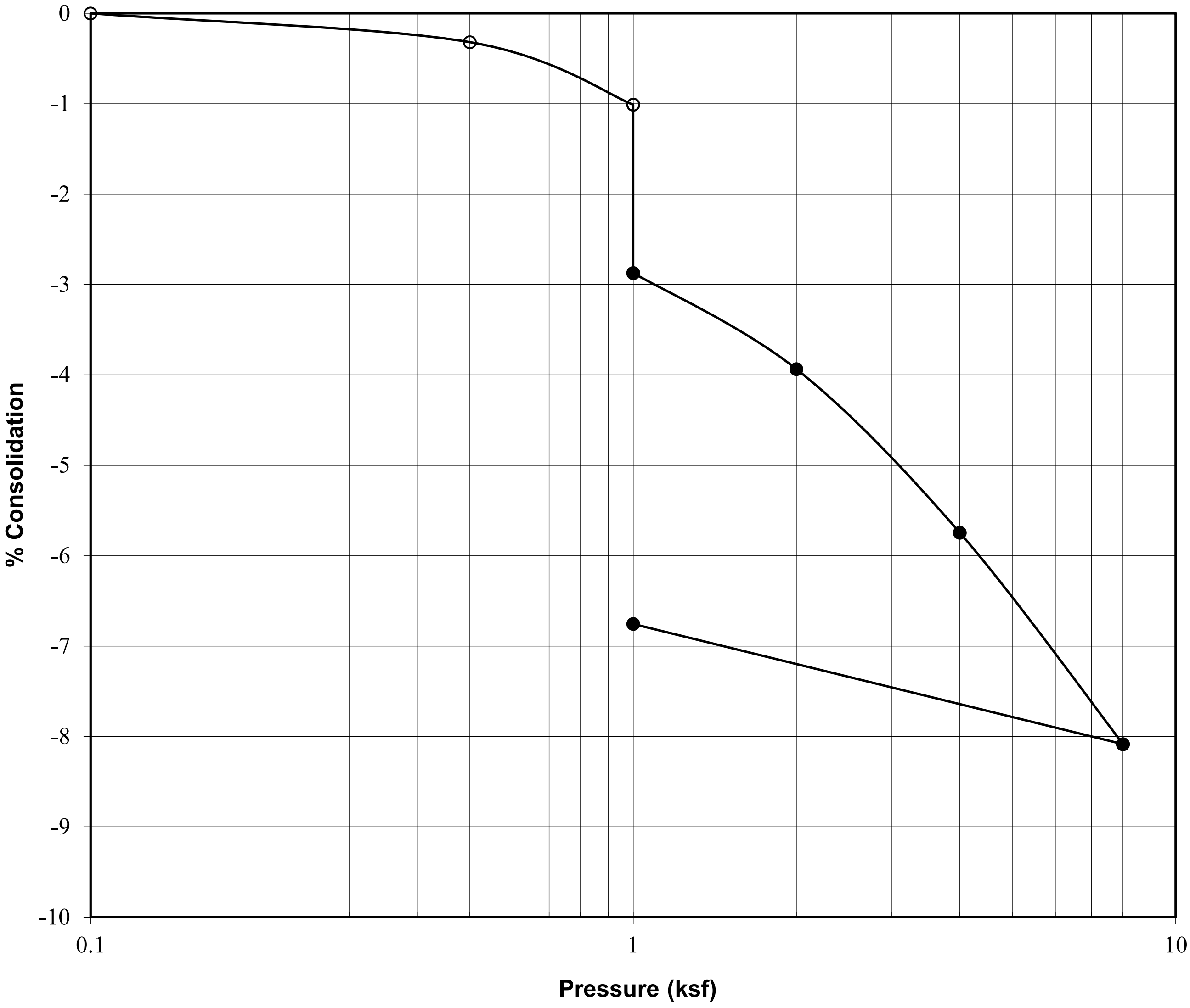
1. The logs are subject to the limitations, conclusions, and recommendations in this report.
2. Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
3. Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
4. In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

