Geotechnical Investigation

Micron Property – Lehi Emerald and Single Family

Approximately 500 West and State Road 92
Lehi, Utah

January 18, 2021

Prepared For:

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Preliminary Geotechnical Investigation
Micron Property Lehi Single Family 145-Acre Portion
Approximately 500 West and State Road 92
Lehi, Utah

GeoStrata Job No. 589-100

Reviewed by:

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APPENDICES

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1.0 EXECUTIVE SUMMARY

This report presents the preliminary findings of a geotechnical investigation conducted for 145-acres of the Micron Property at approximately 500 West and State Road 92, in Lehi and Draper, of Utah County. We understand that this section of the proposed development consists of medium to low density residential development. The development will include different structures, with "low" including single family residences 1 to 2 stories in height with basements (if feasible), and "medium" consisting of townhouse and duplex structures. The development for this section will be constructed across 145 acres. We anticipate footing loads on the order of 2 to 4 kips per lineal foot and column loads of up to 20 kips. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide recommendations for general site grading and the design and construction of foundations, slabs-on-grade, and exterior concrete flatwork. The area of this section of the Micron Property contains some geologic hazards that have not been addressed in this report. All recommendations and conclusion in this report are consisted preliminary.

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed development provided that the recommendations contained in this report are incorporated into the design and construction of the project.

As a part of this investigation, subsurface soil conditions were explored by advancing 23 exploratory test pits depths ranging from 8 to 12 feet below the existing site grade. Based on the results of our field observations as well as on our review of applicable surficial geologic maps, the site is overlain partially by approximately ½-foot of topsoil or ½-foot of roadway fill covered a majority of the site. Underlying the topsoil or fill, we encountered deposits mapped by Biek (2005) as consisting of Historical to Oligocene-Eocene-aged materials deposits. Groundwater was not encountered in any of the completed test pits for the section.

Due to the presence of dense granular soils (sands and gravels) and fine-grained soils with low potential for collapsible soil present at the proposed buildings elevations (between 2 to 8 feet below the existing ground surface), strip and spread footings can be placed entirely on non-collapsible undisturbed native soils. If soil at the foundation elevation appears to have a hydro-collapsible nature (pinholes, low natural density, etc.), collapse testing in the laboratory should be performed on a lot-by-lot basis to confirm the that potential collapse will not adversely affect the proposed construction. Foundation elements should not be founded on collapsible soils, and if these soils are encountered, they should be over-excavated according to the results of lot-specific laboratory collapse testing. According to our preliminary soil collapse testing, structural fill depth below footings will be 0 to 12 inches. The site may then be brought back up to design grade using properly placed and compacted structural fill. Strip and spread footings should be a minimum of 20 and 30 inches wide, respectively. Exterior shallow footings and spread footings should be embedded at least 30 inches below final grade for frost protection and confinement. Interior strip shallow footings not susceptible to frost conditions should be embedded at least 18 inches for confinement. Conventional strip and spread footings founded on a native granular soil or on structural fill may be proportioned for a maximum net allowable bearing capacity of **1,800 pounds per square foot (psf)**.

Additional recommendations concerning other aspects of the proposed construction may be found in the body of this report.

IMPORTANT INFORMATION ABOUT THIS GEOTECHNICAL-ENGIEERING REPORT:

Do not rely on the executive summary. The executive summary omits a number of details, any one of which could be crucial. Read and refer to the report in full. Do not rely on this report if this report was prepared for a different client, different project, different purpose, different site, and/or before important events occurred at the site or adjacent to it. All recommendations in this report are confirmation dependent. A two-page document prepared by GBA explains these items with greater detail and can be found in Appendix D (Plates D-1 and D-2).

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a preliminary geotechnical investigation conducted for 145-acres of the property termed the Micron Property located at approximately 500 West and State Road 92 in Lehi and Draper, in Utah County, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide recommendations for general site grading and the design and construction of foundations, slabs-on-grade, and exterior concrete flatwork.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report. Our services were performed in accordance with our proposal and signed authorization, dated November 18, 2020.

The recommendations contained in this report are subject to the limitations presented in the LIMITATIONS section of this report (Section 7.1).

2.2 PROJECT DESCRIPTION

Due to the size of the Micron Property project, we have divided the property into four smaller sections containing similar proposed development types for the purposes of our investigation. This preliminary geotechnical investigation is completed for Lehi Emerald and Lehi Single Family Lots, which represents the northwestern-most 145-acres of the proposed building portions of the development. The property is located at approximately 500 West and State Road 92, in Lehi and Draper, Utah County, Utah (see Plate A-1, *Site Vicinity Map*). Plate A-2, Site Section Map, shows how we have divided up the buildable portions of the Micron property. Based on information received from the Client, we understand that steep and hard to access portions of the Micron Property will not be developed. This 145-acres portion of the Micron Property will be developed with low density (single family residential lots) and medium density (small acre single family lots to townhomes). The resulting construction will include one- to two-story, wood-framed single-family residences founded on conventional spread and strip footings and one- to three-story townhouse structures founded on conventional spread and strip footings. If larger structures are planned, then GeoStrata should be consulted and our recommendations should be updated if necessary. Each of these types of structures are anticipated to have basements or crawlspaces if feasible. We anticipate footing loads on the order of 2 to 4 kips per lineal foot and column loads of up to 20 kips. As stated before, if the anticipated footing loads exceed assumptions or the proposed construction is different than what we have assumed, please contact GeoStrata with the updated information and allow for further analysis. Our investigation for the development will be used to provide geotechnical design parameters for construction of buildings, parking areas, driveways, and associated landscaping and utilities.

3.0 METHOD OF STUDY

3.1 FIELD INVESTIGATION

As a part of this investigation, subsurface soil conditions were explored by advancing 23 exploratory test pits (MW-TP-01 to MW-TP-05, MW-TP-10 to MW-TP-23, MW-TP-27 to MW-TP-30) to depths ranging from 8 to 12 feet below the existing site grade. It should be noted that the northeastern portion of the subject 145 acres extended into property that is currently part of Draper City, and appropriate permits were not able to be obtained in the timeframe allotted for this investigation. As such, no test pits were excavated in the northeastern portions of the subject property. The approximate locations of the explorations are shown on Plate A-3, *Lehi Emerald Single Family and Single-Family Section Exploration Map,* in Appendix A. Exploration points were placed to provide optimum coverage of the site in the areas of proposed residential development. Logs of the subsurface conditions, as encountered in the test pit explorations, were recorded at the time of excavation and advancement by a staff engineer currently employed at GeoStrata and are presented on Plates B-1 to B-23 in Appendix B. A *Soil Symbols Description Key* used in the borehole and test pit logs is included as Plate B-24.

The test pits were excavated with a mini track mounted excavator. Both bulk and relatively undisturbed soil samples were obtained from the test pits. Relatively undisturbed soil samples were obtained from the test pit in the form of tube samples and block samples. All samples were transported to our laboratory for testing to evaluate engineering properties of the various earth materials observed. The soils were classified according to the *Unified Soil Classification System* (USCS) by the Geotechnical Engineer. Classifications for the individual soil units are shown on the attached Test Pit Logs, Plates B-1 to B-23 in Appendix B.

3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on selected relatively undisturbed and bulk soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation include:

- Grain Size Distribution Analysis (ASTM D422)
- Atterberg Limits (ASTM D4318)
- 1-D Collapse Consolidation Test (ASTM D2435)
- California Bearing Ratio Test (ASTM D1883)
- Direct Shear Test (ASTM D3080)

The results of laboratory tests are presented on the Test Pit Logs in Appendix B (Plates B-1 to B-23), the test result plates presented in Appendix C (Plates C-2 to C-19) and in the *Summary of Laboratory Test Results* Table (Plate C-1).

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care.

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

At the time of our subsurface investigation in this 145-acre portion of the Micron Property, no structures existed on the site, although the remains of an abandoned batch plant used during the construction of the Micron facility was observed on the northern boundary of the property. The only other site improvements consisted of dirt roadways and fences constructed across the site. The site slopes towards the south (towards Utah Lake), having a maximum topographic relief of approximately 180 feet. The residential development known as Canyon View borders this property on the west. The remainder of surrounding properties consisted of undeveloped hillside properties.

4.2 SUBSURFACE CONDITIONS

As previously mentioned, the subsurface soil conditions were explored at the subject property by advancing 23 exploratory test pits to depths ranging from 8 to 12 feet below the existing site grade. Subsurface soil conditions were logged using the United Soils Classification System (USCS) at the time of the investigation and are included on the Test Pit Logs in Appendix B (Plates B-1 through B-23). The soil and moisture conditions encountered during our investigation are discussed below.

4.2.1 Soils

Based on the results of our field observations as well as on our review of applicable surficial geologic maps, the site is largely overlain by approximately ½ foot of topsoil or ½ foot of roadbase fill. Underlying the topsoil or fill, we encountered deposits mapped by Biek (2005) as consisting of a variety of soil deposits ranging from Historical to Oligocene-Eocene in age. Descriptions of the soil units shown in the area are described below;

Qlsb - Lacustrine sand and silt (Upper Pleistocene) − Fine- to coarse-grained lacustrine sand and silt with minor gravel; typically thick bedded and well sorted. This geologic soil unit was encountered in MW-TP-11, 13, 14, 20, and 21. The soils were visual classified as consisting of Silty SAND (SM) with varying amounts of clay and gravel.

Qlgb - Lacustrine gravel and sand (Upper Pleistocene) − Moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel and pebbly sand; thin to thick bedded.

This geologic soil unit was encountered in MW-TP-12. The soils encountered were visually classified as Sandy SILT (ML) with gravel.

Qaf_1 - Modern alluvial-fan deposits (Holocene) − Poorly to moderately sorted, non-stratified, clay- to boulder-size sediment deposited principally by debris flows at the mouths of active drainages. This geologic soil unit was encountered in MW-TP-01 and 10. The soil encountered were visually classified as Silty SAND (SM) with varying amounts of gravel.

Qafy - Younger undifferentiated alluvial-fan deposits (Holocene to Upper Pleistocene) − Poorly to moderately sorted, non-stratified, clay- to boulder-size sediment deposited principally by debris flows at the mouths of active drainages, are locally deeply incised; thickness unknown, but likely up to several tens of feet. This geologic soil unit was encountered in MW-TP-15, 16, 22, and 23. The soil encountered general consisted of a Silty SAND (SM) with varying amounts of gravel.

Qfl - Landfill deposits (Historical) − Miscellaneous fill, principally building and road construction debris, placed in sand and gravel or aggregate pits. This geologic soil unit is mapped at MW-TP-02, although the soils at this test pit location appeared to be native. The area around the location had been disturbed due to past excavation and site use.

Qfd - Disturbed land (Historical) – Land disturbed by sand and gravel operations. These deposits were not encountered in our test pit for this section

Tv - Volcanic rocks of the east Traverse Mountains, undivided (Oligocene-Eocene) − Complexly interbedded block and ash-flow tuffs, volcanic mudflow breccia, minor lava flows, and minor fluvial volcaniclastic deposits. No test pits were completed in the geologic unit.

Taf - Alluvial-fan deposits (Miocene[?] to Oligocene[?]) – Unconsolidated, pebble- to boulder-size, subangular to subrounded orthoquartzite and calcareous sandstone clasts. This geologic soil unit was encountered in MW-TP-04 and 05. The soils were visual classified as Silty SAND with gravel (SM).

The stratification lines shown on the enclosed test pit represent the approximate boundary between soil types USCS classifications of the soils (Plates B-1 to B-23). The actual in-situ transition may be gradual. Due to the nature and depositional characteristics of the native soils, care should be taken in interpolating subsurface conditions between and beyond the exploration locations.

4.2.2 Groundwater

Groundwater was not encountered in any of the 23 test pits completed for this portion of the Micron Property. Seasonal fluctuations in precipitation, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions. The observed groundwater conditions can change seasonally depending on the time of year and will impact the proposed construction. It is recommended that lowest floor slab elevation for each structure should be maintained a minimum of 3 feet above any observed groundwater conditions.

4.2.3 Collapsible Soils

Collapse (often referred to as "hydro-collapse") is a phenomena whereby undisturbed soils exhibit volumetric strain and consolidation upon wetting under increased loading conditions. Collapsible soils can cause differential settling of structures and roadways. Collapsible soils do not necessarily preclude development and can be mitigated by over-excavating porous, potentially collapsible soils and replacing with engineered fill and by controlling surface drainage and runoff. For some structures that are particularly sensitive to differential settlement, or in areas where collapsible soils are identified at great depth, a deep foundation system should be considered.

Soils that have a potential to collapse under increased loading and moisture conditions are typically characterized by a pinhole structure and relatively low unit weights. In general, potentially collapsible soils are observed in fine-grained soils that include clay and silt, although collapsible soils may include sandy soils. Test results of the collapse test show negligible to low collapse potential. A table of the collapse test results, depth, and test pit number are provided below. This information is also contained on Plate C-1 and Plates C-7 to C-16.

Test Pit Number	Sample Depth	Collapse Potential
MW-TP-03	3.0	0.32
MW-TP-12	6.0	1.17
MW-TP-13	8.5	0.27
MW-TP-14	6.0	0.09
MW-TP-18	3.0	0.07
MW-TP-19	6	1.40

MW-TP-20	3.5	0.44
MW-TP-21	3.5	0.23
MW-TP-28	3.5	0.47

Based on these lab test results, it is anticipated that between 0 to 12 inches of structural fill may be required under some of the structures that extend into fine-grained soils with a pinhole texture. The 0 to 12 inches of structural fill under the footings is recommended to reduce the potential for collapsible soils to present a significant risk to the foundation elements within the proposed development. In addition to the structural fill soils, all other recommendations presented in this report should be incorporated into the design and construction of the structures.

5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

The site is located at an elevation between 4,995 and 5,165 feet above mean sea level within the northern portion of Utah Valley. The Utah Valley is a deep, sediment-filled structural basin of Cenozoic age flanked by the Wasatch Range to the east and the Lake Mountains, East Tintic Mountains, and the West Hills to the West (Hintze, 1980). The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah.

The near-surface geology of Utah Valley is dominated by sediments deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983). As the lake receded, streams began to incise large deltas formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valleys are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover. Surface soil units as mapped by Biek (2005) consisted of Historical to Oligocene-Eocene-aged materials deposits. Based on the soil and groundwater conditions encountered during our investigation, it is considered likely that each of our test pits were terminated in one of the mapped deposits.

5.2 FAULTING AND SEISMICITY

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is defined as a fault that has had activity within the Holocene (<11ka). Based on information provided by Geologic Hazards on the Utah Geologic Hazard Portal, faults associated with the Wasatch Fault Zone (WFZ) are present to the north and east of the subject property (see Plate A-5, *Fault and Fault Special Study Area Map*). As a result, the northeastern portion of the subject 145-acre development are identified as being located within a surficial faulting special study area. As discussed previously, this portion of the property are located within Draper City limits, and as such no explorations were completed within this area. It is possible that a series of fault investigations including trenches across the proposed building pads may be required prior to development within the area identified on Plate A-5. However, when considering the most recently published geologic maps containing the subject site, no active faults are mapped through or immediately adjacent to the site (Black and others, 2003, and Constenius, et al., 2011). The 145-acre portion of Micron Property is located approximately 5 miles east of the northern strand of the Provo section of the Wasatch Fault Zone. The Provo section is one of the longest sections of the Wasatch Fault Zone (Hecker, 1993) and is estimated to be approximately 43 miles long with a reported rupture length of 37 miles and a maximum potential to produce earthquakes up to magnitude (M_s) 7.5 to 7.7 (Black and others, 2003). The 145-acre portion of Micron Property is also located approximately 6 miles north of the mapped Utah Lake Faults and Folds (ULFF). The ULFF consists of several northeast to northwest trending faults and folds located beneath Utah Lake and are reported to have been active in the past 15 ka (Black et al, 2003). However, since the ULFF is at the bottom of a large lake these faults are poorly understood – as such, the USGS does not include ULFF in their fault database for seismic hazard analysis. Analysis of the ground shaking hazard along the Wasatch Front suggests that the Wasatch Fault Zone is the single greatest contributor to the seismic hazard in the Salt Lake City region. Each of the faults listed above show evidence of Holocene-aged movement and is therefore considered active.

Spectral responses for the Risk-Targeted Maximum Considered Earthquake (MCE_R) are shown in the table below. These values generally correspond to a one percent probability of structure collapse in 50 years for a "firm rock" site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field exploration to 12 feet and our geologic review of the site, it is our opinion that this location is best described as a Site Class C. The spectral accelerations are calculated based on the site's approximate latitude and longitude of 40.442° and -111.850˚ respectively and the Seismic Design Maps web-based application at https://seismicmaps.org/.

Description	Value
Site Class	C
S_s - MCE_R ground motion (period – 0.2s)	1.349
S_1 - MCE_R ground motion (period – 1.0s)	0.494
F_a - Site amplification factor at 1.0s	1.200
F_v - Site amplification factor at 1.0s	1.500
PGA - MCE_G peak ground acceleration	0.602
PGA_M – Site modified peak ground acceleration	0.729

It should be noted that our investigation did not include a site-specific ground motion hazard analysis and a Site Class C has been used to determine the seismic parameters presented above based on maximum depths explored of 12 feet and our geologic review. The seismic parameters presented herein may be used for design of the proposed structures provided that structural design allows for the ground motion hazard analysis exception in ASCE 7-16 Section 11.4.8. Alternatively, GeoStrata may be contacted to complete a ground motion hazard analysis in accordance with ASCE 7-16 Chapter 21.

5.3 LIQUEFACTION

Certain areas within the intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading, such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Based on our review of the *Liquefaction-Special Study Areas, Wastach Front and nearby Area, Utah*, this portion of the Micron Property is located in an area currently designated as having a “Very Low to Low” liquefaction potential. “Low” liquefaction potential indicates that there is between a 5% to 10% probability of having an earthquake within a 100-year period that will be strong enough to cause liquefaction. “Very Low” liquefaction potential indicates that there is less than 5% probability of having an earthquake within a 100-year period that will be strong enough to cause liquefaction.

The near-surface soils observed within our test pits consisted of unsaturated soils. Groundwater was not observed in the test pits. A liquefaction analysis was beyond the scope of the project; however, if the owner or client wishes to have greater understanding of the liquefaction potential of the soils at greater depths, a liquefaction analysis should be completed at the site.

5.4 OTHER GEOLOGIC HAZARDS

According to the latest update to the Geologic Hazards on Utah Geologic Hazard Portal, a portion of the 145-acre portion of Micron property is located in special study areas for debris flows and slope stability. Maps of these hazard are included on Plates A-6 to A-7. Recommendations for development in these mapped hazards special study areas, should be address in geologic hazard report or reports. The results of these reports and findings may limit the development, or require mitigation prior to the development of the site.

6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are complied with. This conclusion should be understood as preliminary, and the results of geologic hazard analysis could designate some portions of this development as hazardous or unbuildable.

The recommendations presented in this report are based on our understanding of the proposed project, the subsurface conditions observed during field exploration, the results of laboratory testing, and our engineering analyses. If subsurface conditions other than those described herein are encountered in conjunction with construction, and/or if design and layout changes are initiated, we must be informed so that the recommendations herein can be reviewed and revised as changes or conditions may require.

Based on our observations, the subject site is overlain by ½-foot of topsoil or ½-foot of roadway fill soils. Increased depth of topsoil may be encountered in the drainages or within the alluvial fan deposits. These soils would need to be over-excavated in all areas underlying footing elements, pavements and any other areas which would underlie structural elements of the new development.

As additional layers of undocumented fill soils may exist existing, particularly in the footprint of the existing roadways or batching plant. The owner and contractor should be aware that the possibility exists that thicker sections of undocumented fill than those reported in our test pits may exist.

6.2 EARTHWORK

Prior to the placement of foundations, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, concrete slabs-on-grade, and pavement sections. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential movement in foundation soils as a result of variations in moisture conditions.

6.2.1 General Site Preparation and Grading

In areas beneath footings and concrete flat work, the highly organic topsoil (top 3 to 6 inches) should be stripped and stockpiled for use in landscape areas or disposal. Debris, vegetation, undocumented fill, roots, loose, soft or other deleterious materials should also be removed. If over-excavation is required, the excavation should extend a minimum of one foot laterally for every foot of depth of over-excavation. The exposed subgrade should be proof-rolled with heavy equipment to identify loose, soft or otherwise disturbed soils. If soft soils are observed, they should be stabilized in accordance with our recommendations in the Soft Soil Stabilization Section (Section 6.2.4); if loose soils are observed, they should be compacted as recommended in Section 6.2.5.

A GeoStrata representative should observe the site preparation and grading operations to assess that the recommendations presented in this report are complied with.

6.2.2 Demolition

Although no structures were observed during our field investigation, the possibility exists that isolated structures may be present at the subject property, particularly in the area of previously existing batch plant. If encountered, demolition of any on-site structures is required prior to subsequent construction. We recommend complete removal of all foundations of any existing structures until native soils are exposed. All debris produced from demolition should be removed from the site to an approved construction and demolition landfill. Loose soils and additional undocumented fill can be created from demolition of existing structures. These loose and deleterious materials should be over-excavated. The upper 12 inches of native soils should be scarified and compacted to 95% of maximum dry density according to ASTM D1557 prior to proceeding with construction.

6.2.3 Excavation Stability

Based on Occupational Safety and Health Administration (OSHA) guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied, however, the presence of fill soils, loose soils, or wet soils may require that the walls be flattened to maintain safe working conditions. When the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Based on our soil observations, laboratory testing, and OSHA guidelines, native soils at the site classify as Type C soils. Deeper excavations, if required, should be constructed with side slopes no steeper than one and one- and one-half horizontal to one vertical (1.5H:1V). Wet conditions should be anticipated side slopes will likely need to be further flattened to maintain slope stability. Alternatively, shoring or trench boxes may be used to improve safe work conditions in trenches. The contractor is ultimately responsible for trench and site safety. Pertinent OSHA requirements should be met to provide a safe work environment. If site specific conditions arise that require engineering analysis in accordance with OSHA regulations, GeoStrata can respond and provide recommendations as needed.

