PRELIMINARY GEOTECHNICAL EXPLORATION REPORT
STEPHENS FARM SINGLE FAMILY RESIDENTIAL DEVELOPMENT
WEST 10TH STREET AND 83RD AVENUE
GREELEY, COLORADO
EEC PROJECT NO. 1162110

Prepared for:

Stephens Farm Investments, LLC
7251 West 20th Street, L-200
Greeley, Colorado 80634

Attn: Mr. Andrew Gerk (Andrew@journeyhomes.com)

Prepared by:

Earth Engineering Consultants, LLC
4396 Greenfield Drive
Windsor, Colorado 80550

December 1, 2016

EARTH ENGINEERING CONSULTANTS, LLC

Stephens Farm Investments, LLC
7251 West 20th Street, L-200
Greeley, Colorado 80634

Attn: Mr. Andrew Gerk (Andrew@journeyhomes.com)

Re: Preliminary Geotechnical Exploration Report
Stephens Farm Single Family Residential Development
West 10th Street and 83rd Avenue
Greeley, Colorado
EEC Project No. 1162110

Mr. Gerk:

Enclosed, herewith, are the results of the preliminary geotechnical subsurface exploration completed by Earth Engineering Consultants, LLC personnel for the referenced project. For this exploration, a total of twenty-two (22) preliminary soil borings were drilled at the approximate locations as indicated on the enclosed *Boring Location Diagram*. The borings were extended to depths of approximately 25 to 30 feet below existing site grades. Individual boring logs, including groundwater observations, depth to bedrock, and results of laboratory testing, are included as a part of the attached report. This exploration was completed in general accordance with our proposal dated October 25, 2016.

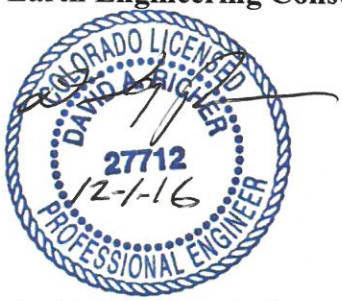
In summary, the subsurface soils encountered in the preliminary test borings generally consisted of a thin layer of topsoil and/or vegetation with underlying silty/clayey sand, silty sand, and sandy lean clay with zones of sand and gravel at some locations extending to depths of approximately 3½ to 24 feet below existing site grades. Sandstone/siltstone bedrock with occasional claystone lenses was encountered beneath the overburden soils and extended to the depths explored, approximately 25 to 30 feet. The overburden soils were generally medium stiff/medium dense, compressible and elevated in moisture contents approaching the groundwater levels. The site soils exhibited low swell potential, and the underlying bedrock exhibited low to moderate swell potential at current moisture and density conditions. Groundwater was observed in the preliminary test borings at depths ranging from approximately 8 to 22 feet below existing site grades.

Preliminary geotechnical recommendations concerning design and construction of foundation systems and support of floor slabs and pavements are provided within the text of the enclosed

report. A final, more thorough subsurface exploration should be performed for each residential lot after final grades and building footprint/layouts, etc. have been determined. A final pavement design will also be required after developing approximate top-of-grade in the roadway areas and installation of in-street water and sewer alignments.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the enclosed report, or if we can be of further service to you in any other way, please do not hesitate to contact us.

Very truly yours,
Earth Engineering Consultants, LLC



David A. Richer, P.E.
Senior Geotechnical Engineer

Reviewed by: Lester L. Litton, P.E
Principal Engineer

DAR/LLL/dla

PRELIMINARY GEOTECHNICAL EXPLORATION REPORT
STEPHENS FARM SINGLE FAMILY RESIDENTIAL DEVELOPMENT
WEST 10TH STREET AND 83RD AVENUE
GREELEY, COLORADO
EEC PROJECT NO. 1162110

December 1, 2016

INTRODUCTION

The preliminary geotechnical subsurface exploration for the proposed residential development at the Stephens Farm property located south of West 10th Street and west of 83rd Avenue in Greeley Colorado, has been completed. As a part of this exploration, twenty-two (22) soil borings were drilled to depths of approximately 25 to 30 feet below existing site grades at the referenced property to obtain information on existing subsurface conditions. Individual boring logs and a site diagram indicating the approximate boring locations are included with this report. This exploration was completed in general accordance with our Subsurface Exploration proposal for the site dated October 25, 2016.

The Stephens Farm property evaluated as a part of this exploration includes approximately 120 acres to be developed for single-family residential lots, including utility and interior roadway infrastructure. Foundation loads for the proposed residential structures are anticipated to be light with continuous wall loads less than 2.5 kips per lineal foot and individual column loads less than 50 kips. Floor loads are expected to be less than 100 psf. Those structures are expected to include below grade construction such as crawl spaces, garden-level and/or full-depth basements where possible. We anticipate maximum cuts and fills on the order of 5 feet (+/-) will be completed to develop the site grades.

The purpose of this report is to describe the subsurface conditions encountered in the preliminary borings, analyze and evaluate the test data and provide preliminary geotechnical recommendations concerning the proposed site development.

EXPLORATION AND TESTING PROCEDURES

The borings were located in the field by Earth Engineering Consultants, LLC (EEC) personnel by pacing and estimating locations relative to observable site features. The approximate boring locations are indicated on the attached boring location diagram. Those locations should be

considered accurate only to the degree implied by the methods used to make the field measurements. Photographs of the site taken at the time of drilling are provided with this report.

The borings were performed using a truck-mounted CME-55 drill rig equipped with a hydraulic head employed in drilling and sampling operations. The boreholes were advanced using 4-inch nominal diameter continuous flight augers. Samples of the subsurface materials encountered were obtained using split-barrel and California barrel sampling procedures in general accordance with ASTM Specifications D1586 and D3550, respectively.

In the split-barrel and California barrel sampling procedures, standard sampling spoons are driven into the ground by means of a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the samplers is recorded and is used to estimate the in-situ relative density of cohesionless soils and, to a lesser degree of accuracy, the consistency of cohesive soils and hardness of weathered bedrock. In the California barrel sampling procedure, relatively intact samples are obtained in removable brass liners. All samples obtained in the field were sealed and returned to our laboratory for further examination, classification and testing.

Laboratory moisture content tests were performed on each of the recovered samples. In addition, selected samples were tested for fines content and plasticity by washed sieve analysis and Atterberg limits tests. Swell/consolidation tests were completed on selected samples to evaluate the subgrade materials' tendency to change volume with variation in moisture content and load. Soluble sulfate tests were completed on selected samples. Results of the outlined tests are indicated on the attached boring logs and summary sheets.

As a part of the testing program, all samples were examined in the laboratory and classified in general accordance with the attached General Notes and the Unified Soil Classification System, based on the sample's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of that classification system is included with this report. Classification of the bedrock was based on visual and tactual observation of disturbed samples and auger cuttings. Coring and/or petrographic analysis may reveal other rock types.

SITE AND SUBSURFACE CONDITIONS

The Stephens Farm property is located south of West 10th Street and west of 83rd Avenue in Greeley, Colorado. The project site is generally undeveloped, a majority of which is currently agriculture fields. Drainage swales run diagonally northeast to southwest across portions of the property to a drainage along the south property boundary. Surface water drainage across the site is generally to the south and east. The estimated relief across the site on the order of 50 to 60 feet.

An EEC field engineer was on-site during drilling to direct the drilling activities and evaluate the subsurface materials encountered. Field descriptions of the materials encountered were based on visual and tactual observation of disturbed samples and auger cuttings. The boring logs included with this report may contain modifications to the field logs based on results of laboratory testing and engineering evaluation. Based on results of field and laboratory evaluation, subsurface conditions can be generalized as follows.

The near surface soils encountered in the borings consisted mostly of brown silty/clayey sand with silty/sandy lean clay observed at varying depths and locations. Zones of sand and gravel were observed with depth in a portion of the southeast borings. The mixed silty sand/sandy clay soils and/or sand and gravel were underlain by sandstone/siltstone bedrock with occasional claystone encountered at approximate depths of 3½ to 24 feet below existing grades. The bedrock was generally encountered at shallower depths in the northwest portion of the site and deeper to the southeast.

The near surface soils generally showed low swell potential at current moisture and density conditions. The sandstone/siltstone bedrock was moderately hard to hard with increased depth and exhibited low to moderate swell potential at current moisture and density conditions.

The stratification boundaries indicated on the boring logs represent the approximate locations of changes in soil and bedrock types; in-situ, the transition of materials may be gradual and indistinct.

GROUNDWATER OBSERVATIONS

Observations were made while drilling and after the completion of drilling to detect the presence and level of groundwater. Groundwater was observed in the borings at depths ranging from approximately 8 feet to 23 feet below existing site grades either while drilling or shortly after drilling. The borings were backfilled after drilling so that longer term observations were not completed. Depth to groundwater measurements are indicated in the upper right hand corner of the enclosed boring logs. Groundwater measurements provided with this report are indicative of groundwater levels at the locations and at the time the borings/groundwater measurements were completed.

Fluctuations in groundwater levels can occur over time depending on variations in hydrologic conditions, irrigation demands on and/or adjacent to the property, and other conditions not apparent at the time of this report. Monitoring in the cased piezometers will be required to more accurately evaluate groundwater levels and fluctuations in the groundwater levels over time.

Perched and/or trapped water may be encountered in more permeable zones in the subgrade soils at times throughout the year. Perched water is commonly encountered in soils immediately overlying less permeable bedrock materials. Fluctuations in ground water levels and in the location and amount of perched water may occur over time depending on variations in hydrologic conditions, irrigation activities on surrounding properties and other conditions not apparent at the time of this report.

ANALYSIS AND RECOMMENDATIONS

Swell/Consolidation Test Results

As a part of our laboratory testing, we conducted nineteen (19) swell/consolidation tests on samples of the overburden soils and underlying sandstone/siltstone bedrock. The swell index values for the samples analyzed revealed low swell characteristics in the overburden soils and low to moderate swell in the underlying bedrock. Results of the laboratory swell tests are indicated on the attached boring logs and on the enclosed summary sheets. It should be noted that interbedded, moderately to highly expansive claystone lenses may exist within the bedrock formation.

The Colorado Association of Geotechnical Engineers (CAGE) uses the following information to provide uniformity in terminology between geotechnical engineers to provide a relative correlation risk performance to measured swell. "The representative percent swell values are not necessarily measured values; rather, they are a judgment of the swell of the soil and/or bedrock profile likely to influence slab performance." Geotechnical engineers use this information to also evaluate the swell potential risks for foundation performance based on the risk categories.

TABLE I: Recommended Representative Swell Potential Descriptions and Corresponding Slab Performance Risk Categories

Slab Performance Risk Category	Representative Percent Swell (500 psf Surcharge)	Representative Percent Swell (1000 psf Surcharge)
Low	0 to < 3	0 < 2
Moderate	3 to < 5	2 to < 4
High	5 to < 8	4 to < 6
Very High	> 8	> 6

General Considerations

General guidelines are provided below for the site subgrade preparation. However, it should be noted that compaction and moisture requirements vary between home builders and, consequently, between geotechnical engineering consultants. If the development lots will be marketed to a target group of tract builders, fill placement criteria should be obtained from those builders and/or their engineers prior to beginning earthwork activities on the site. Representatives from those entities should verify that the fill is being placed consistent with the home builders' guide lines.

The near surface soils at the site generally exhibited low potential to swell; however, were relatively soft and saturated at some locations. The bedrock showed low to moderate swell potential; however, claystone zones in the bedrock may show higher swells. Bedrock was observed at depths of approximately 3½ to 13½ feet in the northwest area of the site and approximately 14½ to 24 feet in the southeast area. If the bedrock used to support structures were to become wetted subsequent to construction of overlying improvements, heaving caused by swelling of the bedrock could result in total and differential movement of site improvements. To reduce the potential movement of foundations, floor slabs and pavements, overexcavation and replacement may be needed at some locations as determined by the individual/lot-specific home builder.

Generally, an overexcavation process involves removing a zone of expansive or compressible materials beneath site improvements and replacing them with low to non-expansive engineered fill material or structural fill. An overexcavation and replacement process will not eliminate the possibility of foundation and/or slab heave; but movements should be reduced and tend to be more uniform.

Groundwater was encountered at depths as shallow as approximately 8 feet to a maximum depth of approximately 24 feet below existing site grade. If lower level construction or full-depth basements are being considered for the site, we would suggest that the lower level subgrade(s) be placed a minimum of 4 feet above the maximum anticipated rise in groundwater levels, or a combination exterior and interior perimeter drainage system(s) be installed. Also, consideration could be given to designing and installing an area underdrain system to lower the groundwater levels provided a gravity discharge point can be established. If a gravity outlet/system cannot be designed another consideration would be to design and install a mechanical sump pump system to discharge the collected groundwater within the underdrain system. Consideration could also be given to elevating/raising the site grades to establish the minimum required 4-foot separation to the maximum anticipated rise in groundwater.

Site Preparation

All existing vegetation and topsoil should be removed from beneath site fills, roadways or building subgrade areas. Stripping depths should be expected to vary, depending, in part, on past agricultural and/or site usage activities. Any soft native soils observed following overexcavation should be removed from improvement, backfill and fill areas. In addition, any existing fill materials without documentation of controlled fill placement would generally require removal from improvement and/or new fill areas. In areas where existing improvements are in-place, those improvements and any associated fill soils should be completely removed prior to placing overlying improvements. Over excavation of bedrock subgrade materials could be required in individual building areas; the specific extent of overexcavation may vary with different home builders. The extent and depth of material removal and replacement may also be significantly impacted by site grading.

After stripping and completing all cuts, including the overexcavation depths required by the lot-specific home builders, and prior to placement of any fill, building improvements or pavements, the exposed soils would likely be scarified to a minimum depth of 9 inches, adjusted in moisture content and compacted to at least 95% of the material's maximum dry density as determined in accordance with ASTM Specification D698, the standard Proctor procedure. The moisture content of the scarified materials would be adjusted, potentially, to be within a range of ±2% of standard Proctor optimum moisture, at the time of compaction. In areas of shallow groundwater, alternative means may be required to develop stable subgrades for fill placement, depending part on proposed fill depths.

Fill materials used to replace any over excavated materials and generally establish grades in the building areas and pavement/flatwork areas, after the initial zone has been prepared/stabilized, should consist of approved on-site clayey/silty sand or sandy lean clay or approved similar low volume change import material which is free from organic matter and debris. Site overlot fill soils should be placed in maximum 9-inch loose lifts, and be moisture conditioned and compacted as recommended for the scarified soils. Alternative moisture contents may be required by individual home builders.

Specific explorations should be completed for each building/individual residential lot to develop recommendations specific to the proposed structure and owner/builder and for specific pavement sections. A greater or lesser degree of compaction could be specified for specific individual structures along with alternative moisture requirements. The preliminary recommendations provided in this report are, by necessity, general in nature and would be superseded by site specific explorations/recommendations.

Care should be taken after preparation of the subgrades to avoid disturbing the subgrade materials. Positive drainage should be developed away from structures and across and away from pavement edges to avoid wetting of subgrade materials. Subgrade materials allowed to become wetted subsequent to construction of the residences and/or pavements can result in unacceptable performance of those improvements.

Foundation Systems – General Considerations

The soft/wet subsoils will require particular attention in the design and construction to reduce the amount of post-construction movement due to in-situ soft/compressible characteristics. Groundwater was also encountered at relatively shallow depths across a portion of the site which will require special attention in the overall design and construction of the project. In areas of shallow bedrock, care will be needed to address the potential for moderately swelling materials in the subgrade.

The following foundation systems were preliminarily evaluated for use on the site; however final subsurface explorations should be performed after building footprints and elevations have been better defined and actual design loads determined:

- Conventional type spread footings bearing on native subsoils or engineered controlled fill material, and
- Grade beams and straight shaft piers/caissons drilled into the bedrock.

Preliminary Spread Footing Foundation Recommendations

We anticipate use of conventional footing foundations could be considered for at least a portion of the lightly loaded structures at this site. We expect footing foundations would be supported either on the native soils or on newly placed and compacted fills. At some locations, footings may be supported directly on low expansive bedrock. Soft zones were observed in the lean clay soils so that care will be necessary to see that foundations are not supported directly on soft materials. Mitigation for soft subgrade soils should be expected over a portion of the site especially if basements are considered. Additionally, a separation between the groundwater and the building footings should be maintained

In areas where the cohesive subsoils exhibited elevated moisture contents near and/or encroaching on the groundwater levels we would expect these soft zones would require particular attention/ground modification procedures to develop increased support capacity characteristics. We expect enhancing/stiffening of the subgrade/bearing soils could be accomplished by incorporating into the soft/compressible subsoils a layer of granular material, such as a 3-inch minus pit run and/or

recycled concrete or equivalent material, embedded into the soft soils, prior to placement of additional fill material or operating heavy earth-moving equipment as an initial means and method.

For design of footing foundations bearing on approved native subsoils, (i.e., the native subsoils in which soft/compressible conditions are not encountered), or on properly placed and compacted fill materials as outlined above, maximum net allowable total load soil bearing pressures on the order of 1,500 to 2,500 psf could be considered. Higher values could likely be used if footings are supported on low volume change bedrock. Footing foundations should maintain separation above maximum anticipated rise in groundwater elevation of at least 4 feet. The net bearing pressure refers to the pressure at foundation bearing level in excess of the minimum surrounding overburden pressure. Total load would include full dead and live loads.

Exterior foundations and foundations in unheated areas are typically located at least 30 inches below adjacent exterior grade to provide frost protection. Formed continuous footings would have minimum widths of 12 to 16 inches and isolated column foundations would have a minimum width of 24 to 30 inches. Trenched foundations or grade beam foundations could probably be used in the near surface soils. If used, trenched foundations would have a minimum width of 12 inches and formed continuous foundations a minimum width of 8 inches.

Preliminary Drilled Pier Foundations

Depending upon the specific location, the depth to the bedrock, the amount of site grading and/or foundation loads expected, an alternative foundation system would be to support selected structures on a grade beam and straight shaft drilled pier/caisson foundation system. Bedrock was observed across the site at approximate depths of 3½ to 24 feet below existing site grades. Drilled piers would develop support capacity through end bearing and skin friction in the bedrock underlying the site. The design parameters for the drilled pier foundations would need to be developed in the specific structure areas due to the variable nature of the subsurface materials observed across the site.

Drilled piers typically extend into the weathered bedrock on the order of approximately 10 to 15 feet or to a minimum length of 25 feet or greater, whichever results in the longer drilled pier. For design of drilled pier foundations bearing in the moderately hard weathered sandstone/siltstone bedrock, we anticipate total load end bearing pressures on the order of approximately 25,000 psf could be used

along with a skin friction value of 2,500 psf. Minimum dead load pressures may be required on drilled pier foundations.

