CTL|THOMPSON
Founded in 1971

GEOLOGIC HAZARD EVALUATION AND PRELIMINARY GEOTECHNICAL INVESTIGATION

PETERSON ROAD SUBDIVISION
PETERSON ROAD AND HIGHWAY 24
COLORADO SPRINGS, COLORADO

Prepared for:

VINTAGE COMMUNITIES, INC.
c/o CONSTRUCTION MANAGEMENT & CONSULTING, INC.
1191 Applewood Drive
Colorado Springs, CO 80907
Attention: Ron O’Canna

Project No. CS19836-115

August 6, 2024

TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

SCOPE

This report presents the results of our Geologic Hazard Evaluation and Preliminary Geotechnical Investigation for an approximately 14-acre site. We understand the property lines within the project area are being changed, and the area covered by this report will be known as Lots 2 and 3. The project area is located northeast of the intersection of State Highway 24 and Peterson Road, and is south of Sand Creek East Fork, in El Paso County Colorado (Fig. 1). We understand the property lines within the project area are being changed for a proposed residential development and an extension of Meadowbrook Parkway. The purpose of our investigation was to evaluate general geologic and subsurface conditions that influence development to assist in planning and preliminary design. The scope was described in our Proposal (CS-24-0098) dated May 23, 2024. Evaluation of the property for the presence of potentially hazardous materials (Environmental Site Assessment) is outside of our scope of work.

This report is based on our understanding of the planned construction, subsurface conditions disclosed by exploratory borings, results of field and laboratory tests, engineering analysis, and our experience. It contains descriptions of the soil conditions and groundwater levels found in our exploratory borings, and preliminary design and construction criteria for foundations, floor systems, pavements, and surface drainage. The discussions of foundation, floor systems, and pavement are intended for planning purposes only. The geotechnical exploration and laboratory testing information contained in this report can be used as a supplement for future design-level investigations. CTL|Thompson can provide additional borings and design-level geotechnical investigation services as a separate scope of work, if requested. A brief summary of our conclusions and recommendations follows, with more detailed discussion in the report.

SUMMARY OF CONCLUSIONS

1. Strata encountered in our exploratory borings generally consisted of widespread areas of slightly clayey to clayey sand fill at the surface. Slightly silty to silty sand and slightly clayey to very clayey sand, with scattered gravels, was encountered at the surface or below the fill and extended to the maximum depths explored. Surficial fills were not identified in four of the sixteen borings. Bedrock was not encountered.
2. Groundwater was observed in three borings at depths of 6 feet (TH-12), 6.6 feet (TH-14), and 9 feet (TH-15). Groundwater observations in all other borings were

at greater depths, as discussed in the **Groundwater** section. Groundwater levels will vary with seasonal precipitation and landscaping irrigation. Groundwater levels measured in TH-12, TH-14, and TH-15 may influence development and foundation design, depending on final grading and foundation depths.

3. We recommend the preparation of design-level geotechnical investigations for the proposed buildings to develop specific foundation recommendations for the design and construction of foundations and floor systems. We expect spread footing foundations will be the preferred foundation type for the proposed development type. For preliminary planning purposes, mat or spread footing foundations with a maximum allowable soil pressure of 2,000 to 3,000 psf is anticipated.

4. The natural sand, or new, moisture conditioned, densely compacted fill should provide good support for floor slabs. The performance of slabs may be poor if existing fill is present near floor levels. Sub-excavation of existing fill and loose soil replacement with moisture conditioned fill can enhance performance of slabs.

5. We understand the project will include the extension of Meadowbrook Parkway, and residential roadways. On a preliminary basis, we suggest budgeting for section of 5 inches of HMA over 8 inches of aggregate base course. A pavement design report should be prepared in accordance with El Paso County criteria after site plans and grading plans have been completed.

6. Control of surface drainage will be critical to the performance of foundations and slabs-on-grade. Overall surface drainage should be designed to provide rapid removal of surface runoff away from the proposed residences. Conservative irrigation practices should be followed to avoid excessive wetting.

SITE CONDITIONS

The project area is approximately 14 acres located northeast of the intersection of State Highway 24 and Peterson Road and is south of Sand Creek East Fork. Peterson Road bounds the project's west side.

The project area is relatively flat and generally slopes from the northeast down to the southwest. The Sand Creek East Fork is to the north of the project area, and the northern edge of the project area slopes toward the creek. As we understand the project boundaries, the creek bank is located outside of the project area. The project area has some grasses, small shrubs, and trees. Some of the trees appear to have been planted as windbreaks as part of the previous development of the site.

A small hotel is adjacent to the project area to the south, a strip mall, gas station, and golf course are to the west, on the other side of Peterson Road, and an apartment complex is being constructed to the east of the project (CTL|T Project Nos. CS19308-115 and -125). The

Meadowbrook Crossing residential development is located to the northeast (CTL|T Project Nos. CS18620-105, CS18831-120 and CS18831.001-120). Meadowbrook Parkway runs east/west between Meadowbrook Crossing and the apartment development, ending in a cul-de-sac at the eastern edge of the project area.

The project site is currently vacant except for a small, temporary fenced construction yard along Peterson Road and is crisscrossed with two-tracks. Historic aerial images of the site are provided in Appendix D. The 1953 aerial image appears to show a small drainage crossed the site in a northeast/southwest direction. The photo we have covers a small area, and it is difficult to determine if the drainage is the result of concentrated sheet flow, or if it is the remanent of a past meander of the creek. In the 1960 image, an oval shaped track is present in the northern half of the site and is also visible in the 1975 image. In the 1983 image, the site has been redeveloped with six baseball diamonds, and it appears the remainder of the project area had been graded, likely for parking. The baseball diamonds appear to have been active and maintained in the 2004 image, but was abandoned in the 2011 image. The shapes of the baseball diamonds can still be discerned in current imagery.

PROPOSED DEVELOPMENT

We have been provided with the Proposed Roadway Grading, Site Utilities and Concept Plan Exhibit prepared by Matrix, dated May 17, 2024. We understand the property lines within the project area are being changed, and the area covered by this report will be known as Lots 2 and 3. We understand Lots 2 and 3 are being developed for multifamily residential use. Lot 4 which will contain the proposed detention basin is outside of project area of this investigation. We understand that Meadowbrook Parkway will be extended from the eastern edge of the project area to the west, to intersect with Peterson Road. Proposed improvements are anticipated to include roadways and underground utilities.

INVESTIGATION

Subsurface conditions at the site were investigated by drilling sixteen, widely spaced, exploratory borings to depths between 25 and 35 feet. The approximate locations of the borings are shown in Fig. 1. Our representative observed the drilling operations, logged the subsurface conditions found in the borings, and obtained samples for laboratory testing. Graphical logs of the borings, including the results of field penetration resistance tests, and some laboratory test data are presented in Appendix A. Soil samples obtained during drilling were visually classified and laboratory testing was assigned to representative samples. Swell-consolidation and gradation test results are presented in Appendix B. Laboratory test data are summarized in Table B-1.

SUBSURFACE CONDITIONS

The soils encountered during this investigation generally consisted of widespread areas of slightly clayey to clayey sand fill at the surface. Natural, slightly silty to silty sand and slightly clayey to very clayey sand, with scattered gravels, was encountered either at the surface or beneath fill material and extended to the maximum depths explored. Surficial fills were not identified in four of the sixteen borings. Bedrock was not encountered. Some of the pertinent engineering characteristics of the soils and bedrock encountered and groundwater conditions are discussed in the following paragraphs.

Fill

Slightly clayey to clayey sand fill was encountered in twelve borings. The fill ranged from 0.5 to 9 feet in thickness. Due to the likely nature in which the fill was placed, it is possible that more fill exists on the site than was identified in the borings. Fill placement records were not available at the time of this investigation and the fill is considered to be undocumented. If documentation such as field observation and density testing reports is available, it should be provided to our office.

The fill was loose to medium dense based on field penetration resistance testing. Six samples of the fill contained 5 to 33 percent silt and clay-sized particles (passing the No. 200 sieve). Three samples of the fill were tested for swell and consolidation characteristics in our laboratory. The fill samples exhibited slight compression to low swell potential when wetted under estimated overburden pressure. The Liquid Limits were 20 and 25, and the Plasticity Indices were 2 and 6. The measured moisture contents of the fill ranged from 4.3 to 11.1 percent.

Sand Soils

The natural soils encountered consisted of slightly silty to silty sand and slightly clayey to very clayey sand, with scattered gravels. The sand encountered in the borings extended to the maximum depths explored. The sand was loose to very dense based on the results of field penetration resistance tests. Samples of the sand tested in our laboratory contained 5 to 41 percent clay and silt-sized particles (passing the No. 200 sieve). The Liquid Limits were 22 and 24, and the Plasticity Indices were 5 in two samples; three samples were non-plastic. The measured moisture contents of the fill ranged from 2.2 to 21.1 percent.

Seven samples of the sand were swell tested in our laboratory. The sand samples exhibited slight compression to low swell potential when wetted under estimated overburden pressure. Several of the samples consolidated a notable amount under initial loading. We do not believe the initial consolidation is indicative of collapse-prone soils as collapse-prone soils would consolidate after the initial consolidation, when the sample is wetted. The initial consolidation is likely the result of sample disturbance due to the granular nature of the materials.

Bedrock

Bedrock was not encountered during this investigation. The nearby mapped bedrock units can generally be described as sandstone which may have interbedded claystone.

Groundwater

At the time of drilling, groundwater was encountered in thirteen of the sixteen borings. Depth to groundwater ranged from 13.5 to 31 feet below the existing ground surface in twelve borings, and depth to groundwater was 8 feet below the existing ground surface in boring TH-14. Due to the nature of the onsite materials, we were only able to check water levels in seven of the borings several days after the completion of drilling operations as the boring holes had collapsed. Groundwater was observed in three of the seven borings at depths of 28.5 feet (TH-9), 29 feet (TH-10), and 6 feet (TH-12). Groundwater levels will vary with seasonal precipitation and landscaping irrigation. Groundwater levels measured in TH-14 and TH-12 may influence development and foundation design, depending on final grading and foundation depths.

Seismicity

According to the USGS, Colorado's Front Range and eastern plains are considered low seismic hazard zones. The earthquake hazard exhibits higher risk in western Colorado compared to other parts of the state. The Denver Metropolitan area has experienced earthquakes within the past 100 years, shown to be related to deep drilling, liquid injection, and oil/gas extraction. Naturally occurring earthquakes along faults due to tectonic shifts are rare in this area.

The soil and bedrock at this site are not expected to respond unusually to seismic activity. The 2021 International Building Code (Section 1613.2.2) defers the estimation of Seismic Site Classification to ASCE 7-16, as outlined in the table below.

ASCE 7-16 SITE CLASSIFICATION CRITERIA

Seismic Site Class	$\bar{s}_u$, Average Undrained Shear Strength (lb/ft^2)	$\bar{N}$, Average Standard Penetration Resistance (blows/ft)	$\bar{v}_s$, Average Shear Wave Velocity (ft/s)
A. Hard Rock	N/A	N/A	>5,000
B. Rock	N/A	N/A	2,500 to 5,000
C. Very Dense Soil and Soft Rock	>2,000	>50 blows/ft	1,200 to 2,500
D. Stiff Soil	1,000 to 2,000	15 to 50 blows/ft	600 to 1,200
E. Very Loose Sand or Soft Clay Soil	<1,000	<15 blows/ft	<600
F. Soils requiring Site Response Analysis	See Section 20.3.1	See Section 20.3.1	See Section 20.3.1

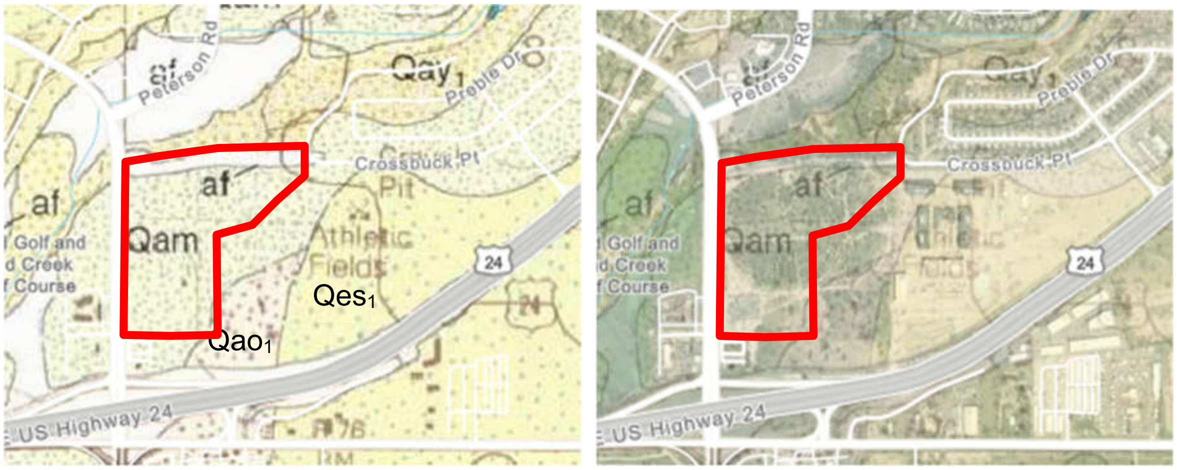
Based on the results of our investigation, we judge the subsurface is likely Seismic Site Classification D. The subsurface conditions indicate low susceptibility to liquefaction from a materials and groundwater perspective.

SITE GEOLOGY

The surficial geology at the site was evaluated by reviewing published geologic maps and our site reconnaissance and subsurface exploration. The Colorado Springs Quadrangle map published by the Colorado Geological Survey (CGS), by Richard F. Madole, and Jon P. Thorson, 2002[1] was reviewed for the project site. Our borings generally confirm the CGS mapping. The various deposits mapped at the site are described in more detail based on the Geologic Map descriptions in the following sections. Mapping shown was obtained from the USGS National Geologic Map Database.

---

[1] Madole, Richard F., and Thorson, Jon P., 2002, Geologic Map of the Elsmere Quadrangle, El Paso County, Colorado: Colorado Geological Survey Open-File Map 02-2, scale 1:24,000.



Excerpt from the Elsmere Quadrangle with the approximate project area shown in red

Artificial Fill (Map Unit af): Disturbed areas or artificial fill placed during construction activities.

Young alluvium one (Qay$_1$): late Holocene age, alluvial deposits transported and deposited by flowing water in channels, chiefly light brownish-gray, grayish-brown, and dark-grayish-brown, poorly sorted sand, silty sand, and minor pebble gravel. Exists on narrow flood plains and the floors of stream channels, most of which are incised. Exposed thickness generally is 2-8 feet.

Middle alluvium (Qam): late Pleistocene age, alluvial deposits transported and deposited by flowing water in channels, chiefly light-brownish-gray, pale-brown, light-yellowish-brown, and grayish-brown, poorly sorted sand and subordinate amounts of gravel. Estimated thickness is 20-50 feet.

Old alluvium one (Qao$_1$): middle Pleistocene age, alluvial deposits transported and deposited by flowing water in channels, chiefly pale-brown to strong-brown, extremely poorly sorted, fine to very coarse sand, silty and clayey sand, and gravel. Most gravel is in thin beds that consist dominantly of fine pebbles, although locally some deposits contain small amounts of large cobbles. Estimated thickness is 3-30 ft.

Mapped bedrock units: near the site include Dawson Formation Facies unit one (TKda$_1$), Dawson Formation Lower part (Kda), Laramie Formation Upper member (Klu), Fox Hills Sandstone (Kfh), and Laramie Formation (Kl), with TKda$_1$ being the unit closest in geographic proximity to the site. Bedrock was not encountered during this investigation. The mapped bedrock units can generally be described as sandstone which may have interbedded claystone.

GEOLOGIC HAZARD DISCUSSION

Colorado is a challenging location to practice geotechnical engineering. The climate is relatively dry, and the near-surface soils are typically dry and comparatively stiff. These soils and related sedimentary bedrock formations react to changes in moisture conditions. Some of the soils swell as they increase in moisture and are referred to as expansive soils. Other soils can compress significantly upon wetting and are identified as compressible or collapsible soils. Much of the land available for development east of the Front Range is underlain by expansive clay or claystone bedrock near the surface. The soils that exhibit compressible behavior are more likely west of the Continental Divide; however, both types of soils occur throughout the state.