We recommend that a GeoStrata representative be on-site during all excavations to assess the exposed soils in trench walls.

6.2.4 Soft Soil Stabilization

Based on observations during our field investigation, if near-surface soils become saturated soft or pumping soils may be exposed in excavations at the site. Once exposed, all subgrade surfaces beneath proposed structure, pavements, and flat work concrete should be proof rolled with heavy wheeled-construction equipment. If soft or pumping soils are encountered, these soils should be stabilized prior to construction of footings. Stabilization of the subgrade soils can be accomplished using a clean, coarse angular material worked into the soft subgrade. We recommend the material be greater than 2-inch diameter, but less than 6 inches. A locally available pit-run gravel may be suitable but should contain a high percentage of particles larger than 2 inches and have less than 7 percent fines (material passing the No. 200 sieve). A pit-run gravel may not be as effective as a coarse, angular material in stabilizing the soft soils and may require more material and greater effort. The stabilization material should be worked (pushed) into the soft subgrade soils until a firm relatively unyielding surface is established. Once a firm, relatively unyielding surface is achieved, the area may be brought to final design grade using structural fill.

In large areas of soft subgrade soils, stabilization of the subgrade may not be practical using the method outlined above. In these areas it may be more economical to place a woven geotextile fabric against the soft soils covered by 18 inches of coarse, sub-rounded to rounded material over the woven geotextile. An inexpensive non-woven geotextile “filter” fabric should also be placed over the top of the coarse, sub-rounded to rounded fill prior to placing structural fill or pavement section soils to reduce infiltration of fines from above. The woven geotextile should be Mirafi RS280i or prior approved equivalent. The filter fabric should consist of a Mirafi 140N, or equivalent as approved by the Geotechnical Engineer.

We recommend that a GeoStrata representative be on-site to assess the exposed excavation soils and be allowed to review the excavation plans when they are prepared in order to evaluate their compatibility with these recommendations.

6.2.5 Structural Fill and Compaction

All fill placed for the support of structures, flatwork or pavements, should consist of structural fill. Onsite soils may be utilized for structural fill, although the contractor should be aware that due to the over-sized aggregates or the clayey composition of the native soils, it may be difficult if not impossible to maintain active and accurate proctor values for moisture conditioning and compaction. As such, the native soil onsite may need to be screened and well mixed prior to the use of the native soils as structural fill for development. Onsite undocumented fill soils may likewise be used as structural fill. The contractor should have confidence that the anticipated method of compaction will be suitable for the type of structural fill used. All structural fill should be free of vegetation, debris or frozen material, and should contain no inert materials larger than **4 inches** in nominal diameter.

If an imported material will be used as structural fill, it should consist a relatively well-graded granular soil with a maximum of 50 percent passing the No. 4 sieve and a maximum fines content (minus No.200 mesh sieve) of 25 percent. Fill material potion finer than the No. 40 sieve should have a liquid limit (LL) less than 35 and a plasticity index (PI) less than 25. The table below provides our recommended gradation and Atterberg limits requirements for structural fill.

Grain Size	Percent Passing
4-inch	100
2-inch	85 to 100
No. 4	15 to 50
No. 200	< 25
Liquid Limit (LL)	<35
Plasticity Index (PI)	<25

All structural fill soils should be approved by the Geotechnical Engineer prior to placement. Earth materials not meeting the aforementioned criteria may be suitable for use as structural fill; however, such material should be evaluated on a case-by-case basis and should be approved by the Geotechnical Engineer prior to use. These requirements for structural fill meet the needs of the site; however, regulating entities including special service districts, cities etc. may require the use of a predefined structural fill for use in their utility corridors/trenches. The contractor should be aware of the special requirements of structural fill by these regulating entities.

GeoStrata observed that some of the native soils meet the requirements for A-1-a according to AASTHO soil classification system. A table of the laboratory tests and soil classification are provided below;

Sample Location and Depth	USCS Classification	AASTHO Classification	Can be used as onsite structural fill
MW-TP-01	GP-GM	A-1-a	Yes
MW-TP-02	GP	A-1-a	Yes
MW-TP-04	GC	A-2-4	Yes
MW-TP-10	GP-GC	A-2-4	Yes
MW-TP-11	SM	A-1-b	Yes
MW-TP-16	GP-GM	A-1-a	Yes
MW-TP-17	SM	A-2-4	No
MW-TP-21	CL	A-6	No
MW-TP-22	CL	A-6	No
MW-TP-23	GC	A-2-4	Yes
MW-TP-29	SC	A-2-6	No

All structural fill should be placed in maximum 10-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 12-inch loose lifts if compacted by riding rollers or heavy-duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by the geotechnical engineer. Structural fill should be compacted to at least 95% of the maximum dry density, as determined by ASTM D-1557, for fill 5 feet or less in thickness. The required compaction should be increased to 98% for fills greater than 5 feet in thickness. The moisture content should be at or slightly above the optimum moisture content at the time of placement and compaction. Also, prior to placing any fill, the excavations should be observed by the geotechnical engineer to observe that any unsuitable materials or loose soils have been removed. In addition, proper grading should precede placement of fill, as described in the **General Site Preparation and Grading** subsection of this report (Section 6.2.1).

We understand that grading fills and structural fill will be placed up to 12 feet in total height. Fill soils placed for subgrade below exterior flat work and pavements, should be within 3% of the optimum moisture content when placed and compacted to at least 95% of the maximum dry density as determined by ASTM D-1557, for fills less than 6 feet in depth. Fill soils placed for subgrade below exterior flat work and pavements, should be within 3% of the optimum moisture content when placed and compacted to at least 95% of the maximum dry density as determined by ASTM D-1557, for fills more than 6 feet and less than 12 feet in depth. Contact Geostrata for recommendations for fill placement exceed 12 feet in depth. All utility trenches backfilled below the proposed structure, pavements, and flatwork concrete, should be backfilled with onsite soils or structural fill that is within 3% of the optimum moisture content when placed and compacted to at least 95% of the maximum dry density as determined by ASTM D-1557. All other trenches, in landscape areas, should be backfilled and compacted to at least 90% of the maximum dry density (ASTM D-1557).

The gradation, placement, moisture, and compaction recommendations contained in this section meet our minimum requirements but may not meet the requirements of other governing agencies such as city, county, or state entities. If their requirements exceed our recommendations, their specifications should override those presented in this report.

6.3 FOUNDATIONS

The foundations for the proposed structures may consist of conventional strip and/or spread footings. Strip and spread footings should be a minimum of 20 and 30 inches wide, respectively, and exterior shallow footings should be embedded at least 30 inches below final grade for frost protection and confinement. Interior shallow footings not susceptible to frost conditions should be embedded at least 18 inches for confinement.

6.3.1 Installation and Bearing Material

Due to the presence of dense granular soils (sands and gravels) and fine-grained soils with low potential for collapsible soil present at the proposed buildings elevations (between 2 to 8 feet below the existing ground surface), strip and spread footings can be placed entirely on non-collapsible undisturbed native soils. If soil at the foundation elevation appears to have a hydro-collapsible nature (pinholes, low natural density, etc.), collapse testing in the laboratory should be performed on a lot-by-lot basis to confirm the that potential collapse will not adversely affect the proposed construction. Foundation elements should not be founded on collapsible soils, and if these soils are encountered, they should be over-excavated according to the results of lot-specific laboratory collapse testing. According to our preliminary soil collapse testing, structural fill depth below footings will be 0 to 12 inches. The site may then be brought back up to design grade using properly placed and compacted structural fill. Structural fill should meet material recommendations and be placed and compacted as recommended in Section 6.2.5 of this report.

Foundation elements should not be founded on undocumented fill, and if these soils are encountered, they should be over-excavated until suitable, native soils are exposed. Foundation elements should not be founded on combination soils, and if these soils condition are encountered, they should be over-excavated a minimum of 1-foot. The site may then be brought back up to design grade using properly placed and compacted structural fill. Structural fill should meet material recommendations and be placed and compacted as recommended in Section 6.2.5 of this report.

All organic material, soft areas, frozen material or other inappropriate material shall be removed from the footing zone to a depth determined by the Geotechnical Engineer and be replaced with structural fill where over excavation is required.

6.3.2 Bearing Pressure

Conventional strip and spread footings founded on a native soil or on structural fill may be proportioned for a maximum net allowable bearing capacity of **1,800 pounds per square foot (psf).** The recommended net allowable bearing pressure refers to the total dead load and can be increased by ⅓ to include the sum of all loads including wind and seismic.

6.3.3 Settlement

Settlements of properly designed and constructed conventional footings, founded as described above, are anticipated to be less than 1 inch. Differential settlements should be on the order of half the total settlement over 30 feet.

6.3.4 Frost Depth

All exterior footings and spread footings are to be constructed at least 30 inches below the ground surface for frost protection and confinement. This includes walk-out areas and may require fill to be placed around buildings. Interior strip footings not susceptible to frost conditions should be embedded at least 18 inches for confinement. If foundations are constructed through the winter months, all soils on which footings will bear shall be protected from freezing.

6.3.5 Construction Observation

A geotechnical engineer shall periodically monitor excavations prior to installation of footings. Inspection of soil before placement of structural fill or concrete is required to detect any field conditions not encountered in the investigation which would alter the recommendations of this report. All structural fill material shall be tested under the direction of a geotechnical engineer for material and compaction requirements.

6.3.6 Foundation Drainage

As stated in Section 4.2.2 of this report, groundwater was not encountered in the test pits. IRC Section R405 *Foundation Drainage* recommends the construction of a foundation drain around any walls or portions thereof that retain earth and enclose spaces and floors below grade. Where a site is located in well-drained gravel or sand/gravel mixture soils, a dedicated drainage system is not required.

We recommend that the IRC Section R405 Foundation Drainage recommends be complied with. The foundation drain should consist of a 4-inch perforated pipe placed at or below the footing elevation. The pipe should be covered with at least 12 inches of free draining gravel (containing less than 5 percent passing the No. 4 sieve) and be graded to a free gravity outfall or to a pumped sump. A separator fabric, such as Mirafi 140N, should separate the free draining gravel and native soil (i.e. the separator fabric should be placed between the gravel and the native soils at the bottom of the gravel, the side of the gravel where the gravel does not lie against the concrete footing or foundation and at the top of the gravel). We recommend that the gravel extend up the foundation wall to within 2 feet of the final ground surface. As an alternative, the gravel extending up the foundation wall may be replaced with a prefabricated drain panel, such as Ecodrain-E. We recommend that the foundation drain construction be observed and documented in a subsequent observation letter.

As an added precaution, the following moisture protection mitigation recommendations should be implemented to help reduce the risk from potential settlement from occurring. These items are summarized as follows:

- Moisture should not be allowed to infiltrate into the soils in the vicinity of the foundations. As such, design strategies to minimize ponding and infiltration near the home should be implemented.

- The ground surface within 10 feet of the entire perimeter of the building should slope a minimum of five percent away from the structure. Alternatively, a slope of 5% is acceptable if the water is conveyed to a concrete ditch that will convey the water to a point of discharge that is at least 10 feet from the structures.
- Roof runoff devices (rain gutters) should be installed to direct all runoff a minimum of 10 feet away from the structure and preferably day-lighted to the curb where it can be transferred to the storm drain system. Rain gutters discharging roof runoff adjacent to or within the near vicinity of the structure may result in excessive differential settlement.
- We recommend irrigation around foundations be minimized by selective landscaping and that irrigation valves be constructed at least 5 feet away from foundations.
- Jetting (injecting water beneath the surface) to compact backfill against foundation soils may result in excessive settlement beneath the building and is not allowed.
- Backfill against foundations walls should be placed and compacted in accordance with the Section 6.2.4.
- Any additional precautions which may become evident during construction.

6.4 CONCRETE SLAB-ON-GRADE CONSTRUCTION

Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel. Disturbed native soils should be compacted to at least 95% of the maximum dry density as determined by ASTM D-1557 (modified proctor) prior to placement of gravel. The gravel should consist of road base or clean drain rock with a ¾-inch maximum particle size and no more than 12 percent fines passing the No. 200 mesh sieve. The gravel layer should be compacted to at least 95 percent of the maximum dry density of modified proctor or until tight and relatively unyielding if the material is non-proctorable. The maximum load on the floor slab should not exceed 100 psf; greater loads would require additional subgrade preparation and additional structural fill. All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with welded wire, re-bar, or fiber mesh.

6.5 EARTH PRESSURE AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting subgrade. In determining the frictional resistance, a coefficient of friction of 0.41 should be used for native soils against concrete or 0.43 for structural fill against concrete.

Ultimate lateral earth pressures from native soil backfill acting against retaining walls and buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in the following table:

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pounds per cubic foot)
Active[1]	0.29	34
At-rest[2]	0.48	58
Passive[1]	11.62	1394
Seismic Active[3]	0.32	39
Seismic Passive[4]	-8.92	-1071

[1]Based on Coulomb's equation

[2]Based on Jaky

[3]Based on Lew et al. (2010)

[4]Based on Mononobe-Okabe Equation

These coefficients and densities assume level, granular backfill with no buildup of hydrostatic pressures. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. If sloping backfill is present, we recommend the geotechnical engineer be consulted to provide more accurate lateral pressure parameters once the design geometry is established.

Walls and structures allowed to rotate slightly should use the active condition. If the element is constrained against rotation, the at-rest condition should be used. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

For seismic analyses, the *active* and *passive* earth pressure coefficient provided in the table is based on Lew et al (2010) and Mononobe-Okabe respectively and only accounts for the dynamic horizontal thrust produced by ground motion. Hence, the resulting dynamic thrust pressure should be added to the static pressure to determine the total pressure on the wall. The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The coefficients shown assume a vertical wall face. Hydrostatic and surcharge loadings, if any, should be added. Over-compaction behind walls should be avoided. Resisting passive earth pressure from soils subject to frost or heave, or otherwise above prescribed minimum depths of embedment, should usually be neglected in design.

6.6 PAVEMENT SECTION

For pavement design, the following CBR laboratory test result was obtained:

Test Pit	Depth (ft)	Soil Type	CBR (%)
MW- TP-01	7.0	GP-GM	76.7

The test results indicate that CBR value of 76.7 we have elected to use a CBR value of 10.0 in design. This design value well below the test result and is use because of the various soil types encountered at the surface of the site. No traffic information was available at the time this report was prepared; therefore, GeoStrata has assumed traffic counts for the local and private roads and parking areas. We assumed that vehicle traffic along the local and private roadways will consist of approximately 1,500 passenger car trips per day, 2 small trucks per day, and 2 large trucks per day with a 20-year design life. Based on these assumptions, our analysis uses 51,000 ESAL's for for a 20-year design life of the pavement. We assumed that vehicle traffic along the collector and arterial roads will consist of approximately 1,275,000 ESAL's for a 20-year design life (approximately 25 times greater than private roads).

Based on these assumptions, our analysis uses 51,000 and 1,275,000 ESAL's for the traffic over the life of the pavement. Asphalt has been assumed to be a high stability plant mix or Superpave mix with a minimum CBR of 70. The untreated base course material (road base or UTBC) composed of crushed stone with a minimum CBR of 30. The table below presents equivalent recommended pavement sections based on the above assumptions. The City of Lehi or Draper City required minimum pavement sections may govern the pavement design.

Local and Private Roadways Pavement Sections

Pavement Materials	Recommended Minimum Thickness (in)		
	Pavement 1	Pavement 2	City Minimum
Asphaltic Concrete	3	3	3
Untreated Base Course	6	8	6
Granular Borrow/ Engineered Fill	6	0	8

Collector and Arterial Pavement Sections

Pavement Materials	Recommended Minimum Thickness (in)		
	Pavement 1	Pavement 2	City Minimum
Asphaltic Concrete	5	5	6.5
Untreated Base Course	6	8	6
Granular Borrow/ Engineered Fill	9	8	8

The pavement section thicknesses above assume that there is no mixing over time between the road base and the softer native layers below. In order to prevent mixing or fines migration, and thereby prolong the life of the pavement section, we recommend that the owner give consideration to placing a non-woven filter fabric between the native soils and the road base. We recommend that a Propex Geotex® NW-401, NW-601, or a GeoStrata-approved equivalent be used.

If traffic conditions vary significantly from our stated assumptions, GeoStrata should be contacted so we can modify our pavement design parameters accordingly. Specifically, if the traffic counts are significantly higher or lower, we should be contacted to review the pavement sections as necessary. The pavement sections thicknesses above assumes that the majority of construction traffic including cement trucks, cranes, loaded haulers, etc. has ceased. If a significant volume of construction traffic occurs after the pavement section has been constructed, the owner should anticipate maintenance or a decrease in the design life of the pavement area.

In our experience, in areas with heavy truck loads where trucks frequently turn around, backup, or load and unload, such as areas around dumpsters, pavements experience more distress. To prolong the life of the pavement in these areas, consideration should be given to using a Portland cement concrete (rigid) pavement in these areas. The table below presents our recommended rigid pavement section.

Rigid Pavement Section

Pavement Materials	Recommended Minimum Thickness (in)
	Rigid Pavement 1
Concrete	5
Untreated Base Course	6

Concrete should consist of a low slump, low water cement ratio mix with a minimum 28-day compressive strength of 4,000 psi. Base course should be compacted to at least 95% of the maximum dry density as determined by the ASTM D-1557.

The pavement sections discussed above meet our minimum recommendations for pavement design. It should be noted that more stringent pavement section requirements may be enforced by Lehi City, Draper City, Utah County or other governing agency.

7.0 CLOSURE

7.1 LIMITATIONS

The recommendations contained in this report are based on our limited field exploration, laboratory testing, and understanding of the proposed construction. The subsurface data used in the preparation of this report were obtained from the explorations made for this investigation. It is possible that variations in the soil and groundwater conditions could exist between and beyond the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, GeoStrata should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, GeoStrata should be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No other warranty, expressed or implied, is made.

It is the Client's responsibility to see that all parties to the project including the Designer, Contractor, Subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

7.2 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction. GeoStrata staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork and structural fill placement.
- Observation of foundation soils to assess their suitability for footing placement.
- Observation of soft/loose soils over-excavation.
- Observation of temporary excavations and shoring.
- Consultation as may be required during construction.
- Quality control and observation of concrete placement.

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We also recommend that project plans and specifications be reviewed by GeoStrata to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience at (801) 501-0583.

7.3 ACKNOWLEDGEMENTS

This project was made possible through the help of Dan Mitchell and Scott Bishop with D.R. Horton, they scheduled meetings with the landowners and worked on permits for land disturbance and scheduled a second trackhoe to dig the east side of the property test pits at the site. Dale Judd with JSI Ventures, LLC, the operator with the excavation company that completed the test pits on the west side of the property. Bryce Jackson, E.I.T., Nate Flores, Ashley Peay, and James Moore with GeoStrata all logged test pits and collected samples at the site. Jerry Olson and Jack Berry with Micron Technology, Inc met multiple times to discuss utility location. There are others with GeoStrata, D.R. Horton, and Micron Technology Inc. that made this project happen. Thank you.