We expect temporary casing may be required to adequately/properly drill and clean piers prior to concrete placement. Groundwater should be removed from each pier hole prior to concrete placement. Pier concrete should be placed immediately after completion of drilling and cleaning.

If pier concrete cannot be placed in dry conditions, a tremie could be used for concrete placement. Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes. Pier concrete with slump in the range of 5 to 8 inches is recommended. Casing used for pier construction should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent infiltration of soil/water or the creation of voids in pier concrete.

Preliminary Floor Slab/Exterior Flatwork Subgrades

Floor slab subgrades would generally be prepared as outlined in the *Site Preparation* section of this report. If the subgrades become dry and desiccated prior to floor slab construction, it may be necessary to rework the subgrades prior to floor slab placement.

Fill soils required to develop the floor slab subgrades should consist of approved, low-volume change materials which are free from organic matter and debris. Those fill materials should be placed as outlined in the section *Site Preparation*.

Preliminary Basement Design and Construction

Groundwater was encountered across the site within the preliminary soil borings at approximate depths of 8 feet to 22 feet below existing site grades. If lower level construction for either garden-level or full-depth basements is being considered for the site, we would suggest that the lower level subgrade(s) be placed a minimum of 4-feet above maximum anticipated rise in groundwater levels, or a combination exterior and interior perimeter drainage system(s) be installed.

Consideration could be given to designing and installing an area underdrain system to lower the groundwater levels provided a gravity discharge point can be established. If a gravity outlet/system cannot be designed another consideration would be to design and install a mechanical sump pump

system to discharge the collected groundwater within the underdrain system. It may be possible to elevate/raise the site grades to establish the minimum required four (4) foot separation to the maximum anticipated rise in groundwater. EEC is available to assist in the underdrain design if requested.

Lateral Earth Pressures

Site retaining structures and/or elements of the residential structures constructed below grade may be subject to lateral earth pressures. Passive lateral earth pressures may help resist the driving forces for retaining walls or other similar site structures. Active lateral earth pressures could be used for design of structures where some movement of the structure is anticipated, such as retaining walls. The total deflection of structures for design with active earth pressure is estimated to be on the order of one half of one percent of the height of the down slope side of the structure. We recommend at-rest pressures be used for design of structures where rotation of the walls is restrained, such as basement walls. Passive pressures and friction between the footing and bearing soils could be used for design of resistance to movement of retaining walls.

Typical coefficient values for backfill with anticipated types of soils for calculation of active, at rest and passive earth pressures are provided in the table below. These preliminary values should be adjusted for the specific materials designation for use on this site. Equivalent fluid pressure is equal to the coefficient times the appropriate soil unit weight. Those coefficient values are based on horizontal backfill with backfill soils consisting of essentially on-site cohesive subsoils or approved imported granular materials with friction angles of 25 and 35 degrees respectively. For the at-rest and active earth pressures, slopes down and away from the structure would result in reduced driving forces with slopes up and away from the structures resulting in greater forces on the walls. The passive resistance would be reduced with slopes away from the wall. The top 30 inches of soil on the passive resistance side of walls could be used as a surcharge load; however, should not be used as a part of the passive resistance value. Frictional resistance is equal to the tangent of the friction angle times the normal force.

Table II: Lateral Earth Pressure Coefficients		
Soil Type	**On-Site Low Plasticity Cohesive Subsoils**	**Imported Granular Structural Fill Poorly Graded Sand (SM/SP)**
Wet Unit Weight	115	135
Saturated Unit Weight	135	140
Friction Angle (ϕ) – (assumed)	25°	35°
Active Pressure Coefficient	0.40	0.27
At-rest Pressure Coefficient	0.58	0.43
Passive Pressure Coefficient	2.46	3.70

Surcharge loads or point loads placed in the backfill can also create additional loads on below grade walls. Those situations should be designed on an individual basis. The outlined values do not include factors of safety nor allowances for hydrostatic loads and are based on assumed friction angles, which should be verified after potential material sources have been identified. Care should be taken to develop appropriate drainage systems behind below grade walls to eliminate potential for hydrostatic loads developing on the walls. Those systems would likely include perimeter drain systems extending to sump areas or free outfall where reverse flow cannot occur into the system. Where necessary, appropriate hydrostatic load values should be used for design.

Preliminary Pavement Subgrades

Subgrades for site pavements should generally be prepared as outlined in the section titled *Site Preparation*. Depending on site grading, additional recommendation may be appropriate for developing subgrades in exposed bedrock areas and/or in subgrade areas near the observed groundwater levels. After completion of the pavement subgrades, care should be taken to prevent disturbance of those materials prior to placement of the overlying pavements. Soils which are disturbed by construction activities should be reworked in-place or, if necessary, removed and replaced prior to placement of overlying fill or pavements.

Depending on final site grading and/or weather conditions at the time of pavement construction, stabilization of a portion of the site pavement subgrades may be required to develop a paving platform. The site clayey and/or silty soils could be subject to instability at higher moisture contents. Stabilization could also be considered as part of the pavement design, although prior to finalizing those sections, a stabilization mix design would be required.

Preliminary Site Pavements

Pavement sections are based on traffic volumes and subgrade strength characteristics. The site soils have low remolded strength. An R-value of 10 would be appropriate for design of the pavements supported on the subgrade soils. Suggested preliminary pavement sections for the local residential and minor collector roadways are provided in the table below. Thicker pavement sections may be required for roadways classified as major collectors. A final pavement design thickness evaluation will be determined when a pavement design exploration is completed. The projected traffic may vary from the traffic assumed from the roadway classification based on a site specific traffic study.

TABLE III – PRELIMINARY PAVEMENT SECTIONS

	Local Residential Roadways	**Minor Collector Roadways**
EDLA – assume local residential roadways	10	25
Reliability	75%	85%
Resilient Modulus	3562	3562
PSI Loss – (Initial 4.5, Terminal 2.0 and 2.3 respectively)	2.5	2.2
Design Structure Number	2.60	3.20
Composite Section without Fly Ash – Alternative A		
Hot Mix Asphalt (HMA) Grading S (75) PG 58-28	4″	5-1/2″
Aggregate Base Course ABC – CDOT Class 5 or 6	8″	8″
Design Structure Number	(2.64)	(3.30)
Composite Section with Fly Ash – Alternative B		
Hot Mix Asphalt (HMA) Grading S (75) PG 58-28	4″	4″
Aggregate Base Course ABC – CDOT Class 5 or 6	6 ″	8″
Fly Ash Treated Subgrade	12″	12″
Design Structure Number	(3.02)	(3.24)
PCC (Non-reinforced) – placed on an approved subgrade	5-1/2″	7″

Asphalt surfacing should consist of grading S-75 or SX-75 hot bituminous pavement with PG 64-22 or PG 58-28 binder in accordance with LCUASS requirements. Aggregate base should be consistent with CDOT requirements for Class 5 or Class 6 aggregate base. A suggested specification for stabilization of the subgrades with class C fly ash is included with this report.

Underground Utility Systems

All piping should be adequately bedded for proper load distribution. It is suggested that clean, graded gravel compacted to 70 percent of Relative Density ASTM D4253 be used as bedding. Where utilities are excavated below groundwater, temporary dewatering will be required during excavation, pipe placement and backfilling operations for proper construction. Utility trenches should be excavated on safe and stable slopes in accordance with OSHA regulations as further discussed herein. Backfill should consist of the on-site soils or approved imported materials. The pipe backfill should be compacted to a minimum of 95 percent of Standard Proctor Density ASTM D698.

Other Considerations and Recommendations

Groundwater was observed at depths of approximately 8 feet to 22 feet below present site grades. Excavations extending to the wetter soils could create difficulties for backfilling of the sewer trenches with drying of the subgrade soils required to use those materials as backfill. In general, we believe the subgrade soils could be used as overlot fill and backfill soils although care will be necessary to maintain sufficient moisture to reduce potential for post-construction movement.

Excavations into the on-site soils will encounter a variety of conditions. Excavations into the clays can be expected to stand on relatively steep temporary slopes during construction; however, caving soils may also be encountered especially in close proximity to the groundwater table. Groundwater seepage should also be anticipated for utility excavations. Pumping from sumps may be utilized to control water within the excavations. The individual contractor(s) should be made responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards.

Positive drainage should be developed away from the site structure(s) with a minimum slope of 1 inch per foot for the first 10 feet away from the building in landscaped areas. Flatter slopes could be used in hardscape areas provided positive drainage is maintained. Potential settlement adjacent to the structure should be considered when developing positive drainage.

Water Soluble Sulfates (SO_4)

The results of the soluble sulfate tests completed for this project have indicated low potential for sulfate attack on Portland cement concrete. ASTM Type I Portland cement may be suitable for concrete on and below site grade within the overburden soils. However, if there is no, or minimal cost differential, use of ASTM Type I/II Portland cement is recommended for additional sulfate resistance of construction concrete. Foundation concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

GENERAL COMMENTS

The analysis and recommendations presented in this report are based upon the data obtained from the soil borings performed at the indicated locations and from any other information discussed in this report. This report does not reflect any variations which may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to re-evaluate the recommendations of this report. Site specific explorations will be necessary for the proposed site buildings; we suggest those explorations be completed by individual builders, if possible, prior to completing any site work.

It is recommended that the geotechnical engineer be retained to review the plans and specifications so that comments can be made regarding the interpretation and implementation of our geotechnical recommendations in the design and specifications. It is further recommended that the geotechnical engineer be retained for testing and observations during the infrastructure construction phases to help determine that the design requirements are fulfilled. The builders should direct the testing of individual lot development.

This report has been prepared for the exclusive use of Stephens Farm Investments, LLC for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranty, express or implied, is made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer.

DRILLING AND EXPLORATION

DRILLING & SAMPLING SYMBOLS:

SS: Split Spoon - 13/8" I.D., 2" O.D., unless otherwise noted
ST: Thin-Walled Tube - 2" O.D., unless otherwise noted
R: Ring Barrel Sampler - 2.42" I.D., 3" O.D. unless otherwise noted
PA: Power Auger
HA: Hand Auger
DB: Diamond Bit = 4", N, B
AS: Auger Sample
HS: Hollow Stem Auger
PS: Piston Sample
WS: Wash Sample
FT: Fish Tail Bit
RB: Rock Bit
BS: Bulk Sample
PM: Pressure Meter
WB: Wash Bore

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. split spoon, except where noted.

WATER LEVEL MEASUREMENT SYMBOLS:

WL : Water Level
WCI: Wet Cave in
DCI: Dry Cave in
AB : After Boring
WS : While Sampling
WD : While Drilling
BCR: Before Casing Removal
ACR: After Casting Removal

Water levels indicated on the boring logs are the levels measured in the borings at the time indicated. In pervious soils, the indicated levels may reflect the location of ground water. In low permeability soils, the accurate determination of ground water levels is not possible with only short term observations.

DESCRIPTIVE SOIL CLASSIFICATION

Soil Classification is based on the Unified Soil Classification system and the ASTM Designations D-2488. Coarse Grained Soils have move than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as : clays, if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse grained soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their consistency. Example: Lean clay with sand, trace gravel, stiff (CL); silty sand, trace gravel, medium dense (SM).

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Consistency
< 500	Very Soft
500 - 1,000	Soft
1,001 - 2,000	Medium
2,001 - 4,000	Stiff
4,001 - 8,000	Very Stiff
8,001 - 16,000	Very Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS:

N-Blows/ft	Relative Density
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense
80 +	Extremely Dense

PHYSICAL PROPERTIES OF BEDROCK

DEGREE OF WEATHERING:

Slight	Slight decomposition of parent material on joints. May be color change.
Moderate	Some decomposition and color change throughout.
High	Rock highly decomposed, may be extremely broken.

HARDNESS AND DEGREE OF CEMENTATION:

Limestone and Dolomite:

Hard	Difficult to scratch with knife.
Moderately Hard	Can be scratched easily with knife.
Hard	Cannot be scratched with fingernail.
Soft	Can be scratched with fingernail.

Shale, Siltstone and Claystone:

Hard	Can be scratched easily with knife, cannot be scratched with fingernail.
Moderately Hard	Can be scratched with fingernail.
Soft	Can be easily dented but not molded with fingers.

Sandstone and Conglomerate:

Well Cemented	Capable of scratching a knife blade.
Cemented	Can be scratched with knife.
Poorly Cemented	Can be broken apart easily with fingers.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests					Soil Classification: Group Symbol	Soil Classification: Group Name
Coarse - Grained Soils more than 50% retained on No. 200 sieve	Gravels more than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines	Cu≥4 and 1<Cc≤3[E]		GW	Well-graded gravel [F]
			Cu<4 and/or 1>Cc>3[E]		GP	Poorly-graded gravel [F]
		Gravels with Fines more than 12% fines	Fines classify as ML or MH		GM	Silty gravel [G,H]
			Fines Classify as CL or CH		GC	Clayey Gravel [F,G,H]
	Sands 50% or more coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines	Cu≥6 and 1<Cc≤3[E]		SW	Well-graded sand [I]
			Cu<6 and/or 1>Cc>3[E]		SP	Poorly-graded sand [I]
		Sands with Fines more than 12% fines	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid Limit less than 50	inorganic	PI>7 and plots on or above "A" Line		CL	Lean clay [K,L,M]
			PI<4 or plots below "A" Line		ML	Silt [K,L,M]
		organic	Liquid Limit - oven dried / Liquid Limit - not dried	<0.75	OL	Organic clay [K,L,M,N] / Organic silt [K,L,M,O]
	Silts and Clays Liquid Limit 50 or more	inorganic	PI plots on or above "A" Line		CH	Fat clay [K,L,M]
			PI plots below "A" Line		MH	Elastic Silt [K,L,M]
		organic	Liquid Limit - oven dried / Liquid Limit - not dried	<0.75	OH	Organic clay [K,L,M,P] / Organic silt [K,L,M,O]
Highly organic soils		Primarily organic matter, dark in color, and organic odor			PT	Peat

[A]Based on the material passing the 3-in. (75-mm) sieve

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines required dual symbols:
GW-GM well graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly-graded gravel with silt
GP-GC poorly-graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E]$Cu=D_{60}/D_{10}$ $Cc=\frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains ≥15% sand, add "with sand" to

[G]If fines classify as CL-ML, use dual symbol GC-CM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name

[I]If soil contains >15% gravel, add "with gravel" to group name

[J]If Atterberg limits plots shaded area, soil is a CL-ML, Silty clay

[K]if soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L]If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

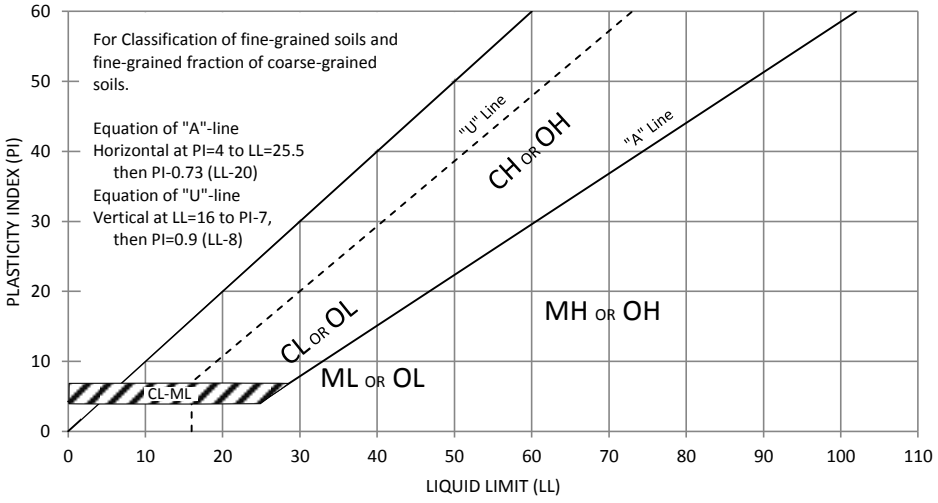
[M]If soil contains ≥30% plus No. 200 predominantly gravel, add "gravelly" to group name.

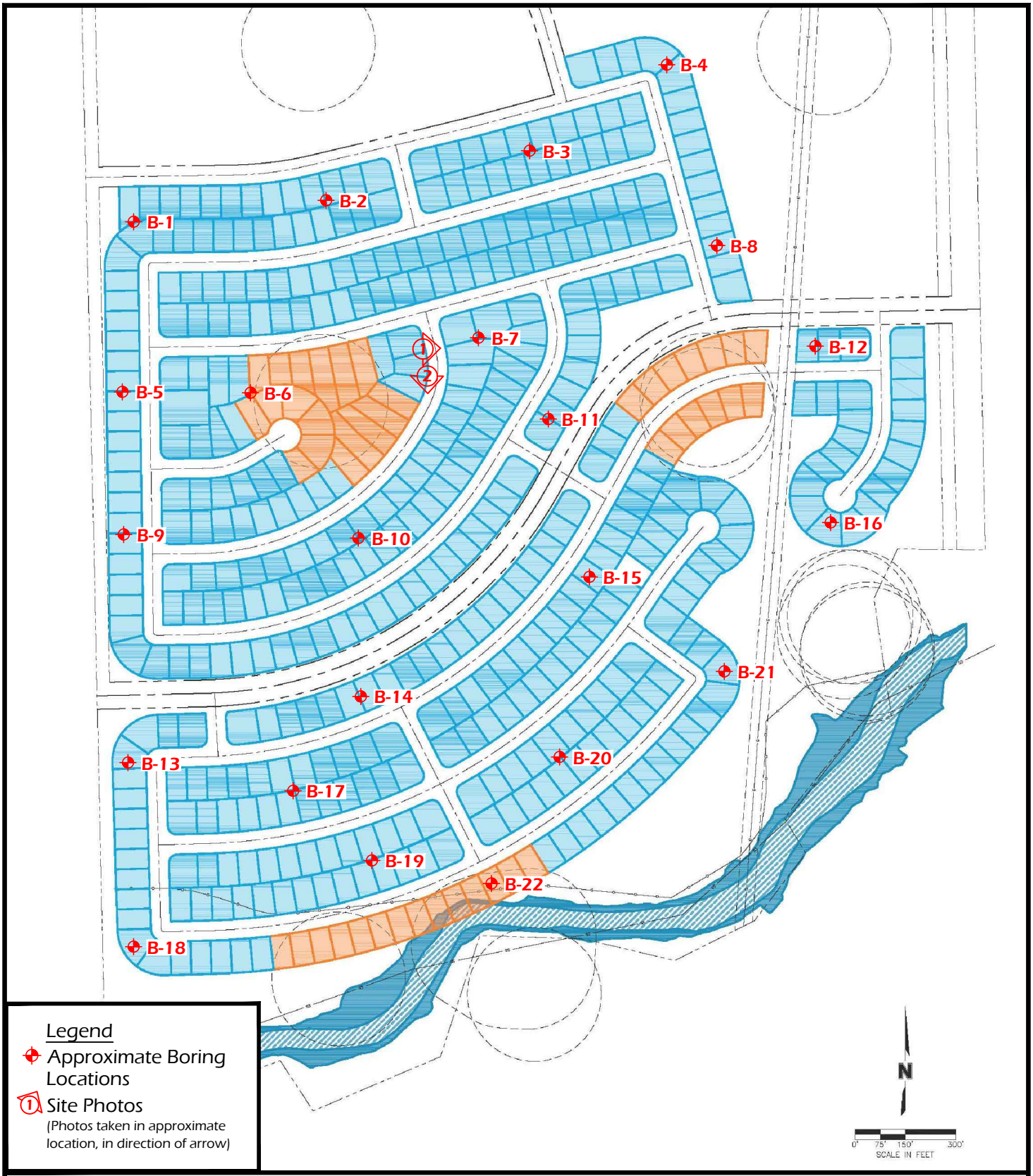
[N]PI≥4 and plots on or above "A" line.