Covering the ground with structures, streets, parking lots, patios, etc., coupled with lawn irrigation and changing drainage patterns, leads to an increase in subsurface moisture conditions. As a result, some soil movement due to heave or settlement is inevitable. Local areas of slightly expansive soils are present at this site, which constitutes a geologic hazard. There is risk that foundations and slab-on-grade floors will experience heave or settlement and damage. It is critical that precautions are taken to increase the chances that the foundations and slabs-on-grade will perform satisfactorily. Engineered planning, design and construction of grading, pavements, foundations, slabs-on-grade, and drainage can mitigate, but not eliminate, the effects of expansive and compressible soils. Sub-excavation is a ground improvement method that can be used to reduce the impacts of swelling soils.

Based on the subsurface profiles, swell-consolidation test results and our experience, we calculated potential heave at the existing ground surface for each test hole. The analysis involves dividing the soil profile into layers and modeling the heave of each layer from representative swell tests. We calculated potential ground heave of less than 1-inch for the borings drilled during this investigation. A depth of wetting of 24 feet below existing grades was considered for the analysis. This depth of wetting is typically used for irrigated, residential sites. Variations from our estimates should be anticipated. It is not certain whether the estimated heave will occur.

Assessment of the site for: the potential for wildfire hazards; corrosive soils; erosion problems; protections against erosion, such as the design and implementation of a Stormwater Management Plan; flooding; flood protection; assessment of estimated peak flows and physiographic flood plains of drainages; source permanence and variation in amounts of surface water; hydraulic gradients of groundwater; hazards associated with airports and major utility facilities; polluted water; problems of groundwater circulation; and excessive flow of groundwater is beyond the scope of this investigation.

The following conditions were considered in this evaluation:

- Collapse prone soils
- Shallow ground water tables
- A history of landfill, uncontrolled, or undocumented fill activity
- Flood prone areas
- Expansive soils and expansive rock
- Landslide areas or potential landslide areas
- Existing unstable or potentially unstable slopes
- Debris flow and debris fans
- Rockfall
- Subsidence and abandoned mining activity
- Groundwater springs or seeps
- Steeply dipping bedrock
- Faults
- Elevated radioactivity and Radon

It is our opinion that no geologic hazards exist at this site that preclude subdividing the site and commercial or residential development. We believe conditions that exist on-site can be mitigated with engineering design and construction methods commonly employed in the area.

Collapse-Prone Soils

Features indicating subsidence or settlement were not observed in the project area. However, lab testing indicates collapse-prone soils may be present at this site at boring TH-2 at a depth of 4 feet. Collapse-prone soils may be susceptible to hydro-collapse, a phenomenon where soils undergo a decrease in volume upon an increase in moisture content, with or without an increase in external loads.

The presence of collapse-prone soils implies risk that slabs-on-grade and foundations will settle and be damaged. The risks associated with collapse-prone soils can be mitigated by careful design, common construction practices, including grading considerations, and maintenance procedures. We believe the recommendations in this report will help to control risk of foundation and/or slab damage; they will not eliminate that risk. The owner should understand that slabs-on-grade and, in some instances, foundations may be affected by these soils.

Maintenance will be required to control risk. We believe the collapse-prone soils at this site present a moderate to low risk without mitigation.

Shallow Groundwater Tables, Springs, and Seeps

At the time of drilling, groundwater was encountered in thirteen of the sixteen borings. Groundwater levels measured in TH-12, TH-14, and TH-15, located in north-central area of the proposed development, may influence development and foundation design, depending on final grading and foundation depths.

The geologic mapping does not indicate the presence of groundwater springs or seeps. Areas graded to impound water may locally influence groundwater levels. We believe local variations in groundwater levels can be mitigated with engineering design.

Landfill, Uncontrolled, or Undocumented Fill Activity

We did not identify materials in our exploratory borings indicative of landfill activities. Review of historic aerial imagery also did not indicate landfill activities on the site.

Slightly clayey to clayey sand fill was encountered in twelve borings. The fill ranged from 0.5 to 9 feet in thickness. Fill placement records were not available at the time of this investigation and the fill is considered to be undocumented. If documentation such as field observation and density testing reports is available, it should be provided to our office.

The site has been disturbed, and our borings were widely spaced. Due to the historic disturbance of the site additional fill may be identified during a design level investigation or during site earthwork activities. A design level geotechnical investigation should be conducted to confirm the extents of fill which may be present after grading operations; and whether the engineering characteristics of the remaining fill are suitable to support structures.

Flooding

The FEMA panel covering the project site is Map Number 08041C0752G effective 12/7/2018 covering the northern end of the project, and Map Number 08041C0754G effective 12/7/2018 covering the majority of the project. The eastern side of the project area lies within the mapped Zone AE, and the northern most side of the project appears to be adjacent to Zone AE mapping, however due to the nature of the mapping the Zone AE may extend into the northern edge of the property. The project Civil Engineer should determine the extents of the flood mapping for the site, the flood potential, and design surface drainage.

Geologic Hazard mapping for El Paso County is limited in availability. While the site is outside of the City of Colorado Springs boundary, it is close to the boundary and some of the City of Colorado Springs GIS mapping data, available on the SpringsView website, covers the project site. The western side of the project area is shown within the 100-year floodplain as shown on zoning layers on the SpringsView webpage. The mapping of the 100-year floodplain is roughly equivalent to the Zone AE mapping in the FEMA panels.

Clip from online City of Colorado SpringsView mapping, 100-year floodplain in grey, approximate project area outlined in red

Expansive Soils and Expansive Bedrock

Soils that exhibited low to no expansive potential were identified in the project area. Design-level, geotechnical investigations conducted for each building site should address procedures for mitigation associated with expansive soils.

Potentially Unstable Slopes and Landslide Areas

The project site is within the study area of the CGS Landslide Inventory of El Paso County and does not have any areas mapped as having potential landslide susceptibility. We reviewed slope shaded digital elevation models (DEMs) generated from the El Paso County 2020 1m resolution LIDAR data. We did not identify landslide indicators within the project area. There is a small slope about 6 to 10 feet in height just outside of the project area to the north along the creek. Based on the slope's appearance in the DEMs, the slope has either been graded, or constructed.

Development near slopes should comply with the 2021 IBC requirements for foundation setbacks. Slopes should be revegetated to control erosion by wind and water. Concentrated water flows over slopes should be avoided. Once development plans and proposed grading plans are finalized, site specific geotechnical investigations should be conducted and should include discussion of site development considerations for construction which may affect slope stability, as necessary.

Debris Flow, Debris Fans and Mudflow

The project is not located within areas with conditions favorable for the generation and deposition of debris flows, especially during extreme precipitation events, as mapped in the Colorado Geological Survey Open-File Report 18-11 "Debris Flow Susceptibility Map of El Paso County, Colorado" (2018) by Kevin M. McCoy, Matthew L. Morgan, and Karen A. Berry, and does not appear susceptible per our observations.

This site has been disturbed, and any surficial evidence of debris flows and mudflows has likely been erased from the site. The potential for sheetwash should be identified in a drainage report. The project Civil Engineer should design surface drainage.

Rockfall

The project area is outside of known, local rockfall susceptibly mapping. The site topography is relatively flat, and does not appear susceptible per our observations.

Subsidence and Abandoned Mining Activity

This project site is not covered by the "Colorado Springs Subsidence Investigation" completed by Dames & Moore of the State of Colorado, Division of Mine Reclamation, dated April 1985, which reported areas that have been or could potentially be affected by mine subsidence activity. The subject site was not located within the investigated area. Sub-surface coal mining in, and near Colorado Springs underlie the Rockrimmon neighborhood and extend southwest, toward the County Club Golf Corse and UCCS. The project area is to the north of the projected extension of the mapped subsurface mine structure. We observed no evidence of subsurface mining at the site.

The area directly to the east of the project site has a mapped surficial, open mine, which likely extracted sand and gravel. This site has been disturbed, and any evidence of surficial pit mining has likely been erased from the site. Review of available historic aerial imagery going back to 1937 from the site do not indicate signs of surficial pit mining prior to development.

Steeply Dipping Bedrock

We reviewed mapping of “Areas Susceptible to Differential Heave in Expansive, Steeply Dipping Bedrock, City of Colorado Springs, Colorado” (1999) by John W. Himmelreich, Jr., and David C. Noe published by the Colorado Geologic Survey. Mapping indicates the project area is outside of areas mapped as having steeply dipping bedrock.

Faults

The geologic mapping does not indicate the presence of faulting on the project site. The nearest mapped fault is the Rampart Range Fault, which runs roughly north-south along the eastern flank of the Rocky Mountains. The Rampart Range Fault at its closest point to the project site, is about 9.2 miles to the west-southwest.

The Rampart Range Fault is dated at the middle and late Quaternary by the Colorado Geological Survey. The fault shows limited activity in recent recorded history, which makes determining an accurate recurrence interval difficult. Studies have shown no movement of the fault has occurred in the last 30,000 to 50,000 years. We are not aware of detailed studies performed on the fault that have provided fault-specific Maximum Credible Earthquake or recurrence interval. Although the fault is considered to be potentially active, the apparent large timeframe between earthquakes makes it unlikely that the fault will produce an earthquake during the design lifetime of this project that will detrimentally affect the site.

Elevated Radioactivity and Radon

We believe no unusual hazard exists from naturally occurring sources of radioactivity on the site. However, the materials found in this area are often associated with the production of radon gas and concentrations in excess of those currently accepted by the EPA can occur. Passive and active mitigation procedures are commonly employed in this region to effectively reduce the buildup of radon gas. Measures that can be taken after a structure is enclosed during construction include installing a blower connected to the foundation drain and sealing the joints and cracks in concrete floors and foundation walls. If the occurrence of radon is a concern, we recommend structures be tested after they are enclosed. Commonly utilized mitigation techniques may minimize risk.

SITE DEVELOPMENT CONSIDERATIONS

As the project is in the preliminary planning stage, grading plans were not available at the time of our investigation. The concept site plan provided to us is used in our Figures 1-3. Geotechnical constraints which can be mitigated by careful design, common construction practices, grading considerations, and maintenance procedures, include: potentially collapse prone soils; potential shallow groundwater; and the presence of undocumented fill.

Potentially Collapse-Prone Soils

In the event collapse-prone soils are encountered following grading or are present within about 4 feet of proposed foundations and floor slabs, sub-excavation and reworking of these materials will be necessary. The depth of sub-excavation may increase, depending on the proposed site grading and future testing.

Potential Shallow Groundwater

Groundwater was not encountered or measured at depths well below that which would be expected to impact design or construction in most of our borings. Groundwater was measured at 6 feet below the existing ground surface in TH-12, 6.6 feet in TH-14, and 9 feet in TH-15. Localized shallow groundwater may influence development and foundation design, depending on final grading and foundation depths. The development of site grading plans, and proposed foundation depths should include considerations for the requirements of cuts and fills needed to achieve final grades and the relative depths of observed groundwater. A design level geotechnical investigation should be conducted to confirm the presence and depths of groundwater after grading operations.

Existing Fills

Slightly clayey to clayey sand fill was encountered in twelve borings. The fill ranged from 0.5 to 9 feet in thickness. The development of site grading plans should include considerations for the requirements of cuts and fills needed to achieve final grades and the relative locations of identified fills. The existing fill is unsuitable for support of structure foundations in its present condition. The fills at this site are generally relatively shallow, and the grading plan can include provisions for removal and reprocessing of the existing fills. A design level geotechnical investigation should be conducted to confirm the extents of fill which may be present after grading operations.

Grading Considerations

Site grading plans were not available at the time of this report. Site grading will be necessary to achieve final design grades. We believe site grading can be accomplished using conventional heavy-duty earthmoving equipment.

Exiting fill, vegetation, topsoil, and organic materials should be removed from the ground surface of areas to be filled. Soft or loose soils, if encountered, should be stabilized or removed to expose stable material prior to placement of fill.

The onsite materials are generally suitable for use as grading fill, and excavation backfill, provided they are free of debris, vegetation/organics, and other deleterious materials. Grading fills should be properly moisture treated and processed.

The ground surface in areas to receive fill should be scarified deeply, moisture conditioned and compacted to a high density to establish a stable subgrade for fill placement. The properties of the fill will affect the performance of foundations, slabs-on-grade, and pavements. Detailed recommendations for moisture conditioning, placement, and compaction of grading fill are set forth in Appendix C. Placement and compaction of the grading fill should be periodically observed and tested by our representative during construction.

We recommend grading plans consider long-term cut and fill slopes no steeper than 3:1 (horizontal to vertical). This ratio considers that no seepage of groundwater occurs. If groundwater seepage does occur, a drain system and flatter slopes may be appropriate. Flatter slopes should be considered to reduce erosion potential. Slopes should be revegetated as soon as possible to control erosion by wind and water. Concentrated water flows over slopes should be avoided.

Buried Utilities

Based on the subsurface conditions encountered in our exploratory borings, we anticipate the materials encountered during utility trench excavation will consist of predominantly silty and clayey sands. Utility trench excavation can likely be accomplished using heavy-duty track hoes. Localized areas of shallow groundwater may impact utility installation. Dewatering of deep utility installations in the northern portion of the site may be necessary.

Excavations for utilities should be braced or sloped to maintain stability and should meet applicable local, state, and federal safety regulations. The contractor should identify the soils and bedrock encountered in trench excavations and refer to Occupational Safety and Health Administration (OSHA) standards to determine appropriate slopes. We anticipate the near-surface sand and clay soils will classify as Type C soils. Temporary excavations in Type C materials require maximum slope inclinations of 1.5:1 (horizontal to vertical) in the absence of groundwater, unless the excavation is shored or braced. Where excavations extend into sound bedrock, these materials will classify as Type A requiring maximum slope inclinations of 0.75:1. Excavations deeper than 20 feet should be designed by a professional engineer.

Water and sewer lines are usually constructed beneath paved areas. Compaction of trench backfill will have a significant effect on the life and serviceability of pavements. We recommend trench backfill be moisture conditioned and compacted in accordance with the recommendations set forth in Appendix C. Personnel from our firm should periodically observe and test the placement and compaction of the trench backfill during construction.

FOUNDATION AND FLOOR SYSTEM CONCEPTS

We recommend the preparation of design-level geotechnical investigations for the proposed buildings to develop specific foundation recommendations for the design and construction of foundations and floor systems. The foundation type should be chosen based on the building type, building loads, subsurface conditions, and other factors. Selection of floor system alternatives should consider risk of movement associated with slab-on-grade floors.

We expect spread footing foundations will be the preferred foundation type for the proposed development type. For preliminary planning purposes, spread footing foundations with a maximum allowable soil pressure of 2,000 to 3,000 psf is anticipated. A post-tension slab-on-grade, where the floor slab is structurally integrated with the foundation may also be an option.

PAVEMENTS

Slightly clayey to clayey sand and slightly silty to silty sand soils were the surficial materials identified in our borings. Pavement recommendations can be provided at the time of the design level-investigation, after grading plans have been developed.

The surficial materials will exhibit variable subgrade support for pavements. We judge the soils will predominantly exhibit good support characteristics and behave as a low swelling material. Based on our experience, we believe a preliminary Hveem stabilometer ("R") value of 35 would be appropriate for preliminary design purposes.

We understand the project will include the extension of Meadowbrook Parkway, and residential roadways. On a preliminary basis, we suggest budgeting for section of 5 inches of HMA over 8 inches of aggregate base course for public roadways. Private roadways may use a reduced section. A pavement design report should be prepared in accordance with El Paso County criteria after site plans and grading plans have been completed.

CONCRETE

Concrete in contact with soil can be subject to sulfate attack. We measured water-soluble sulfate concentrations of less than 0.10 percent in four samples. As indicated in our tests and ACI 318-19, the sulfate exposure class is *Not Applicable or S0*. Deviations from the exposure class may occur with additional sampling and testing performed during design-level investigations.

SULFATE EXPOSURE CLASSES PER ACI 318-19

Exposure Classes		Water-Soluble Sulfate (SO_4) in Soil [A] (%)
Not Applicable	S0	< 0.10
Moderate	S1	0.10 to <0.20
Severe	S2	0.20 to 2.00
Very Severe	S3	> 2.00

A) Percent sulfate by mass in soil determined by ASTM C1580

For severe levels of sulfate concentration, ACI 318-19, *Building Code Requirements for Structural Concrete,* indicates there are special cement type requirements for sulfate resistance as indicated in the table below.