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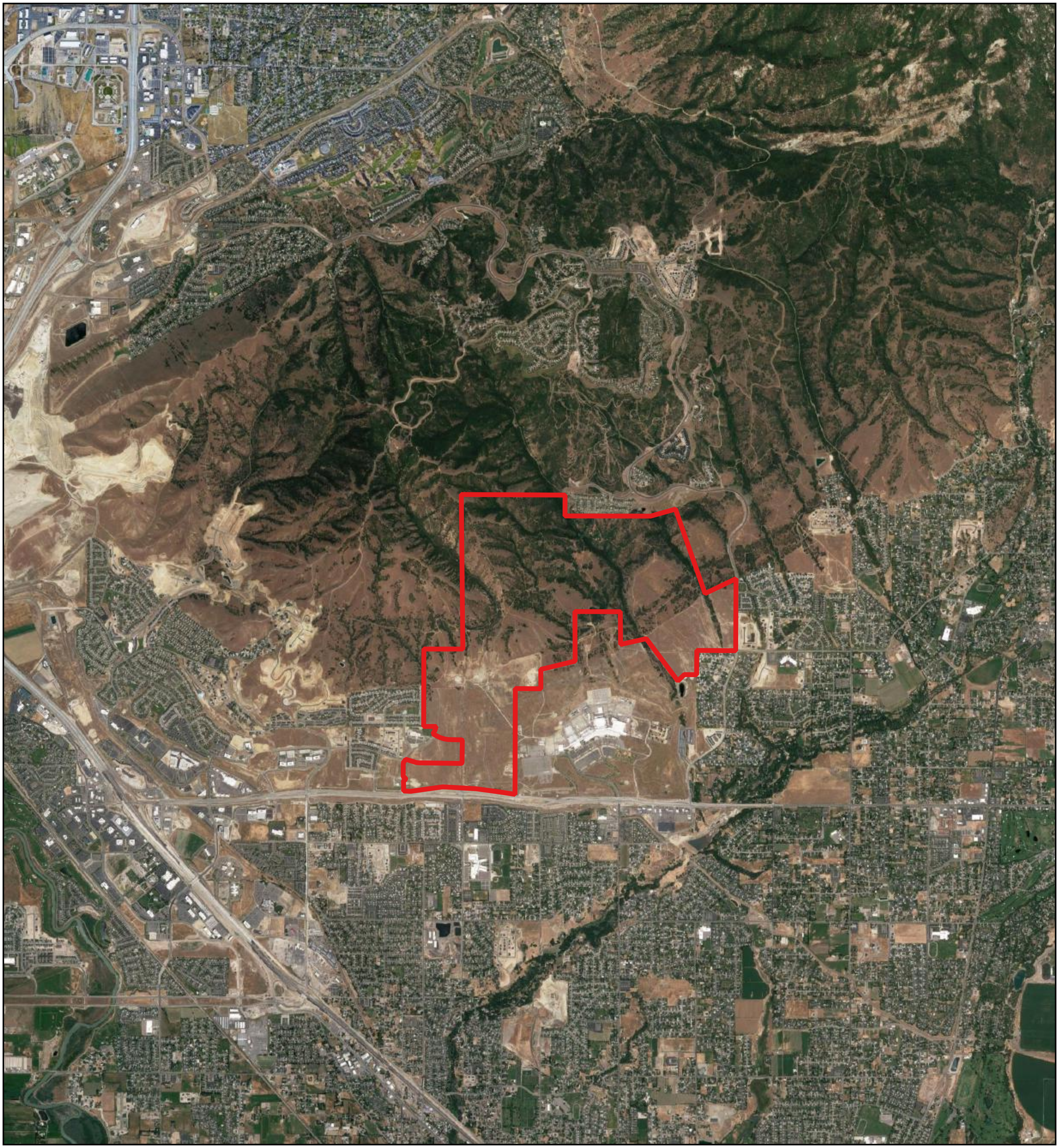
APPENDIX A



Legend

Bondaries

400 0 400 800 1200 1600 ft

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GeoStrata

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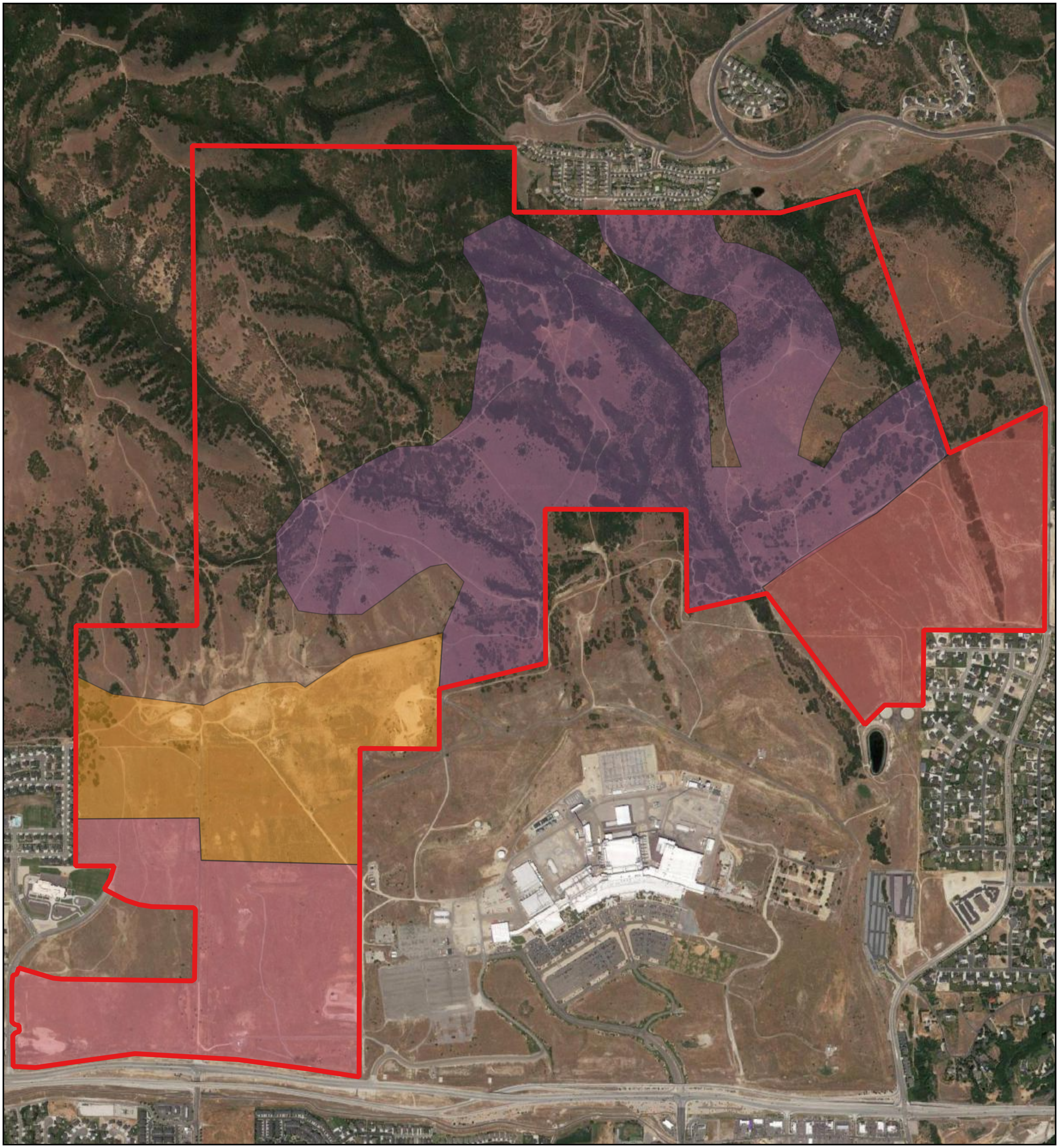
D.R. Horton
Mircon Property
Lehi/Draper, Utah
Project Number

Site Vicinity Map

Plate A-1



Legend

- Mircon Property Boundaries
- High Density Single Family, Commerial, and Apartments
- Lehi Emerald Single Family and Single Family
- Highland Emerald Single Family
- Mountain Single Family

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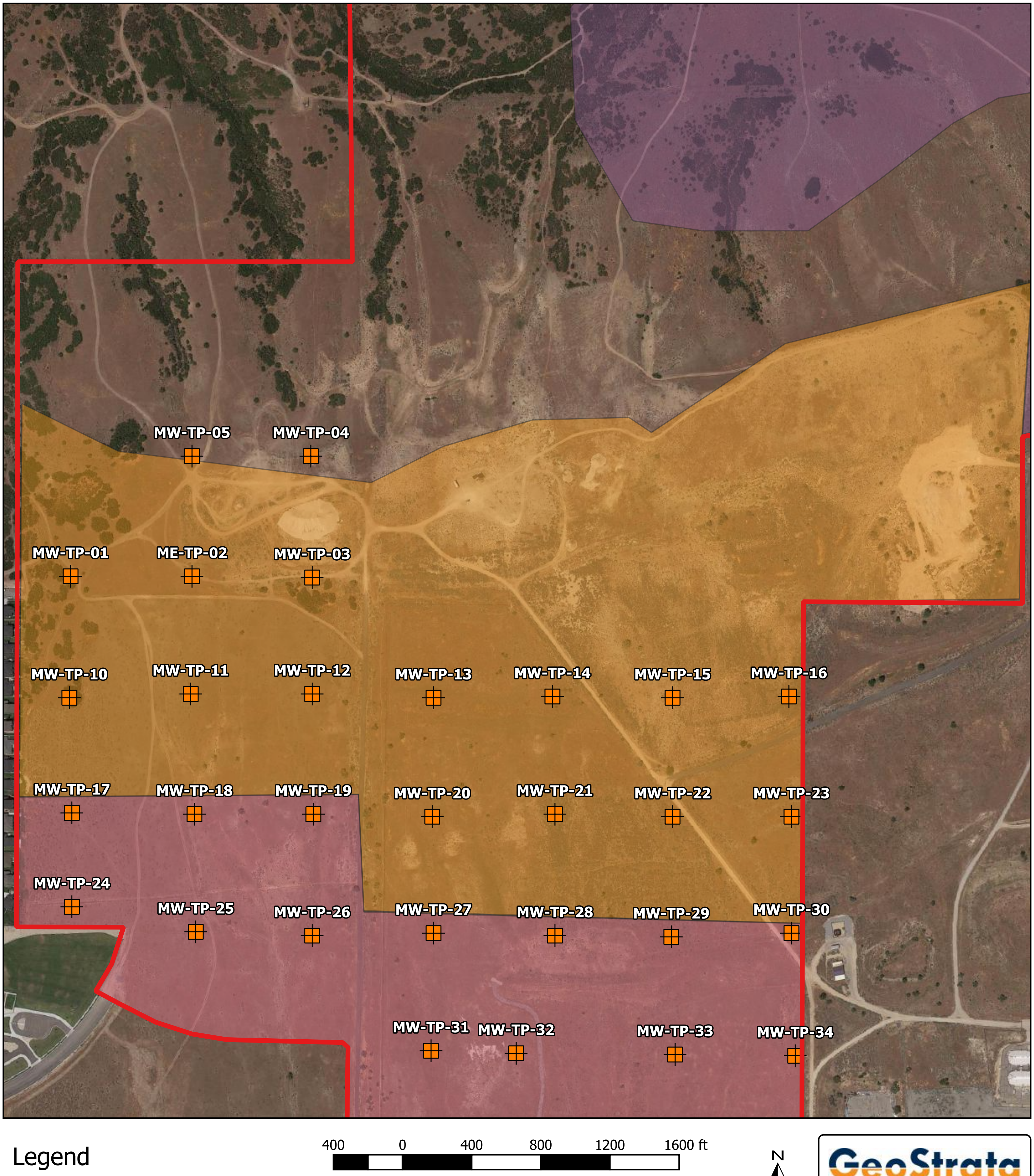
D.R. Horton
Mircon Property
Lehi/Draper, Utah
Project Number

Site Section Map

Plate A-2



Legend

Mircon Property Boundaries

Approximate Test Pit Location

High Density Single Family, Commercial, and Apartments

Lehi Emerald Single Family and Single Family

Highland Emerald Single Family

Mountain Single Family

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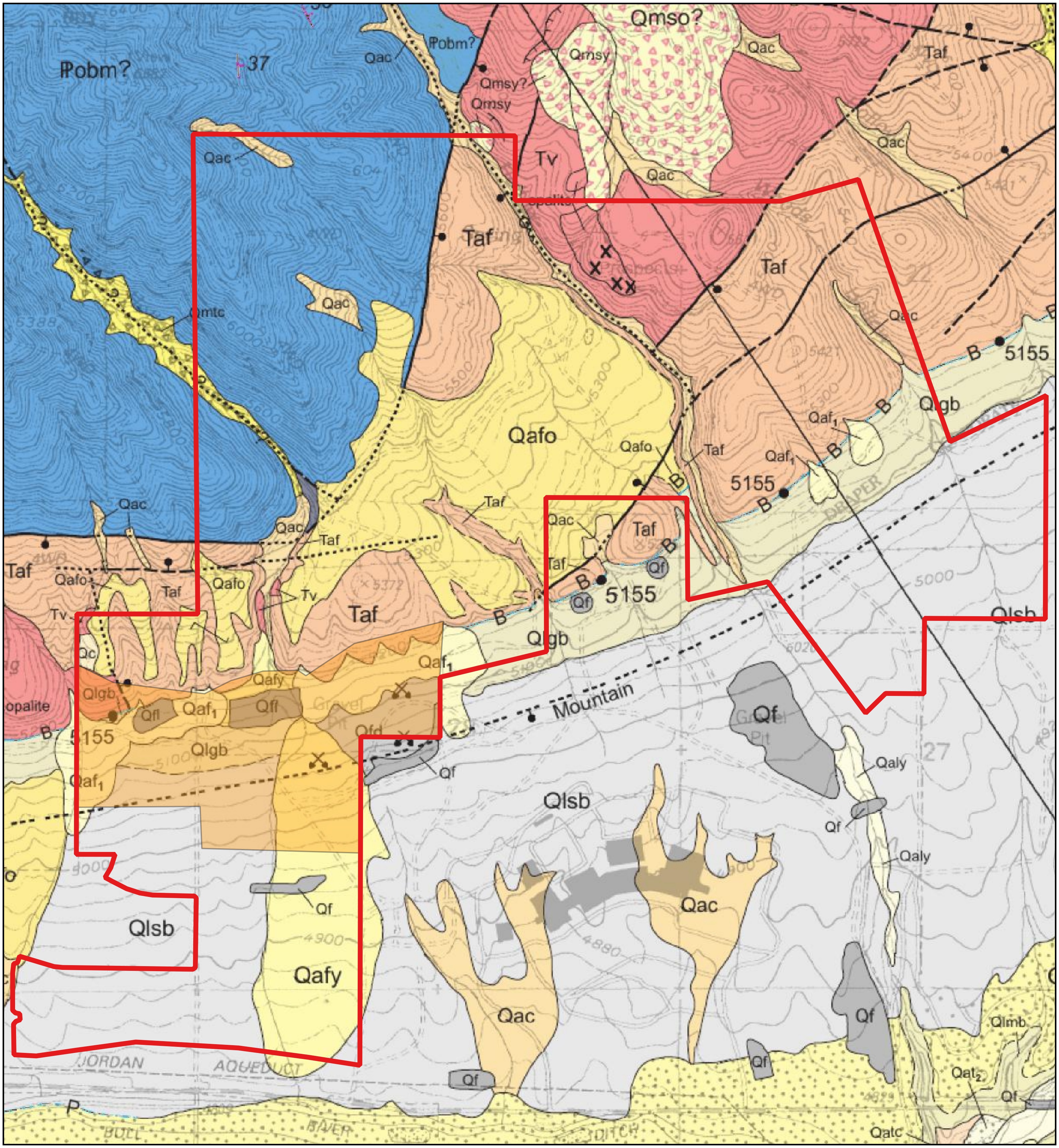
Mircon Property
Lehi/Draper, Utah

Lehi Emerald Single Family and Single Family Section Exploration Map

Plate A-3



Legend

Mircon Property Boundaries

Lehi Emerald Single Family and Single Family

400 0 400 800 1200 1600 ft

1:17000

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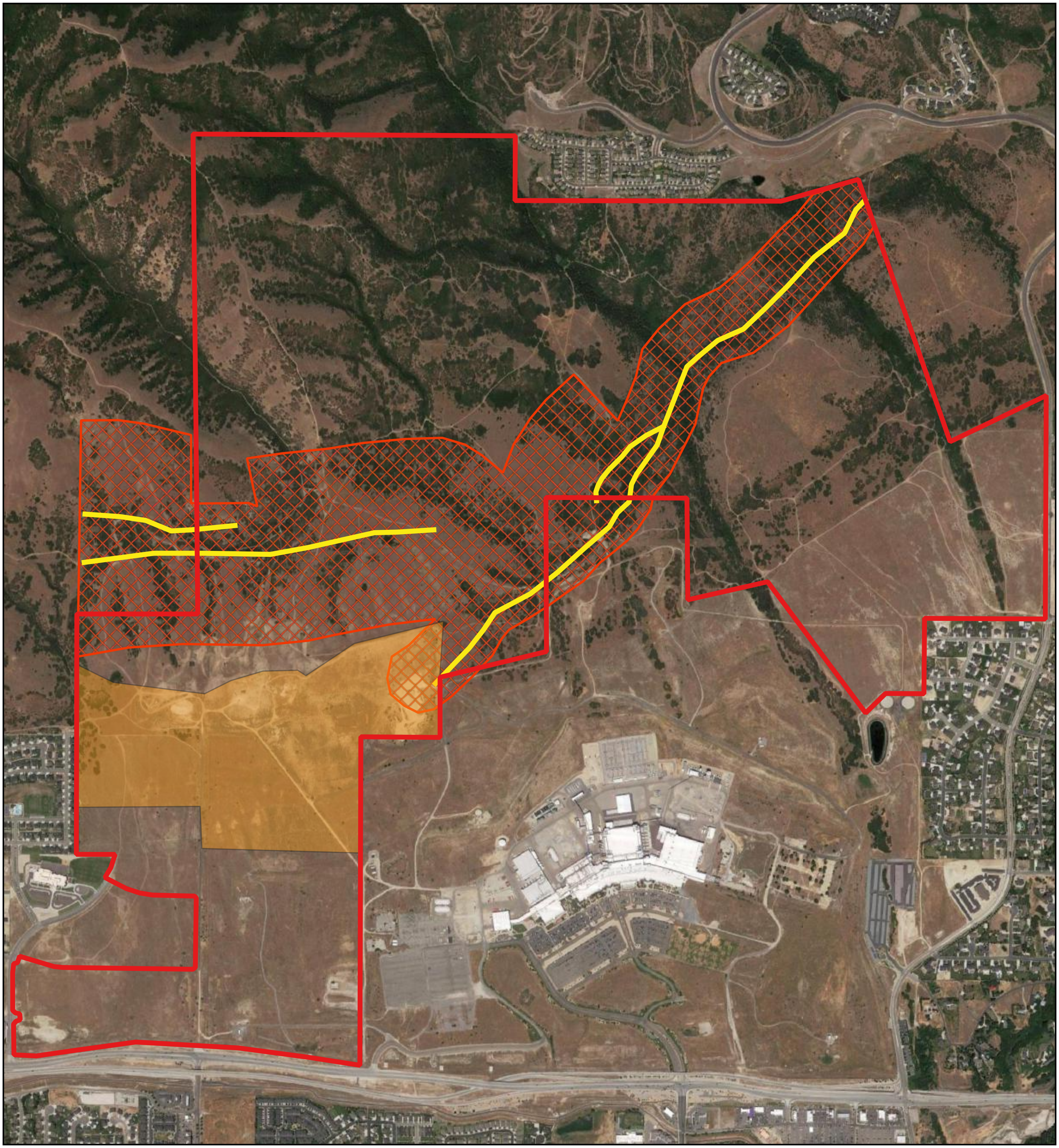
Mircon Property
Lehi/Draper, Utah
Project Number 589-100

Site Geology Map

Plate A-4



Legend

- Mircon Property Boundaries
- Lehi Emerald Single Family and Single Family
- Approximate Faults
- Fault Special Study Area

400 0 400 800 1200 1600 ft

1:17000

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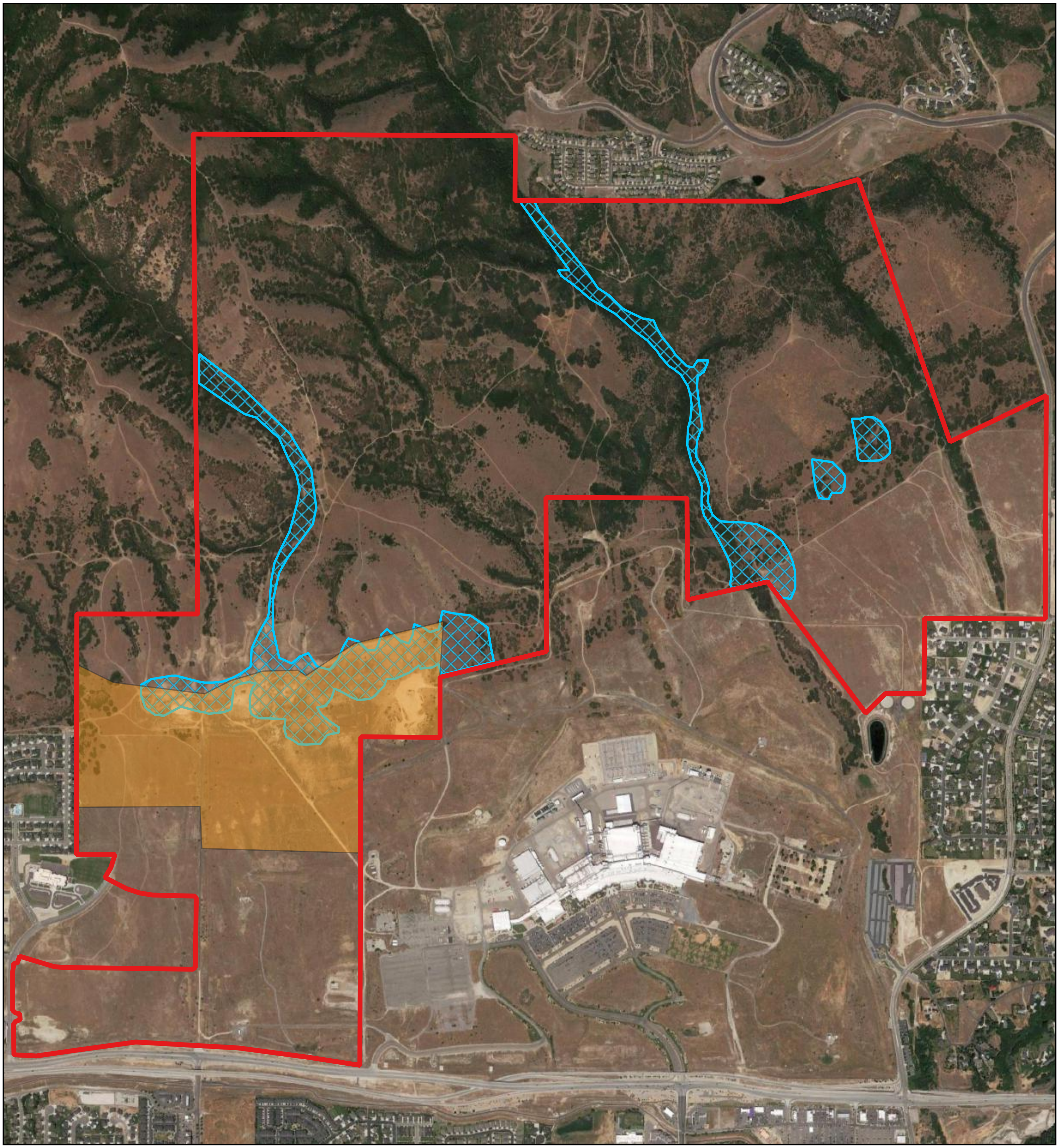
Lehi/Draper, Utah
Project Number 589-100