[O]PI≤4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.





North
Not to Scale

Boring Location Diagram
Stephens Development - Residential Development
Weld County, Colorado
EEC Project Number: 1162110 Date: November 2016

EARTH ENGINEERING CONSULTANTS, LLC

STEPHEN'S SUBDIVISION - RESIDENTIAL
GREELEY, COLORADO
EEC PROJECT NO. 1162110
NOVEMBER 2016

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-1**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **14'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
CLAYEY SAND (SC) / SANDY LEAN CLAY (CL)		2									
brown / tan											
medium stiff to stiff		3									
	CS		**8**	**4000**	**10.8**	**106.8**	**26**	**8**	**46.8**	**650 psf**	**0.1%**
* classified as CLAYEY SAND (SC)		4									
	SS	5	**7**	**7000**	**15.6**						
		6									
		7									
		8									
		9									
	CS	10	**32**	**9000+**	**11.6**	**119.2**					
SANDSTONE / SILTSTONE											
brown / rust		11									
weathered moderately hard to hard		12									
		13									
		14									
	SS	15	**50/9"**	**1000**	**28.5**						
		16									
		17									
		18									
		19									
	CS	20	**50/7"**	**4000**	**27.8**	**93.6**					
		21									
		22									
		23									
		24									
	SS	25	**50/10"**	**3000**	**28.4**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-2**	**DATE: NOVEMBER 2016**	
RIG TYPE: CME55	*SHEET 1 OF 1*	**WATER DEPTH**	
FOREMAN: DG	**START DATE** 11/11/2016	**WHILE DRILLING**	**None**
AUGER TYPE: 4" CFA	**FINISH DATE** 11/11/2016	**AFTER DRILLING**	**N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV** N/A	**24 HOUR**	**N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDY LEAN CLAY (CL)		2									
light brown		3									
medium stiff to stiff		4									
	CS	**5**	**10**	**2000**	**13.7**	**111.6**				**<500 psf**	**None**
		6									
		7									
		8									
SANDSTONE / SILTSTONE		9									
brown / rust											
weathered, moderately hard to hard	SS	**10**	**50/10"**	**1000**	**26.9**						
		11									
		12									
		13									
		14									**% @ 1000 psf**
	CS	**15**	**50/10"**	**3000**	**18.7**	**102.9**	**30**	**NP**	**65.9**	**<1000 psf**	**None**
cemented seams		16									
		17									
		18									
		19									
SANDSTONE / CLAYSTONE	SS	**20**	**50/6"**	**1000**	**31.1**						
had		21									
		22									
		23									
*intermittent cemented sandstone lenses with depth		24									
	CS	**25**	**50/5"**	**1000**	**28.1**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-3**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **13.5'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY CLAYEY SAND (SM/SC)		2									
brown											
loose		3									
	CS		**5**	**7000**	**20.4**	**95.0**					
		4									
	SS	5	**10**	**3000**	**18.4**						
SANDSTONE / SILTSTONE		6									
brown / rust / grey											
highly weathered / poorly cemented		7									
		8									
		9									
	CS	10	**40**	**8500**	**18.1**	**108.6**				**4600 psf**	**3.6%**
		11									
		12									
		13									
		14									
brown / rust	SS	15	**49**	**4500**	**20.6**						
		16									
		17									
		18									
		19									
	CS	20	**50/5"**								
		21									
		22									
		23									
		24									
*intermittent cemented sandstone lenses with depth	SS	25	**50/5"**	**3500**	**24.8**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-4**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **14'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
CLAYEY SAND (SC)		2									
dark brown		3									
loose		4									
	CS	5	4	2000	15.5	105.4	25	8	45.2	<500 psf	None
		6									
		7									
		8									
		9									
SANDSTONE / CLAYSTONE / SILTSTONE	SS	10	26	6500	23.9						
brown / rust / grey		11									
weathered / poorly cemented		12									
		13									
		14									
SANDSTONE / CLAYSTONE / SILTSTONE	CS	15	50/5.5"	5000	25.4						
brown / rust		16									
moderately hard to hard		17									
		18									
		19									
	SS	20	45	5000	27.1						
		21									
		22									
		23									
		24									
	CS	25	50/6"	--	20.0						
BOTTOM OF BORING DEPTH 25.0'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-5**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **12'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDSTONE / CLAYSTONE / SILTSTONE		2									
brown / grey / rust		3									
highly weathered, moderately hard		4									
	CS	**5**	**20**	**2000**	**16.1**	**96.9**				**<500 psf**	**None**
		6									
		7									
		8									
		9									
SANDSTONE	SS	**10**	**50/8"**	**1000**	**28.8**						
brown / rust		11									
poorly cemented		12									
		13									
		14									
SANSTONE / CLAYSTONE	CS	**15**	**50/10"**	**6500**	**28.0**	**95.4**					
brown / grey / rust		16									
moderately hard to hard		17									
		18									
		19									
	SS	**20**	**50/11"**	**2000**	**25.6**						
		21									
		22									
		23									
		24									
	CS	**25**	**50/5"**	**6000**	**23.7**	**95.7**					
BOTTOM OF BORING DEPTH 25.0'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-6**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **8'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
SILTY SANDY LEAN CLAY (CL)		1									
brown		2									
medium stiff	CS	3	**7**								
		4									
SANDSTONE / SILTSTONE / CLAYSTONE											
brown / rust	SS	**5**	**27**	**1000**	**27.3**						
poorly cemented		6									
		7									
		8									
		9									
SANDSTONE	CS	**10**	**50/6"**	**1000**	**25.0**	**93.0**					
brown / rust											
weathered poorly cemented to moderately hard		11									
		12									
		13									
		14									
	SS	**15**	**50/6"**	**3000**	**24.8**						
		16									
		17									
		18									
		19									
with intermittent grey claystone	CS	**20**	**50/9"**	**9000+**	**17.1**	**109.8**					
		21									
		22									
		23									
		24									
	SS	**25**	**50**	**3500**	**29.0**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-7**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **12.0'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDY LEAN CLAY (CL)		2									
brown		3									
very stiff		4									
	CS	**5**	**9**	**8500**	**14.1**	**111.2**	**30**	**14**	**50.3**	**1200 psf**	**0.3%**
		6									
		7									
		8									
		9									
	SS	**10**	**10**	**1000**	**19.5**						
		11									
		12									
		13									
		14									
CLAYSTONE / SANDSTONE / SILTSTONE											
brown / grey / rust	CS	**15**	**32**	**9000+**	**25.9**	**99.6**					
weathered moderately hard to hard		16									
		17									
		18									
		19									
*intermittent cemented SANDSTONE lenses w/ depth											
	SS	**20**	**50/5"**	**--**	**27.6**						
		21									
		22									
		23									
		24									
	CS	**25**	**50/6"**	**3500**	**26.3**	**97.5**					
BOTTOM OF BORING DEPTH 25.0'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-8**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **13.0'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDY LEAN CLAY (CL)		2									
dark brown											
soft to medium stiff											
with calcareous deposits	CS	3	**4**	**5500**	**15.8**	**104.4**					
		4									
	SS	5	**4**	**3000**	**15.5**						
light brown		6									
		7									
		8									
		9									% @ 1000 psf
	CS	10	**18**	**9000+**	**23.0**	**102.4**	**37**	**21**	**88.4**		**1.1%**
CLAYSTONE / SANDSTONE / SILTSTONE		11									
brown / grey / rust		12									
weathered moderately hard to hard											
*classified as LEAN CLAY (CL)		13									
		14									
											% @ 1000 psf
	SS	15	**50/6"**	**1000**	**26.3**					**<1000 psf**	**None**
		16									
		17									
		18									
		19									
	CS	20	**50/8"**	**7000**	**24.9**	**103.2**					
CLAYSTONE / SANDSTONE / SILTSTONE		21									
moderately hard to hard		22									
		23									
		24									
	SS	25	**50/5"**	**--**	**28.4**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-9**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **12.0'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY CLAYEY SAND (SM/SC)		2									
brown		3									
medium dense		4									
	CS	**5**	**14**	**4000**	**12.2**	**97.0**					
		6									
		7									
		8									
SANDSTONE / SILTSTONE / CLAYSTONE		9									
brown / grey / rust											
poorly cemented / highly weathered	SS	**10**	**50/11"**	**3500**	**24.7**						
moderately hard to hard		11									
		12									
		13									
		14									
	CS	**15**	**50/10"**	**9000+**	**20.2**	**105.1**					
		16									
		17									
		18									
		19									
	SS	**20**	**50**	**1000**	**22.5**						
		21									
		22									
		23									
		24									
	CS	**25**	**50/6"**								
BOTTOM OF BORING DEPTH 25.0'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-10**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **19.0'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY SANDY LEAN CLAY (CL)		2									
brown											
very stiff											
with calcareous deposits	CS	3	**11**	**9000+**	**13.2**	**110.6**					
		4									
	SS	**5**	**18**	**5500**	**12.5**						
		6									
		7									
SANDSTONE / SILTSTONE		8									
brown / rust		9									
weathered, moderately hard to hard											% @ 1000 psf
	CS	**10**	**50/10"**	**6000**	**17.1**	**104.3**				**<1000 psf**	**None**
		11									
		12									
		13									
		14									
	SS	**15**	**50/6"**	**1000**	**24.0**						
		16									
		17									
		18									
		19									
	CS	**20**	**50/6"**	**2000**	**19.7**	**86.4**					
		21									
		22									
		23									
		24									
	SS	**25**	**50/6"**	**4500**	**19.8**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-11**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **23.0'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY SANDY LEAN CLAY (CL)		2									
brown											
very stiff											
	CS	3	**18**	**9000+**	**10.5**	**104.5**					
		4									
	SS	**5**	**13**	**6000**	**10.3**						
SILTY CLAYEY SAND (SM/SC)											
brown		6									
medium dense		7									
		8									
		9									
	CS	**10**	**18**	**5000**	**10.9**	**108.4**	**21**	**NP**	**37.5**	**<500 psf**	**None**
		11									
		12									
		13									
		14									
SILTY CLAYEY SAND / SILTY SAND (SC/SM)	SS	**15**	**11**	**2500**	**19.6**						
brown		16									
medium dense											
SANDSTONE / SILTSTONE		17									
brown / rust		18									
weathered, moderately hard to hard		19									
	CS	**20**	**50/5"**	**3000**	**25.5**	**99.4**					
		21									
		22									
with cemented lenses		23									
		24									
	SS	**25**	**50/6"**	**1000**	**27.6**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-12**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 2*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **19'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
CLAYEY SAND (SC)		2									
brown		3									
medium dense		4									
	CS	**5**	**16**	**3000**	**4.2**	**112.5**	**27**	**13**	**14.8**	**1000 psf**	**0.5%**
		6									
		7									
		8									
		9									
brown / rust / grey											
	CS	**10**	**15**	**6000**	**10.3**	**110.7**					
		11									
		12									
		13									
		14									
brown / tan											
	SS	**15**	**15**	**3000**	**16.9**						
		16									
		17									
		18									
		19									
brown / grey / rust											
with gravel	CS	**20**	**21**	**3500**	**13.9**	**115.5**					
		21									
		22									
		23									
		24									
SANDSTONE / SLTSTONE											
brown / rust / grey	SS	**25**	**50**	**1000**	**22.0**						
Continued on Sheet 2 of 2											

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-12**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 2 OF 2*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **19'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
Continued from Sheet 1 of 2		26									
SANDSTONE / SILTSTONE		27									
brown / grey / rust											
with claystone seams		28									
moderately hard to hard											
		29									
	CS	**30**	**50/6"**	**9000+**	**16.5**	**112.5**					
BOTTOM OF BORING DEPTH 30.0'		31									
		32									
		33									
		34									
		35									
		36									
		37									
		38									
		39									
		40									
		41									
		42									
		43									
		44									
		45									
		46									
		47									
		48									
		49									
		50									

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-13**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **16.0'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY CLAYEY SAND (SM/SC)		2									
brown											
medium dense											
	CS	3	**14**	**4000**	**6.0**	**85.5**					
		4									
	SS	**5**	**12**	**9000+**	**5.4**						
		6									
		7									
		8									
		9									
brown / rust											
with traces of light gravel	CS	**10**	**13**	**5000**	**8.4**	**103.6**				**<500 psf**	**None**
		11									
		12									
		13									
		14									
	SS	**15**	**14**	**2500**	**20.6**						
SANDY LEAN CLAY (CL)		16									
brown											
stiff		17									
with traces of light gravel											
		18									
		19									
	CS	**20**	**14**	**1000**	**21.0**	**104.6**					
		21									
		22									
SANDSTONE / SILTSTONE											
brown / rust		23									
weathered, moderately hard to hard											
		24									
	SS	**25**	**50/6"**	**2000**	**27.9**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-14**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **22.0'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY CLAYEY SAND (SM/SC)		2									
brown		3									
medium dense		4									
	CS	**5**	**15**	**7000**	**9.5**	**107.7**				**<500 psf**	**None**
		6									
		7									
		8									
		9									
SANDY LEAN CLAY (CL)	SS	**10**	**17**	**4000**	**21.2**						
brown / tan		11									
stiff		12									
		13									
		14									
brown / grey / rust											
	CS	**15**	**19**	**3500**	**15.3**	**112.0**					
		16									
		17									
		18									
		19									
SANDSTONE / CLAYSTONE / SILTSTONE	SS	**20**	**50/11"**	**1000**	**15.9**						
weathered, moderately hard to hard		21									
		22									
		23									
		24									
	CS	**25**	**50/6"**	**8500**	**20.2**	**104.9**					
BOTTOM OF BORING DEPTH 25.0'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-15**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 2*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **15'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDY LEAN CLAY / CLAYEY SAND (CL/SC)		2									
brown / tan		3									
very stiff / medium dense		4									
	CS	**5**	**16**	**9000+**	**9.5**	**109.0**				**700 psf**	**0.1%**
		6									
		7									
		8									
		9									
SILTY CLAYEY SAND (SM/SC)	SS	**10**	**13**	**1500**	**10.8**						
light brown		11									
medium dense		12									
		13									
		14									
with trace gravel											
	CS	**15**	**17**	**5000**	**20.2**	**111.3**					
		16									
		17									
		18									
		19									
SAND & GRAVEL (SP/GP)											
extremely dense	SS	**20**	**50/3"**	**--**	**16.0**						
SANDSTONE / CLAYSTONE		21									
brown / rust / grey		22									
weathered, moderately hard to hard		23									
		24									
	CS	**25**	**50/2"**	**9000+**	**21.5**	**124.2**					
Continued on Sheet 2 of 2											

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-15**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 2 OF 2*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **15'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
Continued from Sheet 1 of 2		26									
SANDSTONE / SILTSTONE moderately hard to hard		27 28 29									
	SS	**30**	**50/4"**	**1000**	**26.5**						
BOTTOM OF BORING DEPTH 30.5'		31 32 33 34 **35** 36 37 38 39 **40** 41 42 43 44 **45** 46 47 48 49 **50**									

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-16**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 2*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **11.5'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDY LEAN CLAY (CL)		2									
brown											
medium stiff to stiff		3									% @ 150 psf
	CS		**10**	**4000**	**8.9**	**100.8**	**25**	**9**	**50.8**	**1100 psf**	**1.5%**
		4									
	SS	5	**4**	**3000**	**11.6**						
SILTY SANDY LEAN CLAY/CLAYEY SAND (CL/SC											
brown		6									
stiff / loose											
with calcareous deposits		7									
		8									
		9									
	CS	10	**12**	**4500**	**28.6**	**97.1**					
		11									
		12									
		13									
		14									
SAND & GRAVEL (SP/GP)											
dense	SS	15	**31**	**--**	**13.1**						
		16									
		17									
		18									
		19									
SANDSTONE / SILTSTONE											
brown / rust											
weathered, moderately hard to hard	CS	20	**50/3"**	**2000**	**26.4**	**95.7**					
		21									
		22									
		23									
		24									
	SS	25	**50/3"**	**2500**	**23.2**						

Continued on Sheet 2 of 2

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-16**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 2 OF 2*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **11.5'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
Continued from Sheet 1 of 2		26									
		27									
SANDSTONE / SILTSTONE											
brown / rust		28									
hard											
		29									
	CS	**30**	**50/3"**	**7000**	**22.7**	**100.6**					
BOTTOM OF BORING DEPTH 30.0'		31									
		32									
		33									
		34									
		35									
		36									
		37									
		38									
		39									
		40									
		41									
		42									
		43									
		44									
		45									
		46									
		47									
		48									
		49									
		50									