PROJECT NO.: 240363G

EARTHTEC ENGINEERING

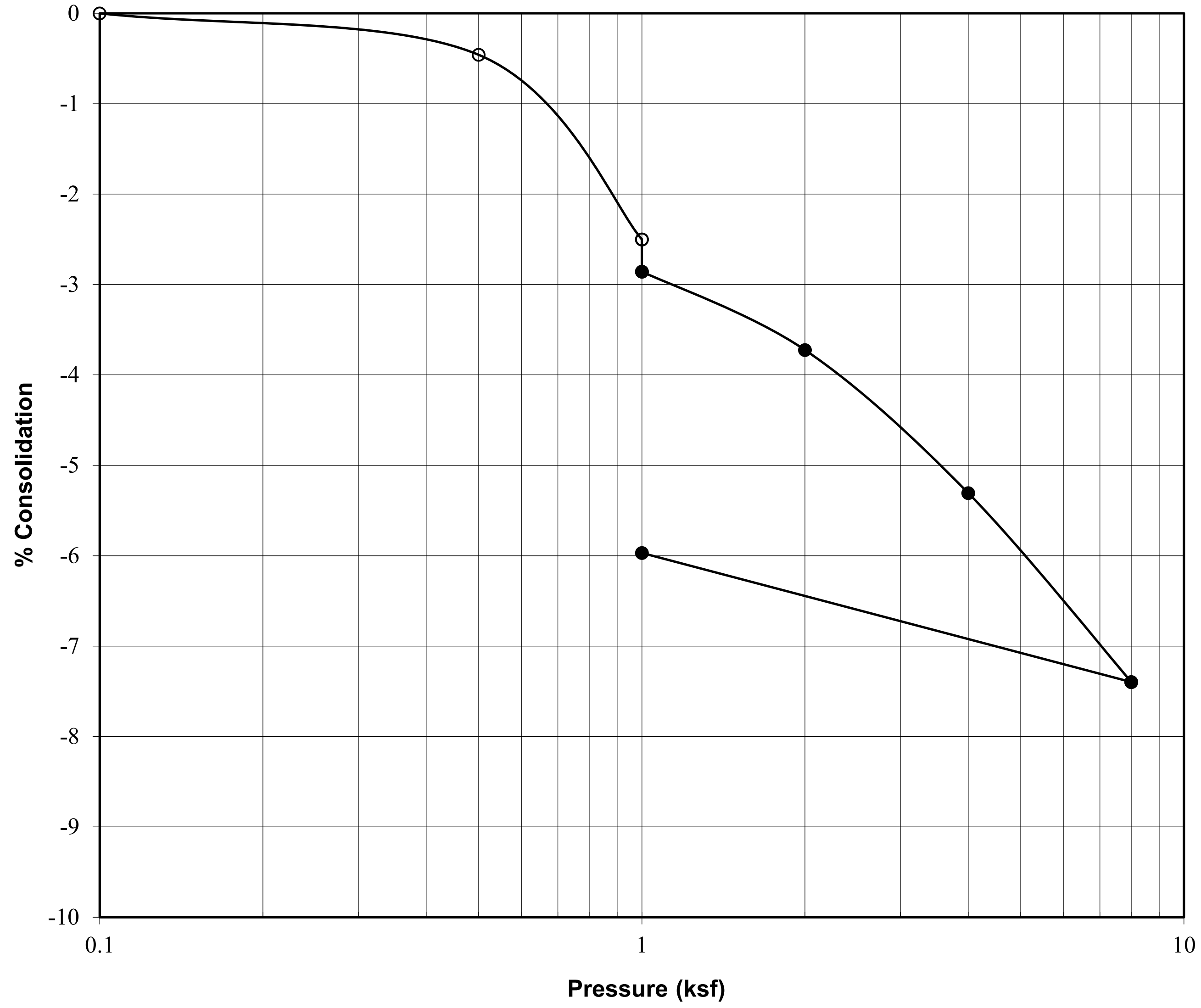
FIGURE NO.: 8

CONSOLIDATION - SWELL TEST



Project:	Orem North 4
Location:	B-1
Sample Depth, ft:	5
Description:	Shelby
Soil Type:	Lean CLAY with sand (CL)
Natural Moisture, %:	25
Dry Density, pcf:	102
Liquid Limit:	27
Plasticity Index:	12
Water Added at:	1 ksf