Fault and Fault Special Study Area Map

Plate A-5



Legend

Mircon Property Boundaries

Lehi Emerald Single Family and Single Family

Debris Flow Study Areas

400 0 400 800 1200 1600 ft

1:17000

N

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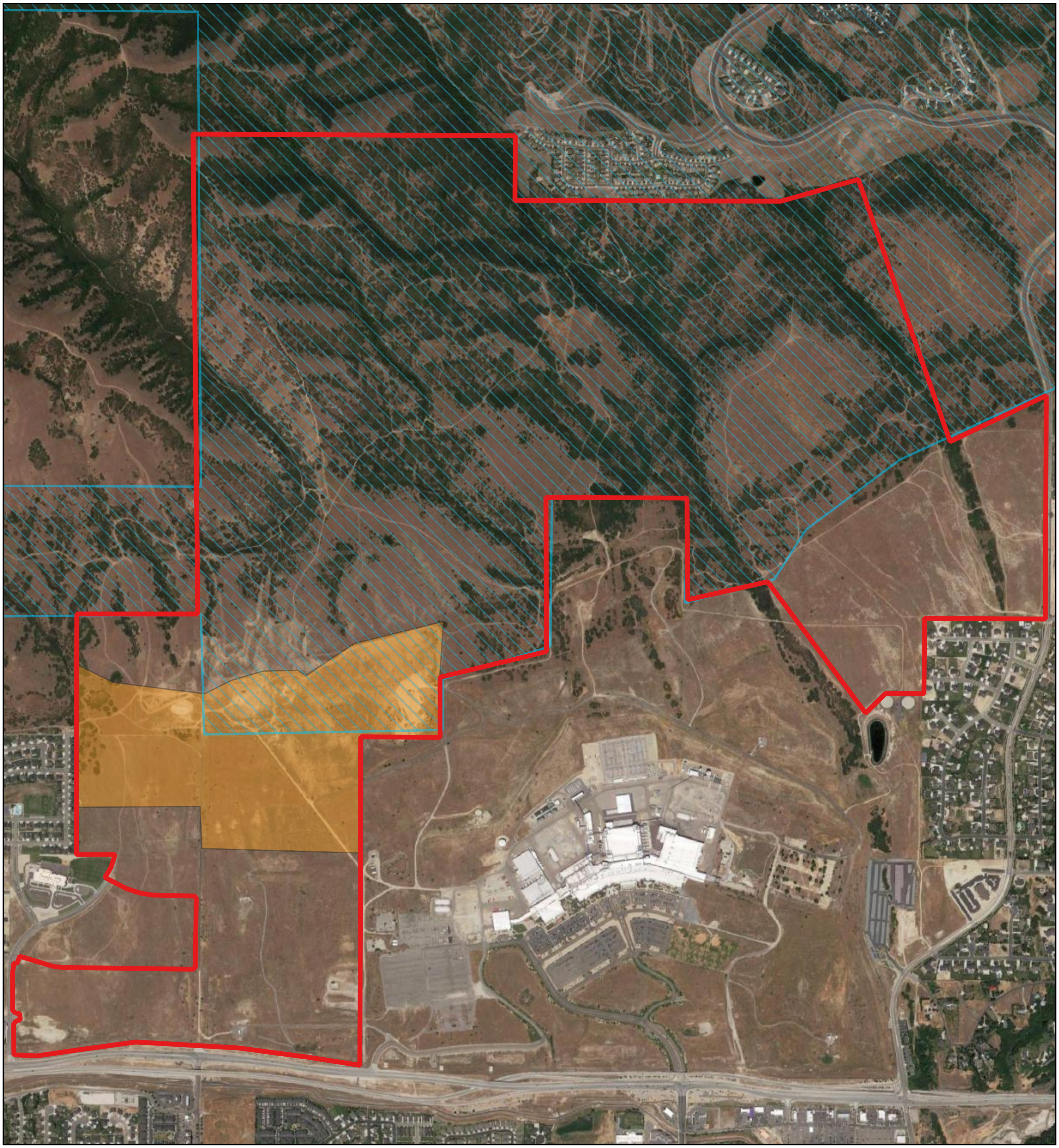
Lehi/Draper, Utah
Project Number 589-100

Debris Flow Special Study Area Map

Plate A-6



Legend

Mircon Property Boundaries

Slope Stability Special Study Area

400 0 400 800 1200 1600 ft

1:17000

N

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Lehi/Draper, Utah
Project Number 589-100

Slope Stability Special Study Area Map

Plate A-7

APPENDIX B

DATE		
STARTED:	12/1/20	
COMPLETED:	12/1/20	
BACKFILLED:	12/1/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-01
Sheet 1 of 1

LOCATION
NORTHING 4,477,248.00 EASTING 4,477,248.00 ELEVATION 5,142-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout					
					GP-GM	Poorly Graded GRAVEL with silt and sand - dense, moist, light brown, gravels and cobbles up to 6 inches in diameter					
		Grab sample									
1											
	5										
2											
		Grab sample						3.3	10.9	22	4
3	10										
						Bottom of Test Pit @ 12 Feet					
4											

Moisture Content and Atterberg Limits

Plastic Limit — Moisture Content — Liquid Limit

10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 1

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DATE		
STARTED:	12/1/20	
COMPLETED:	12/1/20	
BACKFILLED:	12/1/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO: **MW-TP-02**
Sheet 1 of 1

LOCATION
NORTHING 4,477,249.00 EASTING 4,477,249.00 ELEVATION 5,123-ft

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout						
					SM	Silty SAND with gravel - dense, moist, dark brown, gravels and cobbles up to 6 inches in diameter						
		Grab			SM	Silty SAND with gravel - dense, moist, light brown, gravels and cobbles up to 6 inches in diameter						
1	5											
2		Grab			GP	Poorly Graded GRAVEL with sand - medium dense, moist, brown, subrounded gravel up to 5 inches in diameter		5.1	3.4	NP	NP	
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 2

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DATE		
STARTED:	12/1/20	
COMPLETED:	12/1/20	
BACKFILLED:	12/1/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-03
Sheet 1 of 1

LOCATION
NORTHING 4,477,241.00 EASTING 4,477,241.00 ELEVATION 5,114-ft

MATERIAL DESCRIPTION

Depth (ft)	USCS	Material Description	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		Roadbase - Silty SAND with gravel - light brown, moist					
	CL-ML	Silty CLAY - stiff, moist, dark brown					
	ML	SILT - stiff, moist, light brown	92.5	8.0	69.3		
	SM	Silty SAND - medium dense, moist, brown, subrounded gravel up to 3 inches in diameter					
	SP	Poorly Graded SAND with gravel - medium dense, moist, dark brown, subrounded gravel up to 3 inches in diameter					
		Bottom of Test Pit @ 12 Feet					

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

GeoStrata
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Plate
B - 3

DATE	
STARTED:	12/1/20
COMPLETED:	12/1/20
BACKFILLED:	12/1/20

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-04
Sheet 1 of 1

LOCATION
NORTHING 4,477,396.00 EASTING 4,477,396.00 ELEVATION 5,170-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout					
					GC	Clayey GRAVEL with sand - dense, moist, dark brown, gravels and cobbles up to 6 inches in diameter					
1		Grab						4.0	25.2	24	8
	5										
2		Grab									
3	10										
						Bottom of Test Pit @ 12 Feet					
4											

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

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Plate
B - 4

DATE		
STARTED:	12/1/20	
COMPLETED:	12/1/20	
BACKFILLED:	12/1/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-05
Sheet 1 of 1

LOCATION
NORTHING 4,477,391.00 EASTING 4,477,391.00 ELEVATION 5,182-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit) 10 20 30 40 50 60 70 80 90
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout						
		Grab			SM	Silty SAND with gravel - dense, moist, dark brown, gravels and cobbles up to 6 inches in diameter						
1												
	5											
2												
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

2020 LOG OF TEST PIT - PLATE (B) 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

DATE		
STARTED:	12/1/20	
COMPLETED:	12/1/20	
BACKFILLED:	12/1/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-10
Sheet 1 of 1

LOCATION
NORTHING 4,477,099.00 EASTING 4,477,099.00 ELEVATION 5,092-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout						
					GP-GC	Poorly Graded GRAVEL with clay and sand - dense, moist, dark brown						
		Grab sample						2.2	13.1	25	9	
1												
	5											
		Grab sample			SP	Poorly Graded SAND with gravel - medium dense, moist, brown, subrounded gravel up to 3 inches in diameter						
2												
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 6

DATE		
STARTED:	12/1/20	
COMPLETED:	12/1/20	
BACKFILLED:	12/1/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-11
Sheet 1 of 1

LOCATION
NORTHING 4,477,103.00 EASTING 4,477,103.00 ELEVATION 5,071-ft

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout						
					SM	Silty SAND with gravel - stiff, moist, dark brown						
		◫										
1												
	5											
2		◫						5.7	21.6	NP	NP	●
						Bottom of Test Pit @ 8 Feet						
3	10											
4												

SAMPLE TYPE
◫ - GRAB SAMPLE
▨ - 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼ - MEASURED
▽ - ESTIMATED

NOTES:

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Plate
B - 7

DATE		
STARTED:	12/1/20	
COMPLETED:	12/1/20	
BACKFILLED:	12/1/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-12
Sheet 1 of 1

LOCATION
NORTHING 4,477,106.00 EASTING 4,477,106.00 ELEVATION 5,065-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Sandy SILT with gravel - dark brown, moist, organics throughout						
					ML	Sandy SILT with gravel - stiff, moist, brown						
1												
	5											
2					SM	Silty SAND - medium dense , moist, tan	95.0	5.3	39.5			●
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼- MEASURED
▽- ESTIMATED

NOTES:

Plate
B - 8

DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-13
Sheet 1 of 1

LOCATION
NORTHING 4,477,092.00 EASTING 4,477,092.00 ELEVATION 5,058-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0					TOPSOIL - Sandy SILT with gravel - dark brown, moist, organics throughout					
					SM	Silty SAND with gravel - medium dense, moist, dark brown					
		Grab									
1		Grab				-light brown					
	5										
2											
					SM	Silty SAND - dense, moist, light brown, Fe staining throughout					
		Grab					81.0	16.7	41.7	NP	NP
3	10										
						Bottom of Test Pit @ 12 Feet					
4											

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

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2020 LOG OF TEST PIT - PLATE (B) 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21

DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-14
Sheet 1 of 1

LOCATION
NORTHING 4,477,101.00 EASTING 4,477,101.00 ELEVATION 5,051-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Sandy SILT with gravel - dark brown, moist, organics throughout						
					SM	Silty SAND with gravel - medium dense, moist, light brown						
1		Grab										
	5											
2		Grab					110.7	13.5	41.3			● (13.5)
		Grab			SM	Silty SAND - dense, moist, light brown, few carbonite stringers						
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

2020 LOG OF TEST PIT - PLATE (B) 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 10

DATE				
STARTED:	12/2/20	D.R. Horton Micron Property Lehi, Utah Project Number 589-100	GeoStrata Rep: B.J. Rig Type: Trackhoe	TEST PIT NO: **MW-TP-15** Sheet 1 of 1
COMPLETED:	12/2/20			
BACKFILLED:	12/2/20			

LOCATION

NORTHING 4,477,102.00 EASTING 4,477,102.00 ELEVATION 5,046-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit) 10 20 30 40 50 60 70 80 90
0	0					TOPSOIL - Sandy SILT with gravel - dark brown, moist, organics throughout						
					SM	Silty SAND with gravel - medium dense, moist, light brown						
1												
	5											
					SM	Silty SAND - dense, moist, light brown						
2												
		Grab sample										
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

2020 LOG OF TEST PIT - PLATE (B) 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate

B - 11

DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-16
Sheet 1 of 1

LOCATION
NORTHING 4,477,097.00 EASTING 4,477,097.00 ELEVATION 5,040-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit) 10 20 30 40 50 60 70 80 90
0	0					TOPSOIL - Sandy SILT with gravel - dark brown, moist, organics throughout						
					GP-GM	Poorly Graded GRAVEL with silt and sand - medium dense, moist, brown, subrounded gravel up to 3 inches in diameter						
		Grab sample						3.6	7.0	NP	NP	●
1												
	5											
2												
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
▼ - MEASURED
▽ - ESTIMATED

NOTES:

Plate
B - 12

DATE			
STARTED:	12/2/20	D.R. Horton Micron Property Lehi, Utah Project Number 589-100	GeoStrata Rep: B.J. Rig Type: Trackhoe	TEST PIT NO: **MW-TP-17** Sheet 1 of 1
COMPLETED:	12/2/20			
BACKFILLED:	12/2/20			

LOCATION

NORTHING 4,476,957.00 EASTING 4,476,957.00 ELEVATION 5,040-ft

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit – Moisture Content – Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Sandy SILT with gravel - dark brown, moist, organics throughout						
					SM	Silty SAND with gravel - medium dense, moist, dark brown						
		Grab										
1		Grab						4.1	25.6	NP	NP	
	5											
2												
		Grab			SM	Sandy SILT with gravel - stiff, moist, light brown						
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

2020 LOG OF TEST PIT - PLATE (B) 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21

GeoStrata

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-18
Sheet 1 of 1

LOCATION
NORTHING 4,476,959.00 EASTING 4,476,959.00 ELEVATION 5,024-ft

MATERIAL DESCRIPTION

Depth (ft)	USCS	Material Description	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		TOPSOIL - Sandy SILT with gravel - dark brown, moist, organics throughout					
	CL	Lean CLAY with sand - stiff, moist, dark brown					
~3.3		-light brown, with iron staining	86.7	20.1	85.1		
~7	SP	Poorly Graded SAND with gravel - medium dense, moist, light brown, subrounded gravel up to 3 inches in diameter					
12		Bottom of Test Pit @ 12 Feet					

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit (scale 10 20 30 40 50 60 70 80 90)

DEPTH: METERS 0, 1, 2, 3, 4; FEET 0, 5, 10

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 14

GeoStrata

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DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-19
Sheet 1 of 1

LOCATION
NORTHING 4,476,956.00 EASTING 4,476,956.00 ELEVATION 5,018-ft

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout						
					SM	Silty SAND with gravel - dense, moist, light brown, gravels and cobbles up to 6 inches in diameter						
1	5											
2					ML	Sandy SILT - stiff, moist, tan	88.6	8.1	65.1			
3	10				SM	Silty SAND with gravel - dense, moist, tan, gravels and cobbles up to 6 inches in diameter						
						Bottom of Test Pit @ 12 Feet						
4												

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 15

DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-20
Sheet 1 of 1

LOCATION
NORTHING 4,476,954.00 EASTING 4,476,954.00 ELEVATION 5,009-ft

DEPTH (METERS)	DEPTH (FEET)	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0		TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout					
		ML	Sandy SILT - stiff, moist, tan					
1				92.9	21.8	83.7		
	5							
2		SM	Silty SAND - dense, moist, light brown, Fe staining throughout					
3	10	SM	Silty SAND with gravel - dense, moist, tan, gravels and cobbles up to 6 inches in diameter					
4			Bottom of Test Pit @ 12 Feet					

Moisture Content and Atterberg Limits
Plastic Limit | Moisture Content | Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

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Plate
B - 16

DATE	STARTED: 12/2/20	D.R. Horton	GeoStrata Rep: B.J.	TEST PIT NO:
	COMPLETED: 12/2/20	Micron Property Lehi, Utah	Rig Type: Trackhoe	**MW-TP-21**
	BACKFILLED: 12/2/20	Project Number 589-100		Sheet 1 of 1

LOCATION

NORTHING 4,476,955.00 EASTING 4,476,955.00 ELEVATION 5,001-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0					TOPSOIL; Sandy Lean CLAY - dark brown, moist, organics throughout					
					CL	Lean CLAY with sand - stiff, moist, dark brown, minor organics					
1		Grab					86.6	15.7	82.6	38	14
	5	Grab									
2											
		Grab			SM	Silty SAND - dense, moist, light brown, Fe staining throughout					
3	10										
						Bottom of Test Pit @ 12 Feet					
4											

Moisture Content and Atterberg Limits

Plastic Limit — Moisture Content — Liquid Limit

10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate

B - 17

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DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO: **MW-TP-22**
Sheet 1 of 1

LOCATION
NORTHING 4,476,953.00 EASTING 4,476,953.00 ELEVATION 5,009-ft

MATERIAL DESCRIPTION

Depth (ft)	USCS	Material Description	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout					
	CL	Sandy Lean CLAY - stiff, moist, tan		7.5	65.5	29	13
	CL	Lean CLAY with sand and gravel - stiff to hard, moist, dark brown					
5	SP	Poorly Graded SAND with gravel - dense, moist, tan, gravels, cobbles and boulders up to 12 inches in diameter					
12		Bottom of Test Pit @ 12 Feet					

Depth scale: METERS 0, 1, 2, 3, 4; FEET 0, 5, 10

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

GeoStrata

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Plate
B - 18

DATE		
STARTED:	12/2/20	
COMPLETED:	12/2/20	
BACKFILLED:	12/2/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-23
Sheet 1 of 1

LOCATION
NORTHING 4,476,953.00 EASTING 4,476,953.00 ELEVATION 4,998-ft

MATERIAL DESCRIPTION

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout						
					GC	Clayey GRAVEL with sand - dense, moist, light brown						
		Grab sample						4.6	32.9	24	7	
1												
		Grab sample										
	5											
2												
					SP	Poorly Graded SAND with gravel - medium dense, moist, tan						
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 19

2020 LOG OF TEST PIT - PLATE (B) 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21

DATE					
STARTED:	12/3/20	D.R. Horton Micron Property Lehi, Utah	GeoStrata Rep:	B.J.	TEST PIT NO:
COMPLETED:	12/3/20		Rig Type:	Trackhoe	MW-TP-27
BACKFILLED:	12/3/20	Project Number 589-100			Sheet 1 of 1

LOCATION

NORTHING 4,476,814.00 EASTING 4,476,814.00 ELEVATION 4,965-ft

DEPTH (FEET)	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0				TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout					
	Grab		SM	Silty SAND with gravel - dense, moist, light brown, gravels and cobbles up to 6 inches in diameter					
	Grab		SP	Poorly Graded SAND with gravel - medium dense, moist, light brown					
5									
	Grab		SM	Silty SAND with gravel - dense, moist, light brown, gravels and cobbles up to 6 inches in diameter					
			SP	Poorly Graded SAND with gravel - medium dense, moist, light brown					
10									
				Bottom of Test Pit @ 12 Feet					

Depth scale: METERS 0, 1, 2, 3, 4; FEET 0, 5, 10

Moisture Content and Atterberg Limits

Plastic Limit — Moisture Content — Liquid Limit

10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

GeoStrata

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Plate

B - 20

DATE		
STARTED:	12/3/20	
COMPLETED:	12/3/20	
BACKFILLED:	12/3/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO:
MW-TP-28
Sheet 1 of 1

LOCATION
NORTHING 4,476,812.40 EASTING 4,476,812.40 ELEVATION 4,958-ft

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout					
				CL-ML	Sandy Silty CLAY - stiff, moist, tan					
1		Grab				107.0	6.8	79.2	25	18
				SM	Silty SAND with gravel - dense, moist, light brown					
	5	Grab								
2										
3	10									
		Grab								
					Bottom of Test Pit @ 12 Feet					
4										

Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 21

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DATE		
STARTED:	12/3/20	
COMPLETED:	12/3/20	
BACKFILLED:	12/3/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO: **MW-TP-29**
Sheet 1 of 1

LOCATION
NORTHING 4,476,807.40 EASTING 4,476,807.40 ELEVATION 4,961-ft

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit, Moisture Content, Liquid Limit; 10 20 30 40 50 60 70 80 90)
0	0					TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout						
					ML	Sandy SILT with gravel - stiff, moist, brown						
		Grab			SC	Clayey SAND with gravel - medium dense, moist, tan		4.7	31.3	30	15	
1												
		Grab										
	5											
2												
3	10											
						Bottom of Test Pit @ 12 Feet						
4												

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SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

Plate
B - 22

DATE		
STARTED:	12/3/20	
COMPLETED:	12/3/20	
BACKFILLED:	12/3/20	

D.R. Horton
Micron Property
Lehi, Utah
Project Number 589-100

GeoStrata Rep: B.J.
Rig Type: Trackhoe

TEST PIT NO: **MW-TP-30**

LOCATION
NORTHING 4,476,814.60 EASTING 4,476,814.60 ELEVATION 4,963-ft

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				TOPSOIL - Silty SAND with gravel - dark brown, moist, organics throughout					
				ML	Sandy SILT with gravel - stiff, moist, dark brown					
		Grab		CL	Lean CLAY - stiff, moist. dark brown					
1		Grab								
		Grab				126.6	14.2	92.5	35	15
	5	Grab			- some white mottling					
2										
		Grab			- some iron staining					
3	10				Bottom of Test Pit @ 10 Feet					
4										

Moisture Content and Atterberg Limits
Plastic Limit | Moisture Content | Liquid Limit
10 20 30 40 50 60 70 80 90

SAMPLE TYPE
- GRAB SAMPLE
- 2.5" O.D. THIN-WALLED HAND SAMPLER

WATER LEVEL
- MEASURED
- ESTIMATED

NOTES:

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Unified Soil Classification Per ASTM D 2488

Primary Divisions			Group Symbol	Group Name
COARSE-GRAINED SOILS more than 50% retained on the No. 200 Sieve	GRAVEL More than half of the coarse fraction is larger than the #4 sieve	Clean Gravel	GW	Well Graded GRAVEL
			GP	Poorly Graded GRAVEL
		Gravel with Duel Classifications	GW-GM	Well Graded GRAVEL with silt
			GP-GM	Poorly Graded GRAVEL with silt
			GW-GC	Well Graded GRAVEL with clay
			GP-GC	Poorly Graded GRAVEL with clay
		Gravel with Fines	GM	Silty GRAVEL
			GC	Clayey GRAVEL
			GC-GM	Silty, Clayey GRAVEL
	SAND More than half of the coarse fraction is smaller than the #4 sieve	Clean Sand	SW	Well Graded SAND
			SP	Poorly Graded SAND
		Sand with Dual Classifications	SW-SM	Well Graded SAND with silt
			SP-SM	Poorly Graded SAND with silt
			SW-SC	Well Graded SAND with clay
			SP-SC	Well Graded SAND with clay
		Sand with Fines	SM	Silty SAND
			SC	Clayey SAND
			SC-SM	Silty, Clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 Sieve	SILTY & CLAY less than 50%	Inorganic	CL	Lean CLAY
			ML	SILT
			CL-ML	Silty CLAY
		Organic	OL	Organic CLAY or Organic SILT
	SILTY & CLAY LL 50% or more	Inorganic	CH	Fat CLAY
			MH	Elastic SILT
		Organic	OH	Organic CLAY or Organic SILT
	Highly Organic Soils		PT	Peat