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-17**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **22'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY CLAYEY SAND (SM/SC)		2									
brown / tan		3									
medium dense		4									
	CS	**5**	**13**	**8000**	**7.3**	**102.3**					
		6									
		7									
		8									
		9									
SANDY LEAN CLAY (CL)	SS	**10**	**14**	**3000**	**12.8**						
brown / tan		11									
stiff		12									
		13									
		14									
	CS	**15**	**32**	**5000**	**23.5**	**104.2**	**31**	**12**	**71.1**	**<1000 psf**	**None**
SANDSTONE / CLAYSTONE		16									
brown / rust / grey		17									
weathered, moderately hard to hard		18									
		19									
*interbedded cemented SANDSTONE lenses	SS	**20**	**50/5"**	**--**	**21.9**						
		21									
		22									
		23									
		24									
SANDSTONE / CLAYSTONE / SILTSTONE											
brown / grey / rust	CS	**25**	**50/9"**	**6000**	**23.7**	**98.8**					
BOTTOM OF BORING DEPTH 25.0'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-18**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **9'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **6.5-7'**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
TOPSOIL & VEGETATION		1									
SANDY LEAN CLAY (CL) brown medium stiff to stiff		2 3 4									
	CS	**5**	**10**	**3000**	**25.0**	**100.5**					
		6 7 8 9									
SILTY SAND (SM) brown / rust medium dense	SS	**10**	**18**	**--**	**23.5**						
		11 12 13 14									
SANDY LEAN CLAY (CL) brown / grey / rust very stiff	CS	**15**	**18**	**5000**	**18.1**	**115.8**					
		16 17									
SANDSTONE / SILTSTONE brown / rust weathered, moderately hard to hard		18 19									
	SS	**20**	**50/7"**	**1000**	**28.0**						
		21 22 23 24									
	CS	**25**	**50/5"**	**2000**	**26.8**	**94.3**					
BOTTOM OF BORING DEPTH 25.0'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-19**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **9.5'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SILTY SANDY LEAN CLAY (CL)		2									
brown / rust		3									
medium stiff to stiff		4									
	CS	**5**	**13**	**6500**	**12.6**	**112.0**					
		6									
		7									
		8									
		9									% @ 1000 psf
CLAYEY SAND (SC)	CS	**10**	**17**	**3000**	**21.2**	**106.4**	**24**	**NP**	**28.5**	**<1000 psf**	**None**
brown / rust		11									
medium dense		12									
		13									
		14									
SAND & GRAVEL (SP/GP)	SS	**15**	**29**	**--**	**15.5**						
medium dense		16									
		17									
SANDSTONE / SILTSTONE		18									
brown / rust		19									
weathered, moderately hard to hard	CS	**20**	**50/9"**	**9000+**	**19.1**	**109.1**					
		21									
		22									
		23									
		24									
	SS	**25**	**50/4.5"**	**3000**	**26.5**						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-20**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **10'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDY LEAN CLAY (CL)		2									
brown		3									
medium stiff		4									
	CS	**5**	**5**	**3500**	**9.7**	**111.3**				**<500 psf**	**None**
		6									
		7									
		8									
		9									
	SS	**10**	**19**	**--**	**8.8**						
SAND & GRAVEL (SP/GP)		11									
medium dense / very dense		12									
		13									
		14									
	CS	**15**	**50/7"**	**2000**	**10.6**	**137.8**					
		16									
		17									
		18									
SANDSTONE / SILTSTONE		19									
brown / rust											
weathered, moderately hard to hard	SS	**20**	**50/4"**	**1500**	**24.1**						
		21									
		22									
		23									
		24									
	CS	**25**	**50/2"**	**8500**	**21.9**	**107.0**					

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

PROJECT NO: 1162110	**LOG OF BORING B-21**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **8'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
DISCED FIELD		1									
SANDY LEAN CLAY (CL)		2									
brown		3									
medium stiff		4									
	SS	5	6	1500	21.8						
		6									
		7									
		8									
SAND & GRAVEL (SP/GP)		9									
medium dense to dense	CS	10	28	--							
		11									
		12									
		13									
		14									
	SS	15	37	3000	27.5						
SANDSTONE / CLAYSTONE		16									
brown / rust		17									
weathered, moderately hard to hard		18									
		19									
	CS	20	50/3.5"	9000+	18.4	115.3					
		21									
		22									
		23									
		24									
	SS	25	50/11"	6000	24.6						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

STEPHENS SUBDIVISION - RESIDENTIAL DEVELOPMENT

GREELEY, COLORADO

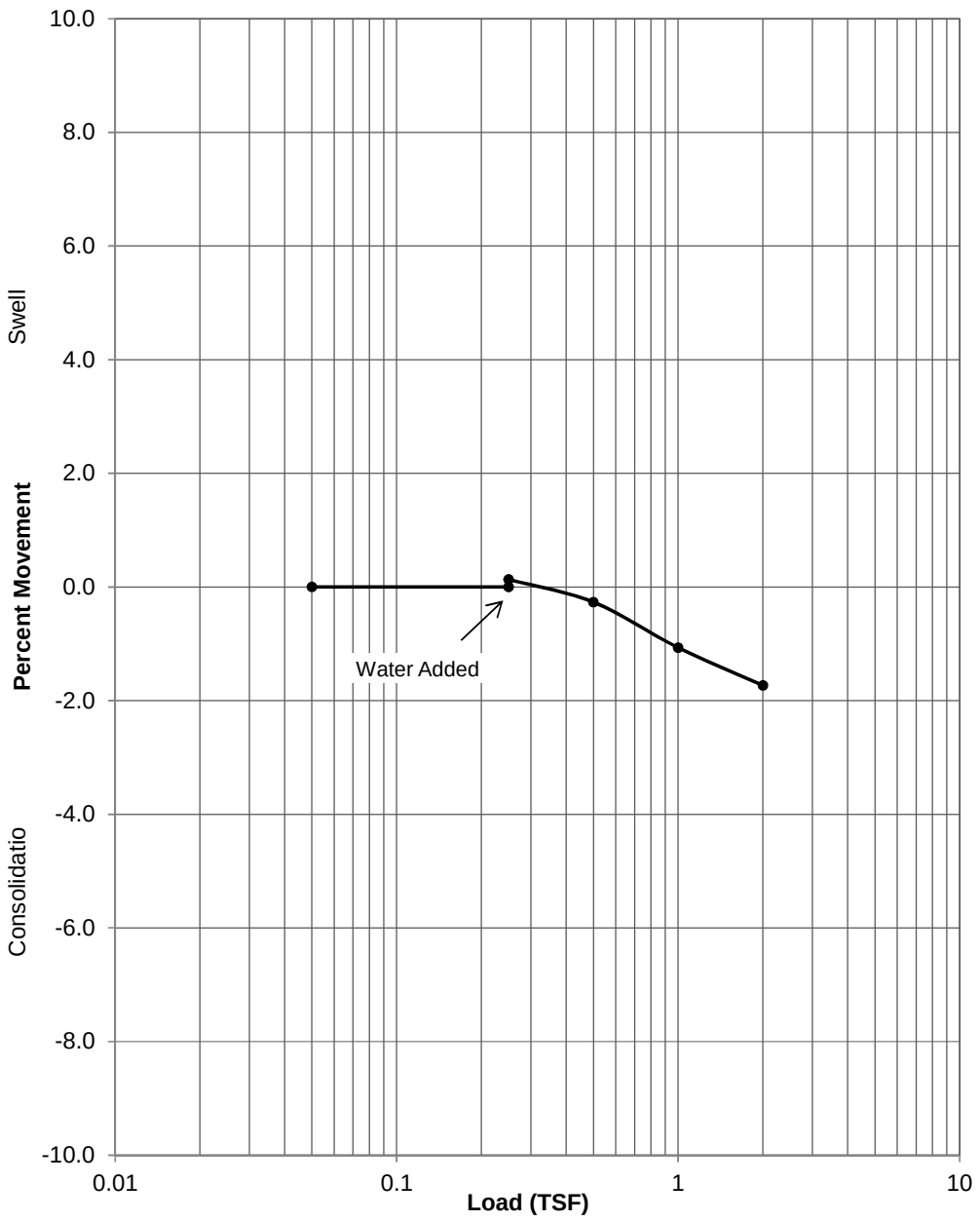
PROJECT NO: 1162110	**LOG OF BORING B-22**		**DATE: NOVEMBER 2016**
RIG TYPE: CME55	*SHEET 1 OF 1*		**WATER DEPTH**
FOREMAN: DG	**START DATE**	**11/11/2016**	**WHILE DRILLING** **10'**
AUGER TYPE: 4" CFA	**FINISH DATE**	**11/11/2016**	**AFTER DRILLING** **N/A**
SPT HAMMER: AUTOMATIC	**SURFACE ELEV**	**N/A**	**24 HOUR** **N/A**

SOIL DESCRIPTION	TYPE	D (FEET)	N (BLOWS/FT)	QU (PSF)	MC (%)	DD (PCF)	A-LIMITS LL	A-LIMITS PI	-200 (%)	SWELL PRESSURE	SWELL % @ 500 PSF
SILTY CLAYEY SAND (SM/SC) brown loose	CS	3	7	2000	6.8	95.6	22	5	42.8	<500 psf	None
CLAYEY SAND / SILTY SAND (CS/SM) brown loose	SS	5	4	1500	15.9						
SAND & GRAVEL (SP/GP) dense	CS	10	31	--	5.4	124.1					
SILTY CLAYEY SAND (SM/SC) medium dense with traces of gravel	SS	15	10	--	21.5						
SANDSTONE / SILTSTONE brown / rust with gravel	CS	20	50/4"	6000	20.3						
	SS	25	50/6"	2000	26.5						
BOTTOM OF BORING DEPTH 25.5'											

Earth Engineering Consultants, LLC

SWELL / CONSOLIDATION TEST RESULTS

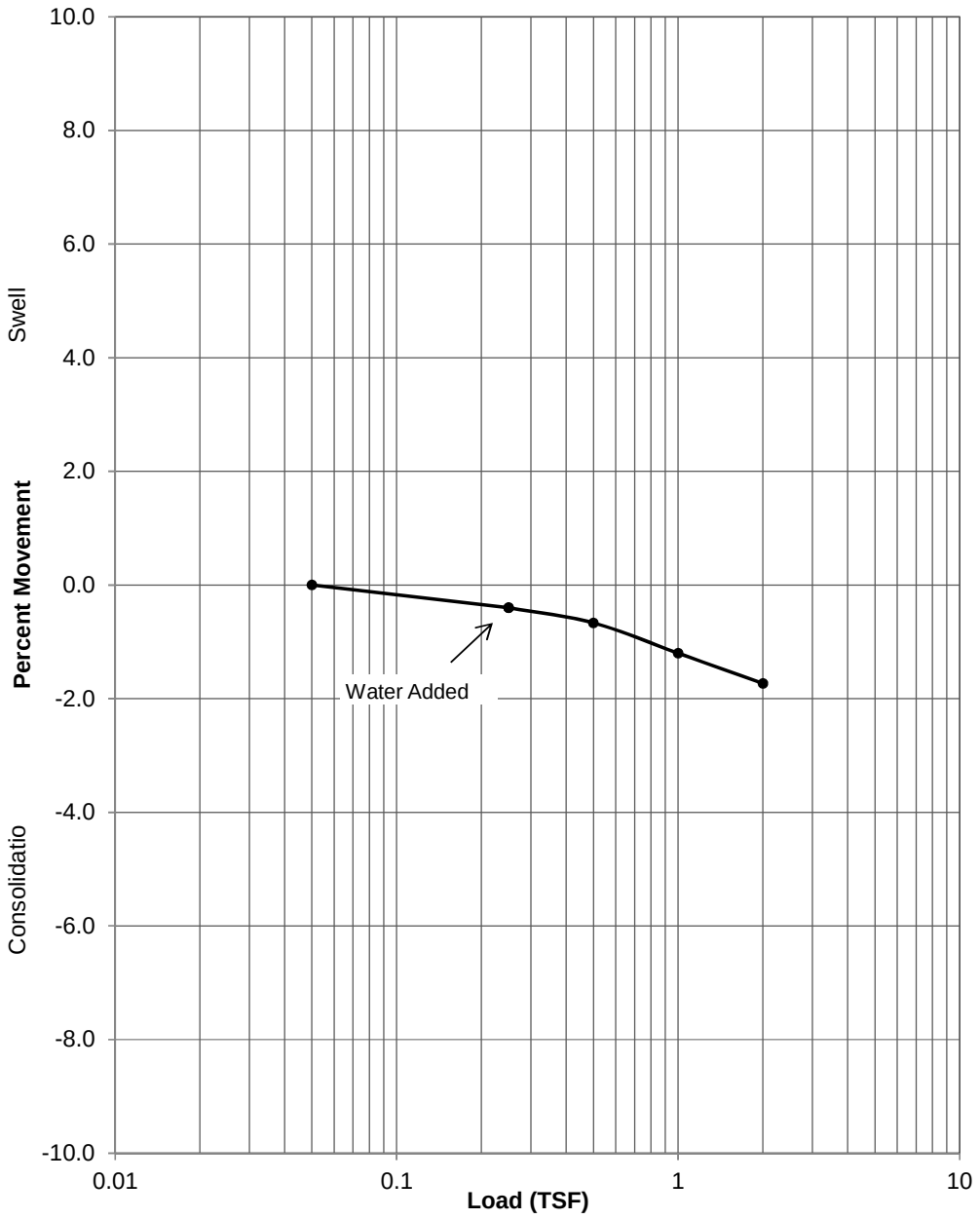
Material Description: Brown / Tan Clayey Sand (SC)		
Sample Location: Boring 1, Sample 1, Depth 2'		
Liquid Limit: 26	Plasticity Index: 8	% Passing #200: 46.8%
Beginning Moisture: 10.8%	Dry Density: 97.5 pcf	Ending Moisture: 20.3%
Swell Pressure: 650 psf	% Swell @ 500: 0.1%	



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

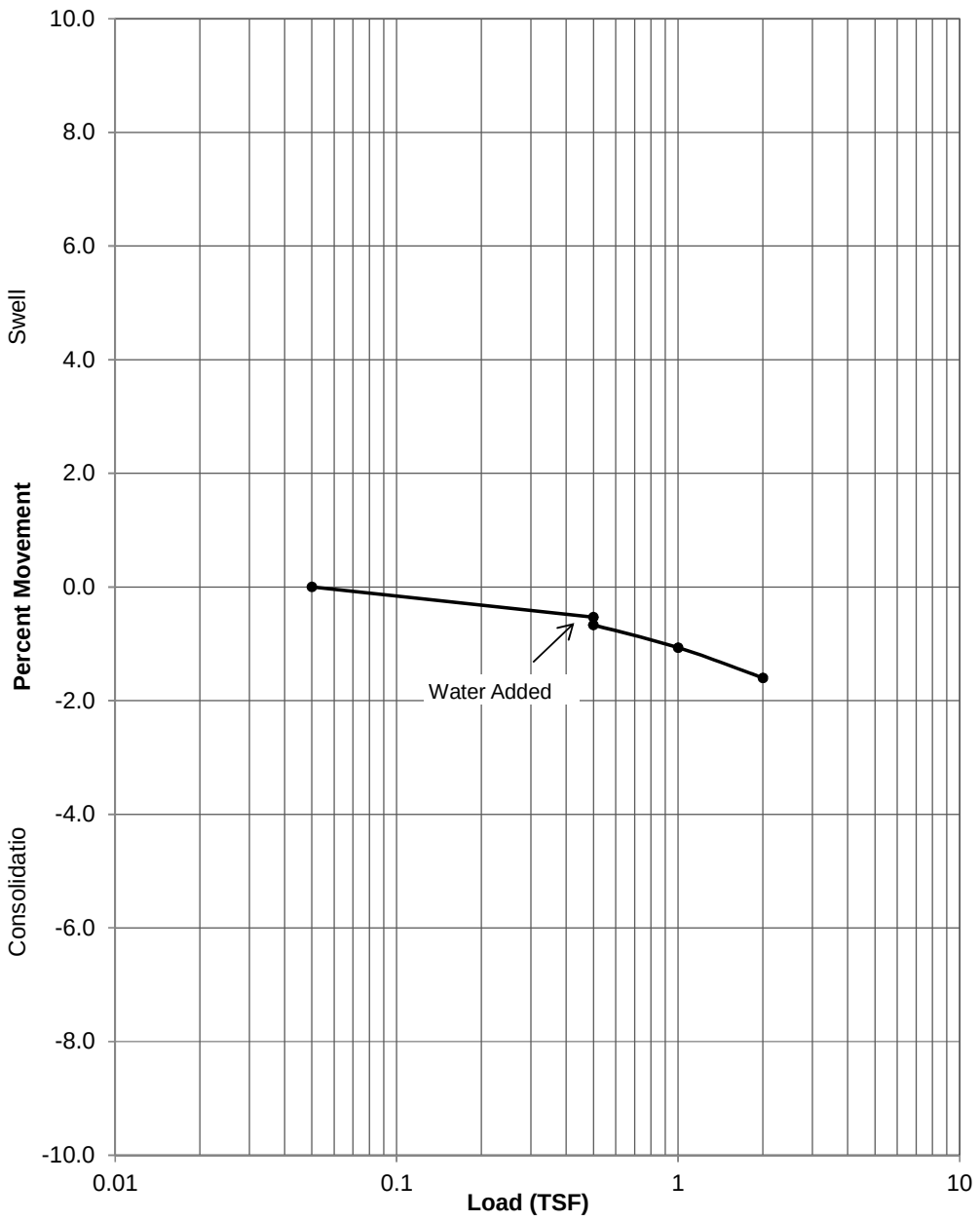
Material Description:	Light Brown Sandy Lean Clay (CL)		
Sample Location:	Boring 2, Sample 1, Depth 4'		
Liquid Limit: - -	Plasticity Index: - -	% Passing #200: - -	
Beginning Moisture: 13.7%	Dry Density: 120.3 pcf	Ending Moisture: 15.8%	
Swell Pressure: <500 psf	% Swell @ 500: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

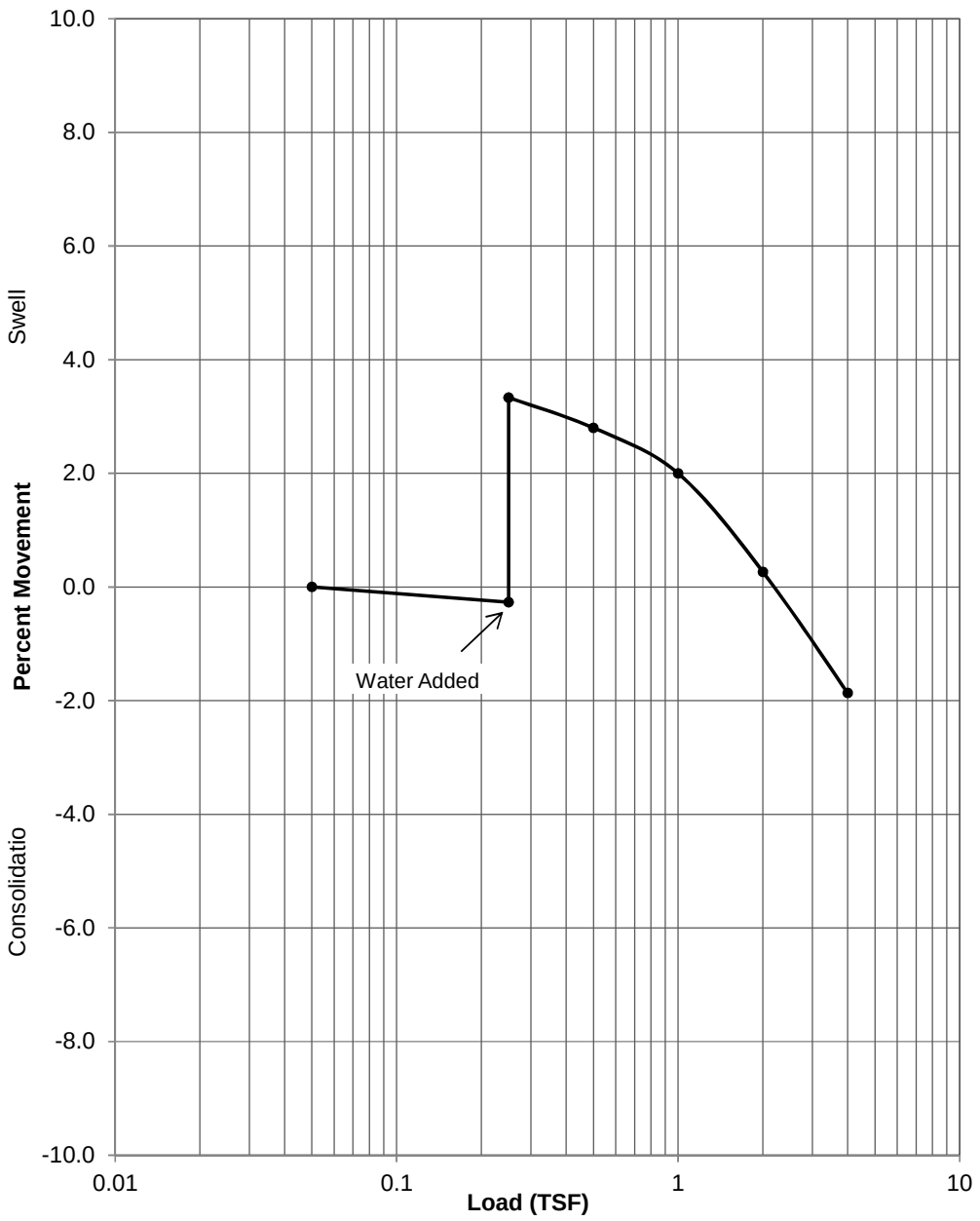
Material Description:	Sandstone / Siltstone - classified as SANDY LEAN CLAY (CL)	
Sample Location:	Boring 2, Sample 3, Depth 14'	
Liquid Limit: 30	Plasticity Index: NP	% Passing #200: 65.9%
Beginning Moisture: 18.6%	Dry Density: 102.7 pcf	Ending Moisture: 24.4%
Swell Pressure: <1000 psf	% Swell @ 1000: None	