CONCRETE DESIGN REQUIREMENTS FOR SULFATE EXPOSURE PER ACI 318-19

Exposure Class		Maximum Water/ Cement Ratio	Minimum Compressive Strength (psi)	Cementitious Material Types [A]			Calcium Chloride Admixtures
				ASTM C150/ C150M	ASTM C595/ C595M	ASTM C1157/ C1157M	
S0		N/A	2500	No Type Restrictions	No Type Restrictions	No Type Restrictions	No Restrictions
S1		0.50	4000	II [B]	Type with (MS) Designation	MS	No Restrictions
S2		0.45	4500	V [B]	Type with (HS) Designation	HS	Not Permitted
S3	Option 1	0.45	4500	V + Pozzolan or Slag Cement [C]	Type with (HS) Designation plus Pozzolan or Slag Cement [C]	HS + Pozzolan or Slag Cement [C]	Not Permitted
S3	Option 2	0.4	5000	V [D]	Type with (HS) Designation	HS	Not Permitted

A) Alternate combinations of cementitious materials shall be permitted when tested for sulfate resistance meeting the criteria in section 26.4.2.2(c).
B) Other available types of cement such as Type III or Type I are permitted in Exposure Classes S1 or S2 if the C3A contents are less than 8 or 5 percent, respectively.
C) The amount of the specific source of pozzolan or slag to be used shall not be less than the amount that has been determined by service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slab to be used shall not be less than the amount tested in accordance with ASTM C1012 and meeting the criteria in section 26.4.2.2(c) of ACI 318.
D) If Type V cement is used as the sole cementitious material, the optional sulfate resistance requirement of 0.040 percent maximum expansion in ASTM C150 shall be specified.

Superficial damage may occur to the exposed surfaces of highly permeable concrete. To control this risk and to resist freeze-thaw deterioration, the water-to-cementitious materials ratio should not exceed 0.50 for concrete in contact with soils that are likely to stay moist due to surface drainage or high-water tables. Concrete should have a total air content of 6 percent ± 1.5 percent. We advocate damp-proofing of all foundation walls and grade beams in contact with the subsoils.

SURFACE DRAINAGE

The performance of structures, flatwork, and pavements will be influenced by surface drainage. When developing an overall drainage scheme, consideration should be given to drainage around each structure and on pavement areas. Drainage should be planned such that surface runoff is directed away from foundations and is not allowed to pond adjacent to foundations or over pavements. The ground surface around the buildings should be sloped to provide positive drainage away from the foundations. We recommend a slope of at least 5 percent for the first 10 feet surrounding each building in landscaped areas. In flatwork areas adjacent to buildings, the slope may be reduced to grades that comply with ADA requirements. A minimum slope of 2 percent is suggested. More slope is desirable. Concrete curbs and sidewalks may "dam" surface runoff adjacent to the buildings and disrupt proper flow. Use of "chase" drains or weep holes at low points in the curb should be considered to allow proper drainage. Roof downspouts and other water collection systems should discharge beyond the limits of backfill around structures.

RECOMMENDED FUTURE INVESTIGATIONS

Based on the results of this study, we recommend the following additional investigations and services be provided by our firm:

- Construction materials testing and observation services during site development and construction.
- Subgrade Investigation and Pavement Design for on-site pavements.
- After site development plans have been formalized, we recommend a design-level geotechnical investigation be completed. Such investigations will be required to determine the appropriate foundation and floor systems for the buildings based upon the over-lot grading and building finished floor elevations.

GEOTECHNICAL RISK

The concept of risk is an important aspect with any geotechnical evaluation primarily because the methods used to develop geotechnical recommendations do not comprise an exact science. We never have complete knowledge of subsurface conditions. Our analysis must be tempered with engineering judgment and experience. Therefore, the recommendations presented in any geotechnical evaluation should not be considered risk-free. Our recommendations represent our judgment of those measures that are necessary to increase the chances that structures will perform satisfactorily.

LIMITATIONS

The information, and conclusions presented herein are based upon consideration of many factors including, but not limited to, the geologic setting, and the subsurface conditions expected. The conclusions contained in the report are not valid for use by others. If the project is not constructed within about three years, we should be contacted to determine is we should update this report.

Our borings were widely spaced to provide a general picture of subsurface conditions for preliminary planning of residential construction. Variations from our borings should be anticipated. We believe this investigation was conducted in a manner consistent with that level of care and skill ordinarily used by geotechnical engineers practicing under similar conditions. No warranty, express or implied, is made.

If we can be of further service in discussing the contents of this report or analysis of the influence of subsurface conditions on the project, please call.

Respectfully submitted,

CTL|THOMPSON, INC.

COLORADO LICENSED
GWENDOLYN ELIZABETH EBERHART
45929
05/06/2024
PROFESSIONAL ENGINEER

Gwendolyn E. Eberhart, P.E.
Project Manager

Reviewed by:

Jeffrey M. Jones, P.E.
Associate Engineer

GE:JMJ:cw

Via e-mail: rcocanna@msn.com

REFERENCES

Geologic Mapping

Madole, Richard F., and Thorson, Jon P., 2002, Geologic Map of the Elsmere Quadrangle, El Paso County, Colorado: Colorado Geological Survey Open-File Map 02-2, scale 1:24,000.

USGS The National Geologic Map Database, MapView: https://ngmdb.usgs.gov/mapview/?center=-104.693,38.845&zoom=15

Geologic Hazards References

Colorado Geological Survey. (1991). Results of the 1987-88 EPA Supported Radon Study in Colorado, with a Discussion on Geology, Colorado Geological Survey Open File Report 91-4.

Charlie, W.A., Battalora, R.J., Siller, T.J., and Doehring, D.O., 2002, Magnitude Recurrence Relations for Colorado Earthquakes: Earthquake Spectra, v. 18, p. 233-250.

Dames & Moore. (1985). State of Colorado, Colorado Springs Subsidence Investigation Mapping.

Federal Emergency Management Agency, Flood Insurance Rate Map, Map Number 08041C0752G effective 12/7/2018 covering the northern end of the project, and Map Number 08041C0754G effective 12/7/2018 covering the majority of the project.

Himmelreich, John W., Jr., and Noe, David C. (1999). Areas Susceptible to Differential Heave in Expansive, Steeply Dipping Bedrock, City of Colorado Springs, Colorado. Colorado Geologic Survey, Map Series 32.

Kirkham, R.M. & Rogers, W.P. (1981). Earthquake Potential in Colorado. Colorado Geological Survey, Bulletin 43.

McCoy, Kevin M. , Morgan, Matthew L. and Berry, Karen A., (2018). Debris Flow Susceptibility Map of El Paso County, Colorado. Colorado Geological Survey Open-File Report 18-11

Morgan, M.L., and Wilson, J.C., 2003, Published Faults of the Colorado Front Range: Colorado Geological Survey, scale 1:250,000, 2 sheets.

Robinson and Associates, Inc. (1977). El Paso County, Colorado Potential Geologic Hazards and Surficial Deposits, Environmental and Engineering Geologic Maps and Tables for Land Use.

Widmann, B.L., Kirkham, R.M., and Rogers, W.P., 1998, Preliminary Quaternary Fault and Fold Map and Database of Colorado: Colorado Geological Survey Open-File Report 98-8, 343 p.

Previous Investigations

CTL|Thompson, Preliminary Geotechnical Investigation, Crossroads Apartments, Meadowbrook Crossing and Colorado Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS19308-115, dated November 13, 2020).

CTL|Thompson, Geotechnical Investigation, Crossroads Apartments, Meadowbrook Crossing and Colorado Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS19308-125, dated May 18, 2021).

CTL|Thompson, Geotechnical Investigation, Crossroads Mixed Use – Alt 2 Pad Building, West of the intersection of US Highway 24 and Colorado State Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS19629-125, dated December 9, 2022).

CTL|Thompson, Geotechnical Investigation, Crossroads Mixed Use – Alt 1 Pad Building, West of the intersection of US Highway 24 and Colorado State Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS19629.001-125, dated December 14, 2022).

CTL|Thompson, Geotechnical Investigation, Crossroads Mixed Use – In-Line Retail Strip Building, West of the intersection of US Highway 24 and Colorado State Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS19629.002-125, dated December 16, 2022).

CTL|Thompson, Geotechnical Investigation, Cowperwood Commercial Building, South East of Peterson Road and Space Village Avenue, Colorado Springs, Colorado (CTL|T Job No. CS-15,073-125, dated January 19, 2005).

CTL|Thompson, Preliminary Geotechnical Investigation, South East of Peterson Road and Space Village Avenue, Colorado Springs, Colorado (CTL|T Job No. CS-15,073-115, dated December 29, 2004).

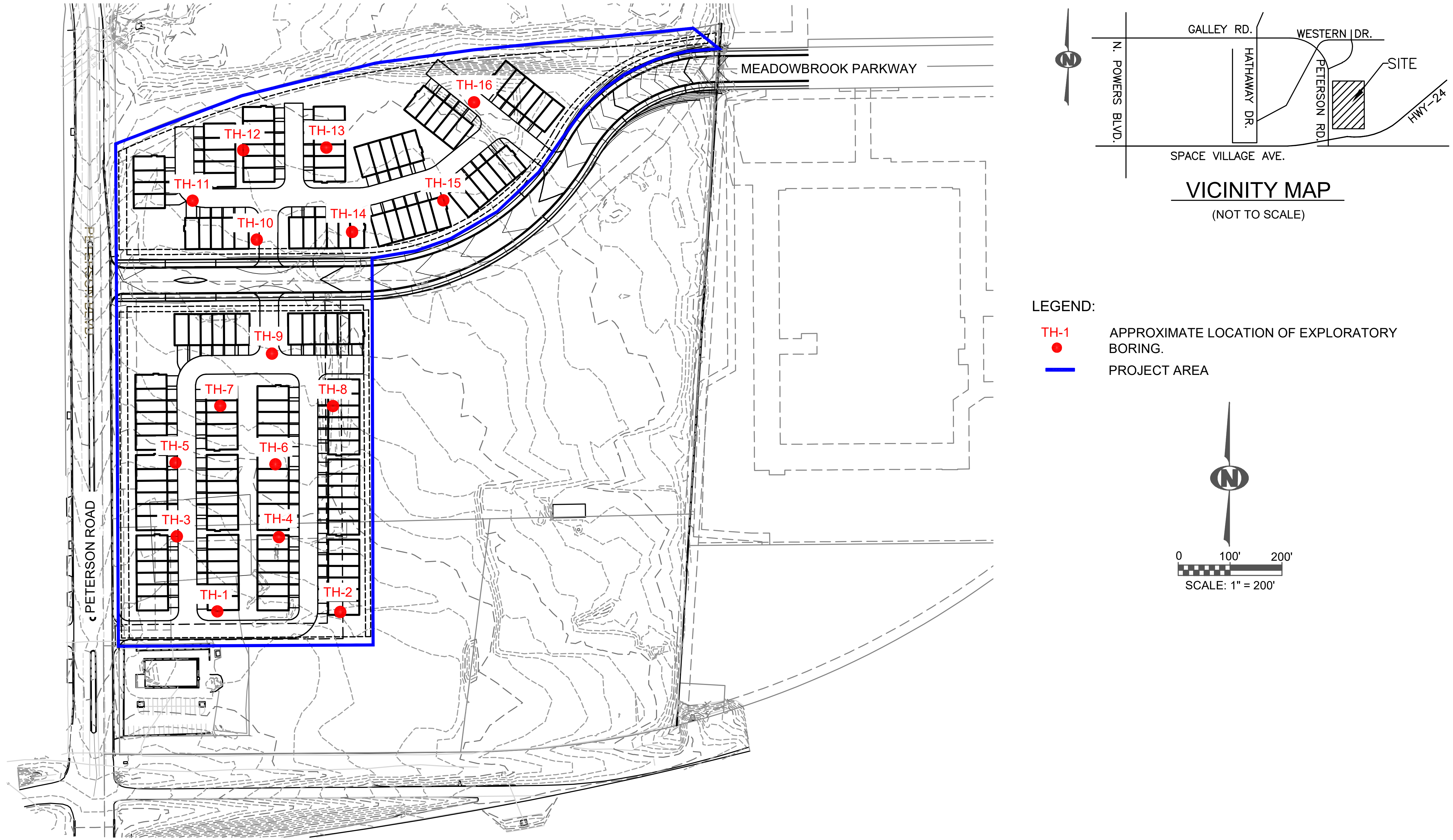
CTL|Thompson, Geologic Hazards Evaluation and Preliminary Geotechnical Investigation, Meadowbrook Crossing Subdivision, Meadowbrook Parkway and State Highway 94, El Paso County, Colorado (CTL|T Project No. CS18620-105, dated December 9, 2016).

CTL|Thompson, Soils and Foundation Investigation, Meadowbrook Crossing Filing No. 1, Model Lots 1 and 2, Meadowbrook Parkway and State Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS18831-120, dated April 20, 2018).

CTL|Thompson, Soils and Foundation Investigation, Meadowbrook Crossing Filing No. 1, 22 Lots, Meadowbrook Parkway and State Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS18831-120, dated April 27, 2018).

CTL|Thompson, Soils and Foundation Investigation, Meadowbrook Crossing Filing No. 2 (35 Lots), Meadowbrook Parkway and State Highway 94, Colorado Springs, Colorado (CTL|T Project No. CS18831.001-120, dated June 12, 2018).

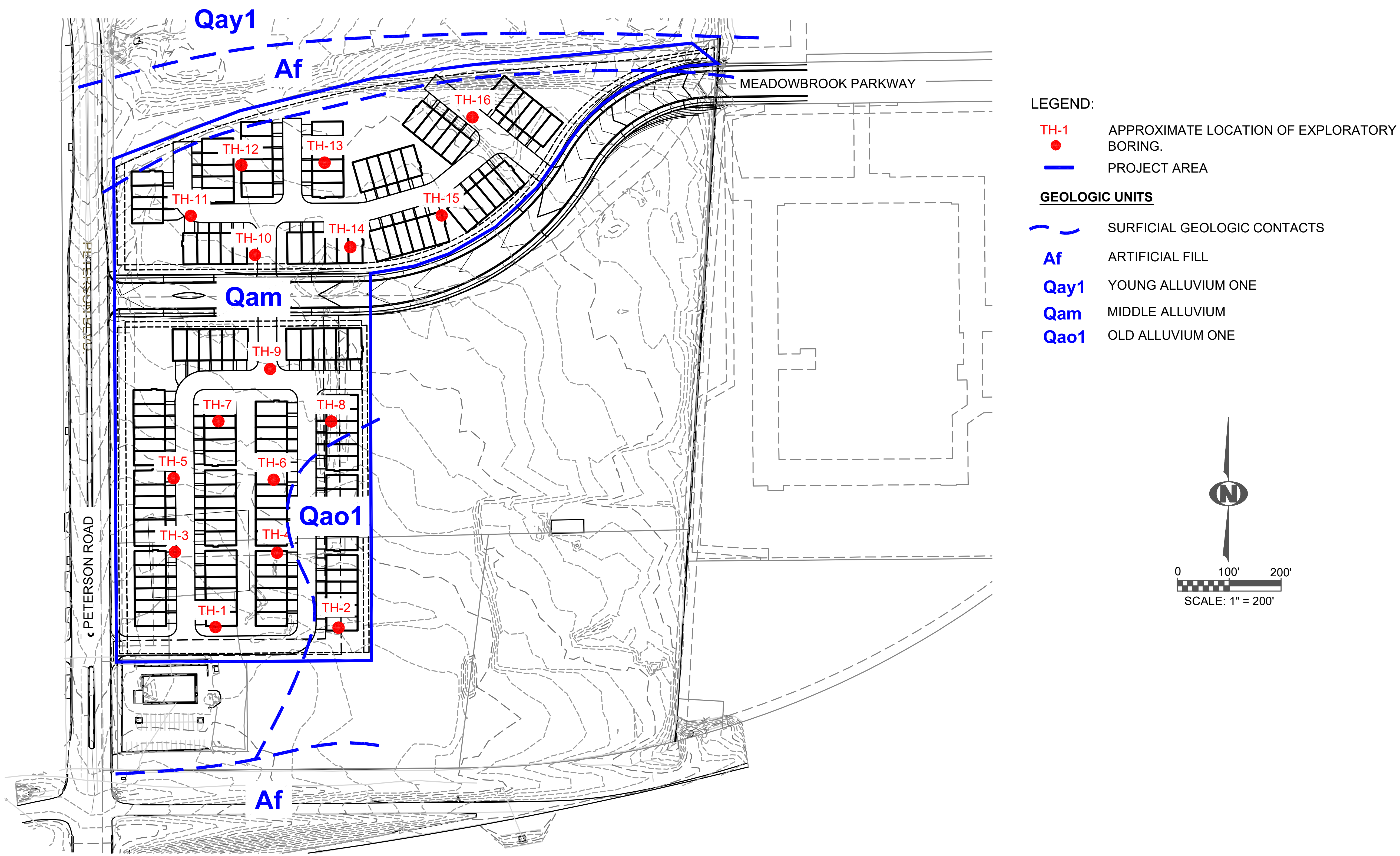
RMG – Rocky Mountain Group, Soils and Geology Study, Crossroads Apartments, Parcel No. 5408007005, El Paso County, Colorado (Job No. 177025, dated August 6, 2020).