Exploration Log Key

Sample Symbols
Auger Cuttings
California Sampler
Rock Core
Bag or Block Sample
Modified California Sampler
No Recovery
Split Spoon
Shelby Tube
Dames and More Sampler

Ground Water Symbol
Measured Groundwater Elevation
Estimated Groundwater Elevation

Relative Density	SPT N (blows/ft)
Very Loose	0 to 4
Loose	5 to 10
Med. Dense	11 to 30
Dense	31 to 50
Very Dense	>51

Consistency	SPT N (blows/ft)
Very Soft	0 to 1
Soft	2 to 4
Med. Stiff	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 60
Very Hard	>61

Modifiers

Description	Percentage
Trace	less than 5
Some	5 to 12
With	more than 12

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Soil Symbols and Description Key

D.R. Horton
Micron Property
Lehi/Draper, Utah
Project Number: 589-100

Plate B-24

APPENDIX C

Test Pit No.	Sample Depth (feet)	USCS Soil Classification	Natural Moisture Content (%)	Natural Dry Density (pcf)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	Gradation			Atterberg		Consolidation			Collapse (%)	CBR (%)
							Gravel (%)	Sand (%)	Fines (%)	LL	PI	Cc	Cr	OCR		
MW-TP-01	7	GP-GM	3.3		6.1	136.3	46.1	38.1	10.9	22	4					76.7
MW-TP-02	8	GP	5.1				50.1	46.5	3.4	NP	NP					
MW-TP-03	3	ML	8	92.5					69.3						0.32	
MW-TP-04	3	GC	4				44.5	30.3	25.2	24	8					
MW-TP-10	2	GC	2.2				59.9	27.0	13.1	25	9					
MW-TP-11	6	SM	5.7				29.8	48.6	21.6	NP	NP					
MW-TP-12	6	SM	5.3	95					39.5						1.17	
MW-TP-13	8.5	SM	16.7	81					41.7	NP	NP				0.27	
MW-TP-14	6	SM	13.5	110.7					41.3						0.09	
MW-TP-16	1.5	GP-GM	3.6				70.7	22.3	7.0	NP	NP					
MW-TP-17	4	SM	4.1				35.6	38.8	25.6	NP	NP					
MW-TP-18	3	CL	20.1	86.7					85.1						0.07	
MW-TP-19	6	ML	8.1	88.6					65.1						1.4	
MW-TP-20	3.5	ML	21.8	92.9					83.7						0.44	
MW-TP-21	3.5	CL	15.7	86.6			0.0	17.4	82.6	38	14				0.23	
MW-TP-22	2	CL	7.5				13.8	20.7	65.5	29	13					
MW-TP-23	1.5	GC	4.6				33.6	33.5	32.9	24	7					
MW-TP-28	3.5	CL-ML	6.8	107					79.2	25	18				0.47	
MW-TP-29	2	SC	4.7				23.4	45.3	31.3	30	15					
MW-TP-30	4	CL	14.2	126.6					92.5	35	15				0.4	

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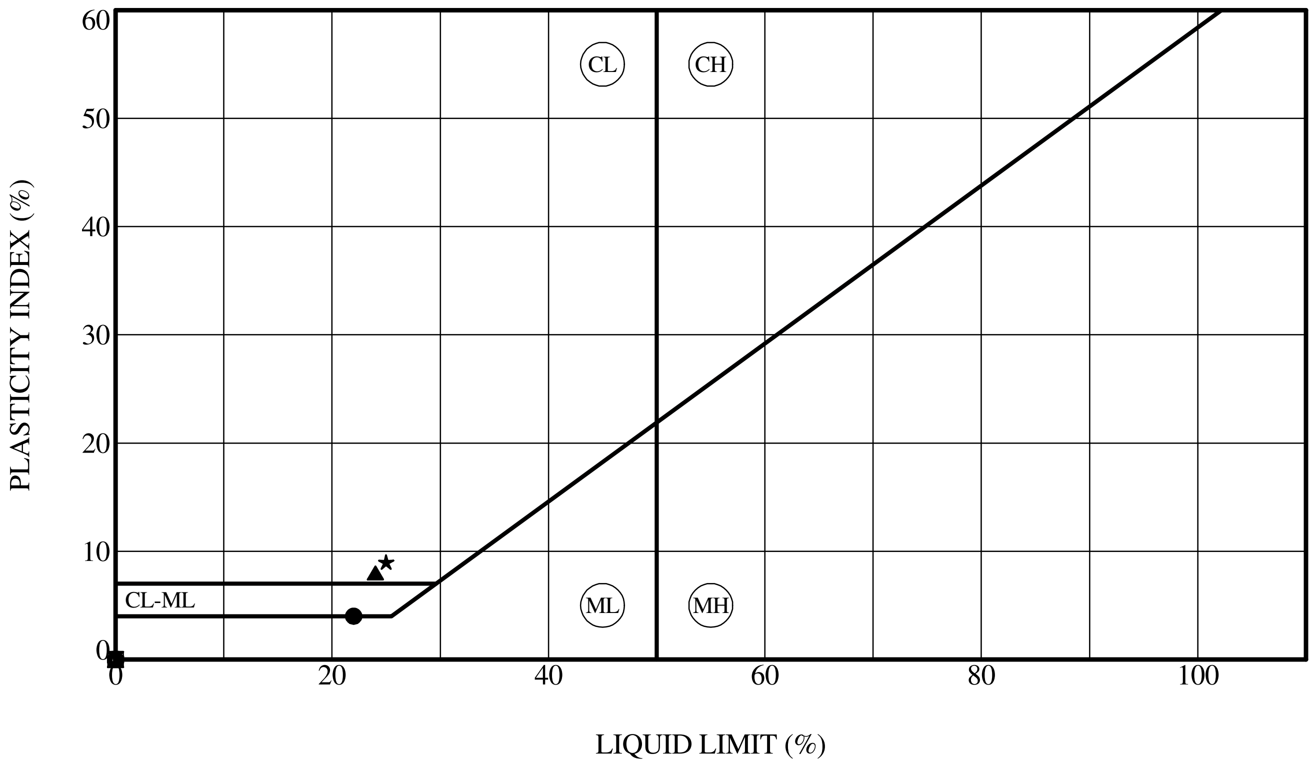
Lab Summary Report

D.R. Horton
Micron Property – Lehi Single Family
Lehi/Draper, Utah
Project Number: 589-100

Plate C - 1



	Sample Location	Depth (ft)	LL (%)	PL (%)	PI (%)	Fines (%)	Classification
●	**MW-TP-01**	**7.0**	**22**	**18**	**4**	**10.9**	**Poorly Graded GRAVEL with silt and sand**
⊠	**MW-TP-02**	**8.0**	**NP**	**NP**	**NP**	**3.4**	**Poorly Graded GRAVEL with sand**
▲	**MW-TP-04**	**3.0**	**24**	**16**	**8**	**25.2**	**Clayey GRAVEL with sand**
★	**MW-TP-10**	**2.0**	**25**	**16**	**9**	**13.1**	**Clayey GRAVEL with sand**
⊙	**MW-TP-11**	**6.0**	**NP**	**NP**	**NP**	**21.6**	**Silty SAND with gravel**
✪	**MW-TP-13**	**8.5**	**NP**	**NP**	**NP**	**41.7**	**Silty SAND**
○	**MW-TP-16**	**1.5**	**NP**	**NP**	**NP**	**7.0**	**Poorly Graded GRAVEL with silt and sand**
△	**MW-TP-17**	**4.0**	**NP**	**NP**	**NP**	**25.6**	**Silty SAND with gravel**

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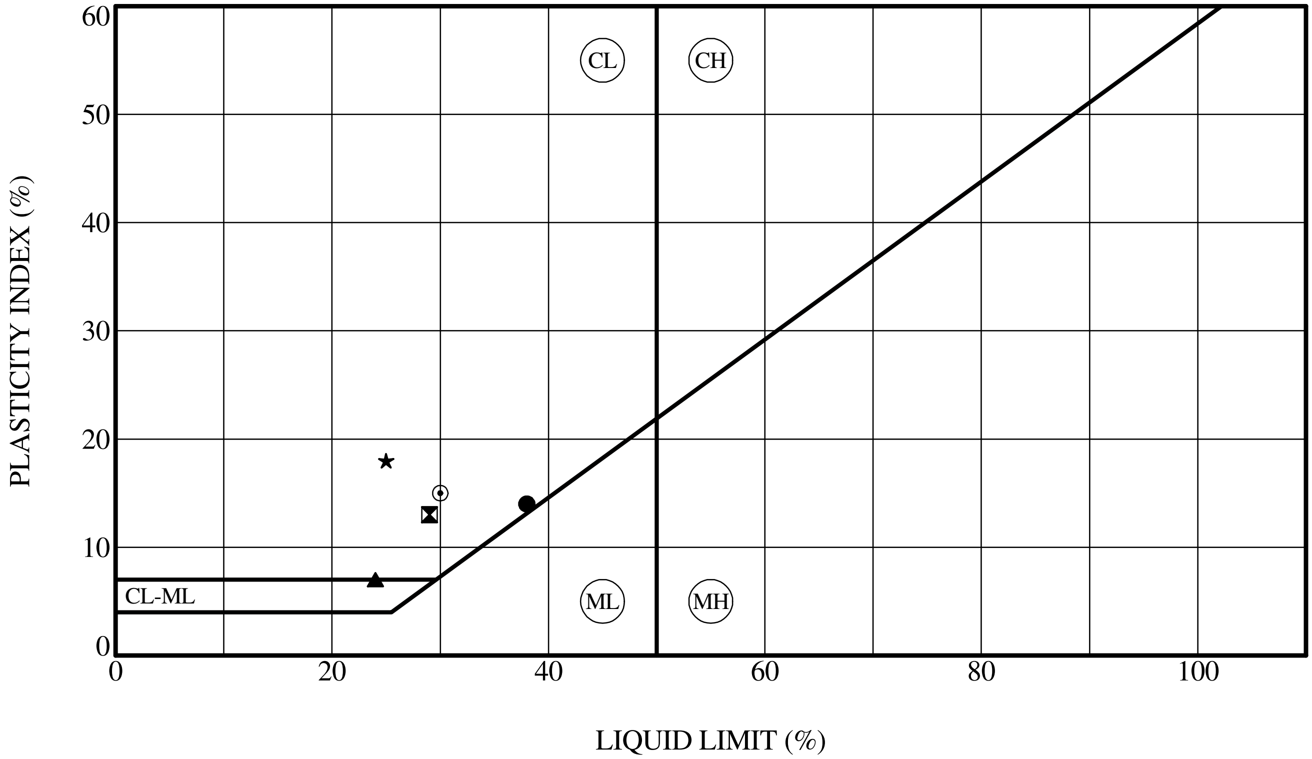
ATTERBERG LIMITS' RESULTS - ASTM D 4318

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate
C - 2

C_ATTERBERG 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	LL (%)	PL (%)	PI (%)	Fines (%)	Classification
●	**MW-TP-21**	**3.5**	**38**	**24**	**14**	**82.6**	**Lean CLAY with sand**
⧗	**MW-TP-22**	**2.0**	**29**	**16**	**13**	**65.5**	**Sandy Lean CLAY**
▲	**MW-TP-23**	**1.5**	**24**	**17**	**7**	**32.9**	**Clayey GRAVEL with sand**
★	**MW-TP-28**	**3.5**	**25**	**7**	**18**	**79.2**	**Sandy Silty CLAY**
⊙	**MW-TP-29**	**2.0**	**30**	**15**	**15**	**31.3**	**Clayey SAND with gravel**

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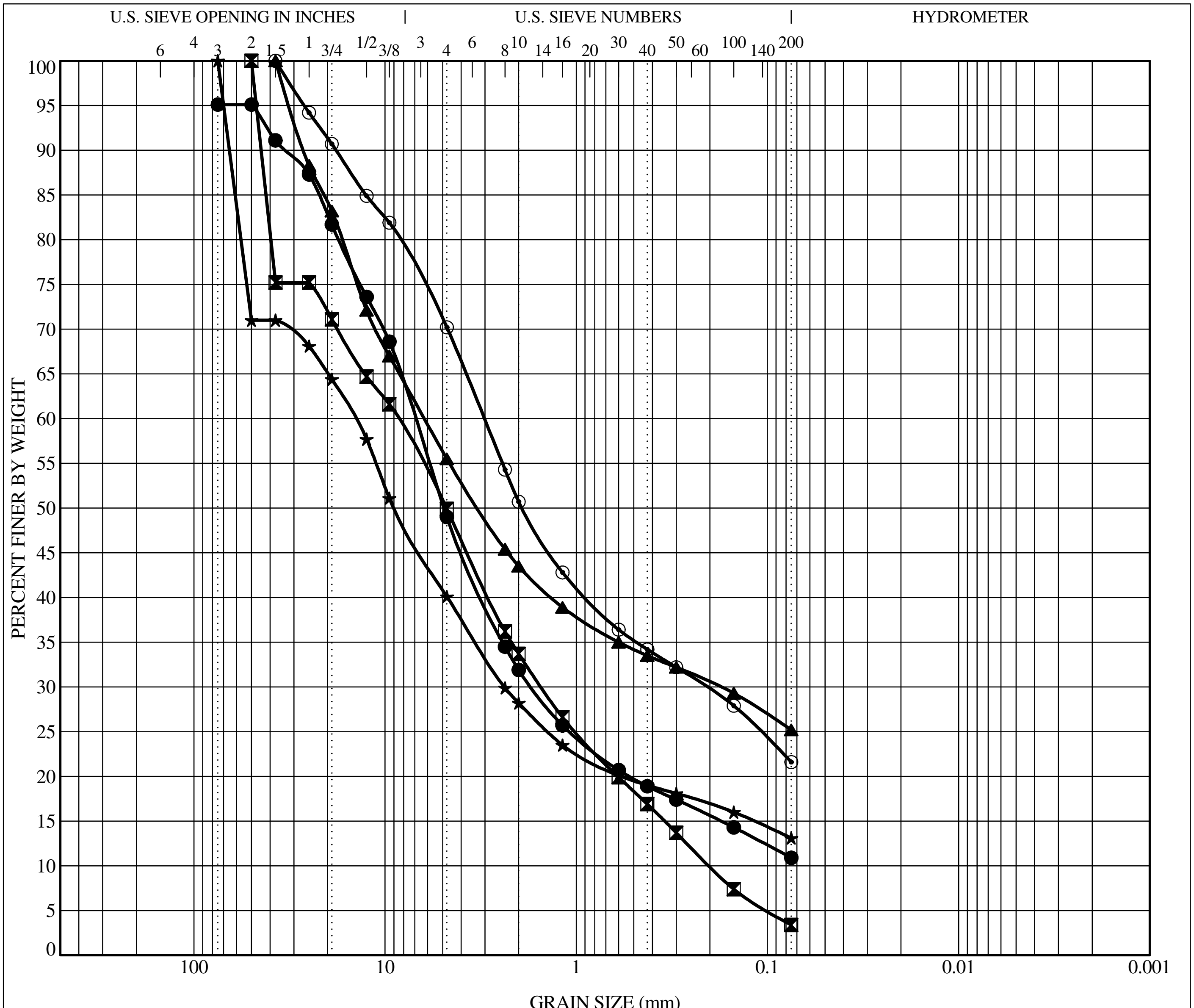
ATTERBERG LIMITS' RESULTS - ASTM D 4318

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Depth	Classification	LL	PL	PI	Cc	Cu
●	**MW-TP-01**	**7.0**	**Poorly Graded GRAVEL with silt and sand**	**22**	**18**	**4**	**6.62**	**112.27**
⊠	**MW-TP-02**	**8.0**	**Poorly Graded GRAVEL with sand**	**NP**	**NP**	**NP**	**1.34**	**43.27**
▲	**MW-TP-04**	**3.0**	**Clayey GRAVEL with sand**	**24**	**16**	**8**		
★	**MW-TP-10**	**2.0**	**Poorly Graded GRAVEL with clay and sand**	**25**	**16**	**9**		
⊙	**MW-TP-11**	**6.0**	**Silty SAND with gravel**	**NP**	**NP**	**NP**		

	Sample Loctaion	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**MW-TP-01**	**7.0**	**75**	**7.009**	**1.701**		**46.1**	**38.1**	**10.9**	
⊠	**MW-TP-02**	**8.0**	**50**	**8.641**	**1.519**	**0.2**	**50.1**	**46.5**	**3.4**	
▲	**MW-TP-04**	**3.0**	**37.5**	**6.23**	**0.177**		**44.5**	**30.3**	**25.2**	
★	**MW-TP-10**	**2.0**	**75**	**14.432**	**2.376**		**59.9**	**27.0**	**13.1**	
⊙	**MW-TP-11**	**6.0**	**37.5**	**3.033**	**0.21**		**29.8**	**48.6**	**21.6**	

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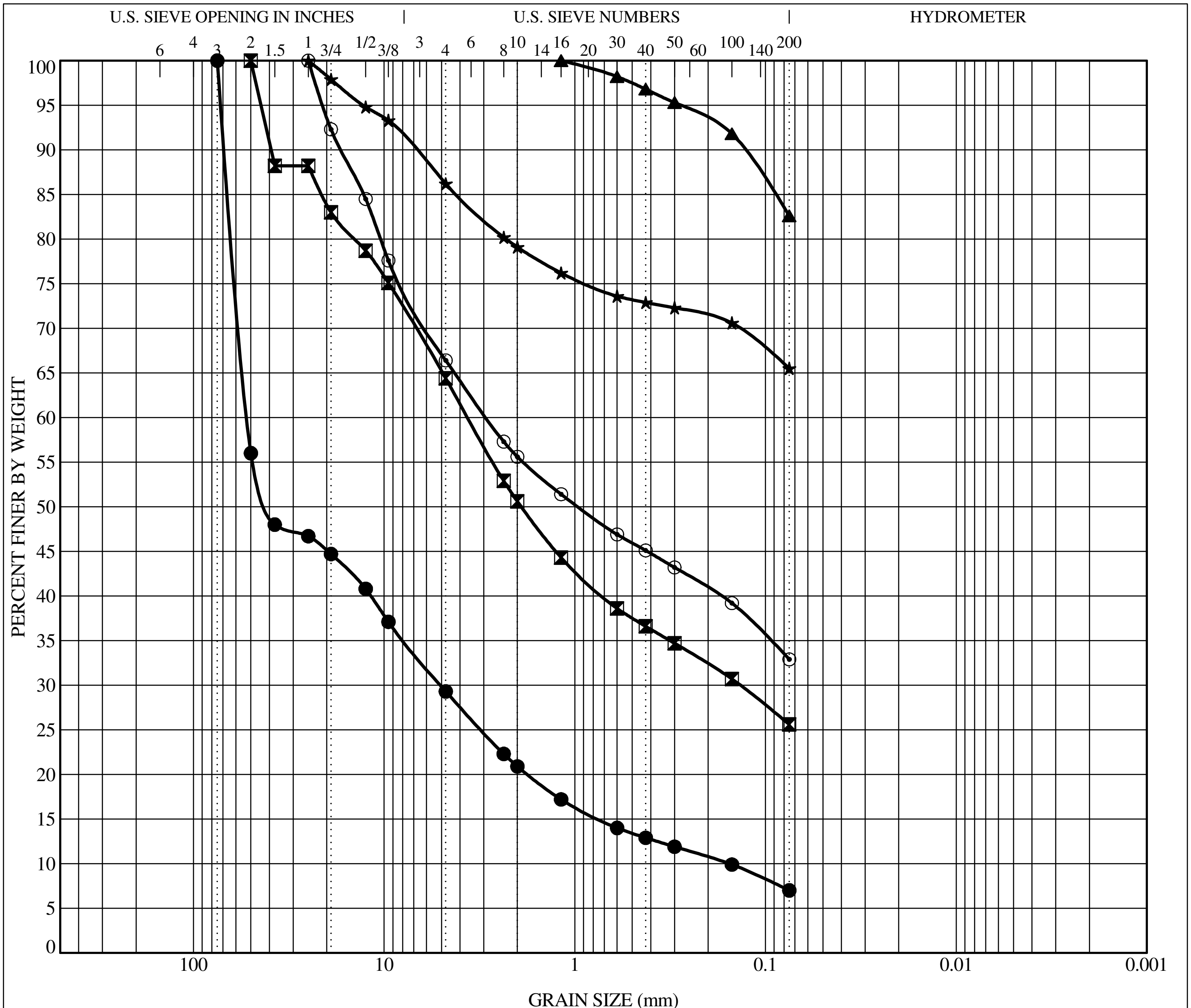
GRAIN SIZE DISTRIBUTION - ASTM D422

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Depth	Classification	LL	PL	PI	Cc	Cu
●	**MW-TP-16**	**1.5**	**Poorly Graded GRAVEL with silt and sand**	**NP**	**NP**	**NP**	**3.17**	**334.07**
⊠	**MW-TP-17**	**4.0**	**Silty SAND with gravel**	**NP**	**NP**	**NP**		
▲	**MW-TP-21**	**3.5**	**Lean CLAY with sand**	**38**	**24**	**14**		
★	**MW-TP-22**	**2.0**	**Sandy Lean CLAY**	**29**	**16**	**13**		
⊙	**MW-TP-23**	**1.5**	**Clayey GRAVEL with sand**	**24**	**17**	**7**		

	Sample Loctaion	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**MW-TP-16**	**1.5**	**75**	**51.877**	**5.055**	**0.155**	**70.7**	**22.3**	**7.0**	
⊠	**MW-TP-17**	**4.0**	**50**	**3.635**	**0.136**		**35.6**	**38.8**	**25.6**	
▲	**MW-TP-21**	**3.5**	**1.18**				**0.0**	**17.4**	**82.6**	
★	**MW-TP-22**	**2.0**	**25**				**13.8**	**20.7**	**65.5**	
⊙	**MW-TP-23**	**1.5**	**25**	**2.904**			**33.6**	**33.5**	**32.9**	