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

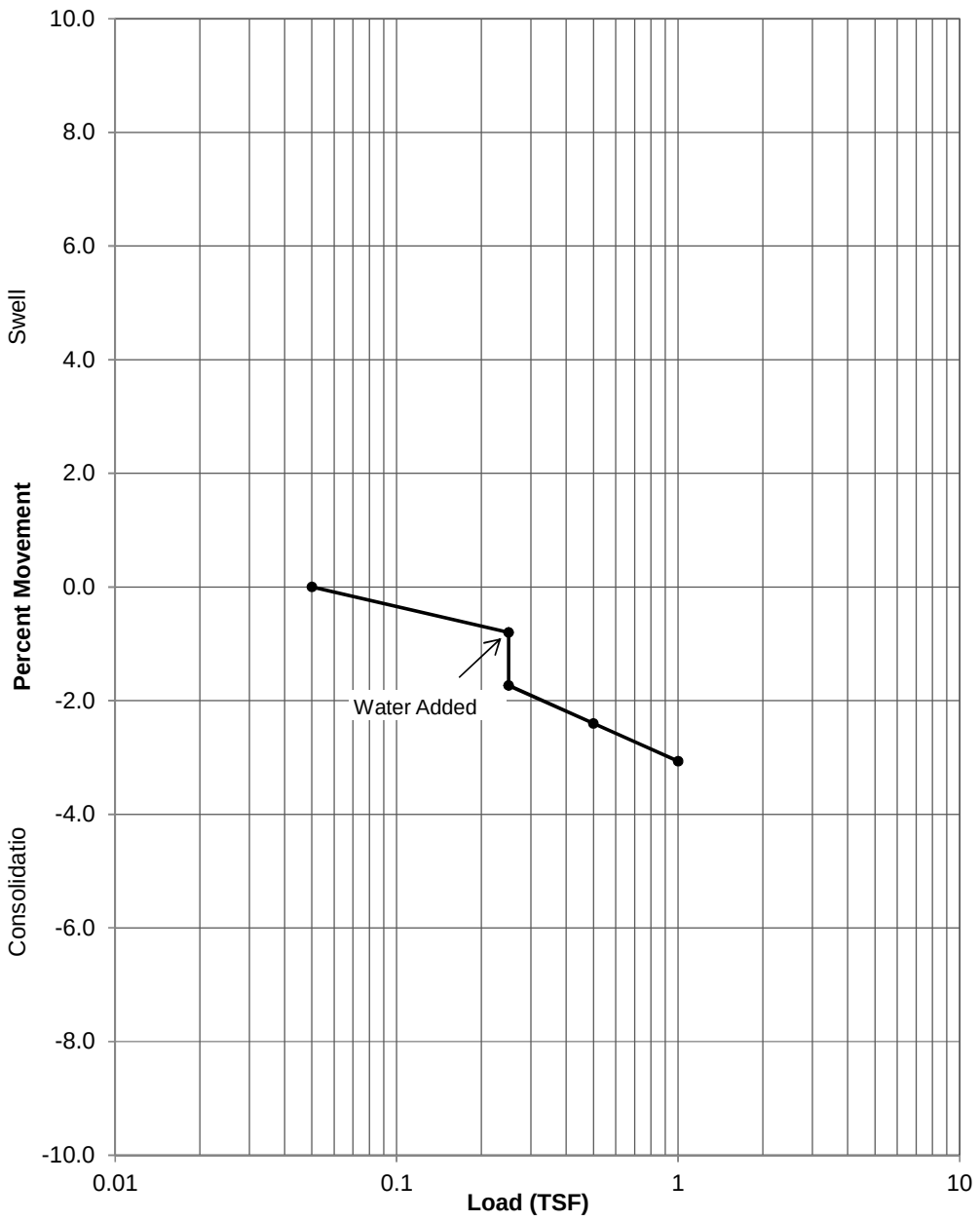
Material Description:	Brown / Rust / Grey Sandstone / Siltstone		
Sample Location:	Boring 3, Sample 3, Depth 9'		
Liquid Limit: - -	Plasticity Index: - -	% Passing #200: - -	
Beginning Moisture: 18.1%	Dry Density: 108.5 pcf	Ending Moisture: 26.0%	
Swell Pressure: 4600 psf	% Swell @ 500: 3.6%		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

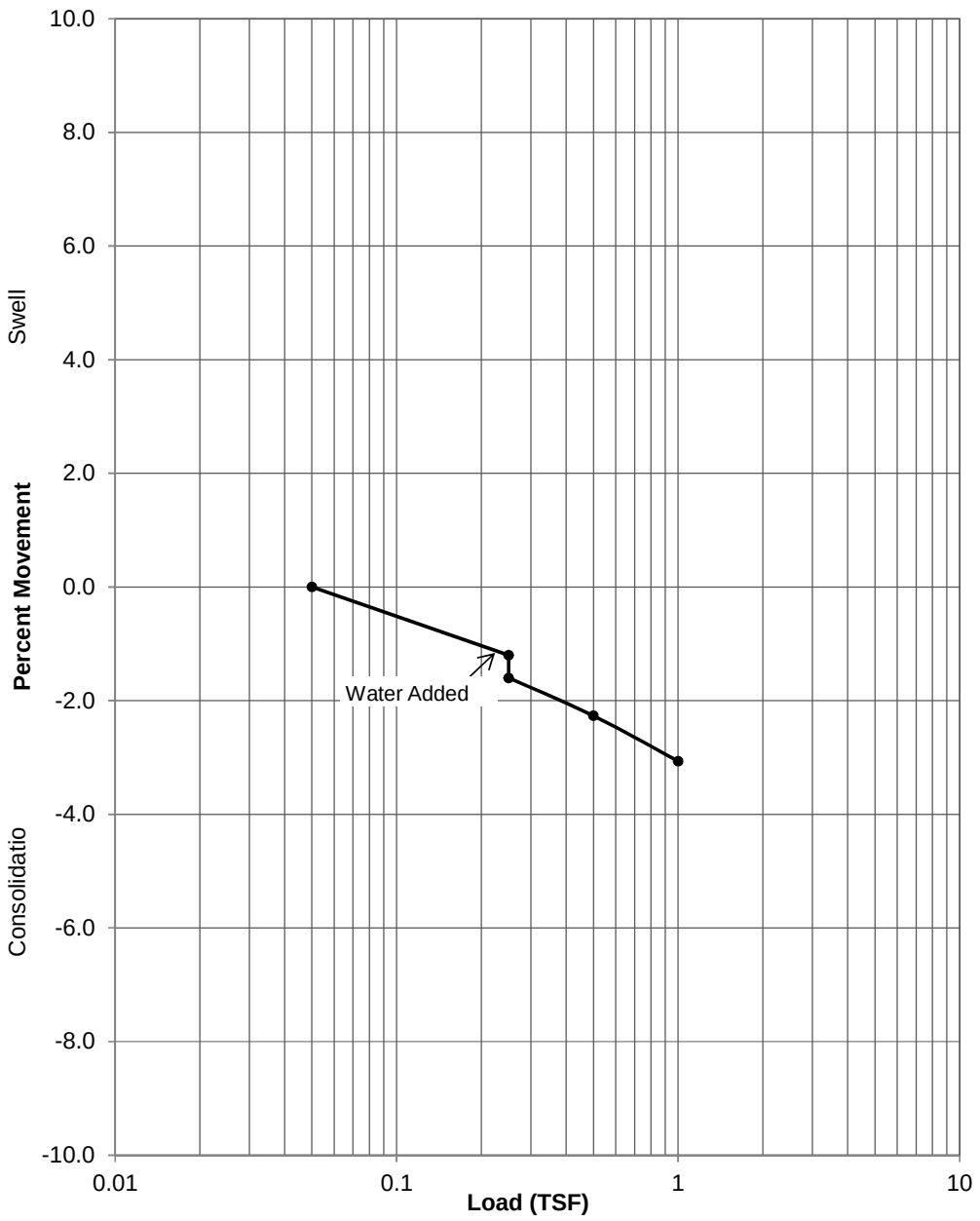
Material Description:	Dark Brown Clayey Sand (SC)		
Sample Location:	Boring 4, Sample 1, Depth 4'		
Liquid Limit: 25	Plasticity Index: 8	% Passing #200: 45.2%	
Beginning Moisture: 15.5%	Dry Density: 117.3 pcf	Ending Moisture: 15.6%	
Swell Pressure: <500 psf	% Swell @ 500: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

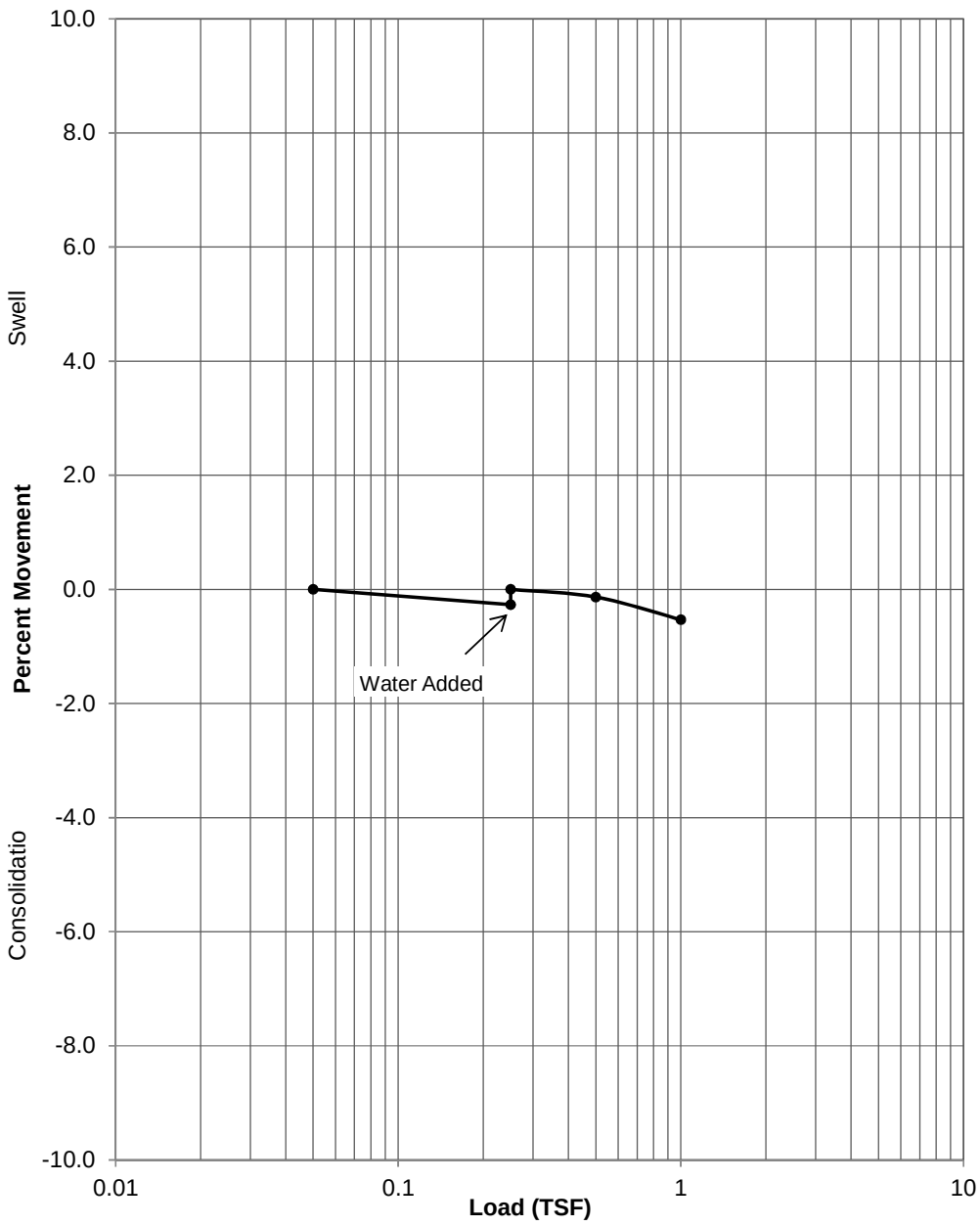
Material Description:	Brown / Grey / Rust Sandstone / Claystone / Siltstone		
Sample Location:	Boring 5, Sample 1, Depth 4'		
Liquid Limit: - -	Plasticity Index: - -	% Passing #200: - -	
Beginning Moisture: 16.1%	Dry Density: 104.7 pcf	Ending Moisture: 25.5%	
Swell Pressure: <500 psf	% Swell @ 500: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

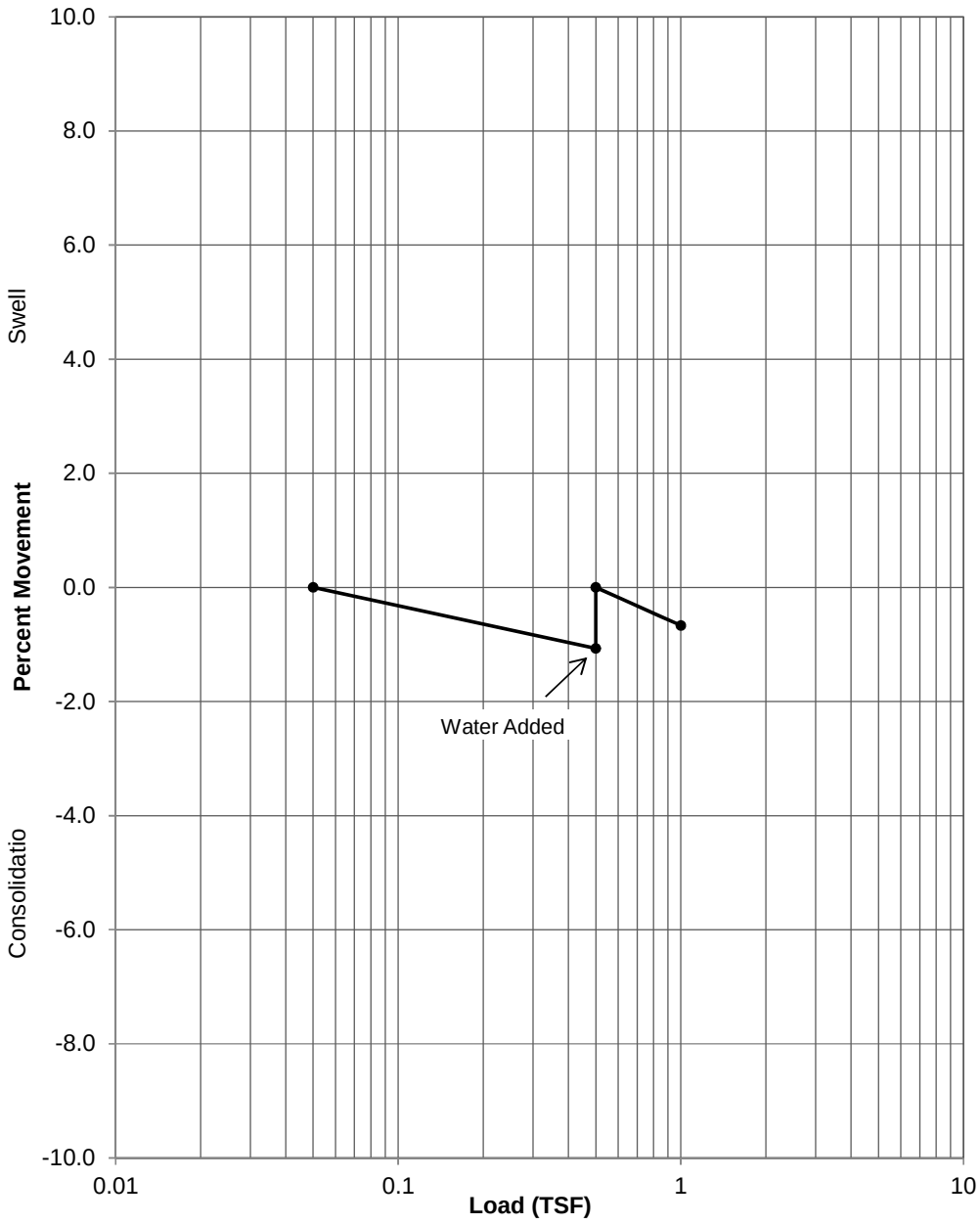
Material Description:	Brown Sandy Lean Clay (CL)		
Sample Location:	Boring 7, Sample 1, Depth 4'		
Liquid Limit: 30	Plasticity Index: 14	% Passing #200: 50.3%	
Beginning Moisture: 14.1%	Dry Density: 114 pcf	Ending Moisture: 16.0%	
Swell Pressure: 1200 psf	% Swell @ 500: 0.3%		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