VINTAGE COMMUNITIES
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Location of Exploratory Borings

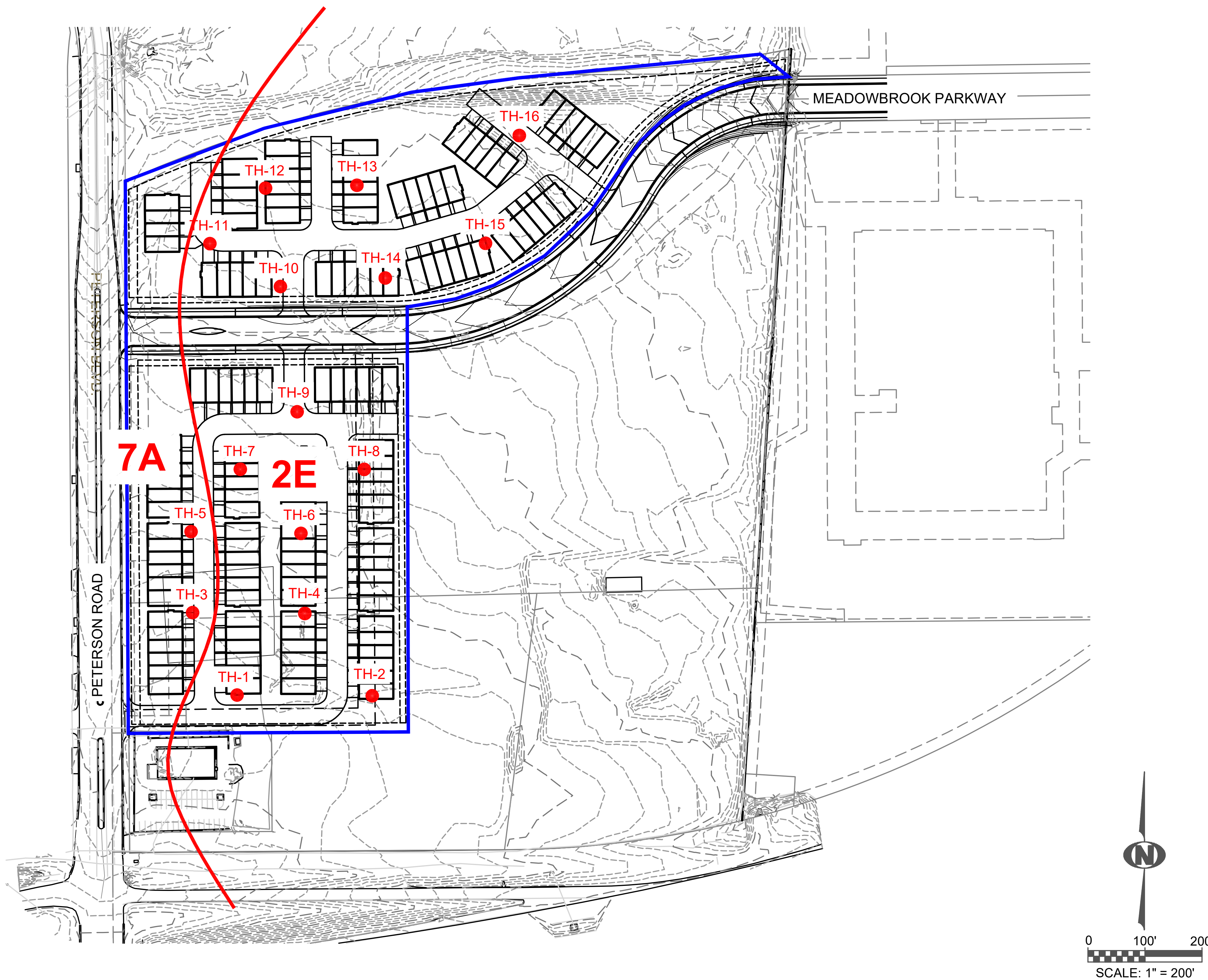
FIG. 1



VINTAGE COMMUNITIES
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Surficial Geologic Conditions

FIG. 2



LEGEND:

TH-1 ●	APPROXIMATE LOCATION OF EXPLORATORY BORING.
(blue line)	PROJECT AREA

ENGINEERING UNITS AND (MODIFIERS)

(red line)	ENGINEERING CONTACTS
7A	PHYSIOGRAPHIC FLOOD PLAN
2E	LOW TERRACES AND VALLEYS OF MINOR TRIBUTARY

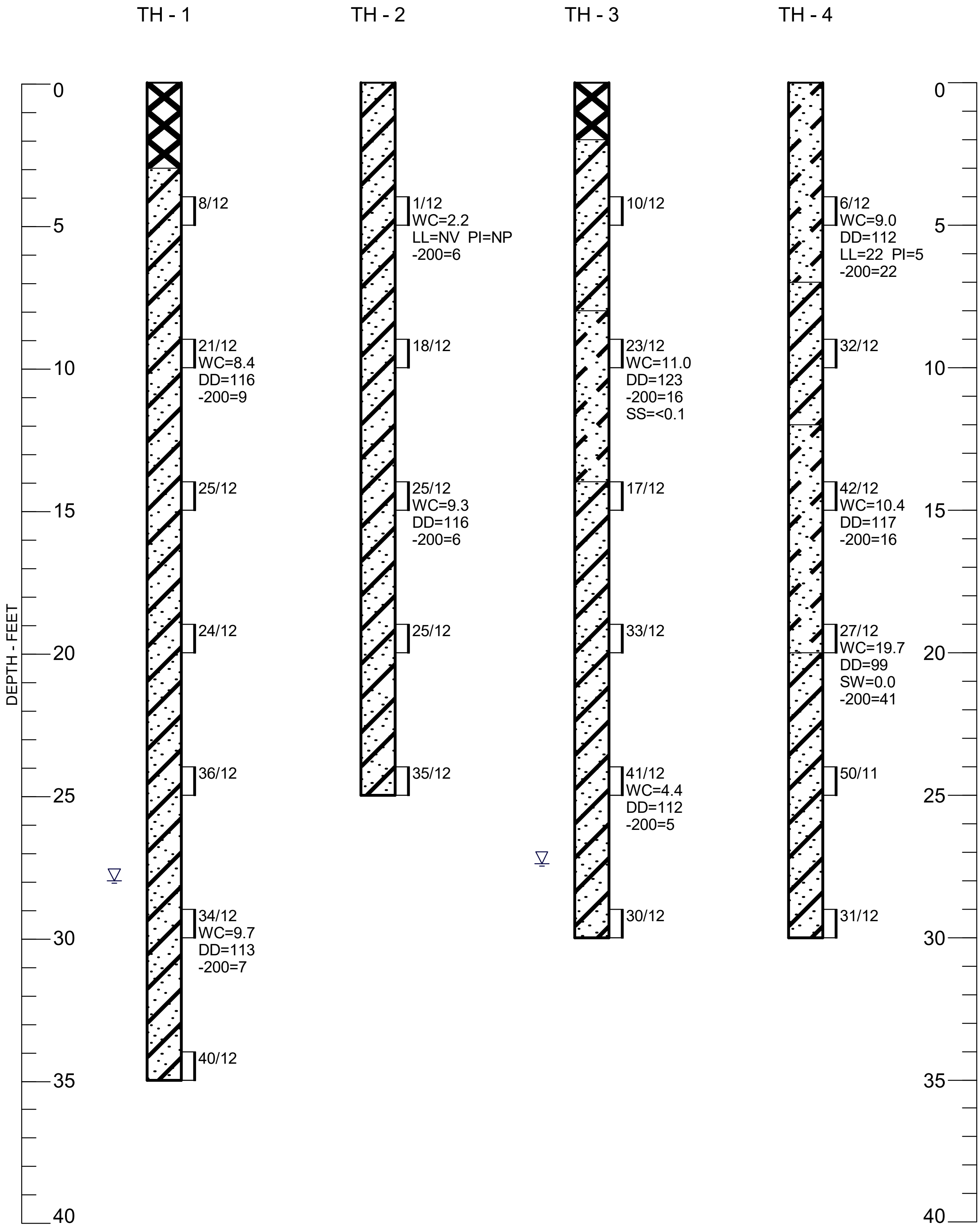
VINTAGE COMMUNITIES
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Engineering Conditions

FIG. 3

APPENDIX A

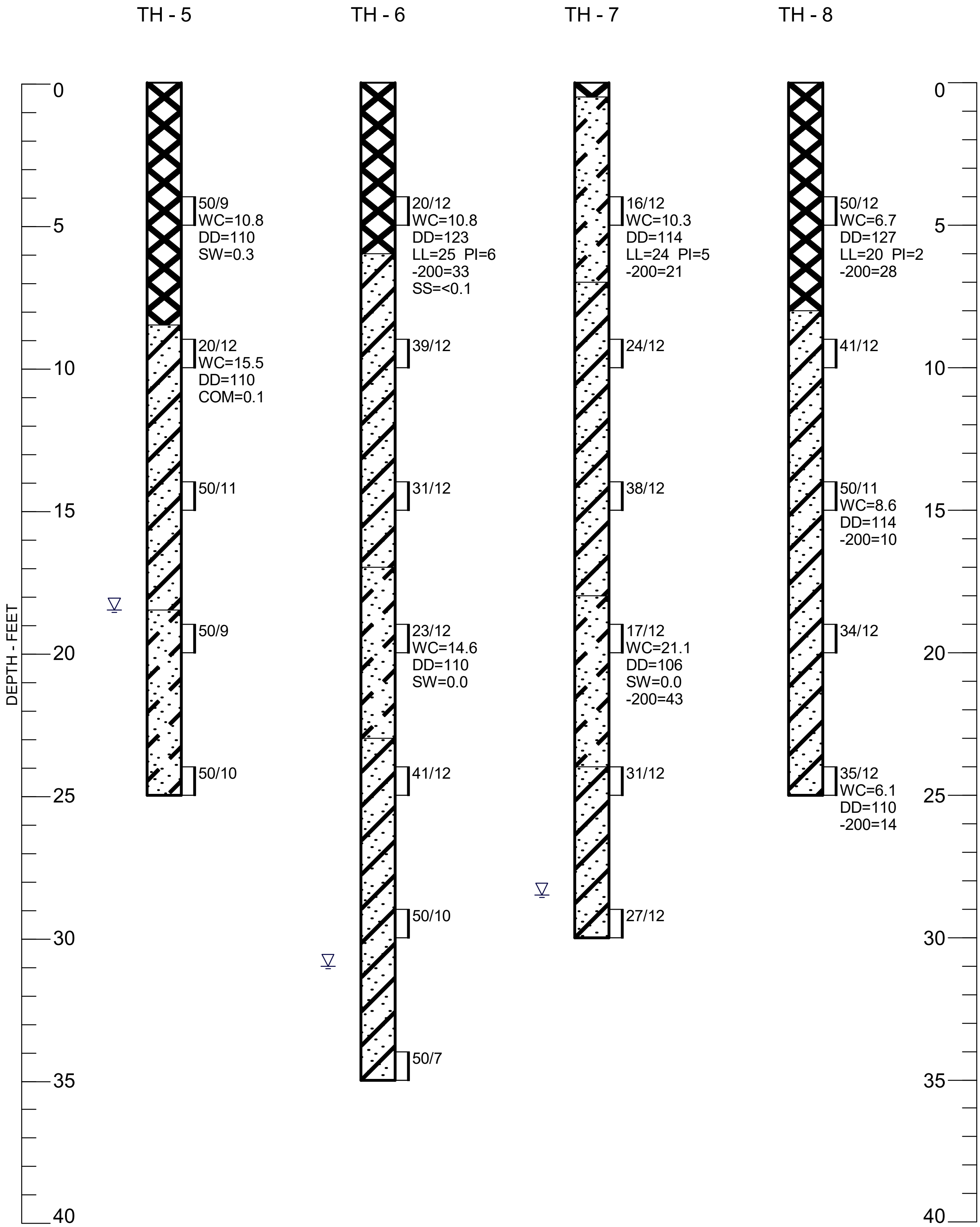
SUMMARY LOGS OF EXPLORATORY BORINGS



VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Summary Logs of Exploratory Borings

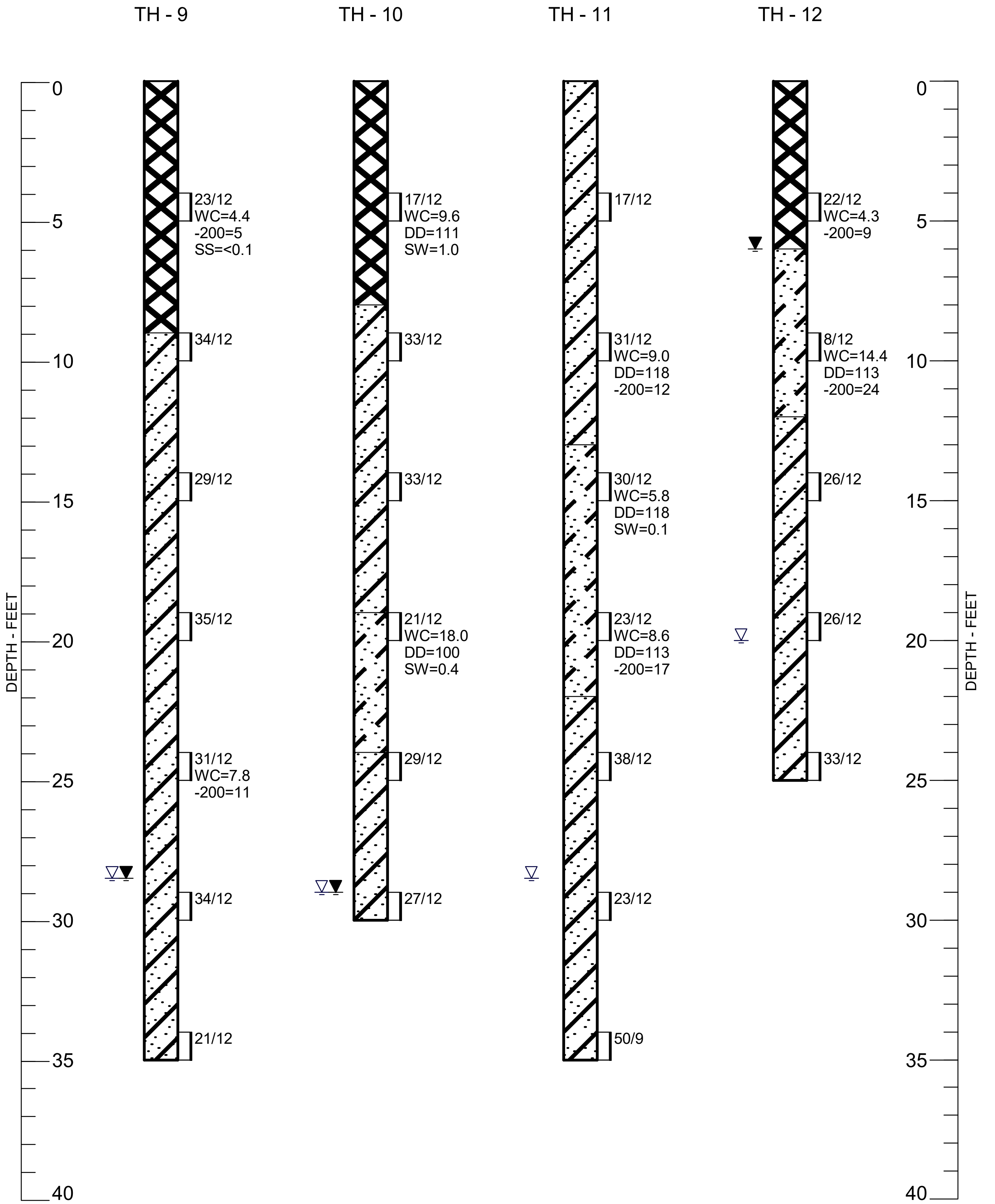
FIG. A-1



VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Summary Logs of Exploratory Borings