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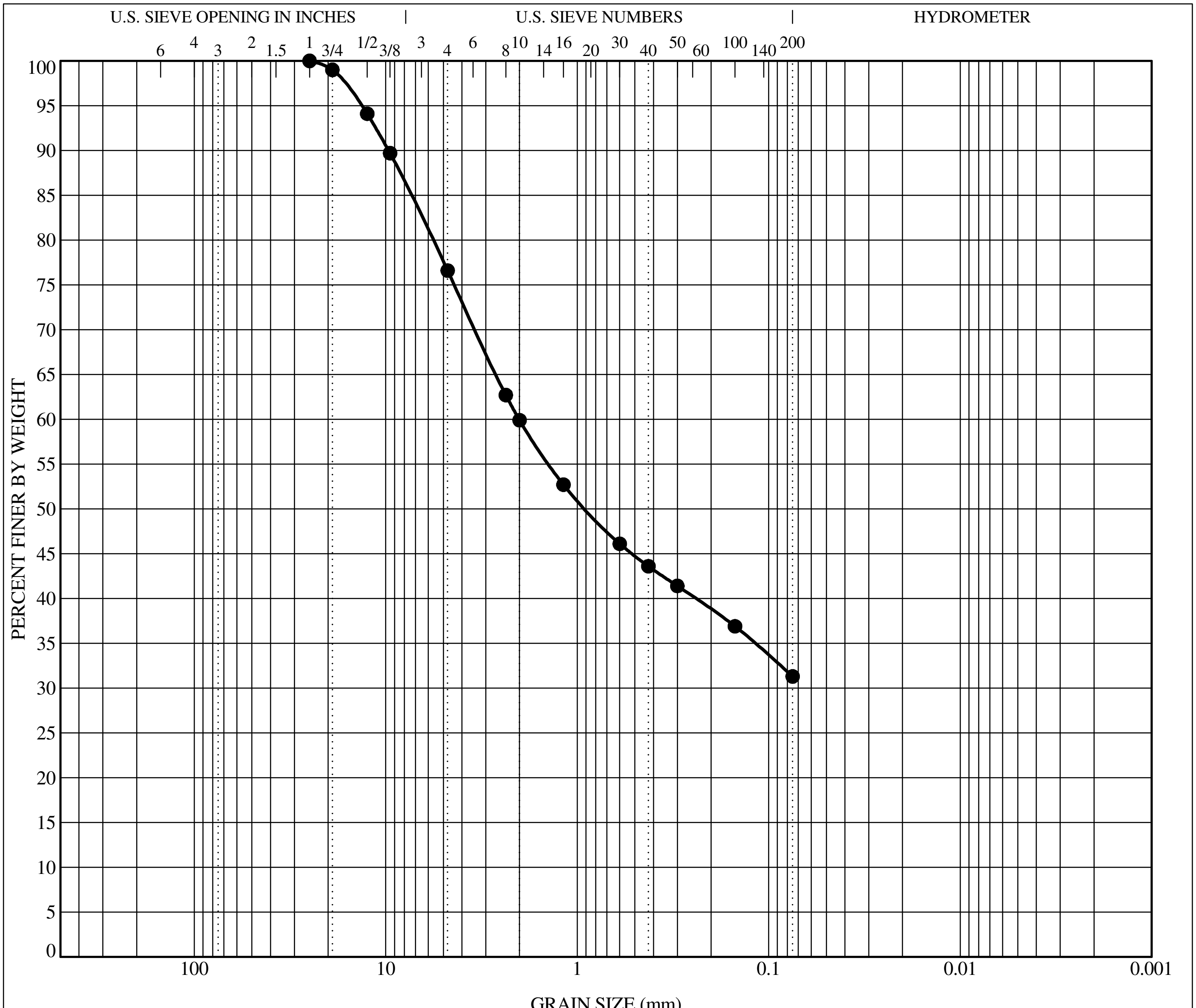
GRAIN SIZE DISTRIBUTION - ASTM D422

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Depth	Classification	LL	PL	PI	Cc	Cu
●	**MW-TP-29**	**2.0**	**Clayey SAND with gravel**	**30**	**15**	**15**		

	Sample Loctaion	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**MW-TP-29**	**2.0**	**25**	**2.012**			**23.4**	**45.3**	**31.3**	

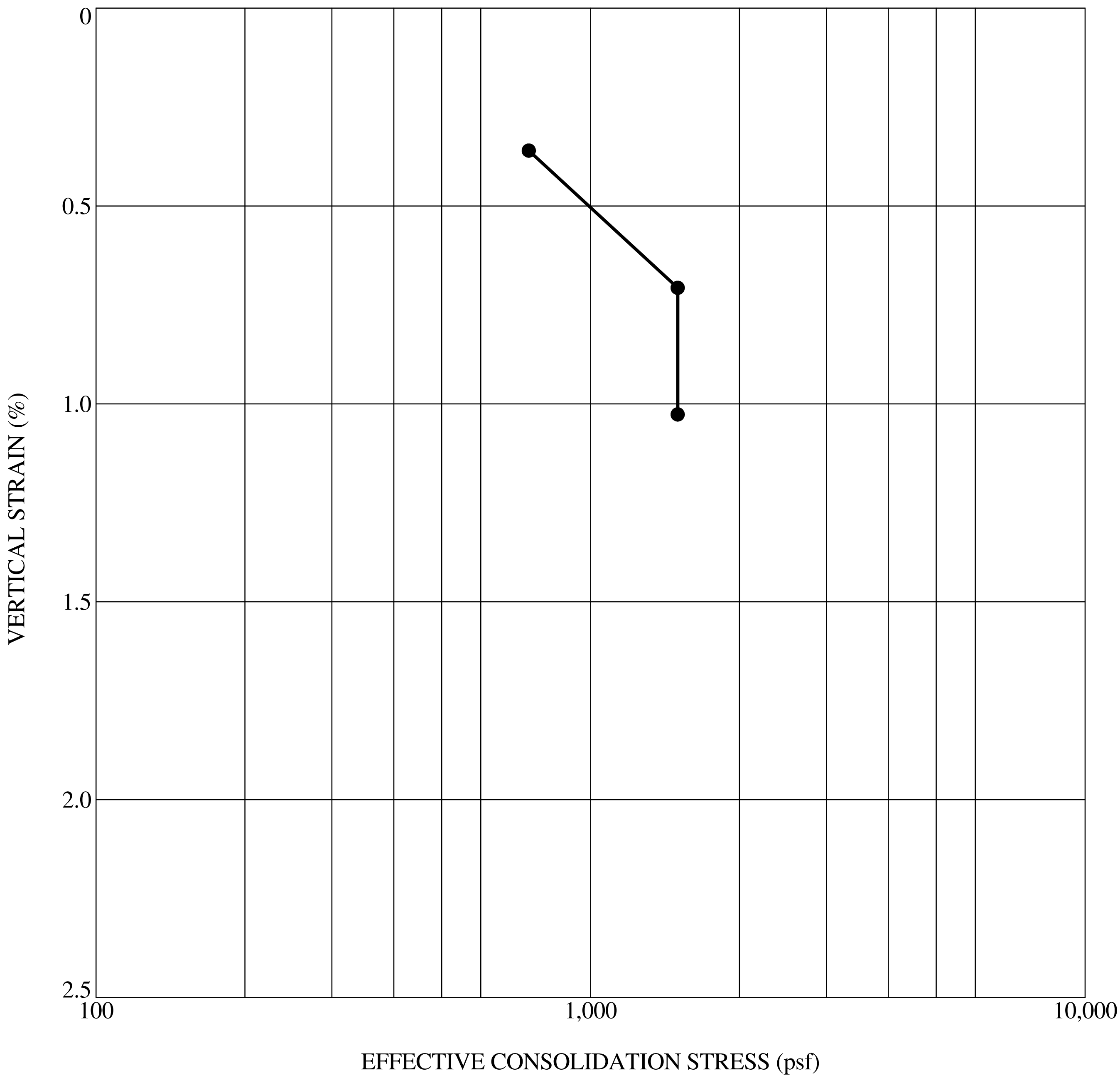
GRAIN SIZE DISTRIBUTION - ASTM D422

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 6

C_GSD 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-03**	**3.0**		**93**	**9**				**1500**		**0.32**

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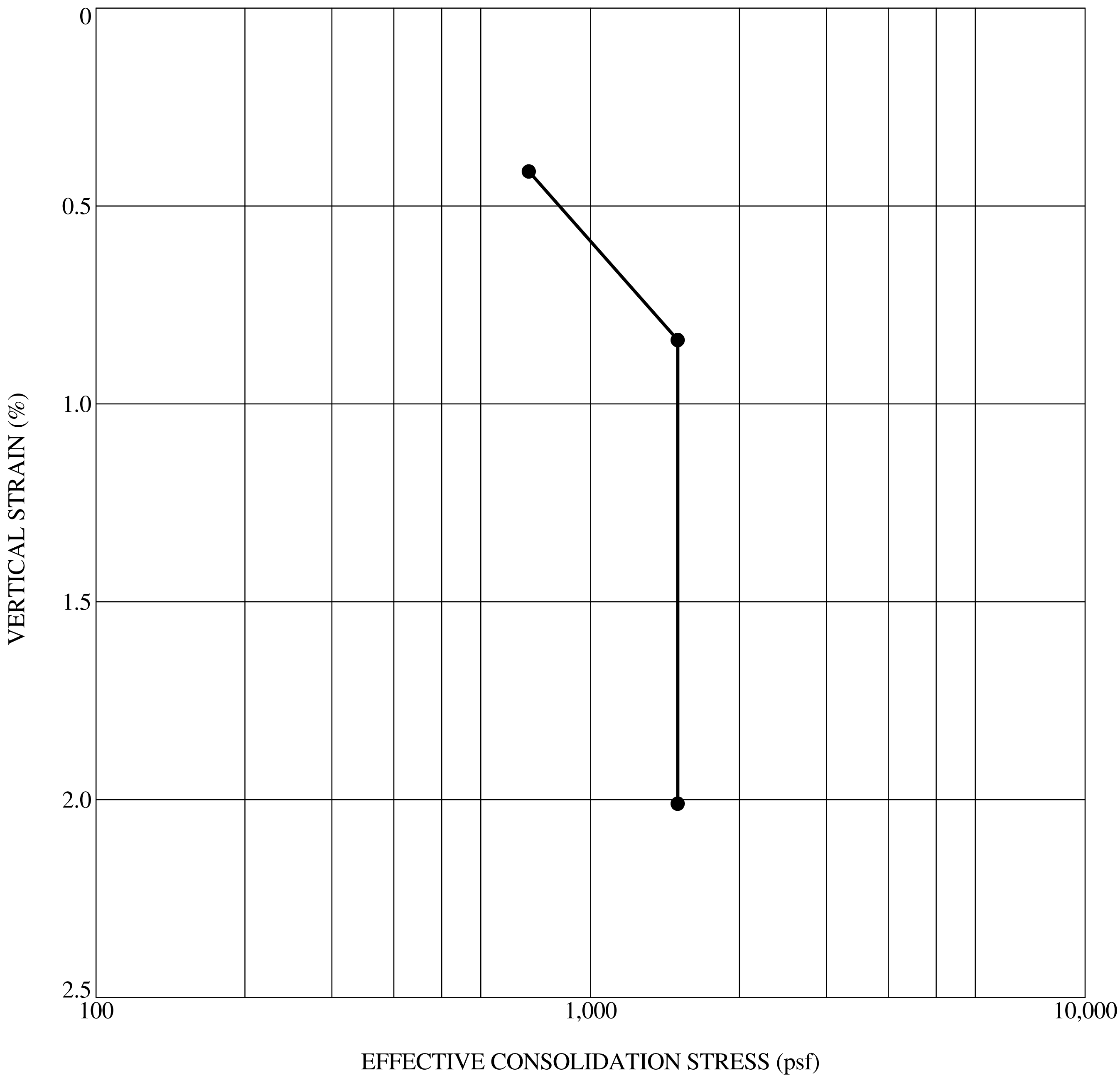
1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate
C - 7

C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-12**	**6.0**	**Silty SAND**	**95**	**7**				**1500**		**1.17**

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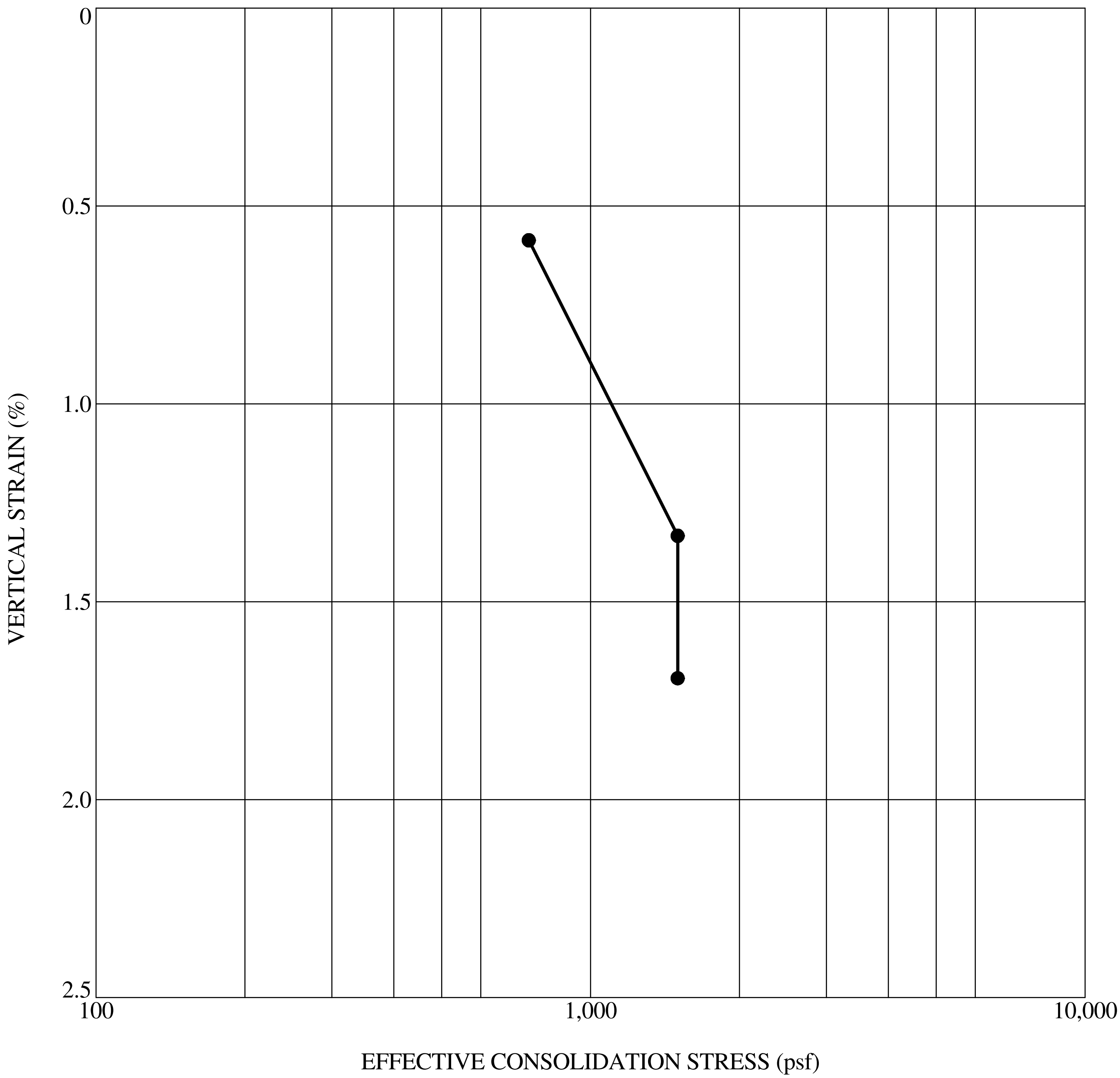
1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 8



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-13**	**8.5**	**Silty SAND**	**81**	**17**				**1500**		**0.27**

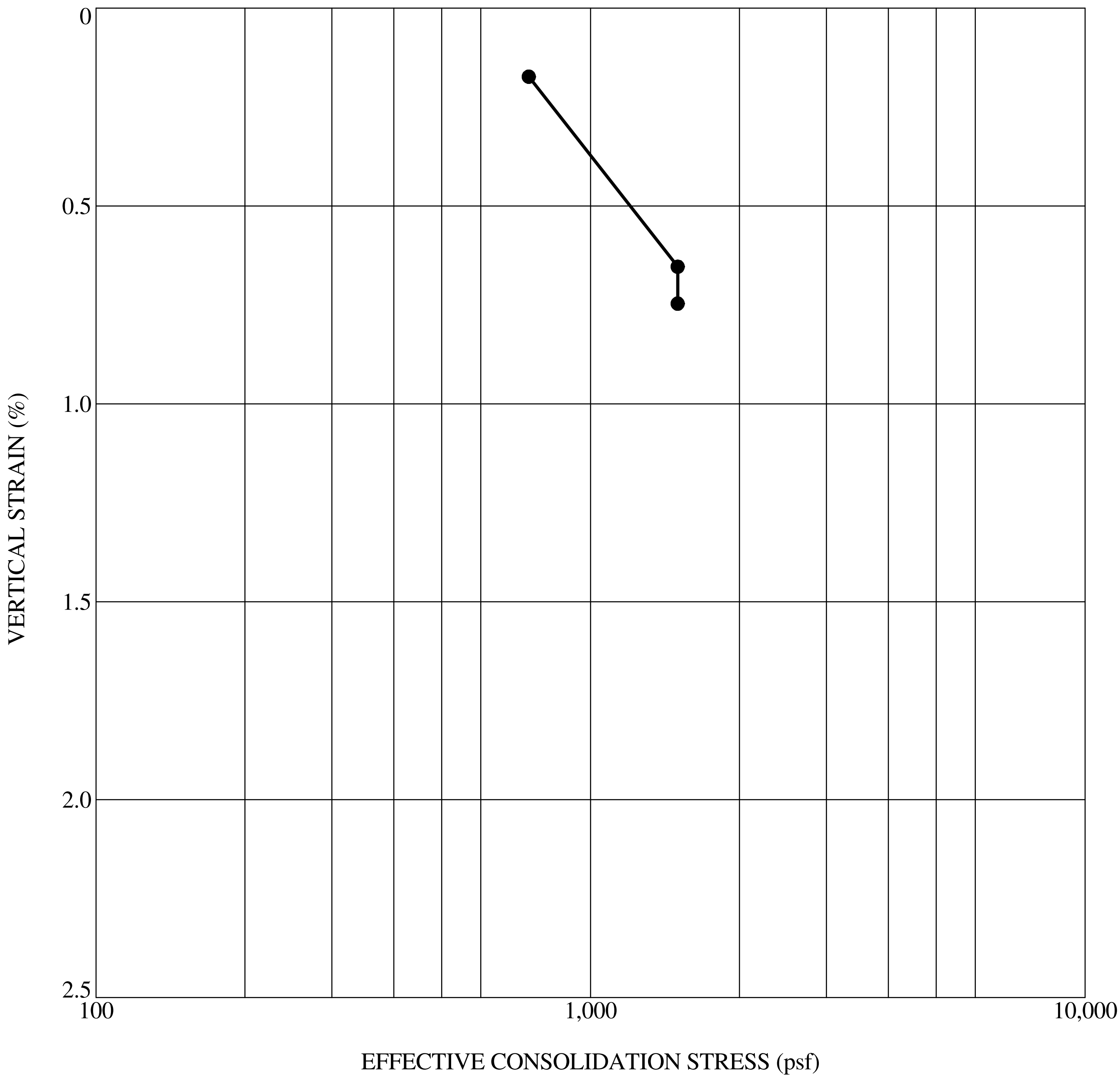
1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 9

C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-14**	**6.0**	**Silty SAND with gravel**	**98**	**14**				**1500**		**0.09**

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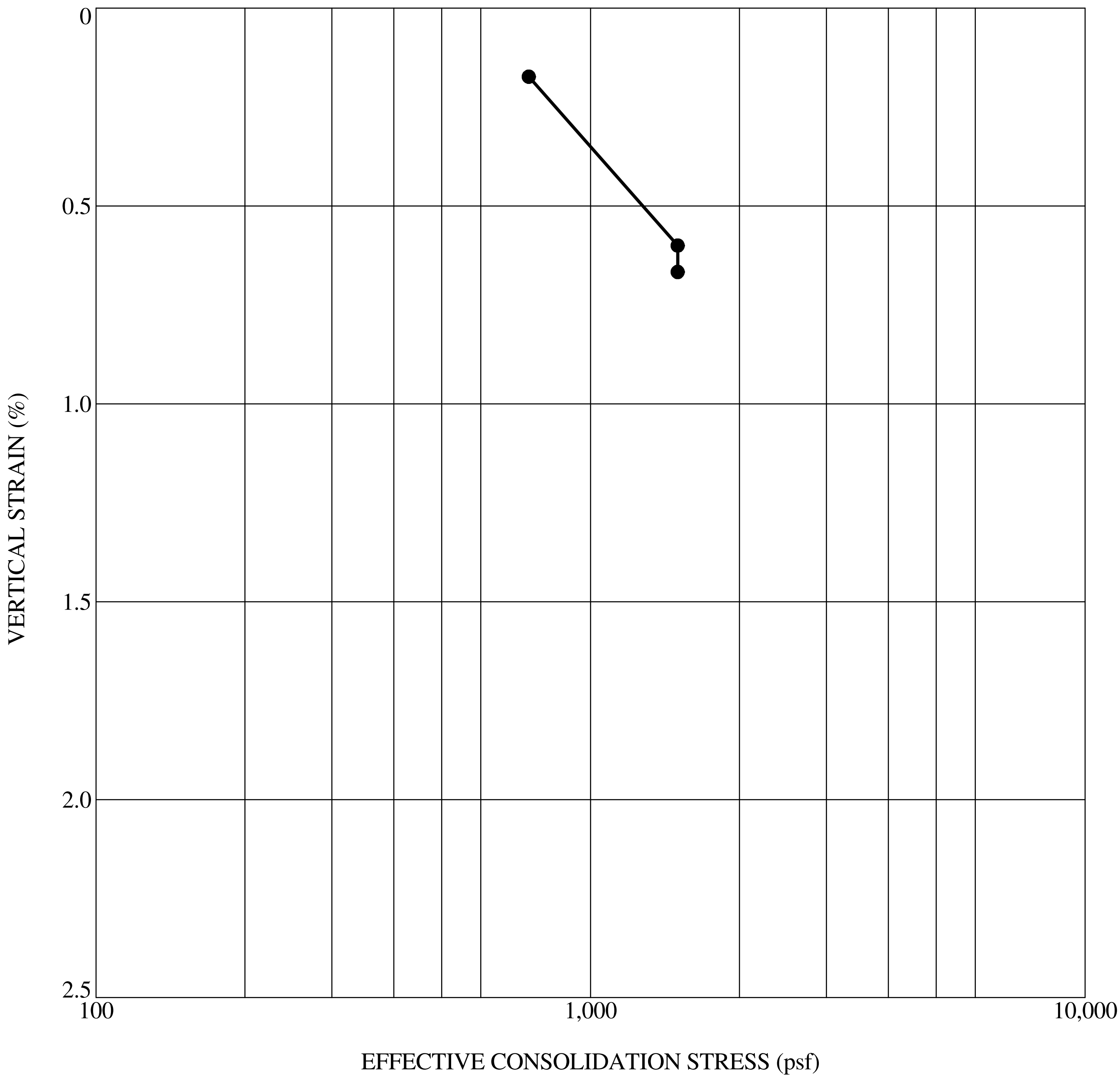
1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 10