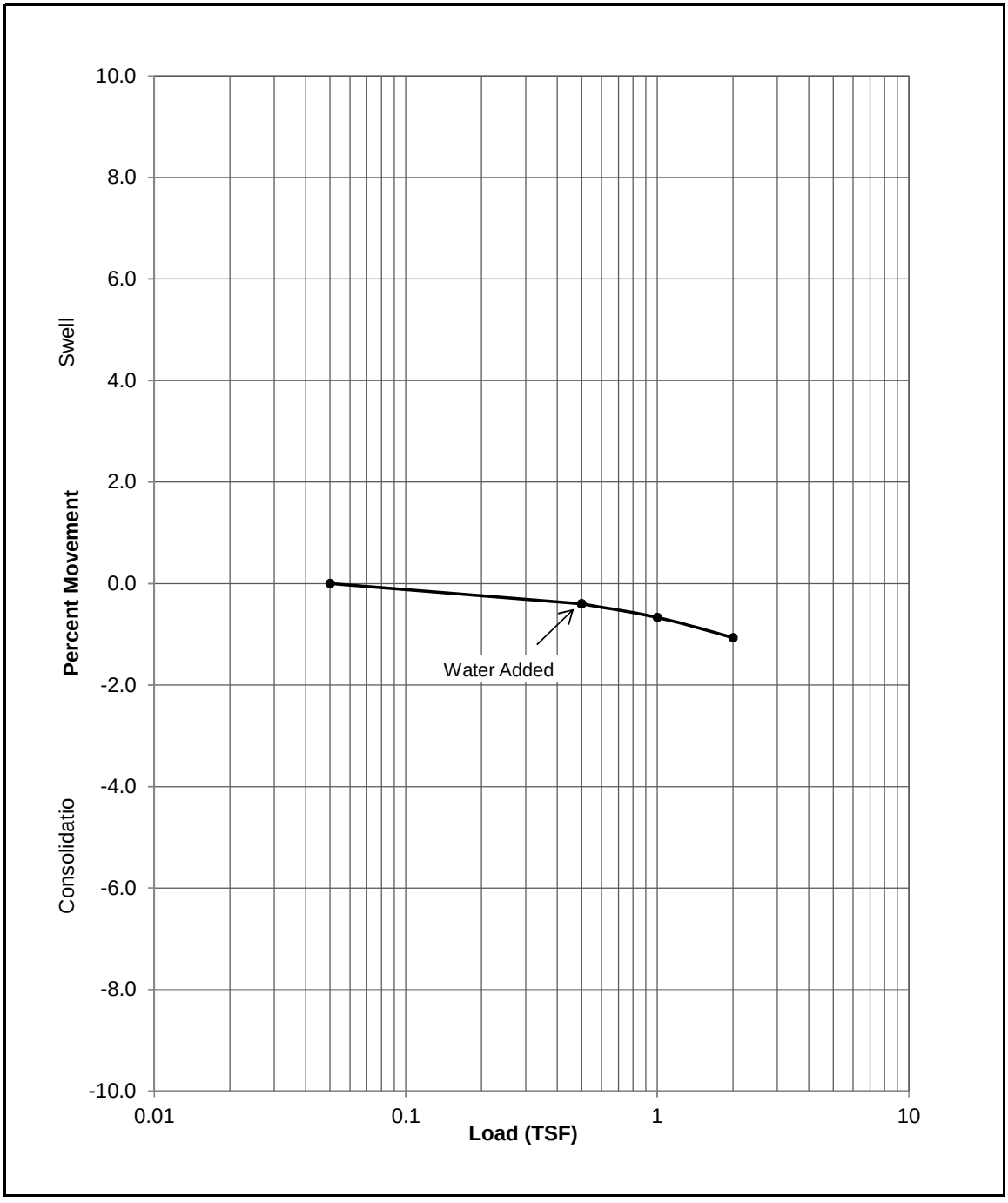
Material Description:	Brown / Grey / Rust Claystone / Sandstone / Siltstone (LEAN CLAY-CL)		
Sample Location:	Boring 8, Sample 3, Depth 9'		
Liquid Limit: 37	Plasticity Index: 21	% Passing #200: 88.4%	
Beginning Moisture: 23.0%	Dry Density: 104.3 pcf	Ending Moisture: 23.7%	
Swell Pressure:	% Swell @ 1000: 1.1%		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

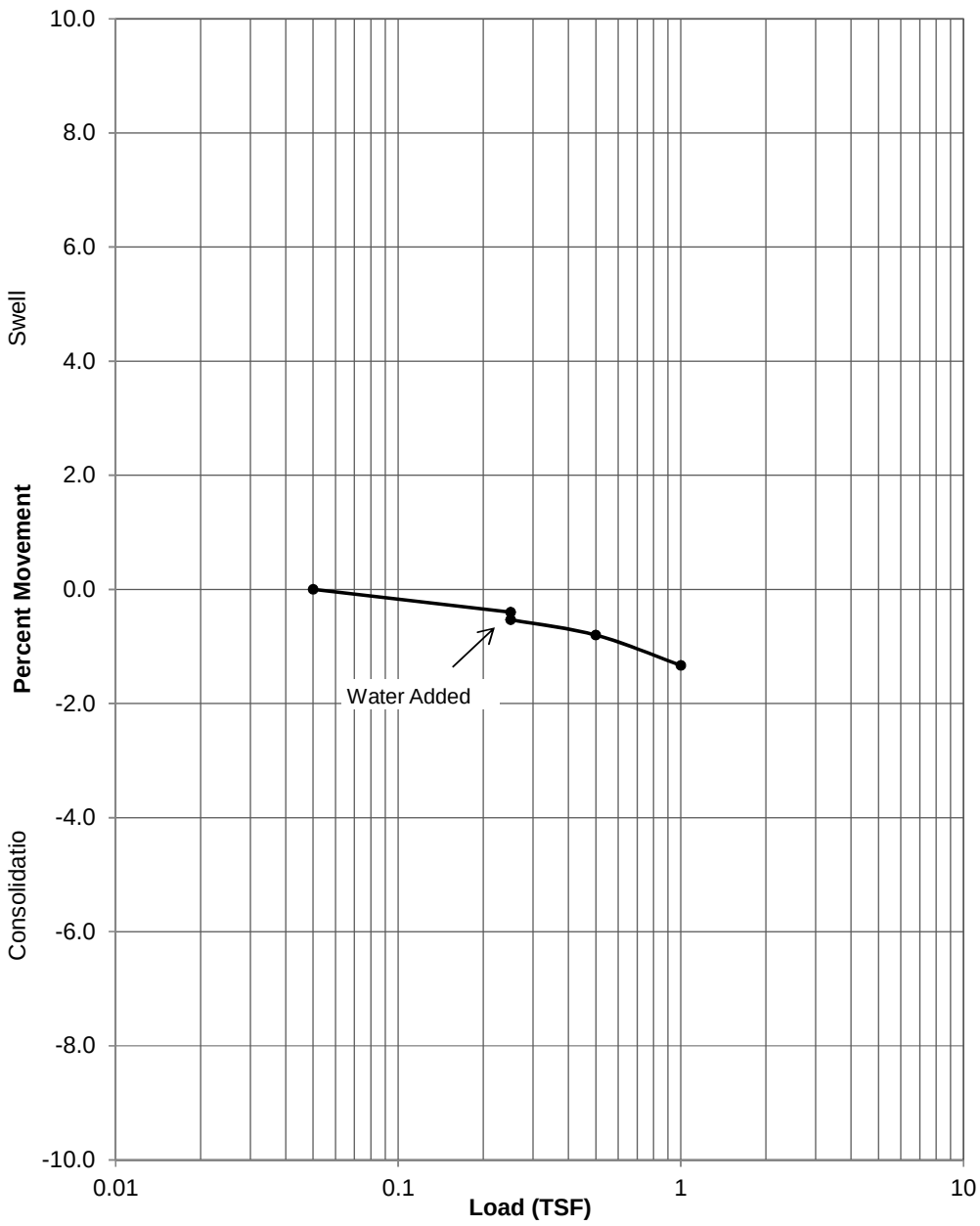
Material Description:	Brown / Rust Sandstone / Siltstone		
Sample Location:	Boring 10, Sample 3, Depth 9'		
Liquid Limit: - -	Plasticity Index: - -	% Passing #200: - -	
Beginning Moisture: 17.1%	Dry Density: 106.7 pcf	Ending Moisture: 22.4%	
Swell Pressure: <1000 psf	% Swell @ 1000: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

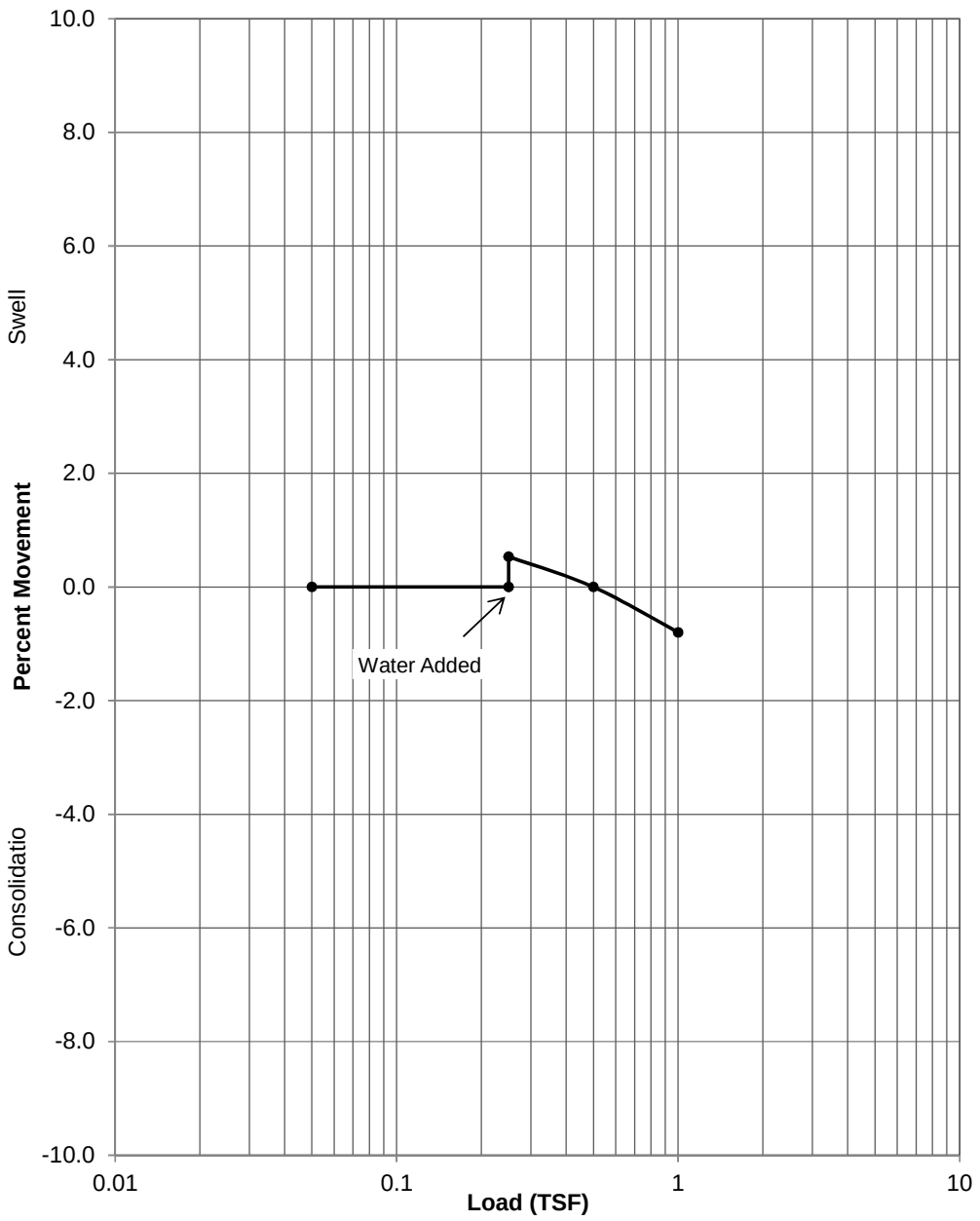
Material Description:	Brown Silty Sand (SM)		
Sample Location:	Boring 11, Sample 3, Depth 9'		
Liquid Limit: NL	Plasticity Index: NP	% Passing #200: 37.5%	
Beginning Moisture: 10.9%	Dry Density: 110.6 pcf	Ending Moisture: 19.1%	
Swell Pressure: <500 psf	% Swell @ 500: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

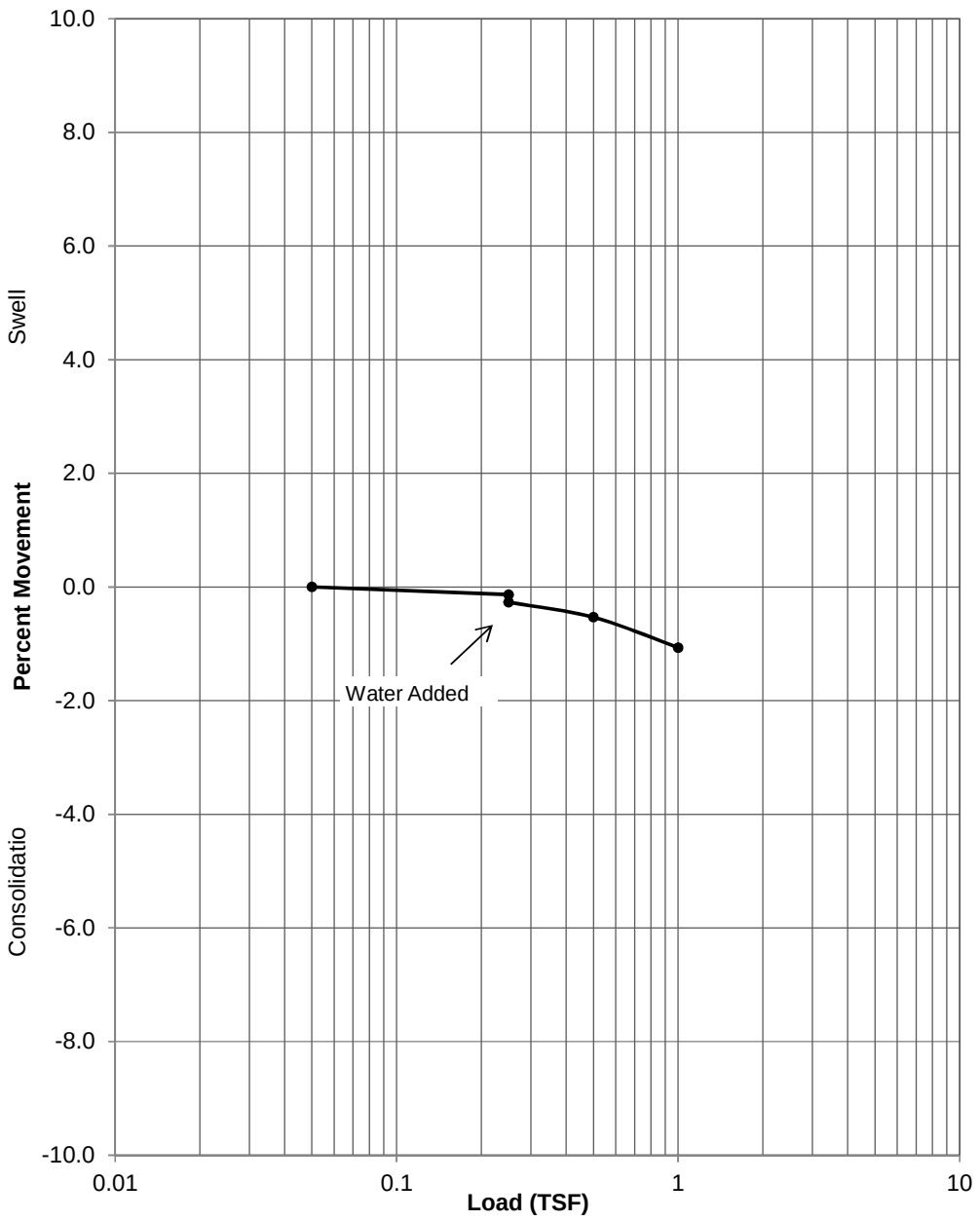
Material Description: Brown Silty Clayey Sand (SM/SC)		
Sample Location: Boring 12, Sample 1, Depth 4'		
Liquid Limit: 27	Plasticity Index: 13	% Passing #200: 14.8%
Beginning Moisture: 4.2%	Dry Density: 121.1 pcf	Ending Moisture: 16.5%
Swell Pressure: 1000 psf	% Swell @ 500: 0.5%	



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

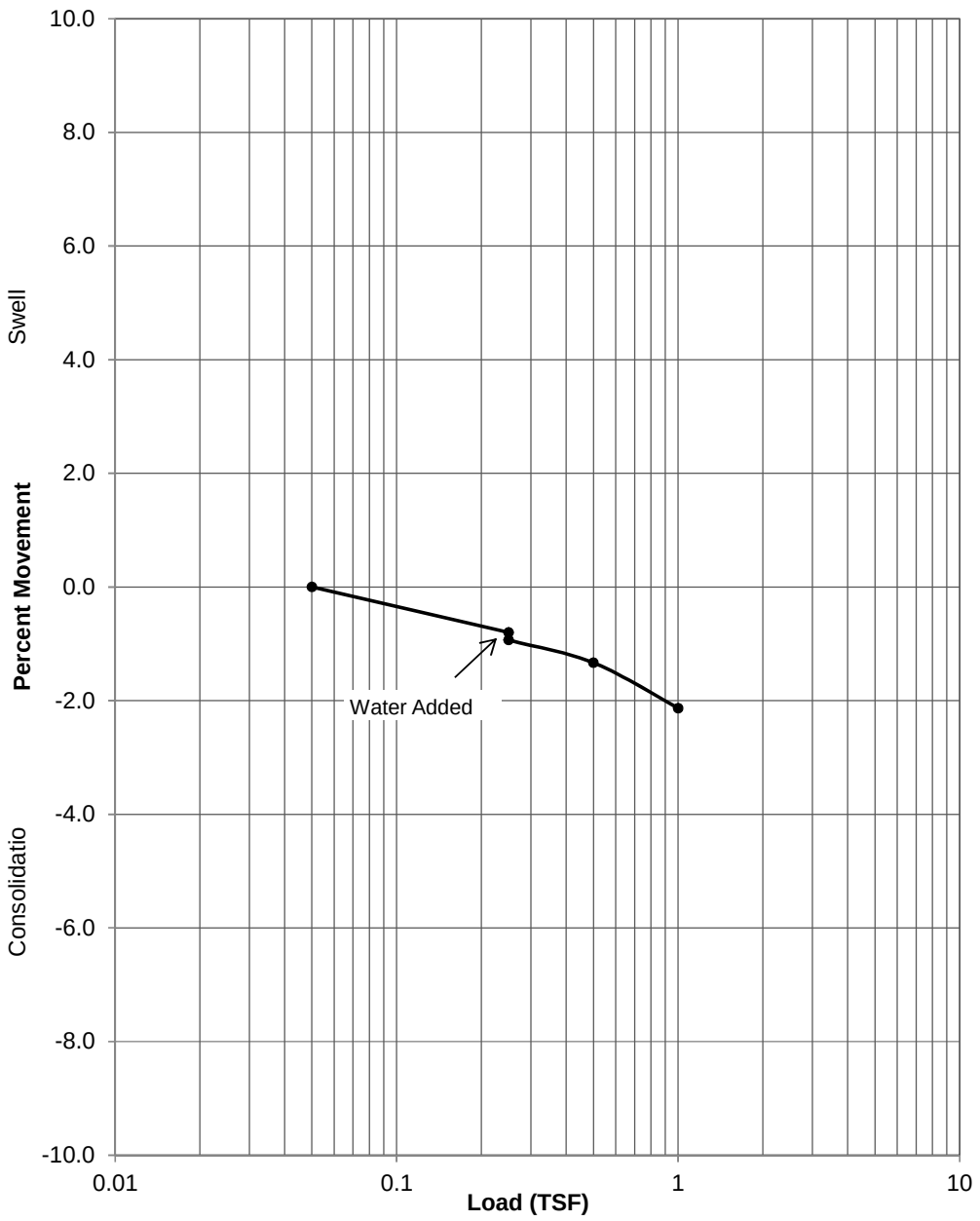
Material Description:	Brown / Rust Silty Clayey Sand (SM/SC)		
Sample Location:	Boring 13, Sample 3, Depth 9'		
Liquid Limit: - -	Plasticity Index: - -		% Passing #200: - -
Beginning Moisture: 8.4%	Dry Density: 107.2 pcf		Ending Moisture: 21.0%
Swell Pressure: <500 psf		% Swell @ 500:	None