Percent Collapse:	1.9

CONSOLIDATION - SWELL TEST



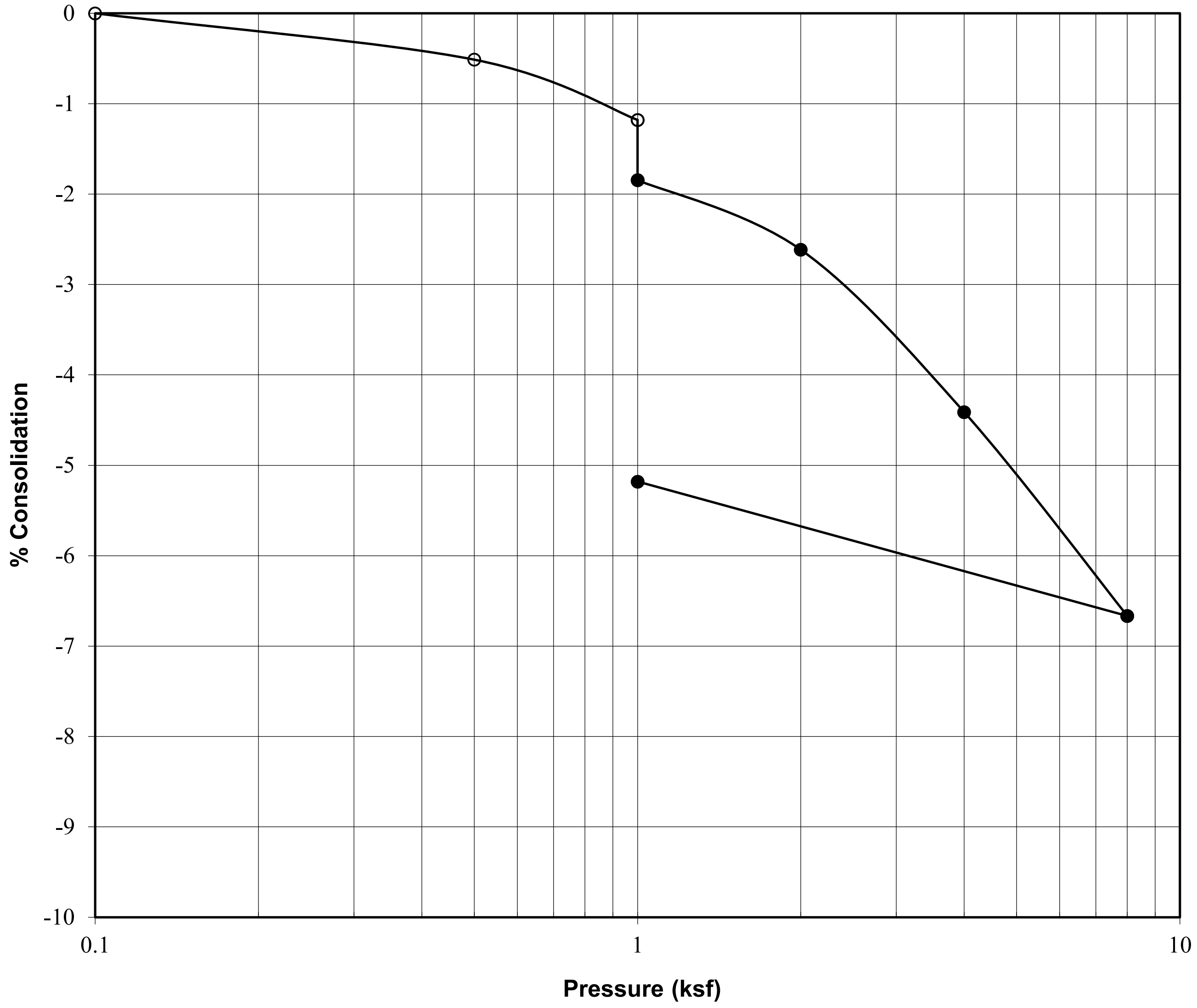
Project:	Orem North 4
Location:	B-2
Sample Depth, ft:	10
Description:	Shelby
Soil Type:	Lean CLAY with sand (CL)
Natural Moisture, %:	25
Dry Density, pcf:	97
Liquid Limit:	30
Plasticity Index:	12
Water Added at:	1 ksf
Percent Collapse:	0.4