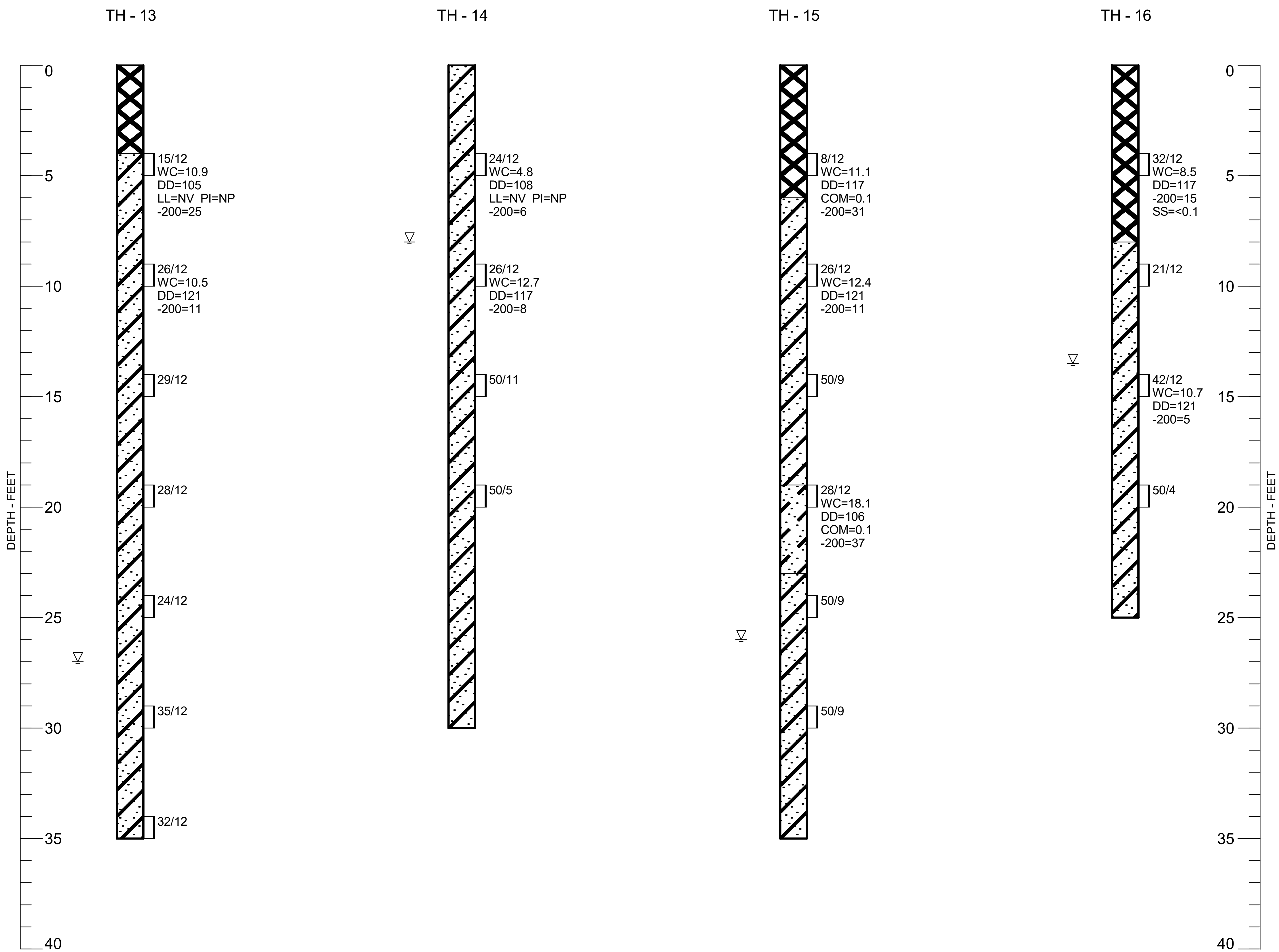
FIG. A-2



VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Summary Logs of Exploratory Borings

FIG. A-3



LEGEND:

FILL, SAND, SLIGHTLY CLAYEY TO CLAYEY AND SAND, SILTY, LOOSE TO MEDIUM DENSE, DRY TO SLIGHTLY MOIST, DARK BROWN.

SAND, CLAYEY TO VERY CLAYEY, LOOSE TO DENSE, SLIGHTLY MOIST TO MOIST, LIGHT BROWN TO BROWN (SC, SC-SM.

SAND, SLIGHTLY SILTY TO SILTY AND SAND, SLIGHTLY CLAYEY WITH OCCASIONAL GRAVEL, VERY LOOSE TO VERY DENSE, DRY TO WET, LIGHT BROWN TO BROWN (SP-SM, SP-SC, SW-SM, SW-SC, SM).

DRIVE SAMPLE. THE SYMBOL 8/12 INDICATES 8 BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.

GROUNDWATER LEVEL MEASURED AT TIME OF DRILLING.

GROUNDWATER LEVEL MEASURED SEVERAL DAYS AFTER DRILLING.

NOTES:

1. THE BORINGS WERE DRILLED JUNE 18 THROUGH 20, 2024 USING A 4-INCH DIAMETER, CONTINUOUS-FLIGHT AUGER AND A CME-55, TRUCK-MOUNTED DRILL RIG.

2. WC - INDICATES MOISTURE CONTENT. (%)
   DD - INDICATES DRY DENSITY. (PCF)
   SW - INDICATES SWELL WHEN WETTED UNDER APPROXIMATE OVERBURDEN PRESSURE. (%)
   COM - INDICATES COMPRESSION WHEN WETTED UNDER APPROXIMATE OVERBURDEN PRESSURE. (%)
   LL - INDICATES LIQUID LIMIT. (NV : NO VALUE)
   PI - INDICATES PLASTICITY INDEX. (NP : NON-PLASTIC)
   -200 - INDICATES PASSING NO. 200 SIEVE. (%)
   SS - INDICATES WATER-SOLUBLE SULFATE CONTENT. (%)

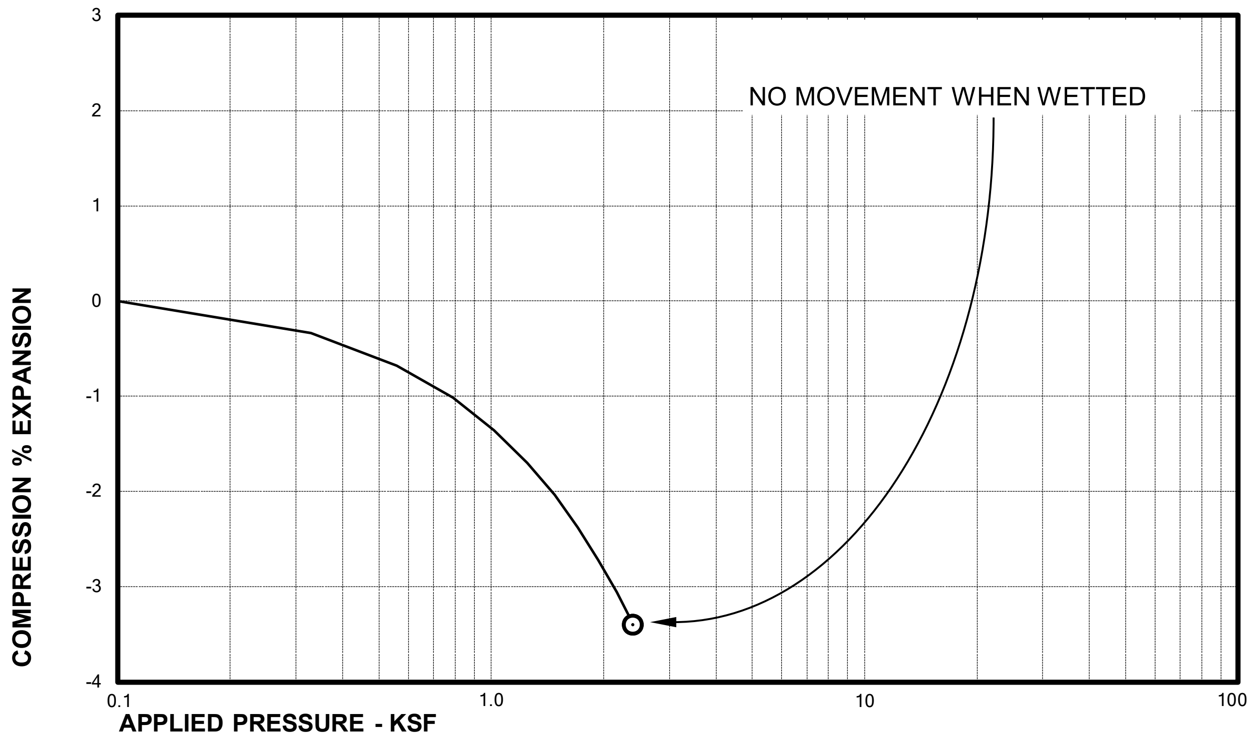
3. THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS, AND CONCLUSIONS AS CONTAINED IN THIS REPORT.

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Summary Logs of Exploratory Borings

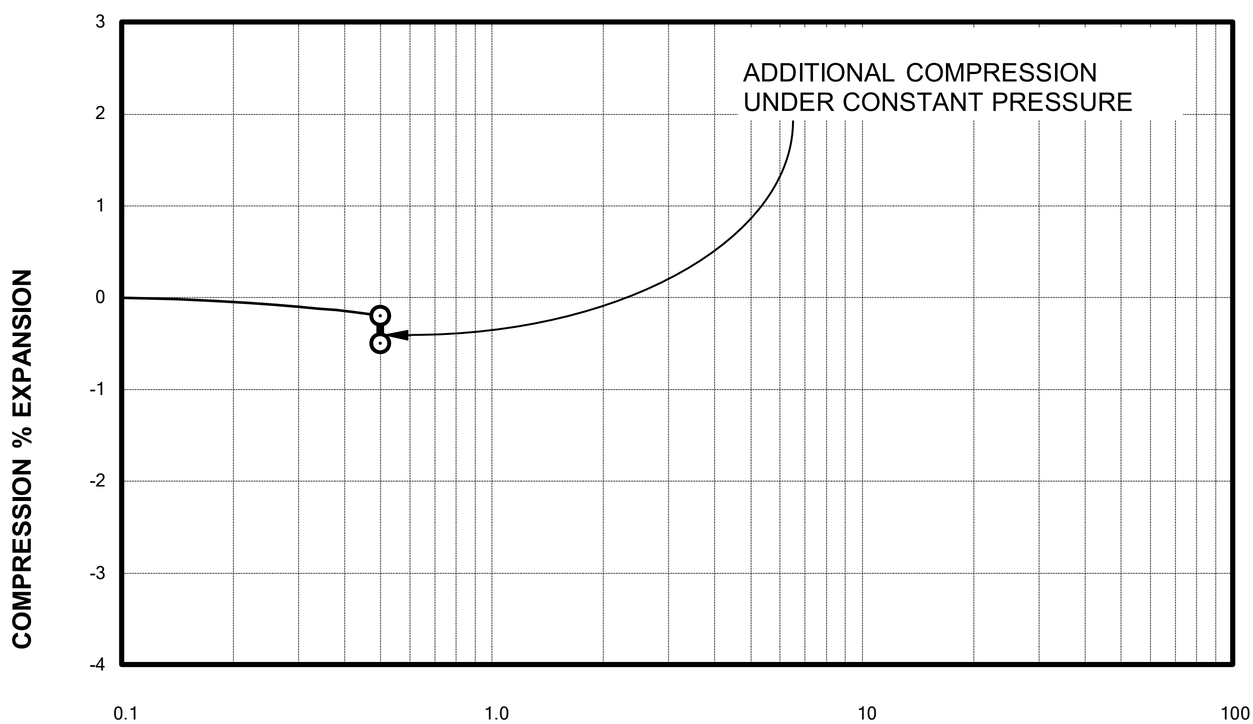
FIG. A-4

APPENDIX B
LABORATORY TEST RESULTS
TABLE B-1



Sample of SAND, VERY CLAYEY (SC)
From TH-4 AT 19 FEET

DRY UNIT WEIGHT= 99 PCF
MOISTURE CONTENT= 19.7 %



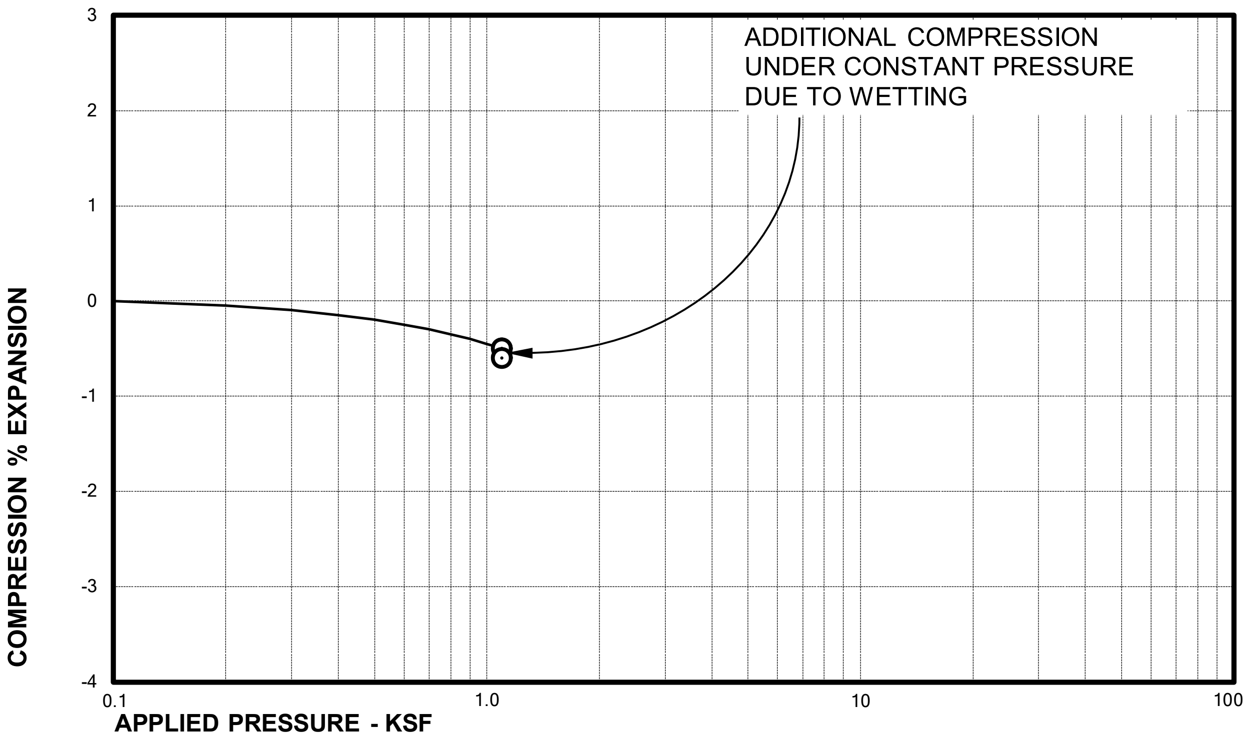
Sample of FILL, SAND, SLIGHTLY CLAYEY
From TH-5 AT 4 FEET

DRY UNIT WEIGHT= 110 PCF
MOISTURE CONTENT= 10.8 %

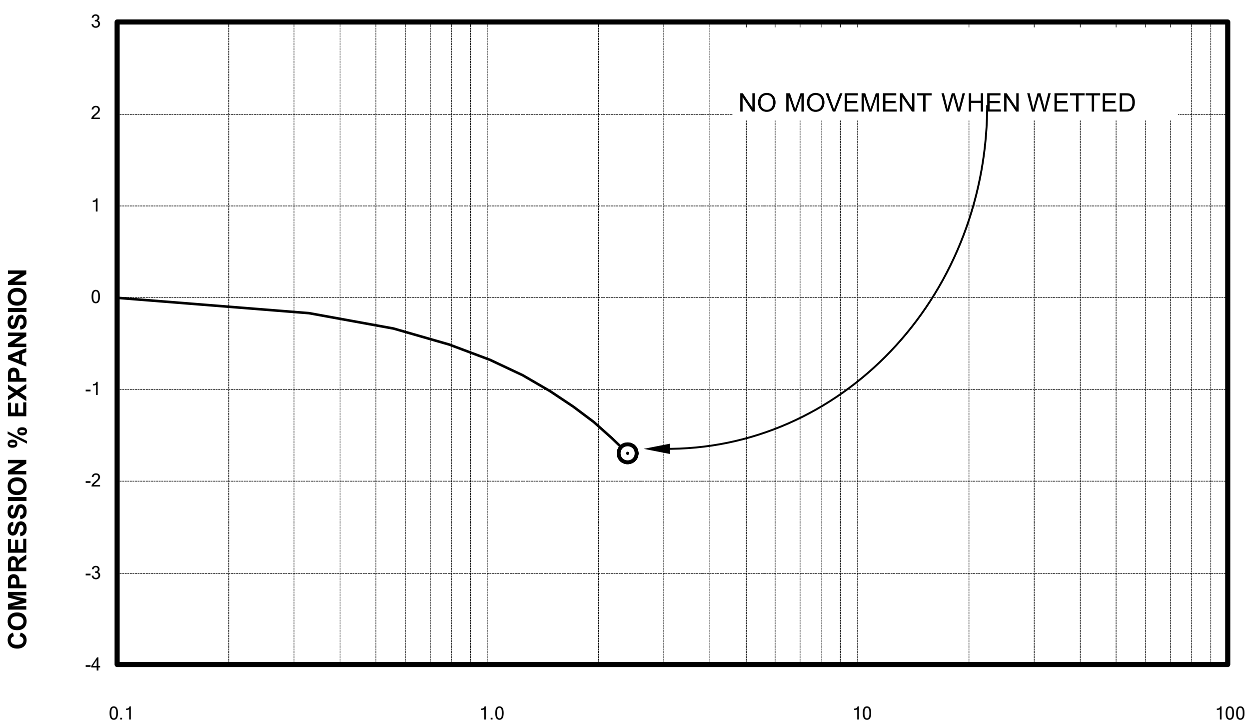
VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Swell Consolidation Test Results