C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-18**	**3.0**	**Lean CLAY with sand**	**87**	**20**				**1500**		**0.07**

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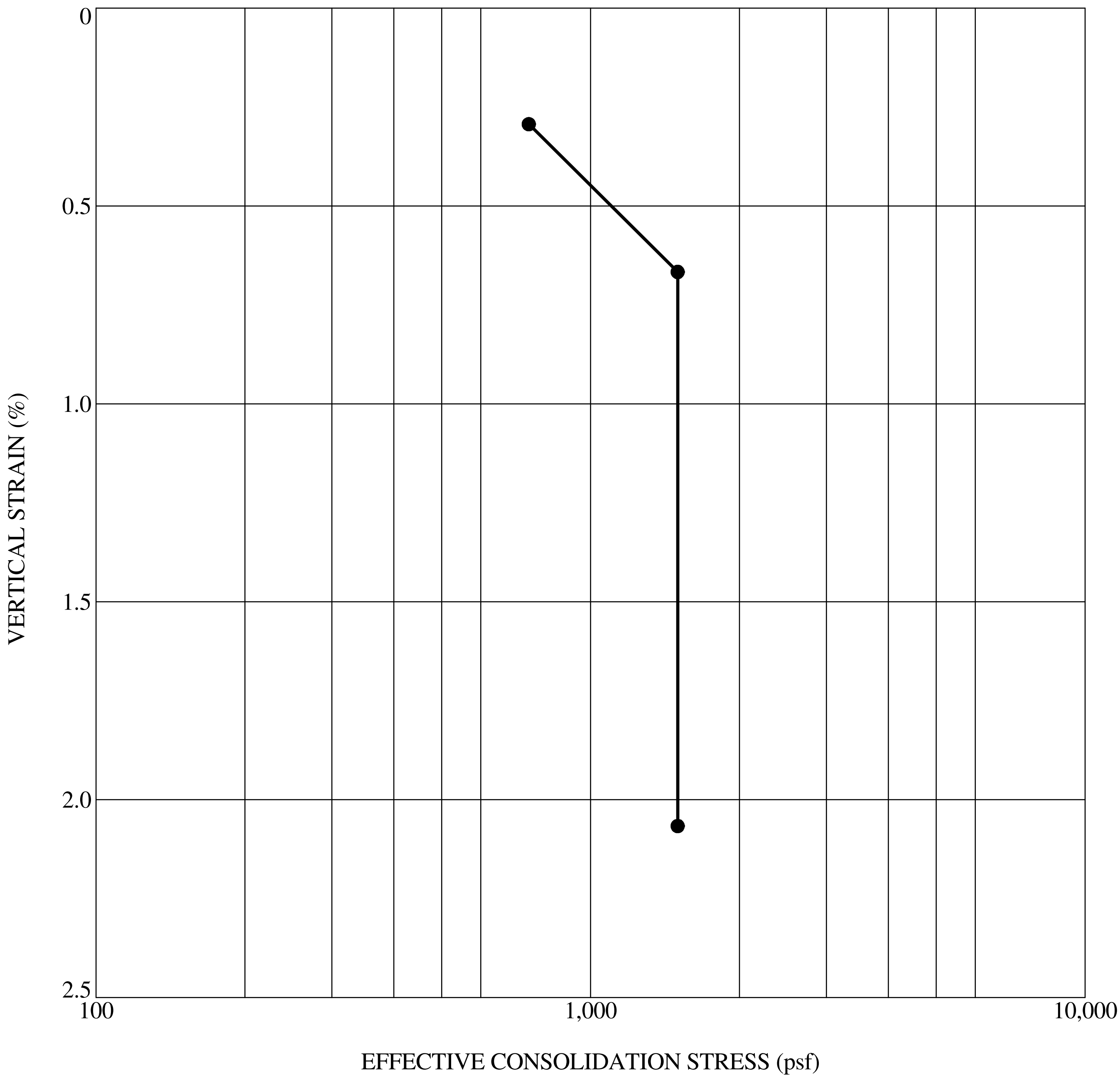
1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate C - 11

C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-19**	**6.0**	**Sandy SILT**	**89**	**8**				**1500**		**1.40**

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1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

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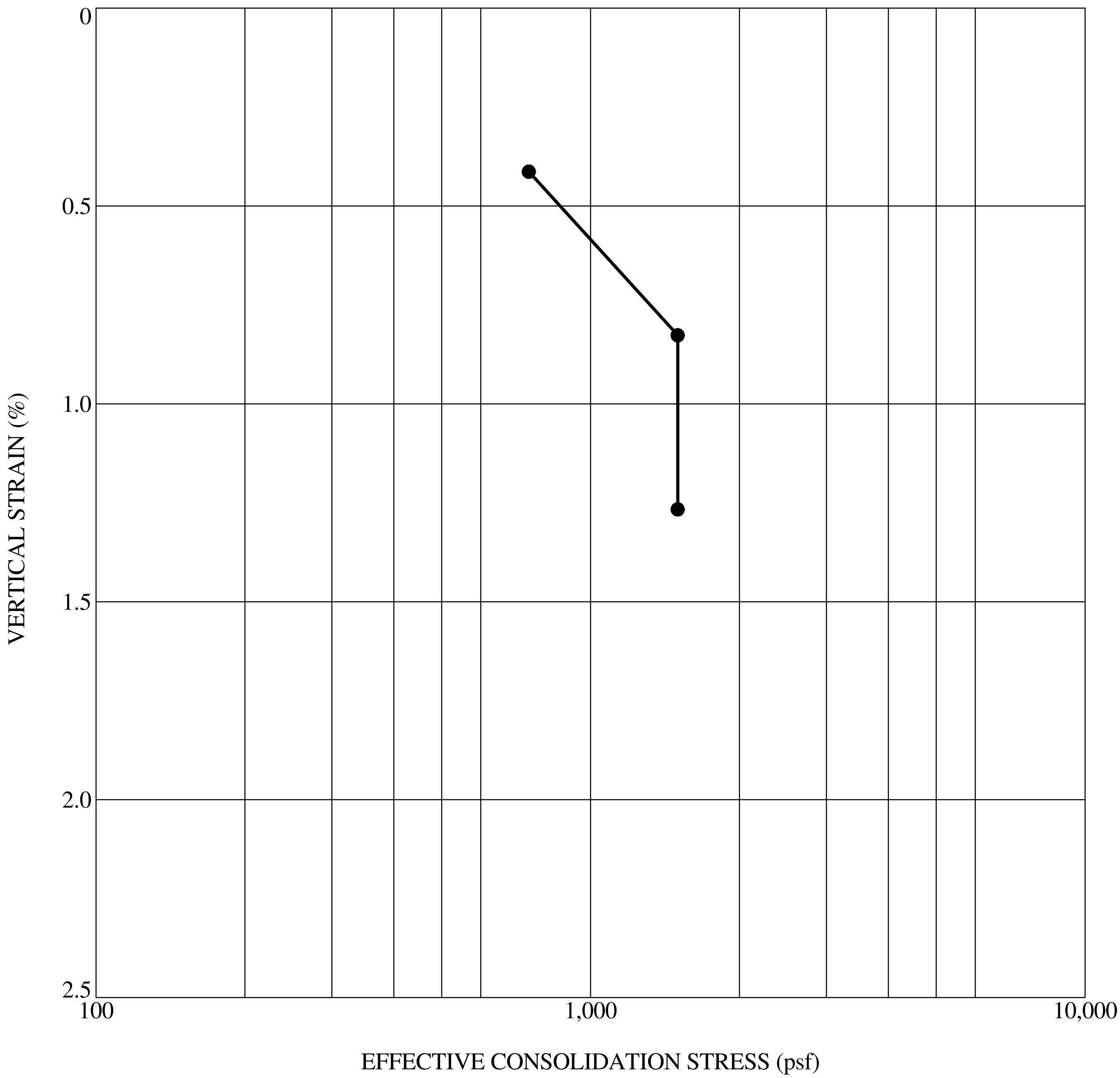
C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-20**	**3.5**		**93**	**22**				**1500**		**0.44**

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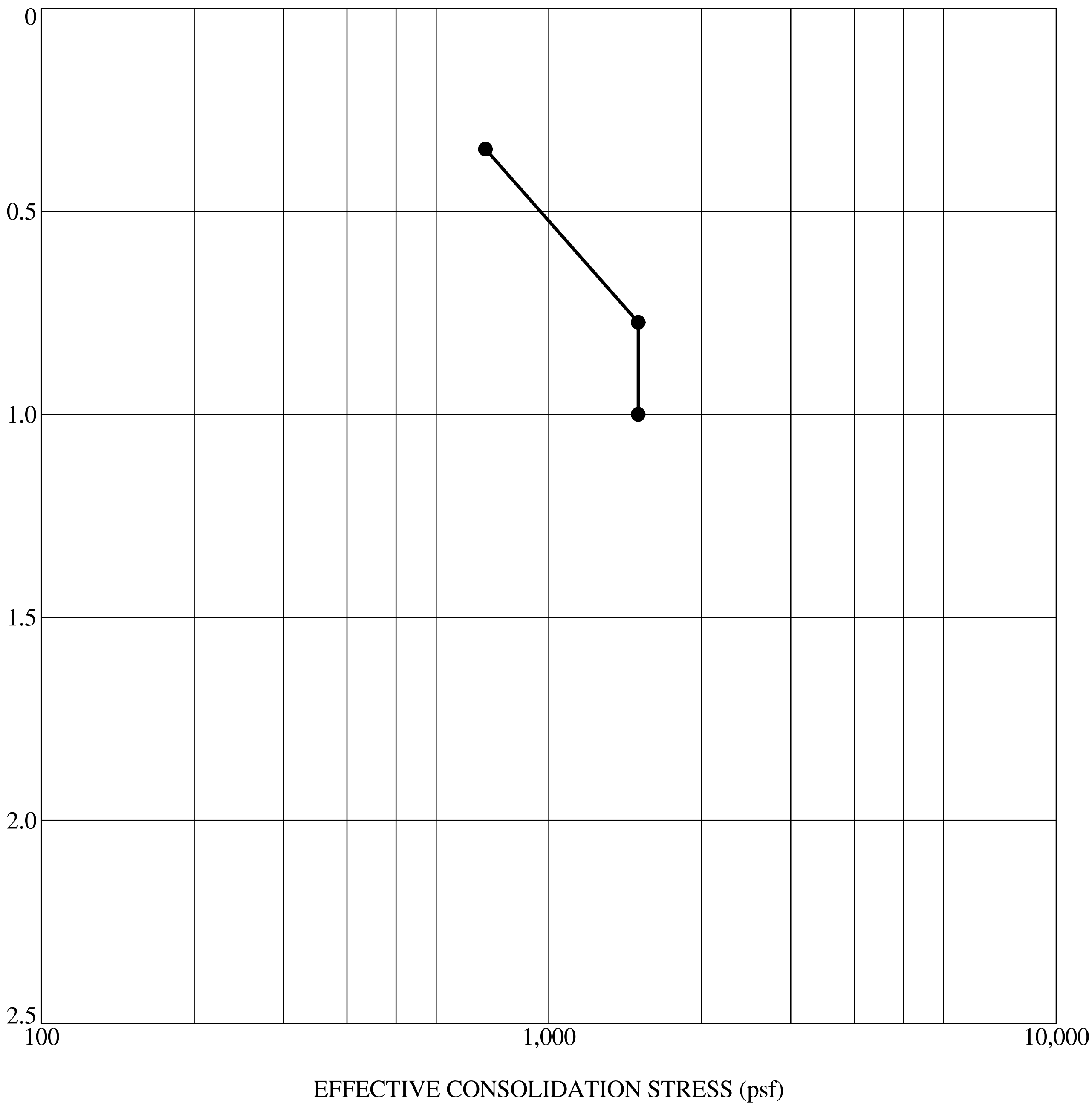
1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

C - 13

C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-21**	**3.5**	**Lean CLAY with sand**	**87**	**16**				**1500**		**0.23**

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1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

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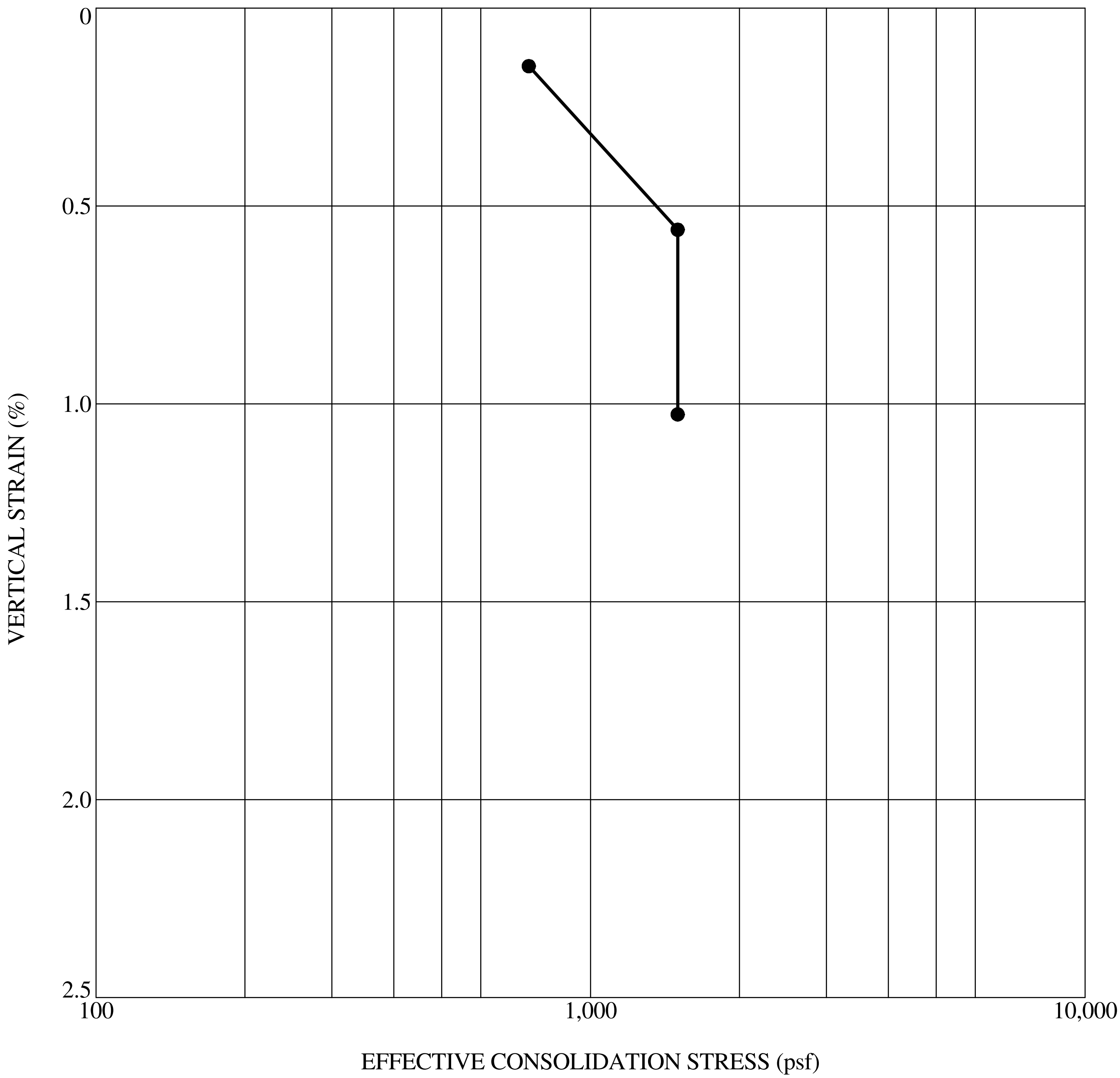
C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-28**	**3.5**	**Sandy Silty CLAY**	**107**	**7**				**1500**		**0.47**

1-D CONSOLIDATION/SWELL/COLLAPSE TEST

GeoStrata

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

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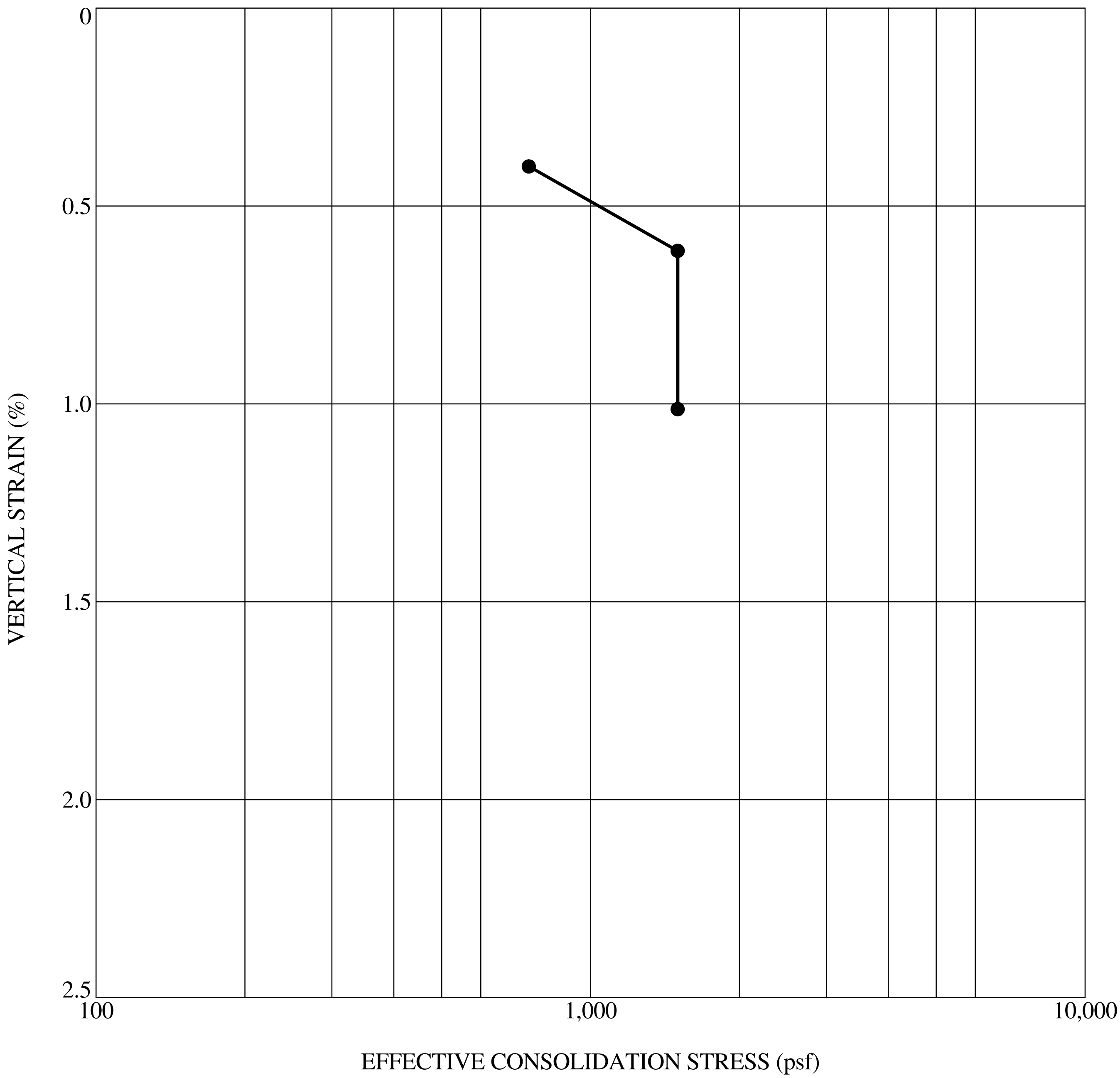

	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR	Inundation Load (psf)	Swell (%)	Collapse (%)
●	**MW-TP-30**	**4.0**	**Lean CLAY**	**103**	**24**				**1500**		**0.40**

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1-D CONSOLIDATION/SWELL/COLLAPSE TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