PROJECT NO.: 240363G

EARTHTEC ENGINEERING

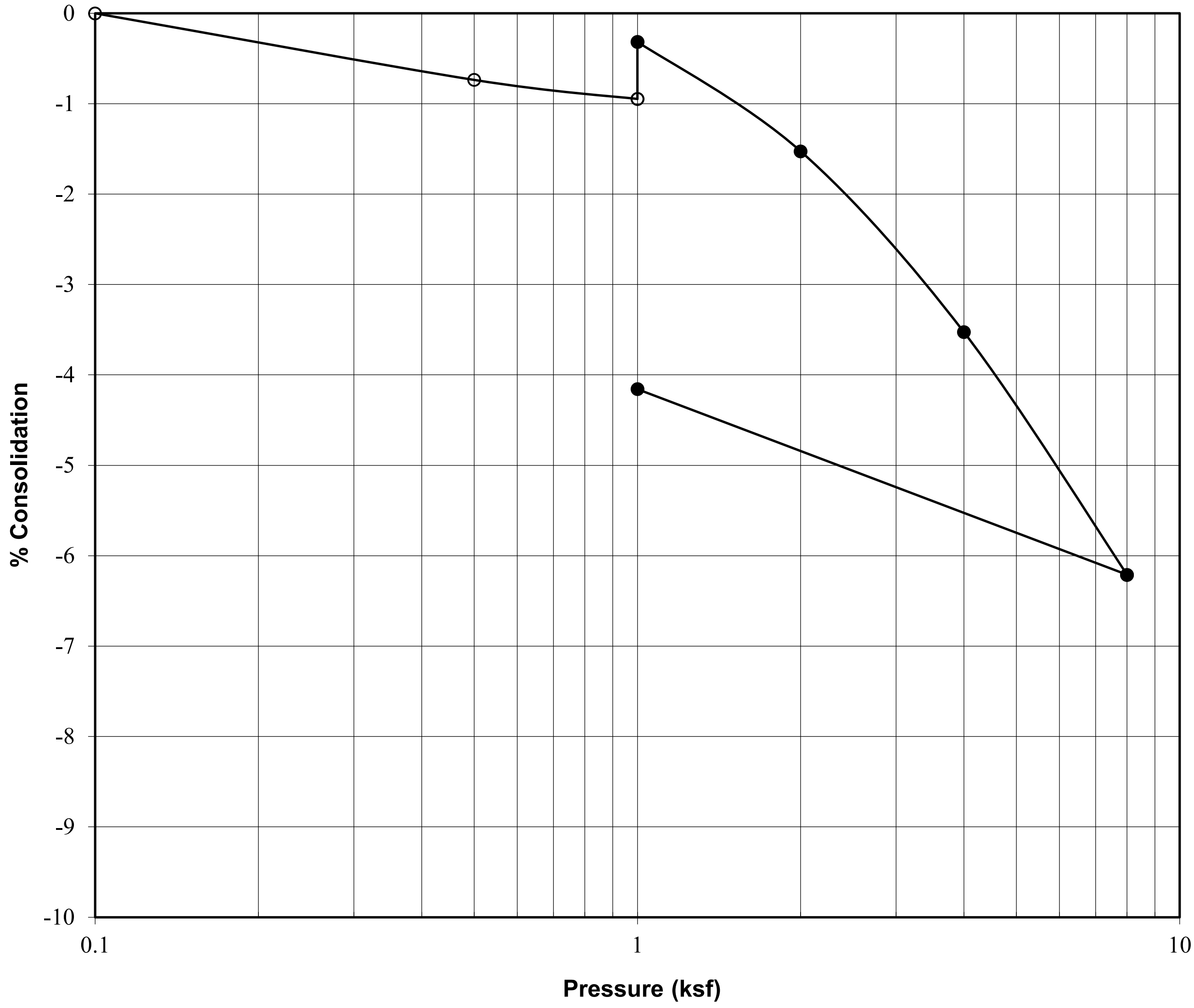
FIGURE NO.: 10

CONSOLIDATION - SWELL TEST



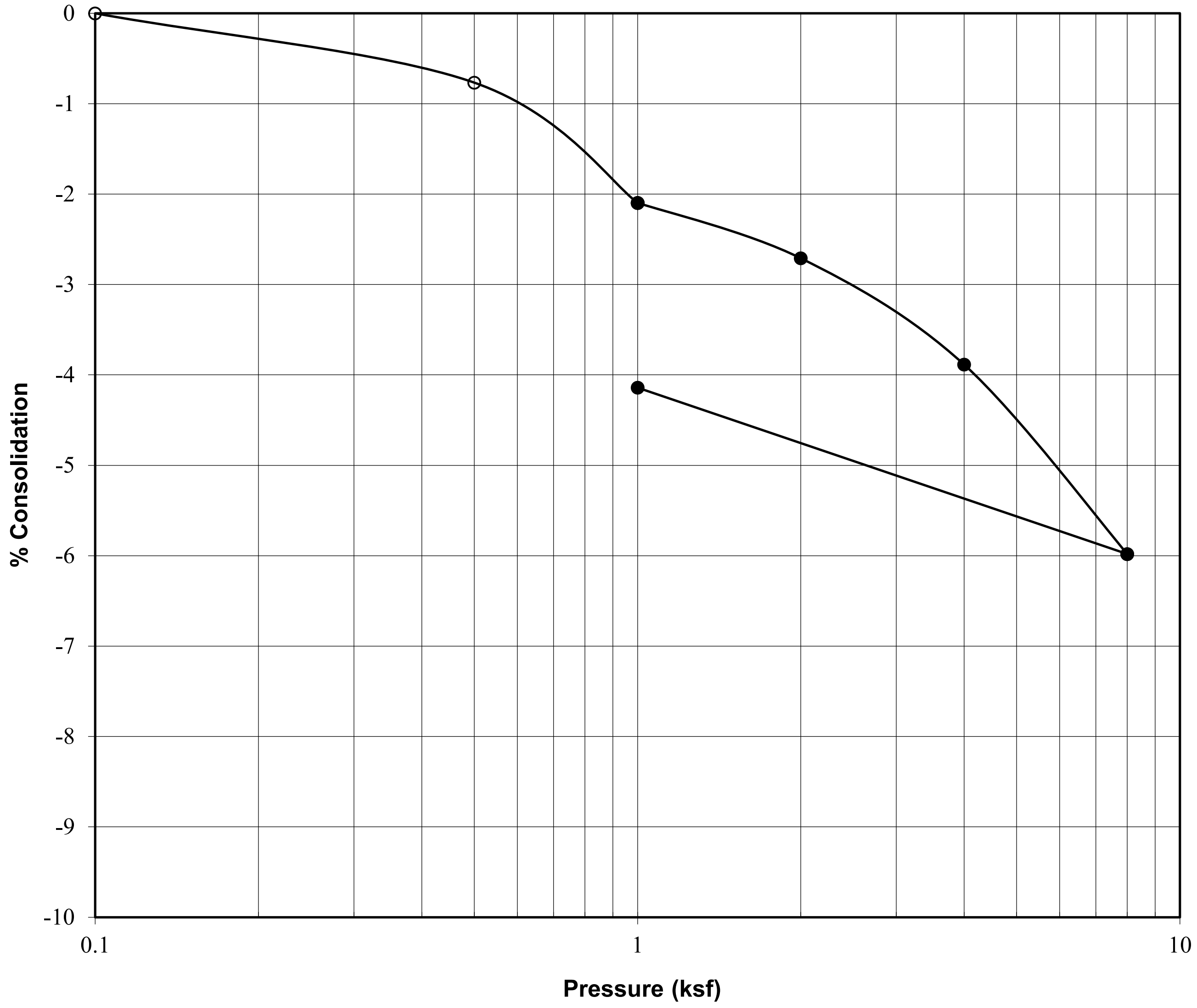
Project:	Orem North 4
Location:	B-3
Sample Depth, ft:	5
Description:	Shelby
Soil Type:	Lean CLAY (CL)
Natural Moisture, %:	25
Dry Density, pcf:	98
Liquid Limit:	44
Plasticity Index:	21
Water Added at:	1 ksf
Percent Collapse:	0.7