FIG. B-1

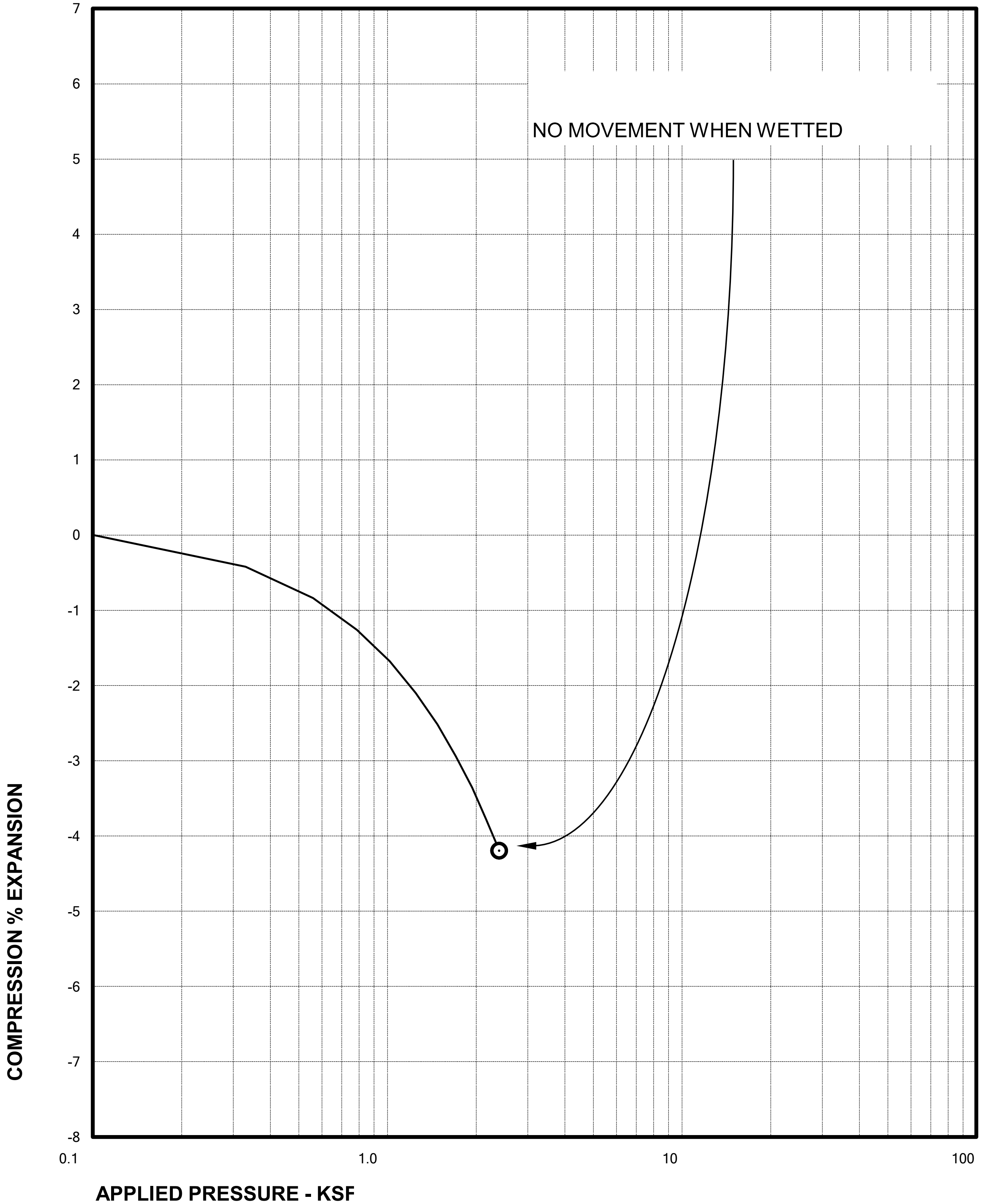


Sample of	SAND, SLIGHTLY CLAYEY (SP-SC)	DRY UNIT WEIGHT=	110	PCF
From	TH-5 AT 9 FEET	MOISTURE CONTENT=	15.5	%



Sample of	SAND, VERY CLAYEY (SC)	DRY UNIT WEIGHT=	110	PCF
From	TH-6 AT 19 FEET	MOISTURE CONTENT=	14.6	%

Swell Consolidation Test Results



Sample of SAND, VERY CLAYEY (SC)

From TH-7 AT 19 FEET

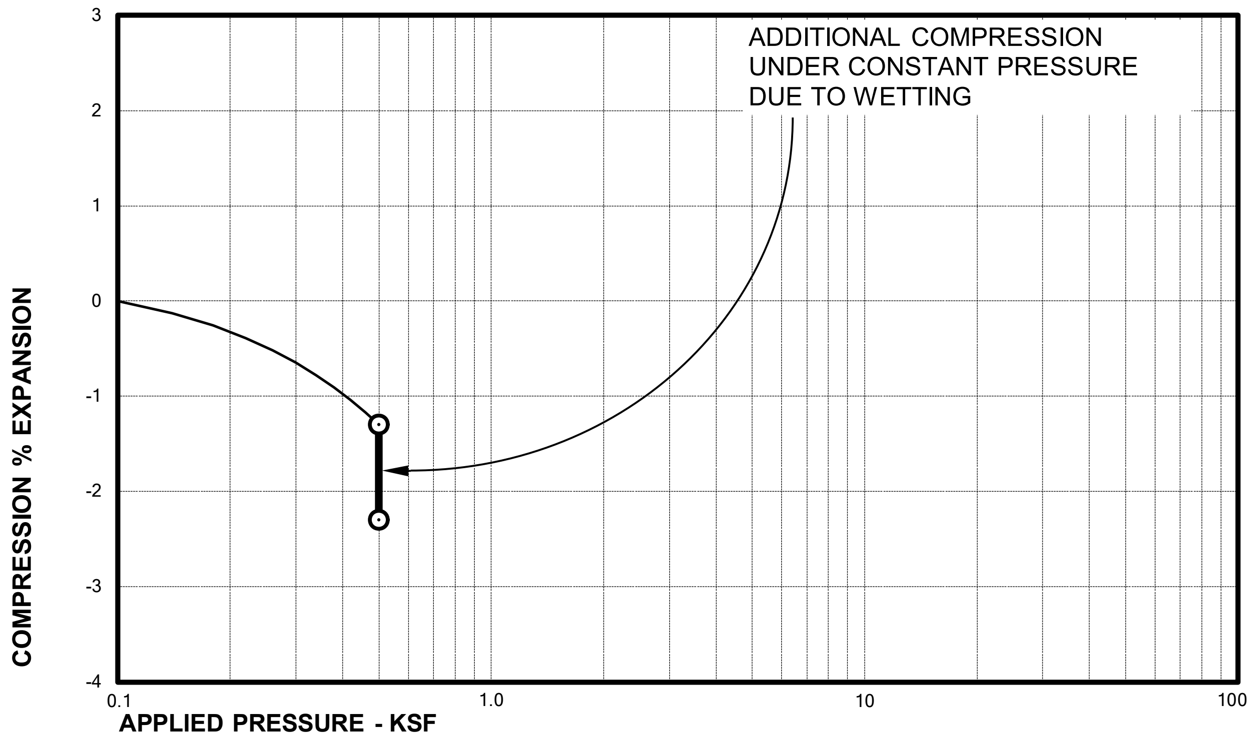
DRY UNIT WEIGHT= 106 PCF

MOISTURE CONTENT= 21.1 %

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

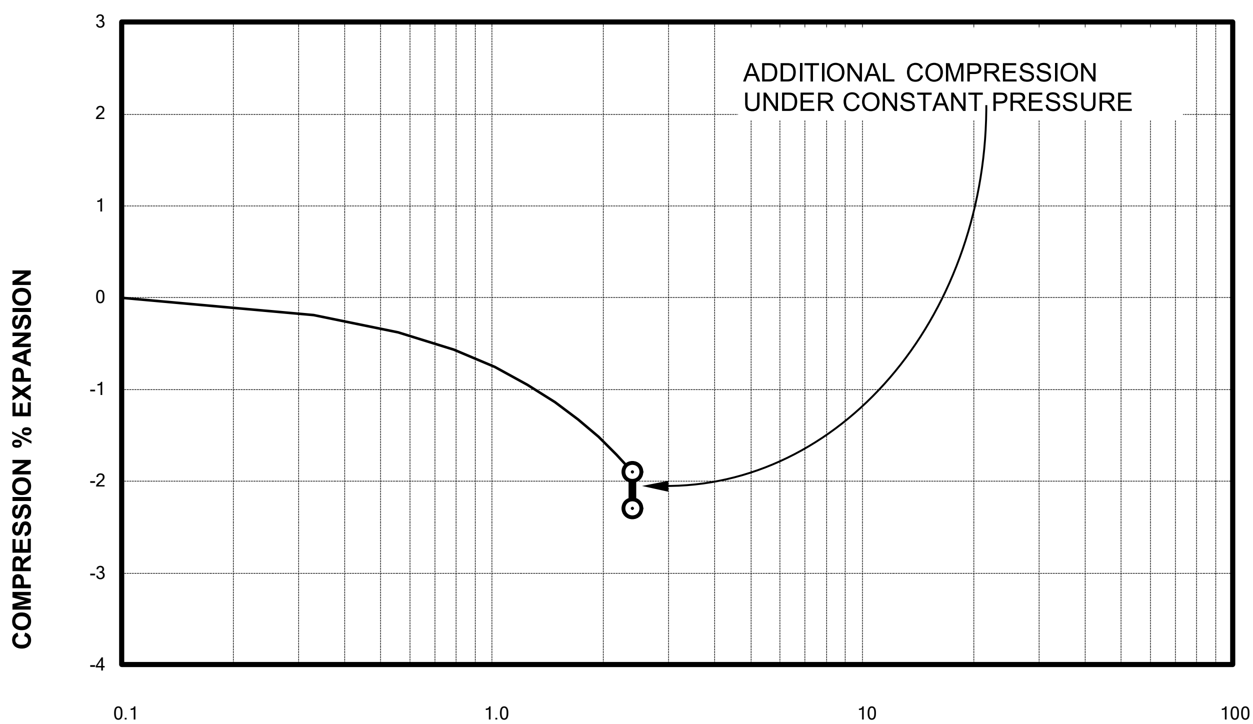
Swell Consolidation Test Results

FIG. B-3



Sample of FILL, SAND, CLAYEY
From TH-10 AT 4 FEET

DRY UNIT WEIGHT= 111 PCF
MOISTURE CONTENT= 9.6 %



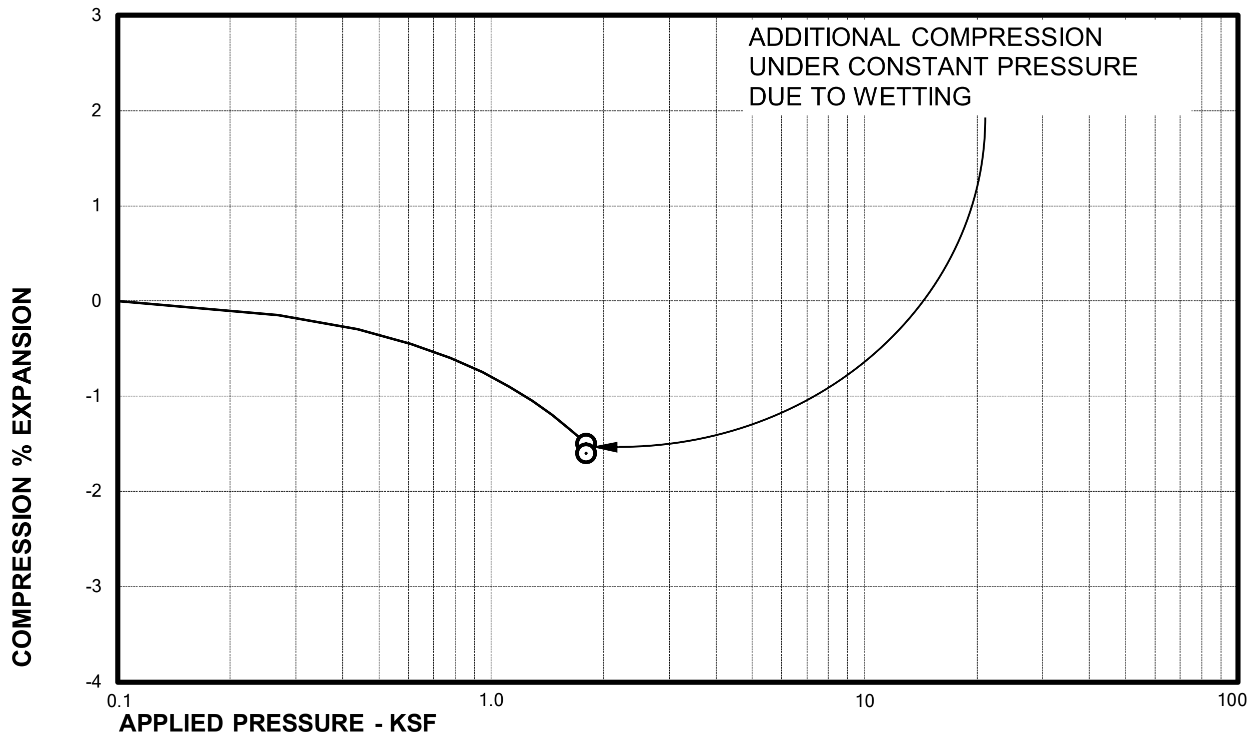
Sample of SAND, VERY CLAYEY (SC)
From TH-10 AT 19 FEET

DRY UNIT WEIGHT= 100 PCF
MOISTURE CONTENT= 18.0 %

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Swell Consolidation Test Results

FIG. B-4

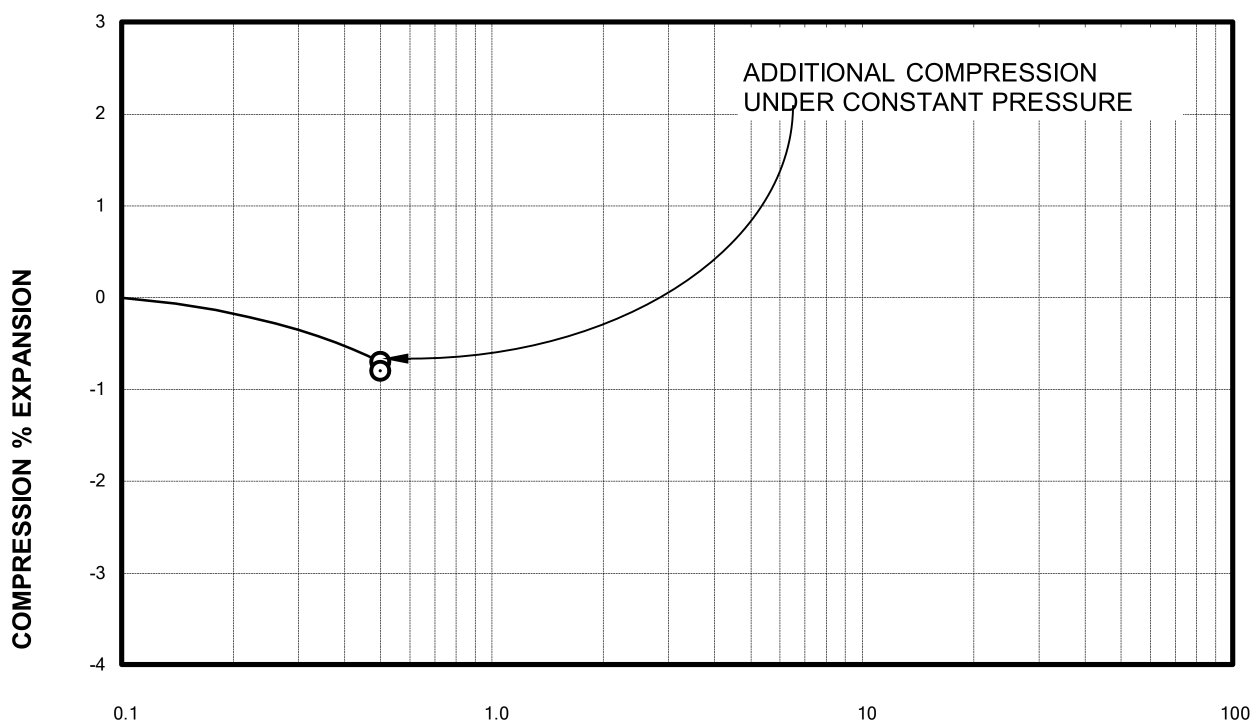


Sample of SAND, CLAYEY (SC)