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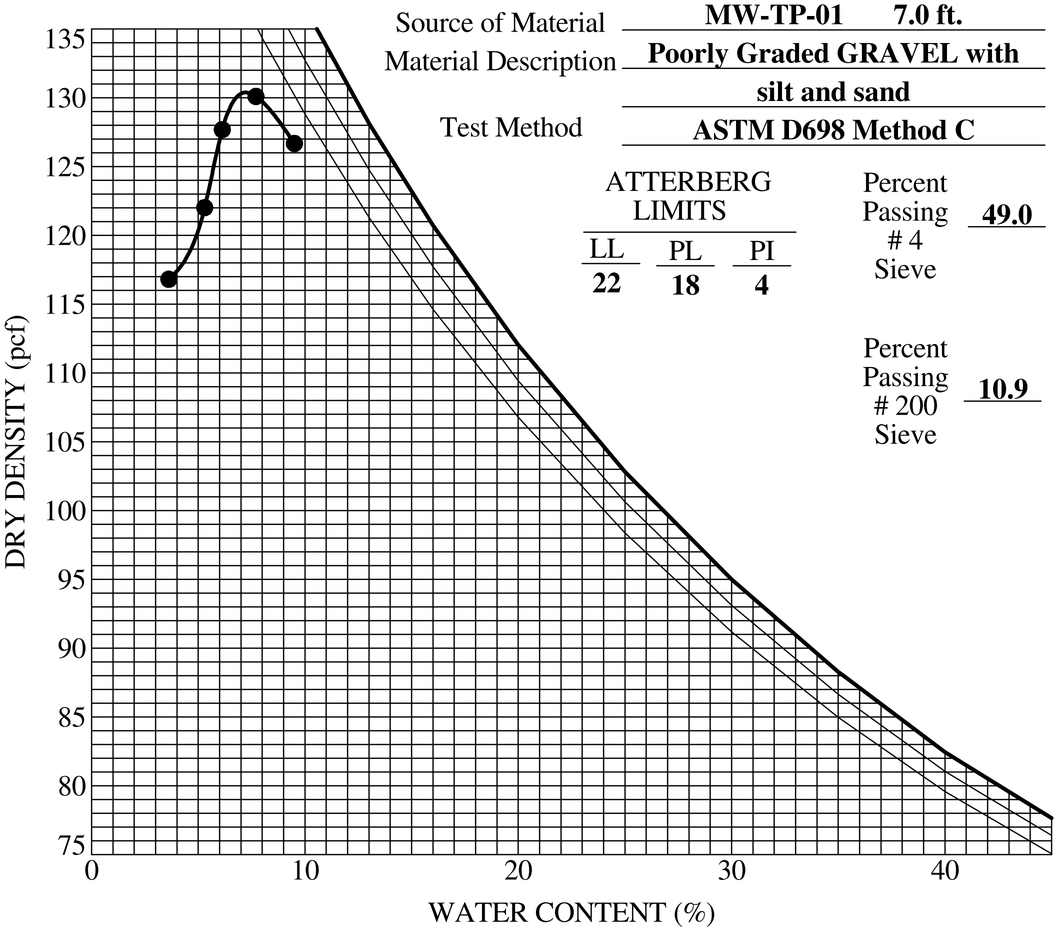
C_CONSOL SWELL/COLLAPSE 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21



Source of Material	MW-TP-01 7.0 ft.
Material Description	Poorly Graded GRAVEL with silt and sand
Test Method	ASTM D698 Method C

ATTERBERG LIMITS		
LL	PL	PI
22	18	4

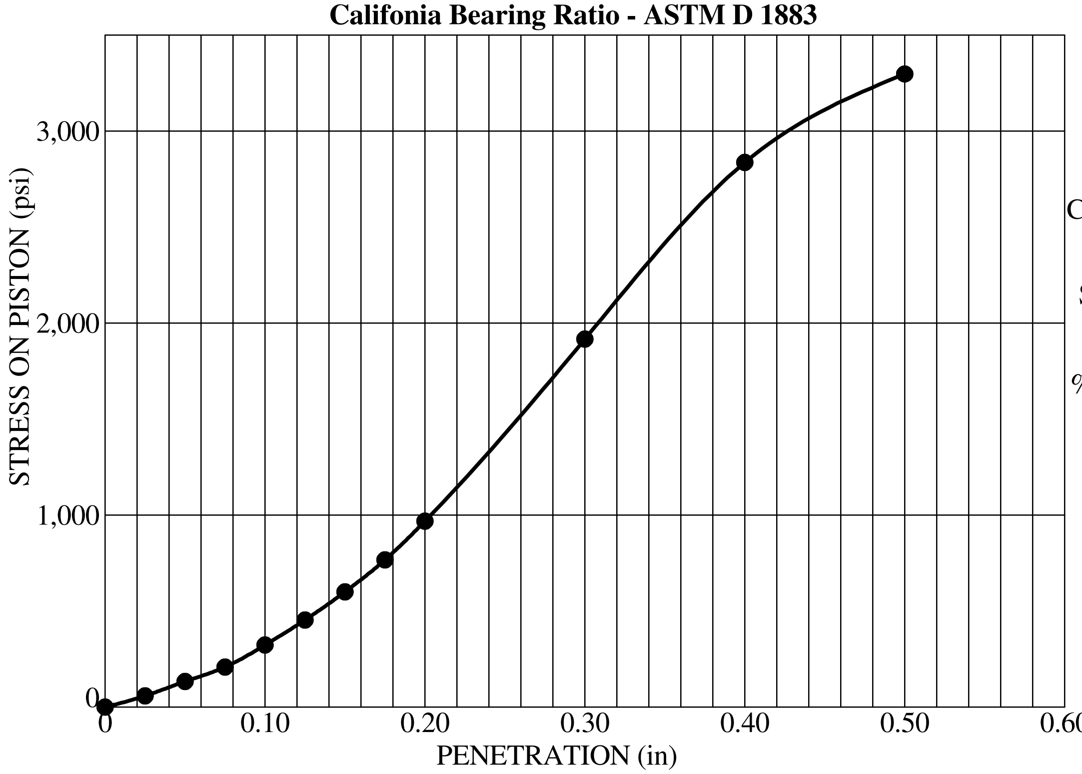
Percent Passing # 4 Sieve	49.0
Percent Passing # 200 Sieve	10.9

TEST RESULTS	
Maximum Dry Density	132.0 (pcf)
Optimum Water Content	7.0 (%)
Percent Rock	18.0 (%)
Corrected Maximum Dry Density	136.3 (pcf)
Corrected Optimum Water Content	6.1 (%)

Curves of 100% Saturation for Specific Gravity Equal to:

2.60, 2.70, 2.80

Califonia Bearing Ratio - ASTM D 1883



Dry Density	132.0 (pcf)
Relative Compaction	100 (%)
Surcharge	51 (psf)
% Standard CBR	76.70
Swell	-0.20 (%)

C_COMPACTION SPLIT 2020 GINT UPDATE TEMPLATE.GPJ GEOSTRATA.GDT 1/18/21

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COMPACTION AND CBR TEST

D.R. Horton
Micron Property
Lehi, Utah
Project Number: 589-100

Plate

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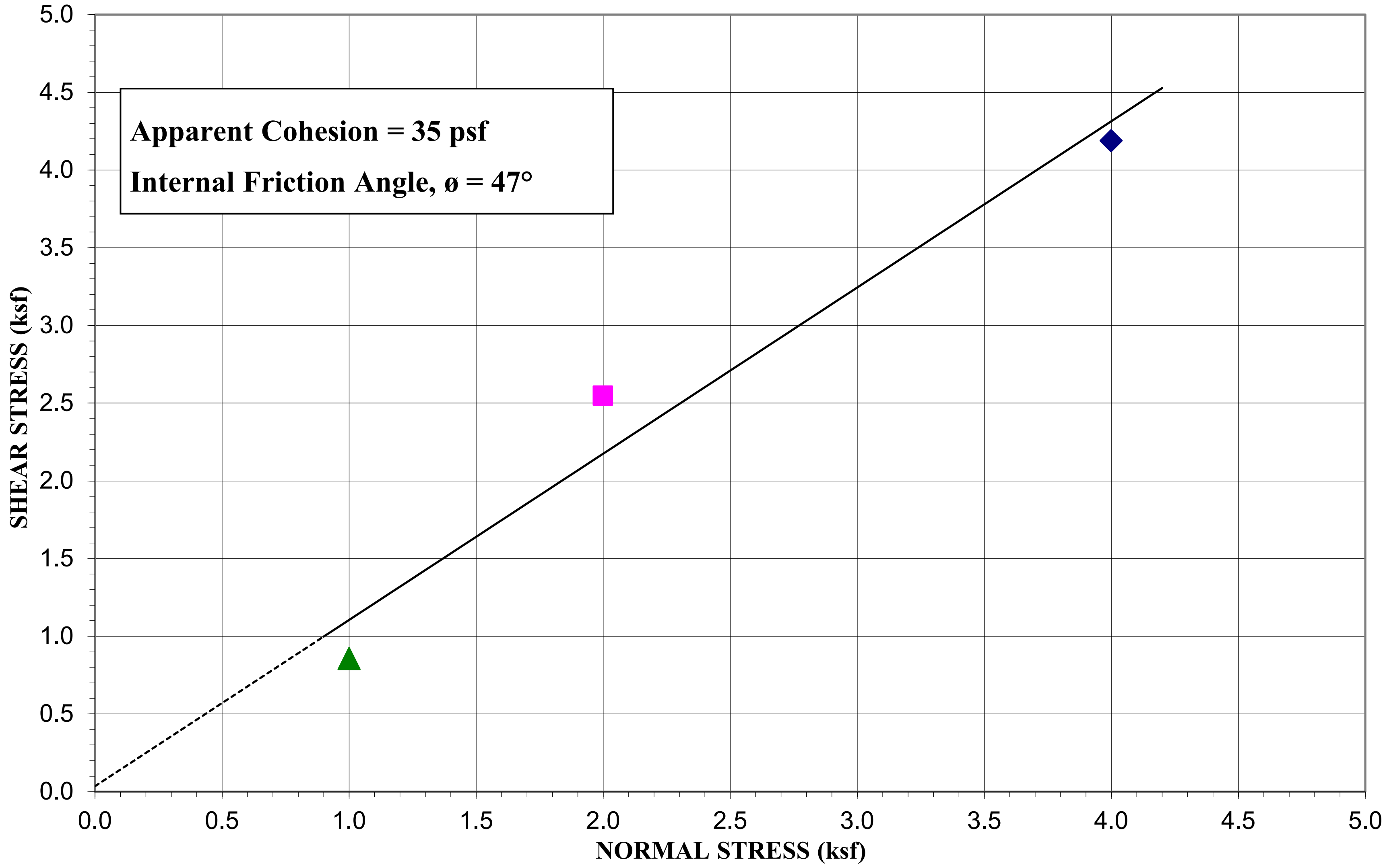
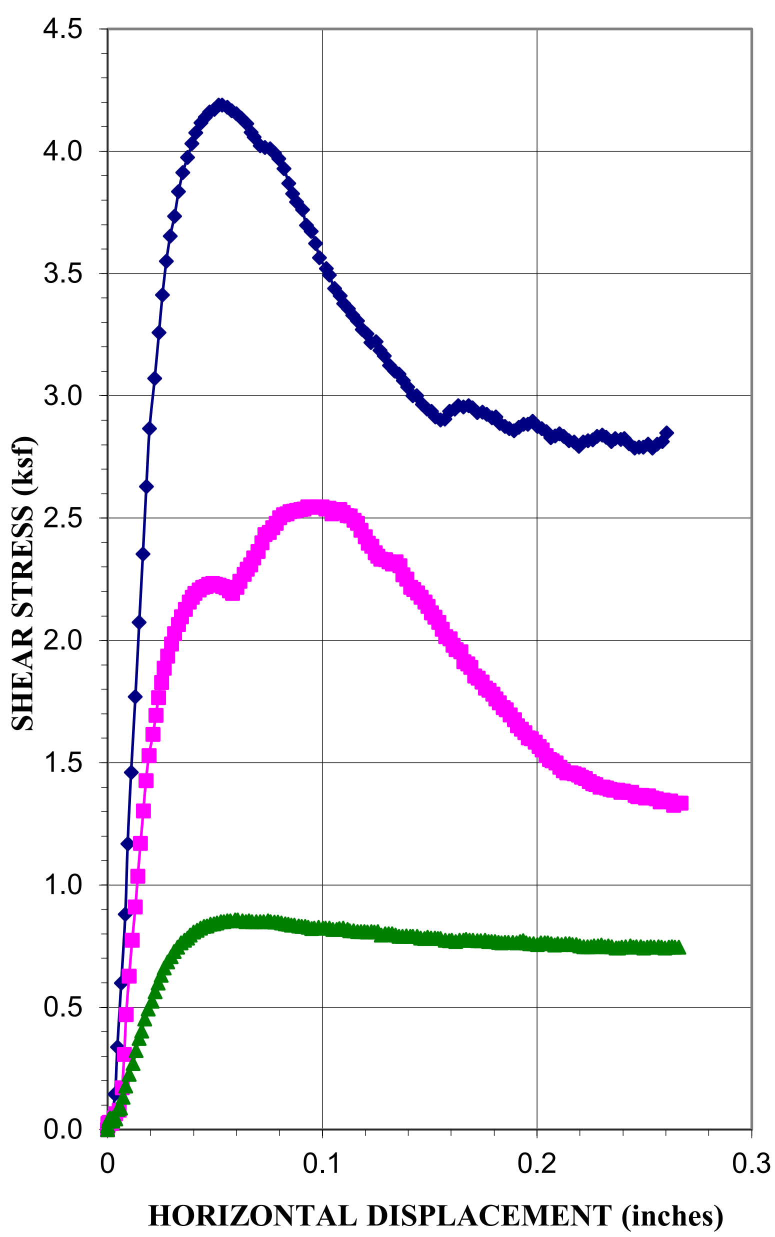
DIRECT SHEAR TEST





Source:	MW-TP-02 at 8 feet
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	1.006	1.018	1.093
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	101.5	100.2	93.6
Dry Density After, pcf	103.3	102.0	95.2
Moisture % Before	8.4	11.2	8.6
Moisture % After	21.0	21.1	23.0
Saturation, % Before	35.1	45.7	29.8
Saturation, % After	92.6	90.0	82.7
Normal Load, ksf	4.0	2.0	1.0
Shear Stress, ksf	4.19	2.55	0.86
Strain Rate	0.00333 IN/MIN		

Sample Properties	
Cohesion, psf	35
Friction Angle, ϕ	47
Liquid Limit, %	NP
Plasticity Index, %	NP
Percent Gravel	50
Percent Sand	46
Percent Passing No. 200 sieve	3.4
Classification	GP

PROJECT: Micron Property

PROJECT NO.: **589-100**

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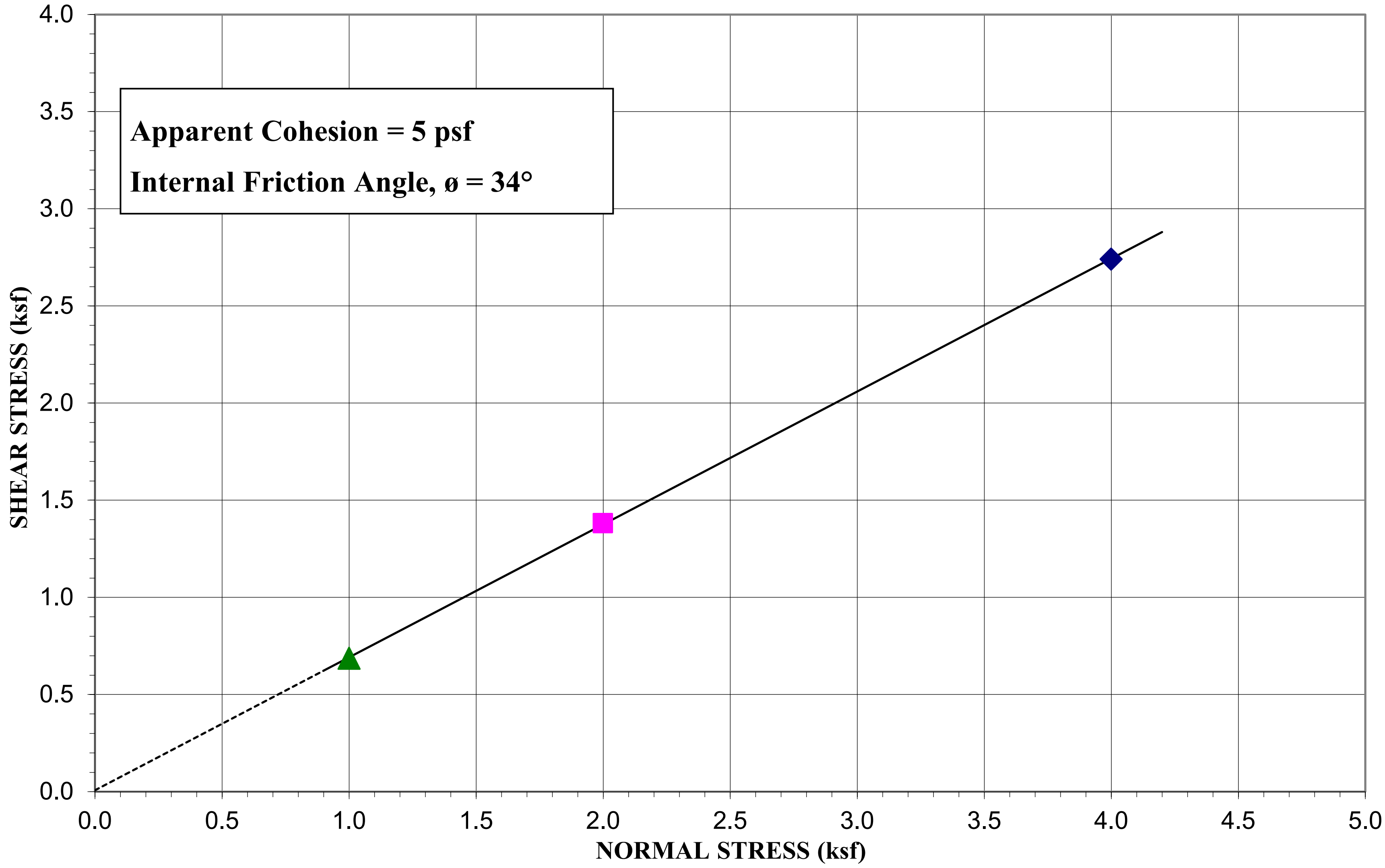
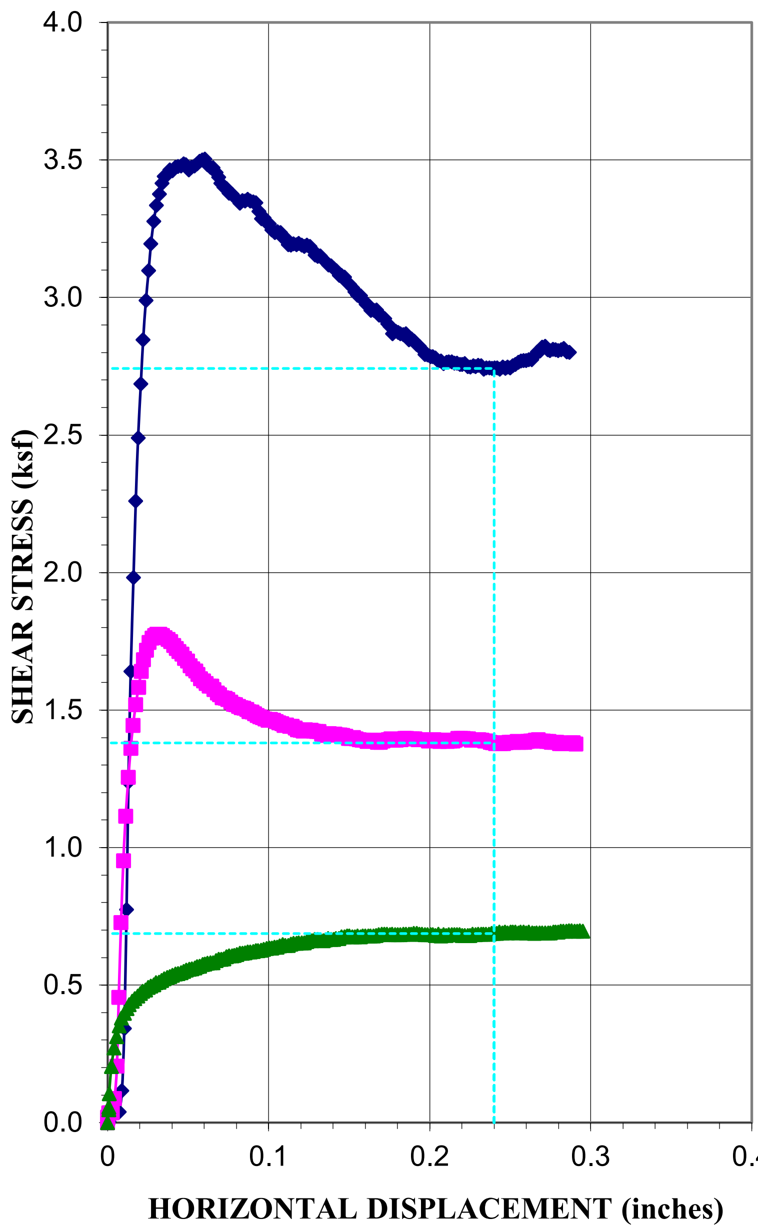
Plate C-18

DIRECT SHEAR TEST





Sample Location:	MW-TP-11 at 6 feet
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	0.829	0.835	0.949
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	118.8	118.0	103.1
Dry Density After, pcf	121.2	120.3	105.1
Moisture % Before	9.9	13.1	10.8
Moisture % After	15.7	16.5	19.2
Saturation, % Before	67.2	86.2	47.3
Saturation, % After	114.2	116.7	89.0
Normal Load, ksf	4.0	2.0	1.0
Shear Stress, ksf	2.74	1.38	0.69
Strain Rate	0.003333 IN/MIN		

Sample Properties	
Cohesion, psf	5
Friction Angle, ϕ	34
Liquid Limit, %	NP
Plasticity Index, %	NP
Percent Gravel	29.8
Percent Sand	48.7
Percent Passing No. 200 sieve	21.6
Classification	SM

PROJECT: Micron Property

PROJECT NO.: **589-100**

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Plate C-19

APPENDIX D

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:
- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:
- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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e-mail: info@geoprofessional.org www.geoprofessional.org

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