CONSOLIDATION - SWELL TEST



Project:	Orem North 4
Location:	B-4
Sample Depth, ft:	15
Description:	Shelby
Soil Type:	Lean CLAY (CL)
Natural Moisture, %:	24
Dry Density, pcf:	93
Liquid Limit:	44
Plasticity Index:	22
Water Added at:	1 ksf
Percent Swell:	0.6

CONSOLIDATION - SWELL TEST



Project:	Orem North 4
Location:	B-5
Sample Depth, ft:	2½
Description:	Shelby
Soil Type:	SILT with sand (ML)
Natural Moisture, %:	23
Dry Density, pcf:	99
Liquid Limit:	22
Plasticity Index:	NP
Water Added at:	1 ksf

APPENDIX A

Chemtech-Ford Laboratories
Serving the Intermountain West Since 1953

9632 South 500 West
Sandy, UT 84070
O:(801) 262-7299 F: (866) 792-0093
www.ChemtechFord.com

Certificate of Analysis

BGT Partners (dba Earthtec Engineering)
Jeremy Balleck
1497 West 40 South
Lindon, UT 84042

PO#: **240363G**
Receipt: **5/24/24 9:07 @ 16.8 °C**
Date Reported: 6/3/2024
Project Name: **Orem North 4**

Sample ID: **240363G B1 - 2.5'**

Matrix: **Solid**

Lab ID: **24E1961-01**

Date Sampled: **5/22/24 9:30**

Sampled By: **Michael Schedel**

	Result	Units	Minimum Reporting Limit	Method	Preparation Date/Time	Analysis Date/Time	Flag(s)
Inorganic							
Sulfate, Soluble (IC)	189	mg/kg dry	13	EPA 300.0	5/30/24	5/30/24	
Total Solids	78.8	%	0.1	CTF8000	5/31/24	5/31/24	

Certificate of Analysis

BGT Partners (dba Earthtec Engineering)
Jeremy Balleck
1497 West 40 South
Lindon, UT 84042

PO#: **240363G**
Receipt: **5/24/24   9:07 @ 16.8** °C
Date Reported: 6/3/2024
Project Name: **Orem North 4**

Report Footnotes

Abbreviations

ND = Not detected at the corresponding Minimum Reporting Limit (MRL).
1 mg/L = one milligram per liter or 1 mg/kg = one milligram per kilogram = 1 part per million.
1 ug/L = one microgram per liter or 1 ug/kg = one microgram per kilogram = 1 part per billion.
1 ng/L = one nanogram per liter or 1 ng/kg = one nanogram per kilogram = 1 part per trillion.
On calculated parameters, there may be a slight difference between summing the rounded values shown on the report vs the unrounded values used in the calculation.