From TH-11 AT 14 FEET

DRY UNIT WEIGHT= 116 PCF

MOISTURE CONTENT= 5.8 %



Sample of FILL, SAND, CLAYEY

From TH-15 AT 4 FEET

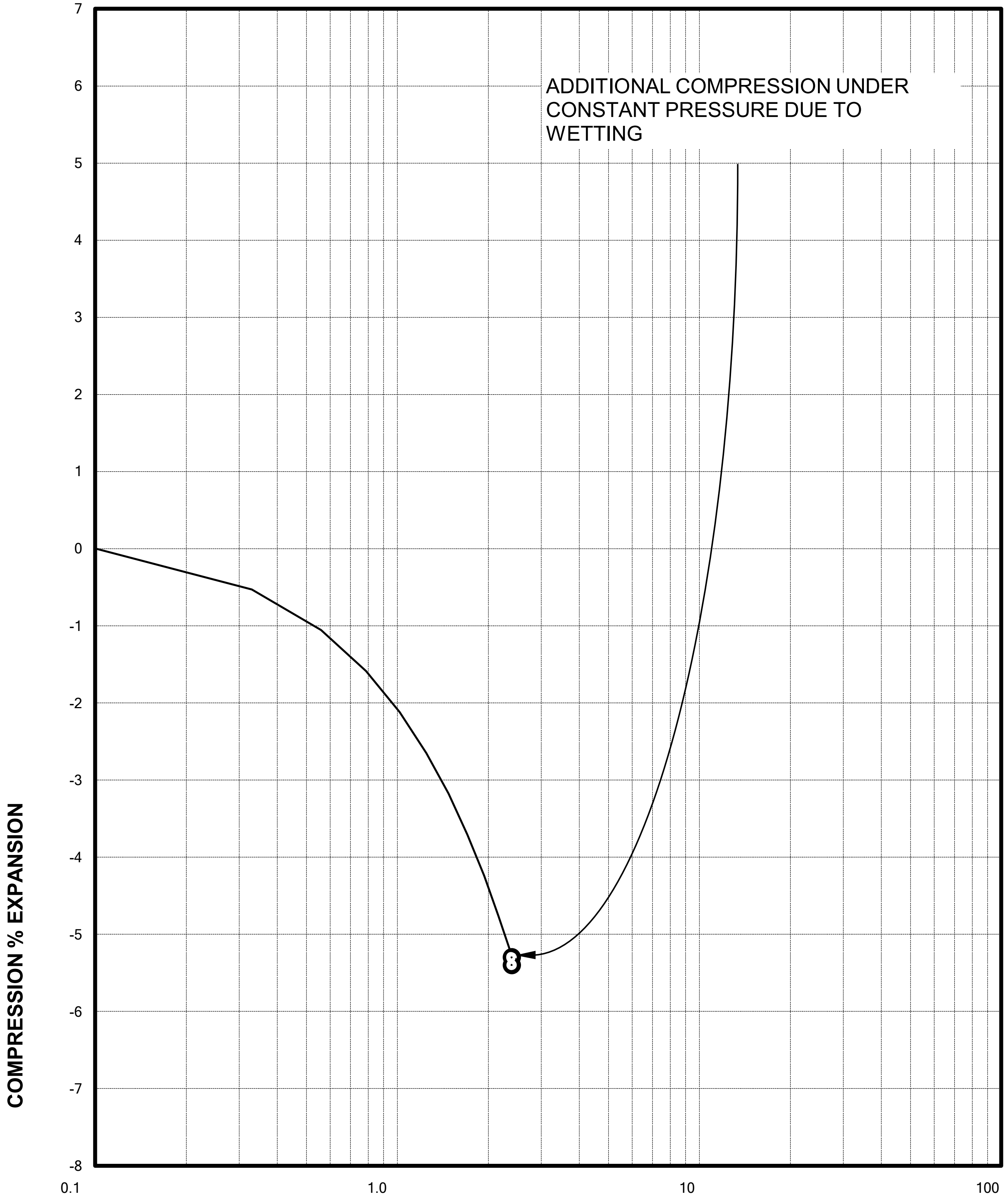
DRY UNIT WEIGHT= 117 PCF

MOISTURE CONTENT= 11.1 %

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Swell Consolidation Test Results

FIG. B-5



Sample of SAND, VERY CLAYEY (SC)

From TH-15 AT 19 FEET

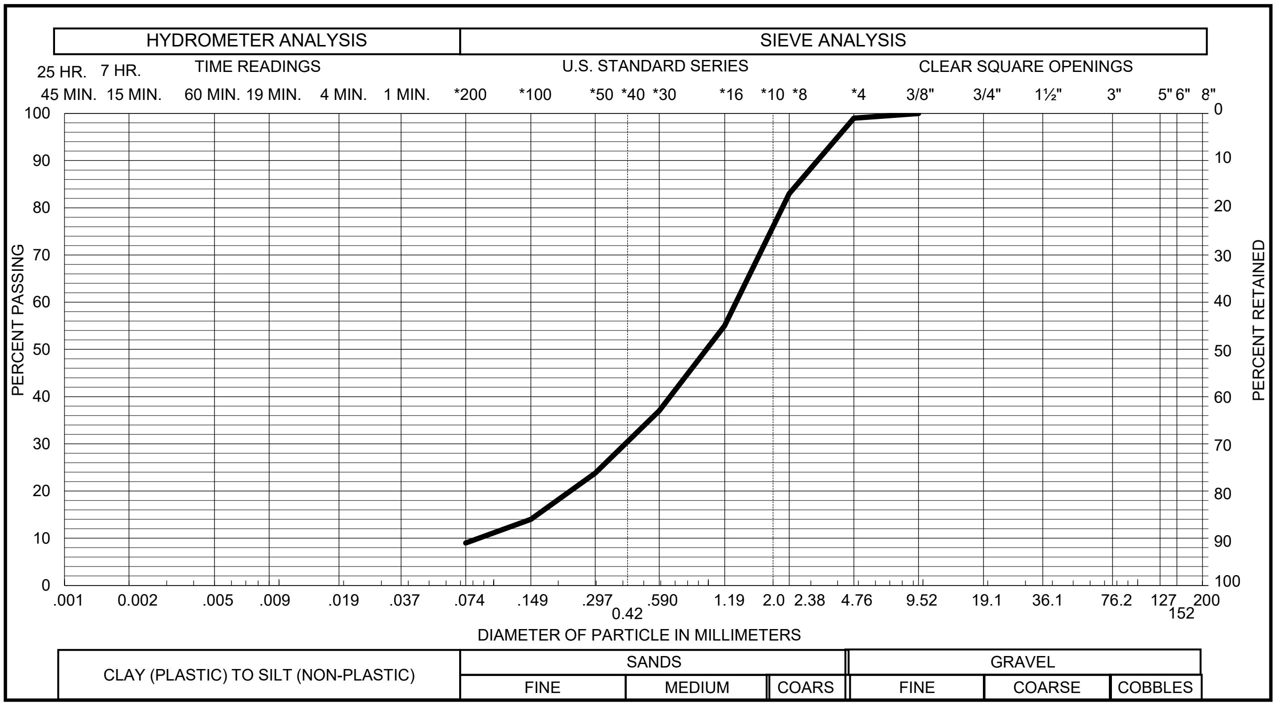
DRY UNIT WEIGHT= 106 PCF

MOISTURE CONTENT= 18.1 %

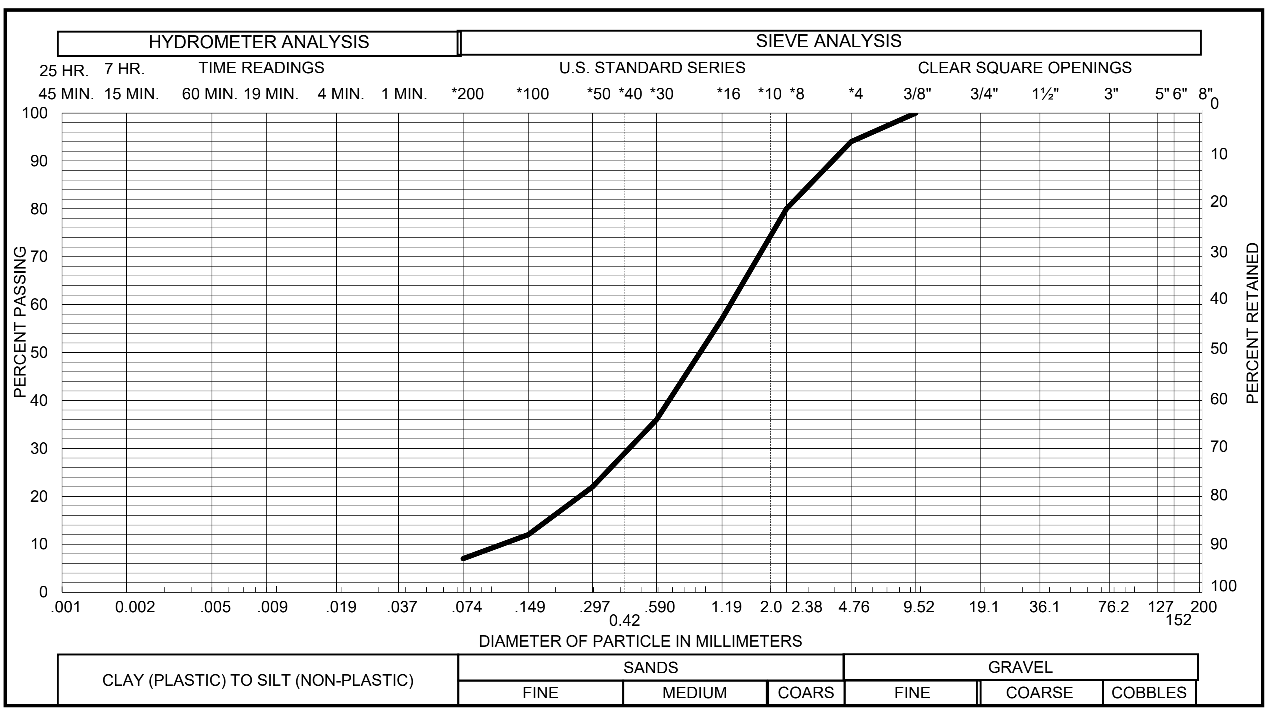
VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Swell Consolidation Test Results

FIG. B-6



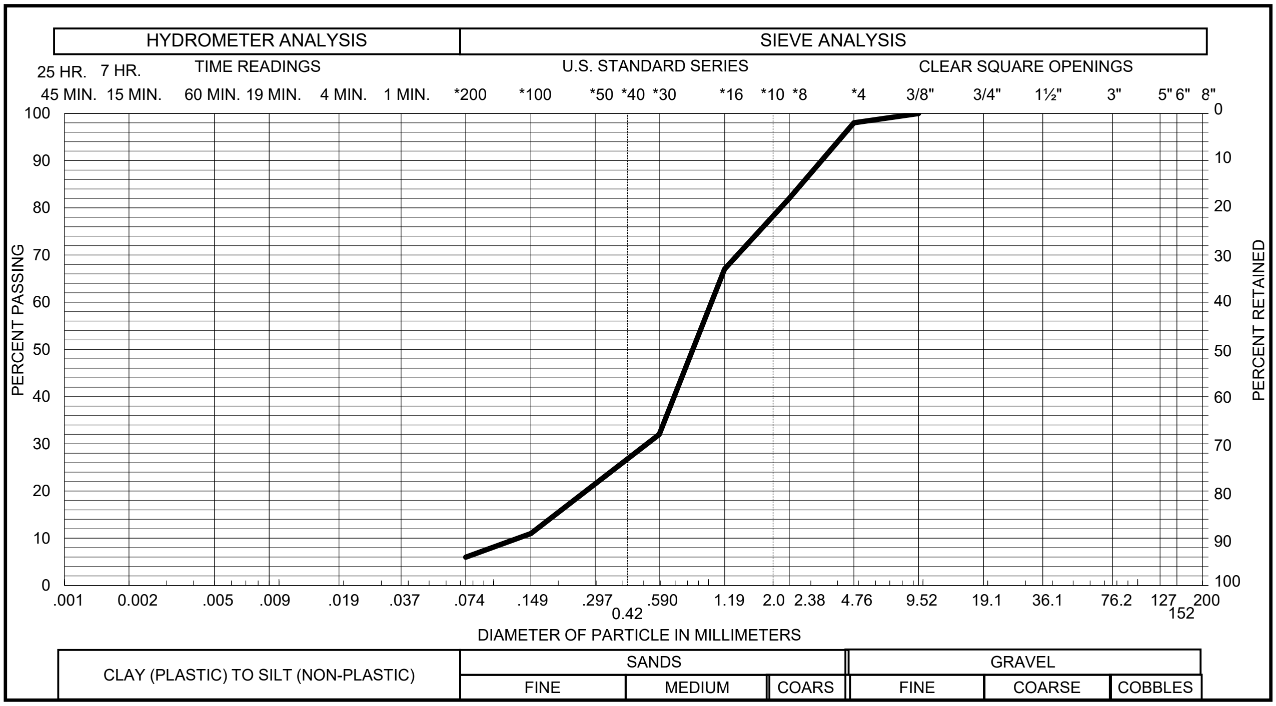
Sample of	SAND, SLIGHTLY CLAYEY (SW-SC)	GRAVEL 1 %	SAND 90 %
From	TH - 1 AT 9 FEET	SILT & CLAY 9 %	LIQUID LIMIT
		PLASTICITY INDEX	



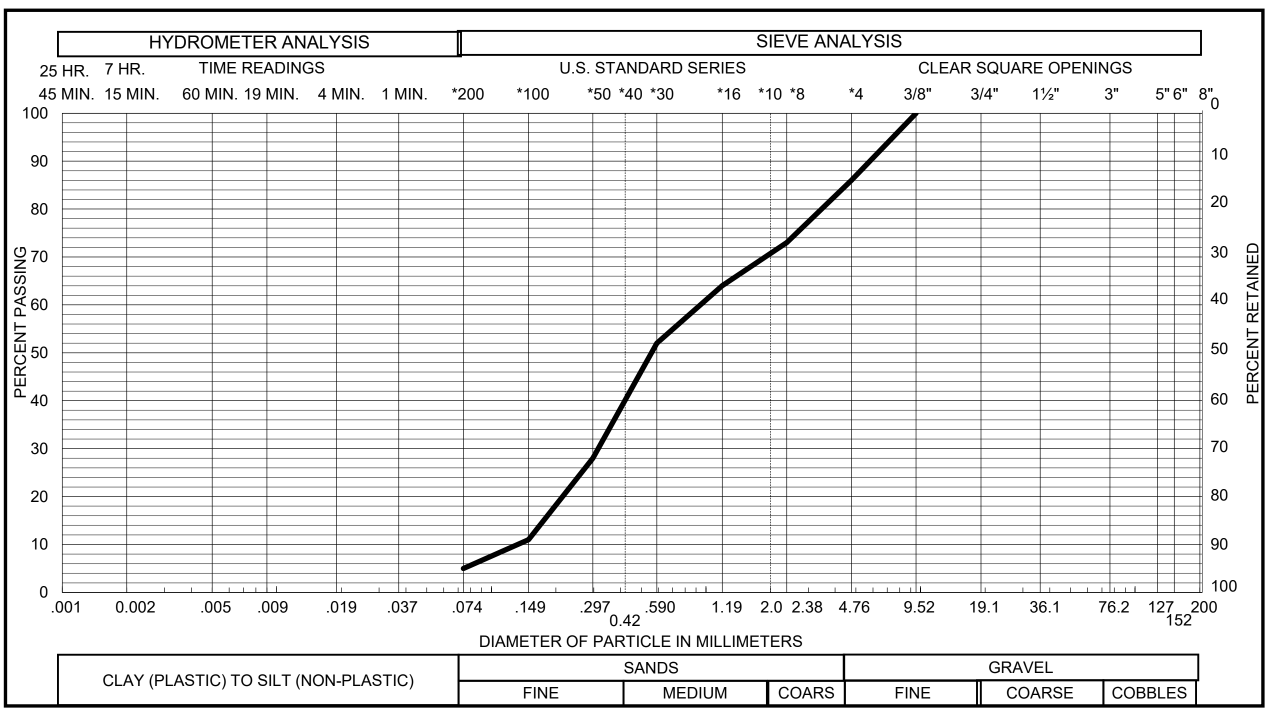
Sample of	SAND, SLIGHTLY SILTY (SW-SM)	GRAVEL 6 %	SAND 87 %
From	TH - 1 AT 29 FEET	SILT & CLAY 7 %	LIQUID LIMIT
		PLASTICITY INDEX	