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

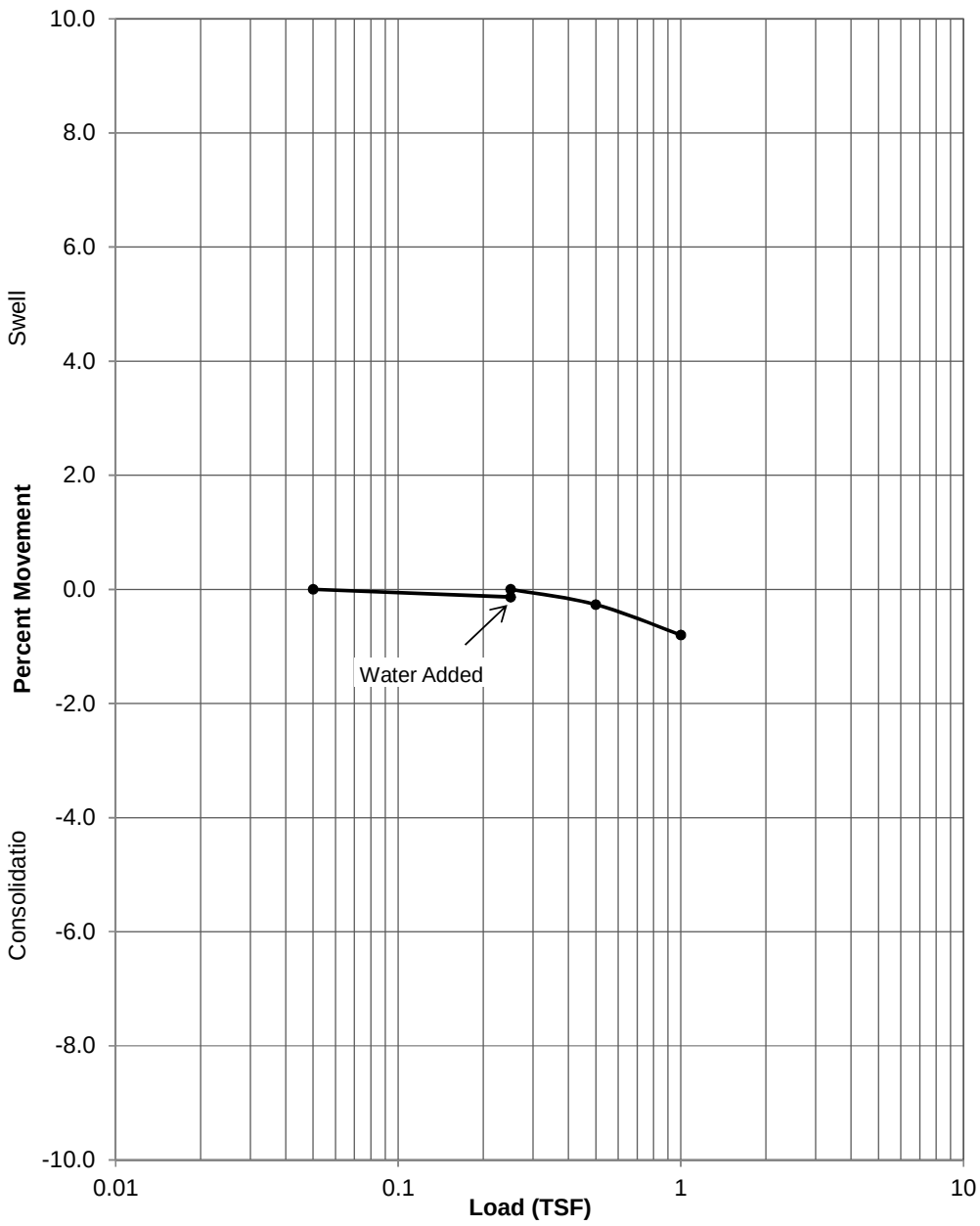
Material Description:	Brown Clayey Sand (SC)		
Sample Location:	Boring 14, Sample 1, Depth 4'		
Liquid Limit: 26	Plasticity Index: 8	% Passing #200: 38.7%	
Beginning Moisture: 9.5%	Dry Density: 120.5 pcf	Ending Moisture: 16.8%	
Swell Pressure: <500 psf	% Swell @ 500: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

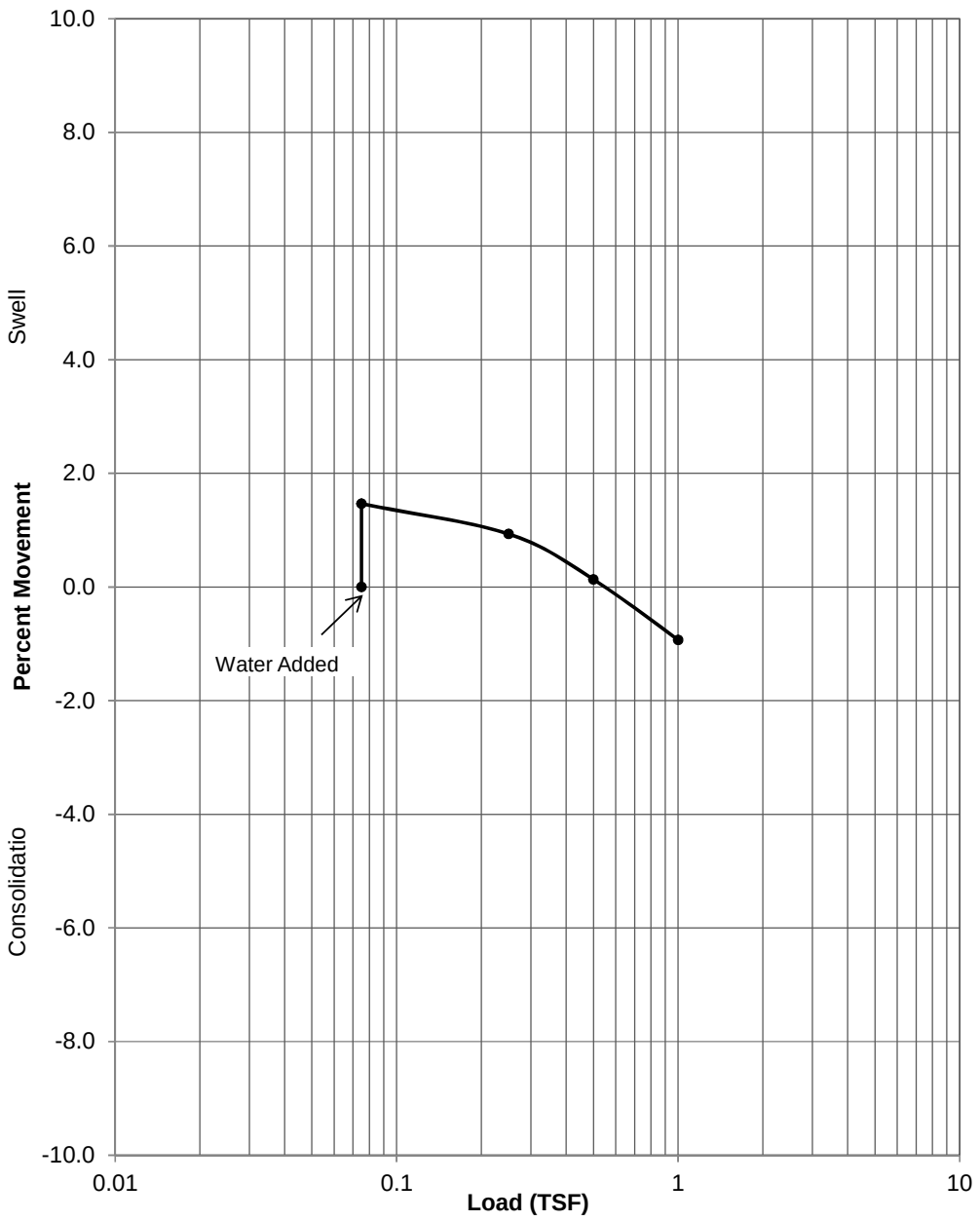
Material Description:	Brown / Tan Silty Clayey Sand (SC-SM)		
Sample Location:	Boring 15, Sample 1, Depth 4'		
Liquid Limit: - -	Plasticity Index: - -	% Passing #200: - -	
Beginning Moisture: 9.5%	Dry Density: 113.5 pcf	Ending Moisture: 18.4%	
Swell Pressure: 700 psf	% Swell @ 500: 0.1%		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

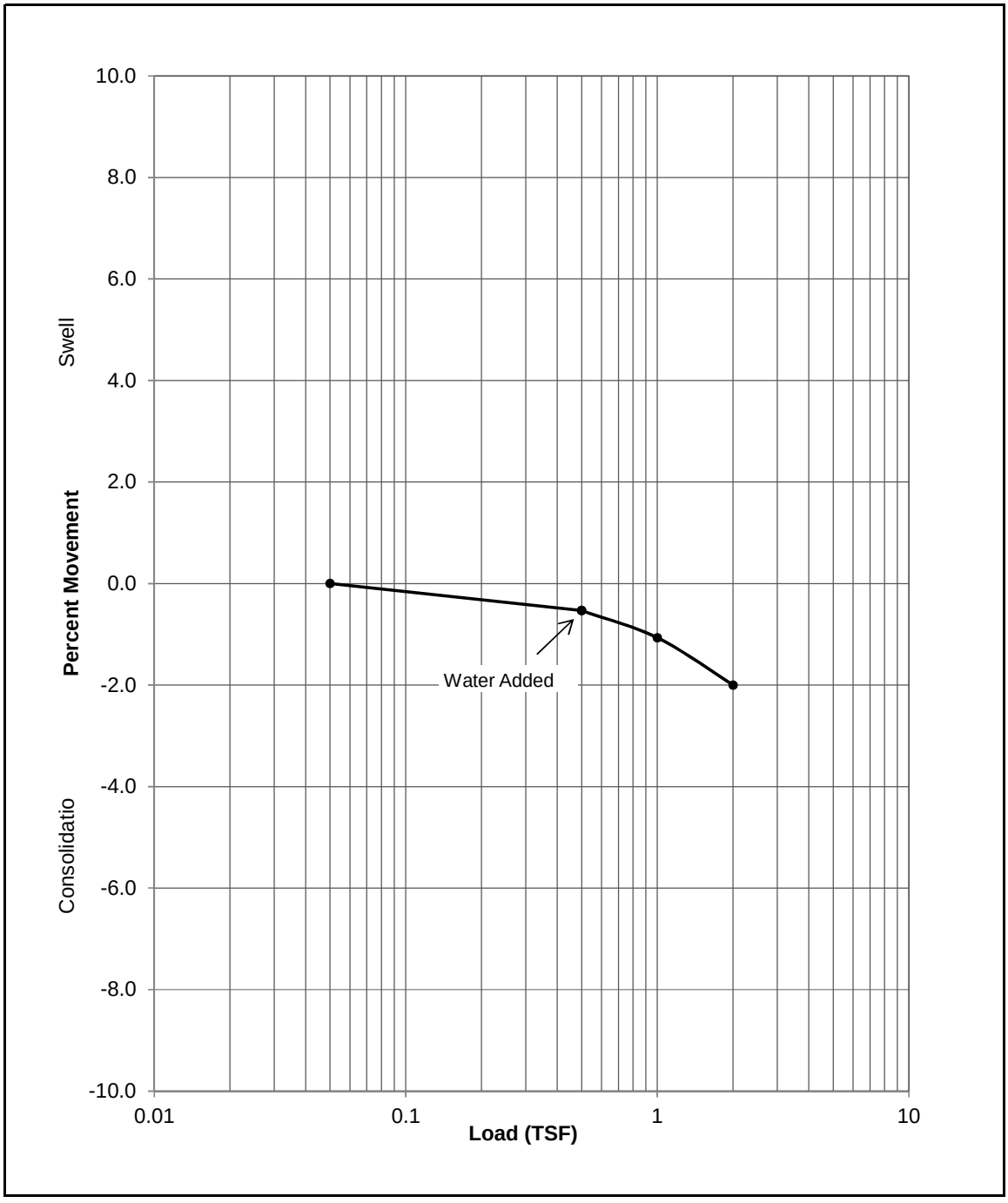
Material Description:	Brown Silty Sandy Lean Clay (CL)	
Sample Location:	Boring 16, Sample 1, Depth 2'	
Liquid Limit: 25	Plasticity Index: 9	% Passing #200: 50.8%
Beginning Moisture: 8.9%	Dry Density: 105.7 pcf	Ending Moisture: 20.8%
Swell Pressure: 1100 psf	% Swell @ 150: 1.5%	



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

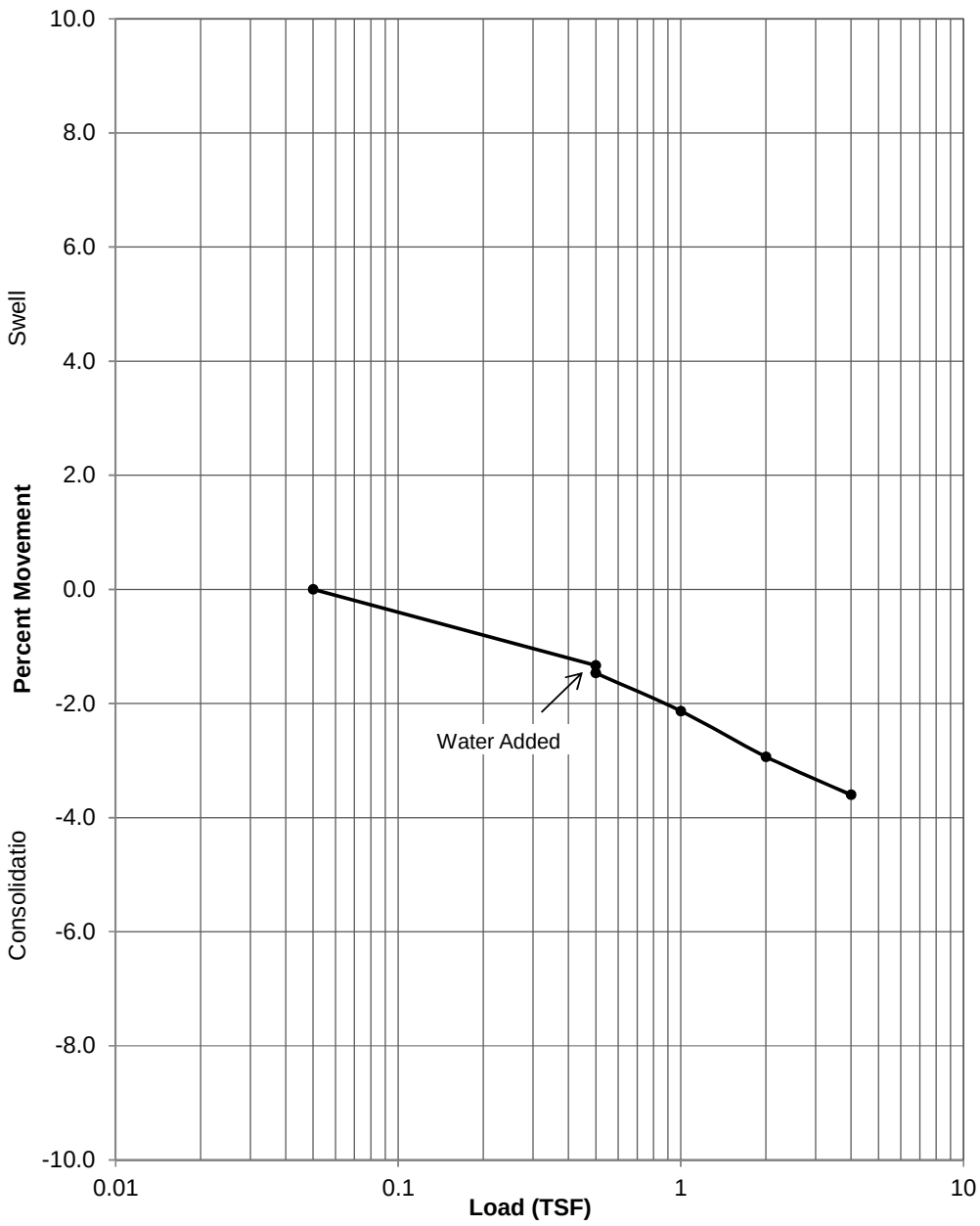
Material Description:	Brown / Rust / Grey Sandstone / Claystone - (Lean Clay w/ Sand -CL)		
Sample Location:	Boring 17, Sample 3, Depth 14'		
Liquid Limit: 31	Plasticity Index: 12	% Passing #200: 71.1%	
Beginning Moisture: 23.5%	Dry Density: 107.8 pcf	Ending Moisture: 20.7%	
Swell Pressure: <1000 psf	% Swell @ 1000: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