Chemtech-Ford, Inc

Joyce Applegate

Joyce Applegate, Project Manager

Analyses presented in this report were performed in accordance with the National Environmental Laboratory Accreditation Conference, unless otherwise noted.

CHAIN OF CUSTODY - SAMPLE SUBMITTAL FORM

COMPANY: BGT Partners (dba Earthtec Engineering
ADDRESS: 1497 W 40 S
CITY/STATE/ZIP: Lindon, UT. 84042
PHONE #: 801-225-5711
CONTACT: Jeremy Balleck Mike Schedel
EMAIL: jballeck@earthteceng.com mschedel@earthteceng.com
PROJECT: Orem North 4
PO Number: 240363G
INVOICE EMAIL ADDRESS: cdavis@earthteceng.com

*RUSH Due Date
5-Day

* Additional fees may apply

QC Level

QC1: None sent to client
QC2: Batch QC, random sample
QC3: 25% surcharge. Narrative + QC client sample
QC4: 40% surcharge. QC3 + raw data

CHEMTECH-FORD
LABORATORIES

Chemtech-Ford Laboratories
- Drop-Off Location -
1384 W 130 S
Orem, Ut. 84058
Phone: 801-229-2282

Sample Condition		Delivery Method	
Custody Seals	[✓ COC Complete]	UPS	USPS
[✓ Container Intact]	[✓ Sufficient Sample Volume]	FedEx	Chemtech-Ford Courier
[✓ COC/Labels Agree]	Headspace Present (VOC)	[✓ Walk-in]	Customer Courier
Received on Ice	Temperature Blank	**Tracking Number:**	
[✓ Correct Containers]	[✓ Received within Holding Time]		

24E1961	CLIENT SAMPLE INFORMATION				TESTS REQUESTED	BOTTLE LOT #S
Lab Use Only	LOCATION / IDENTIFICATION	DATE	TIME	MATRIX	Soluble Sulfate	
-01	1. 240363G - B1-2.5	5/22	0930	S	X	SI 1313
	2.					
	3.					
	4.					
	5.					
	6.					
	7.					
	8.					
	9.					
	10					
	11					

Sampled by: [print] M. Schedel
Sampled by: [signature]

ON ICE [✓ NOT ON ICE] Temp (C°): 16.8

Samples received outside the EPA recommended temperature range of 0-6 C° may be rejected.

Special Instructions:

Relinquished by: [signature]	Date/Time	Received by: [signature]	Date/Time
	5-24/0907		5-24-24 0907
	5-24-24 1400		5/24/24 1442

Payment Terms are net 30 days OAC. 1.5% interest charge per month (18% per annum). Client agress to pay collection costs and attorney's fees.

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Latitude, Longitude: 40.34828856996619, -111.77323395236127

Date	6/17/2024, 10:21:24 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	E - Soft Clay Soil

Type	Value	Description
S_S	1.298	MCE$_R$ ground motion. (for 0.2 second period)
S_1	0.472	MCE$_R$ ground motion. (for 1.0s period)
S_{MS}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	null -See Section 11.4.8	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	null -See Section 11.4.8	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.588	MCE$_G$ peak ground acceleration
F_{PGA}	1.112	Site amplification factor at PGA
PGA_M	0.654	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.298	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.494	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	3.113	Factored deterministic acceleration value. (0.2 second)
S1RT	0.472	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.533	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.252	Factored deterministic acceleration value. (1.0 second)
PGAd	1.237	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.588	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.869	Mapped value of the risk coefficient at short periods

C_{R1}	0.886	Mapped value of the risk coefficient at a period of 1 s
C_v		Vertical coefficient