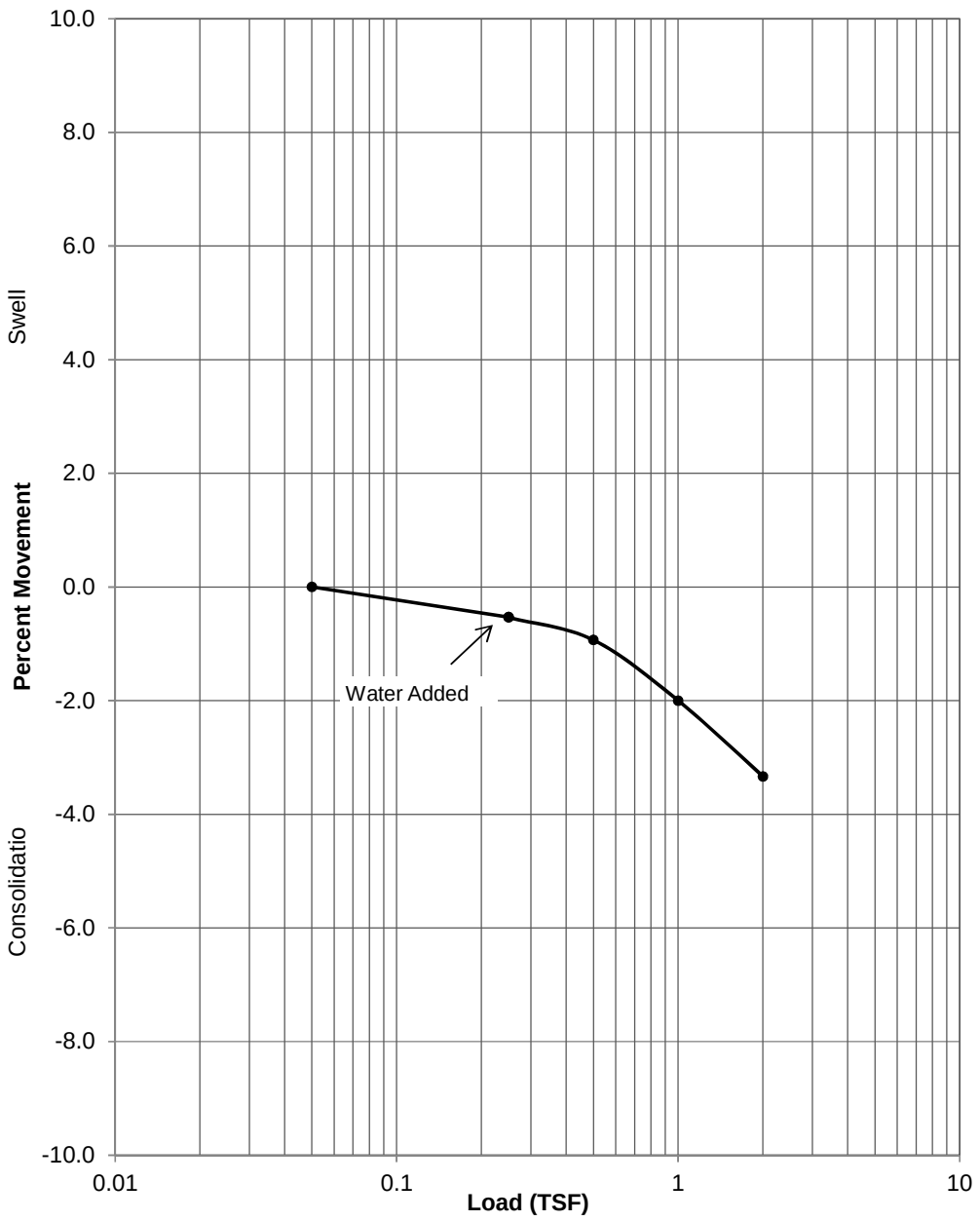
Material Description:	Brown / Rust Silty Sand (SM)		
Sample Location:	Boring 19, Sample 2, Depth 9'		
Liquid Limit: NL	Plasticity Index: NP	% Passing #200: 28.5%	
Beginning Moisture: 21.2%	Dry Density: 98.7 pcf	Ending Moisture: 20.6%	
Swell Pressure: <1000 psf	% Swell @ 1000: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

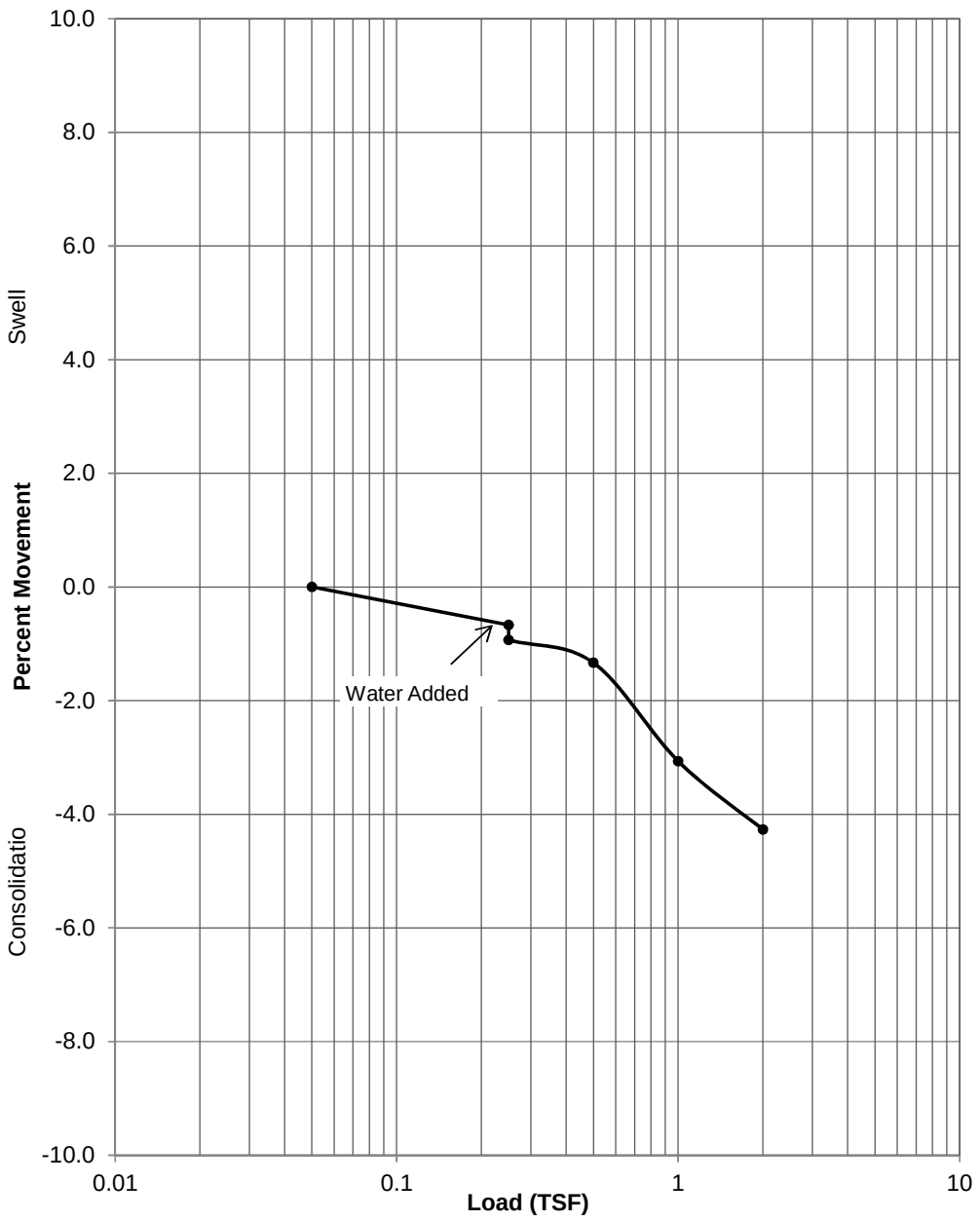
Material Description:	Brown Silty Sandy Lean Clay (CL)		
Sample Location:	Boring 20, Sample 1, Depth 4'		
Liquid Limit: - -	Plasticity Index: - -	% Passing #200: - -	
Beginning Moisture: 9.7%	Dry Density: 119.2 pcf	Ending Moisture: 17.5%	
Swell Pressure: <500 psf	% Swell @ 500: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

SWELL / CONSOLIDATION TEST RESULTS

Material Description:	Brown Silty Clayey Sand (SM/SC)		
Sample Location:	Boring 22, Sample 1, Depth 2'		
Liquid Limit: 22	Plasticity Index: 5	% Passing #200: 42.8%	
Beginning Moisture: 6.8%	Dry Density: 117.5 pcf	Ending Moisture: 18.3%	
Swell Pressure: <500 psf	% Swell @ 500: None		



Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project #: 1162110
Date: November 2016

EARTH ENGINEERING CONSULTANTS, LLC

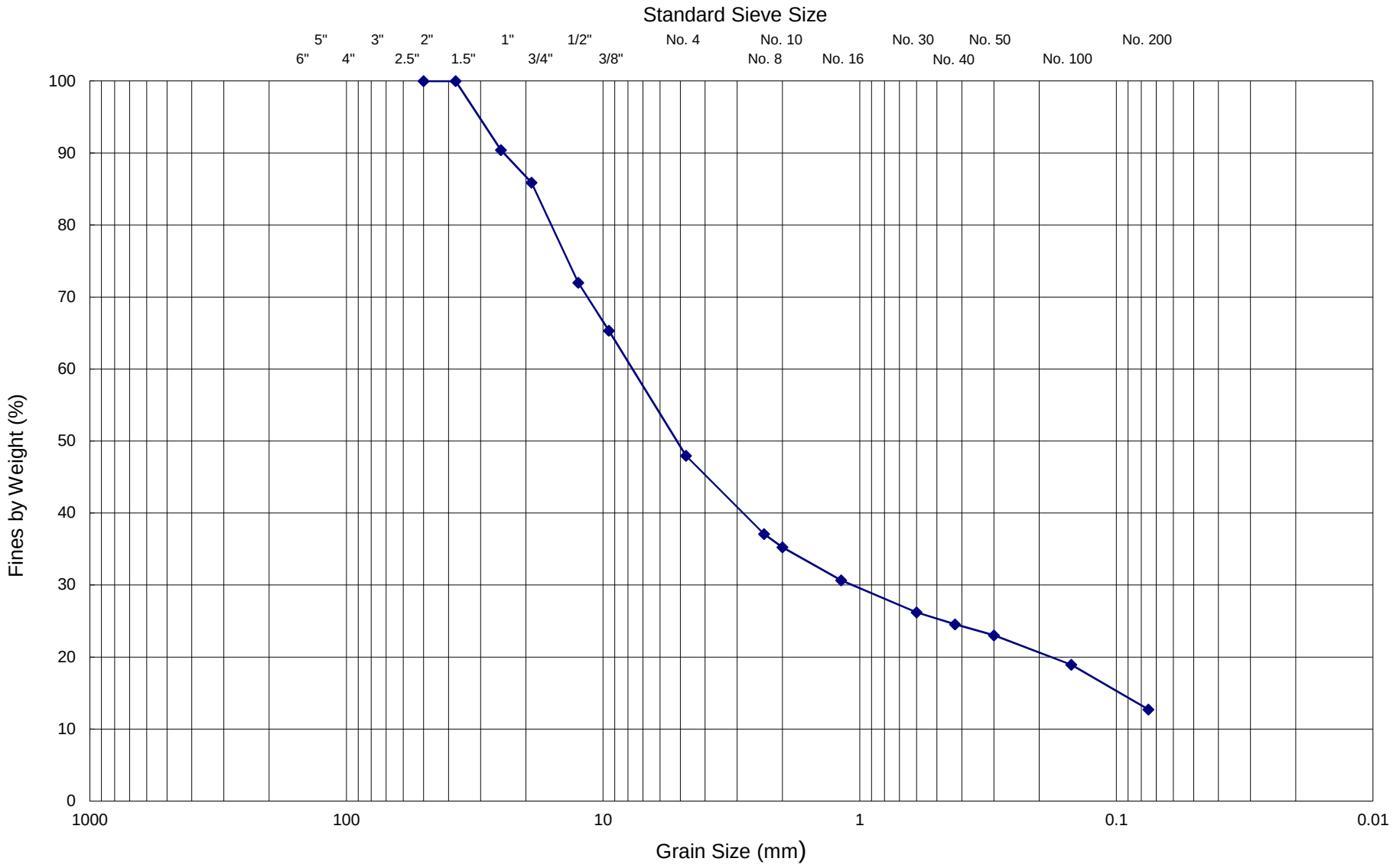
SUMMARY OF LABORATORY TEST RESULTS

Sieve Analysis (AASHTO T 11 & T 27 / ASTM C 117 & C 136)		
Sieve Size		Percent Passing
2"	(50 mm)	100
1 1/2"	(37.5 mm)	100
1"	(25 mm)	90
3/4"	(19 mm)	86
1/2"	(12.5 mm)	72
3/8"	(9.5 mm)	65
No. 4	(4.75 mm)	48
No. 8	(2.36 mm)	37
No. 10	(2 mm)	35
No. 16	(1.18 mm)	31
No. 30	(0.6 mm)	26
No. 40	(0.425 mm)	25
No. 50	(0.3 mm)	23
No. 100	(0.15 mm)	19
No. 200	(0.075 mm)	12.7

Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project No: 1162110
Sample ID: B-19, S-3, 14'
Sample Desc.: Sand & Gravel (SP/GP)
Date: November 2016

EARTH ENGINEERING CONSULTANTS, LLC

Summary of Washed Sieve Analysis Tests (ASTM C117 & C136)



Cobble	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project No: 1162110
Sample ID: B-19, S-3, 14'
Sample Desc.: Sand & Gravel (SP/GP)
Date: November 2016

EARTH ENGINEERING CONSULTANTS, LLC

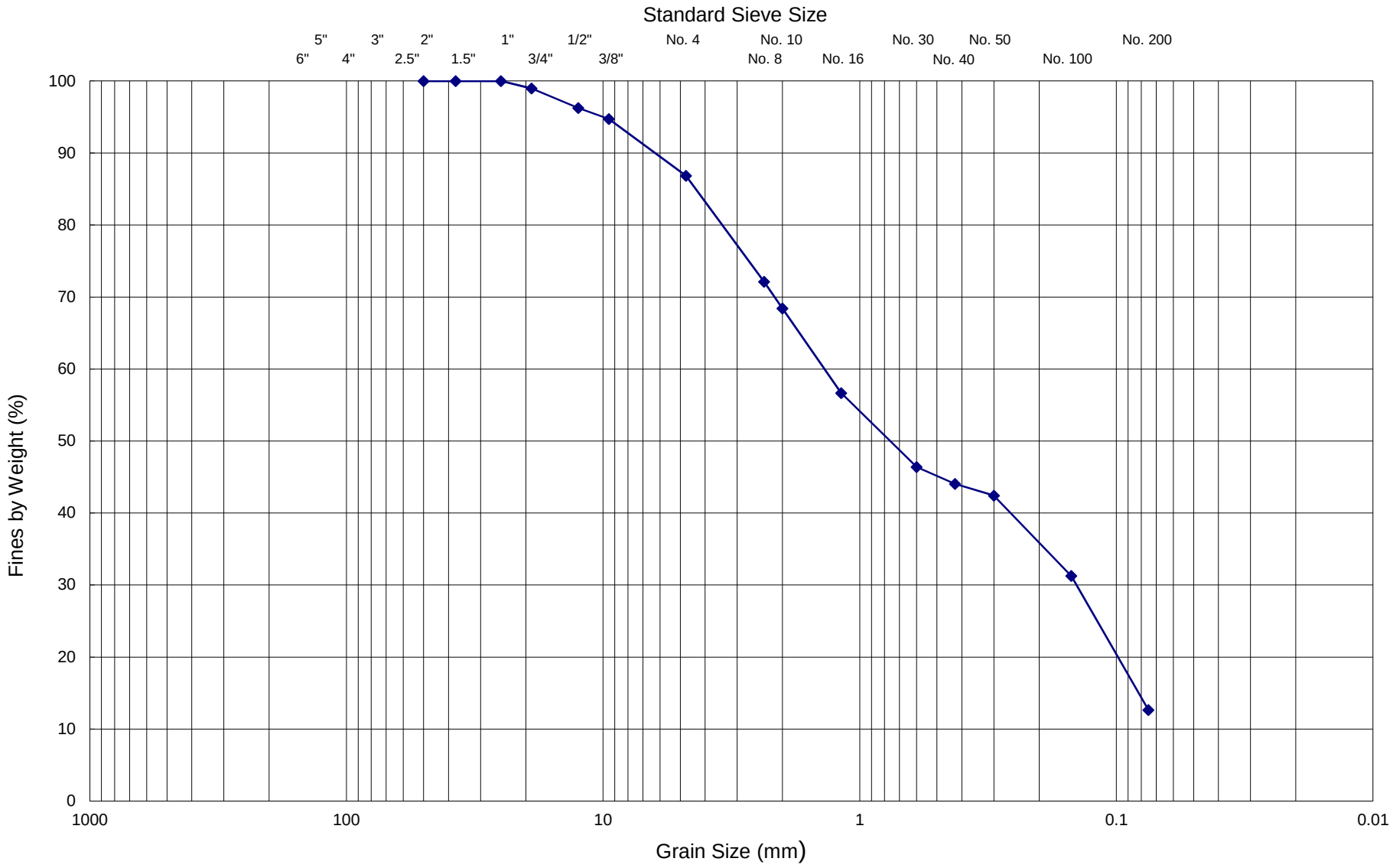
SUMMARY OF LABORATORY TEST RESULTS

Sieve Analysis (AASHTO T 11 & T 27 / ASTM C 117 & C 136)		
Sieve Size		Percent Passing
2"	(50 mm)	100
1 1/2"	(37.5 mm)	100
1"	(25 mm)	100
3/4"	(19 mm)	99
1/2"	(12.5 mm)	96
3/8"	(9.5 mm)	95
No. 4	(4.75 mm)	87
No. 8	(2.36 mm)	72
No. 10	(2 mm)	68
No. 16	(1.18 mm)	57
No. 30	(0.6 mm)	46
No. 40	(0.425 mm)	44
No. 50	(0.3 mm)	42
No. 100	(0.15 mm)	31
No. 200	(0.075 mm)	12.7

Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project No: 1162110
Sample ID: B-22, S-3, 9'
Sample Desc.: Sand & Gravel (SP/GP)
Date: November 2016

EARTH ENGINEERING CONSULTANTS, LLC

Summary of Washed Sieve Analysis Tests (ASTM C117 & C136)



Cobble	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

Project: Stephens Subdivision - Residential Development
Location: Greeley, Colorado
Project No: 1162110
Sample ID: B-22, S-3, 9'
Sample Desc.: Sand & Gravel (SP/GP)
Date: November 2016