Gradation Test Results

FIG. B-7



Sample of	SAND, SLIGHTLY SILTY (SW-SM)	GRAVEL	2 %	SAND	92 %
From	TH - 2 AT 4 FEET	SILT & CLAY	6 %	LIQUID LIMIT	
		PLASTICITY INDEX			

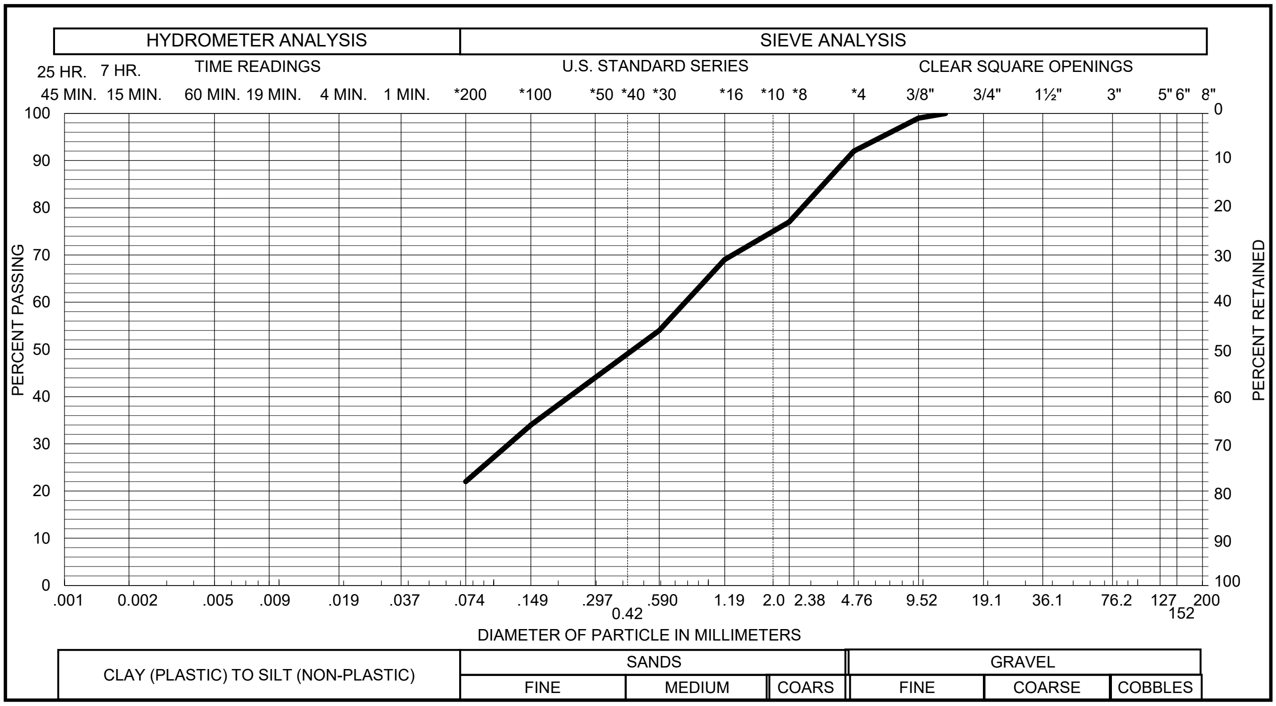


Sample of	SAND, SLIGHTLY SILTY (SP-SM)	GRAVEL	14 %	SAND	81 %
From	TH - 3 AT 24 FEET	SILT & CLAY	5 %	LIQUID LIMIT	
		PLASTICITY INDEX			

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Gradation Test Results

FIG. B-8



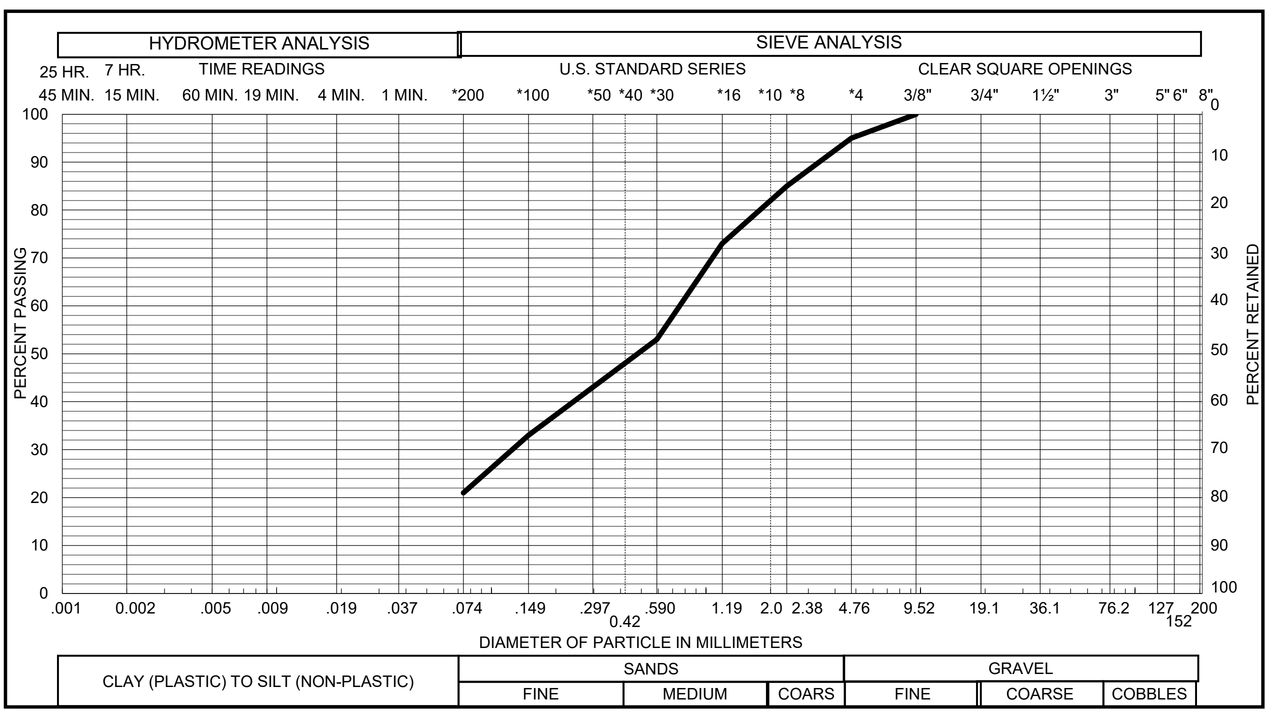
Sample of SAND, CLAYEY (SC)

From TH - 4 AT 4 FEET

GRAVEL 8 % SAND 70 %

SILT & CLAY 22 % LIQUID LIMIT

PLASTICITY INDEX



Sample of SAND, CLAYEY (SC)

From TH - 7 AT 4 FEET

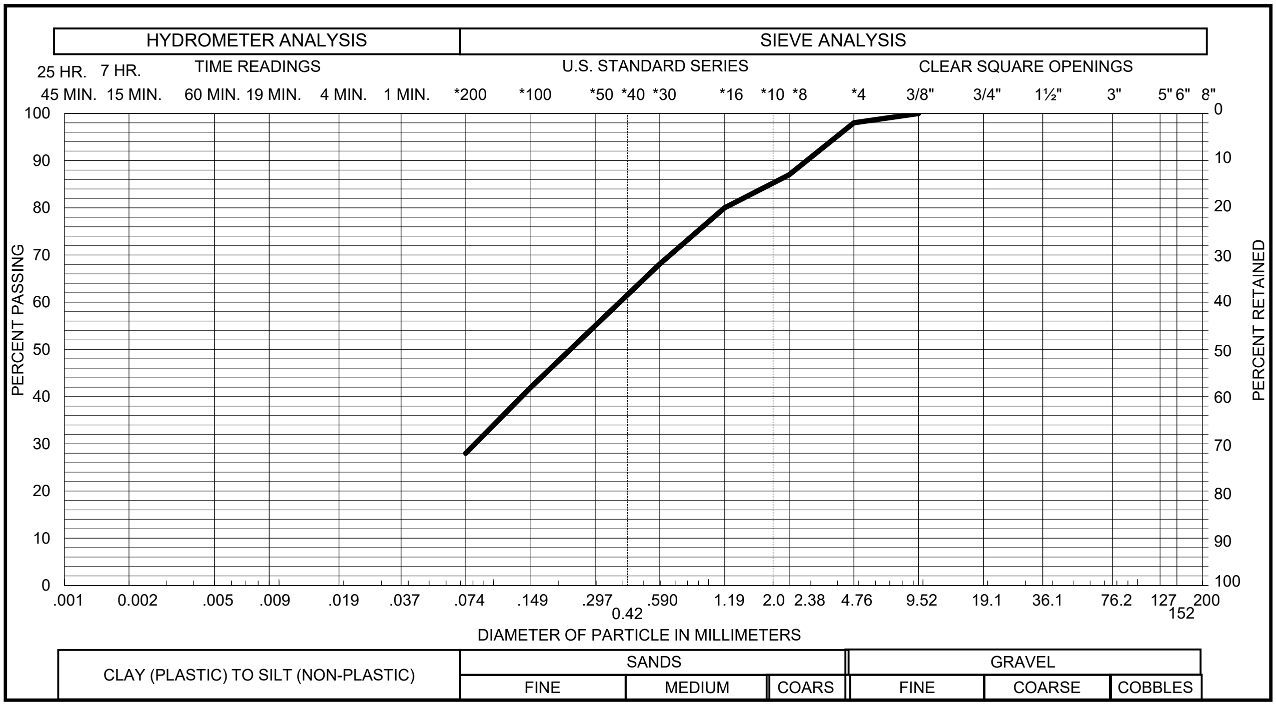
GRAVEL 5 % SAND 74 %

SILT & CLAY 21 % LIQUID LIMIT

PLASTICITY INDEX

Gradation Test Results

FIG. B-9



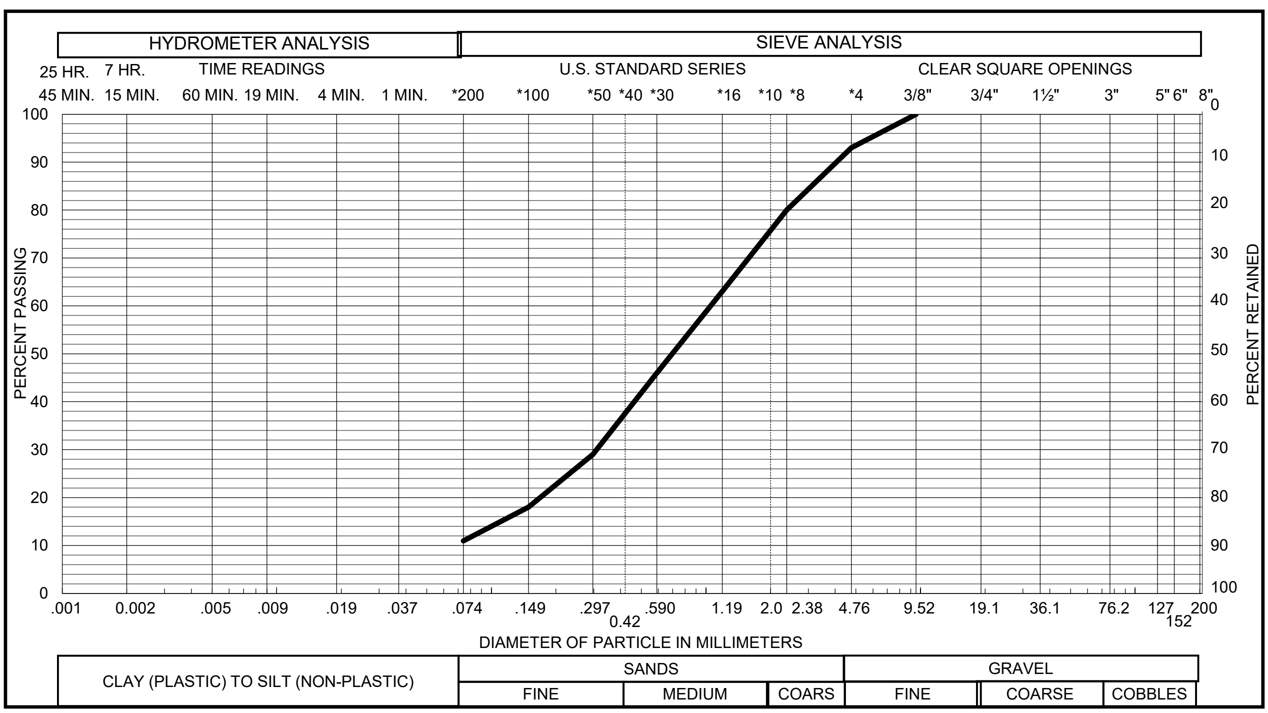
Sample of FILL, SAND, SILTY

From TH - 8 AT 4 FEET

GRAVEL 2 % SAND 70 %

SILT & CLAY 28 % LIQUID LIMIT

PLASTICITY INDEX



Sample of SAND, SLIGHTLY SILTY (SP-SM)

From TH - 9 AT 24 FEET

GRAVEL 7 % SAND 82 %

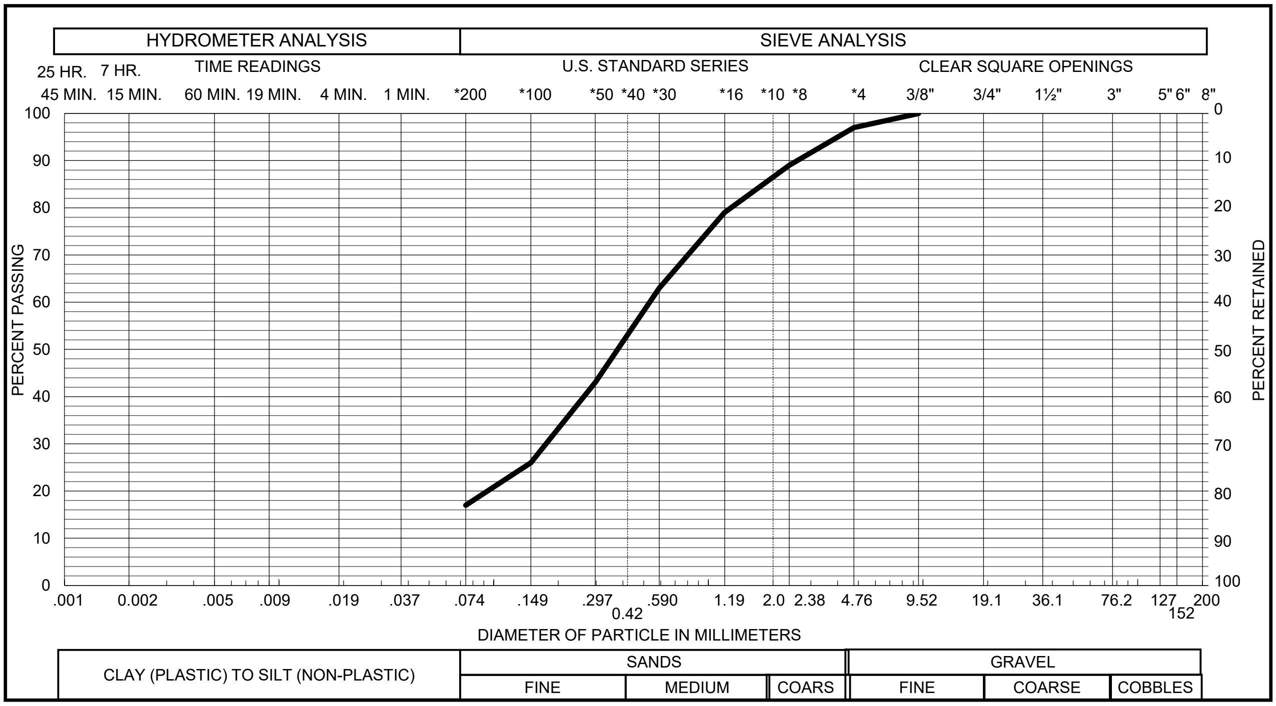
SILT & CLAY 11 % LIQUID LIMIT

PLASTICITY INDEX

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

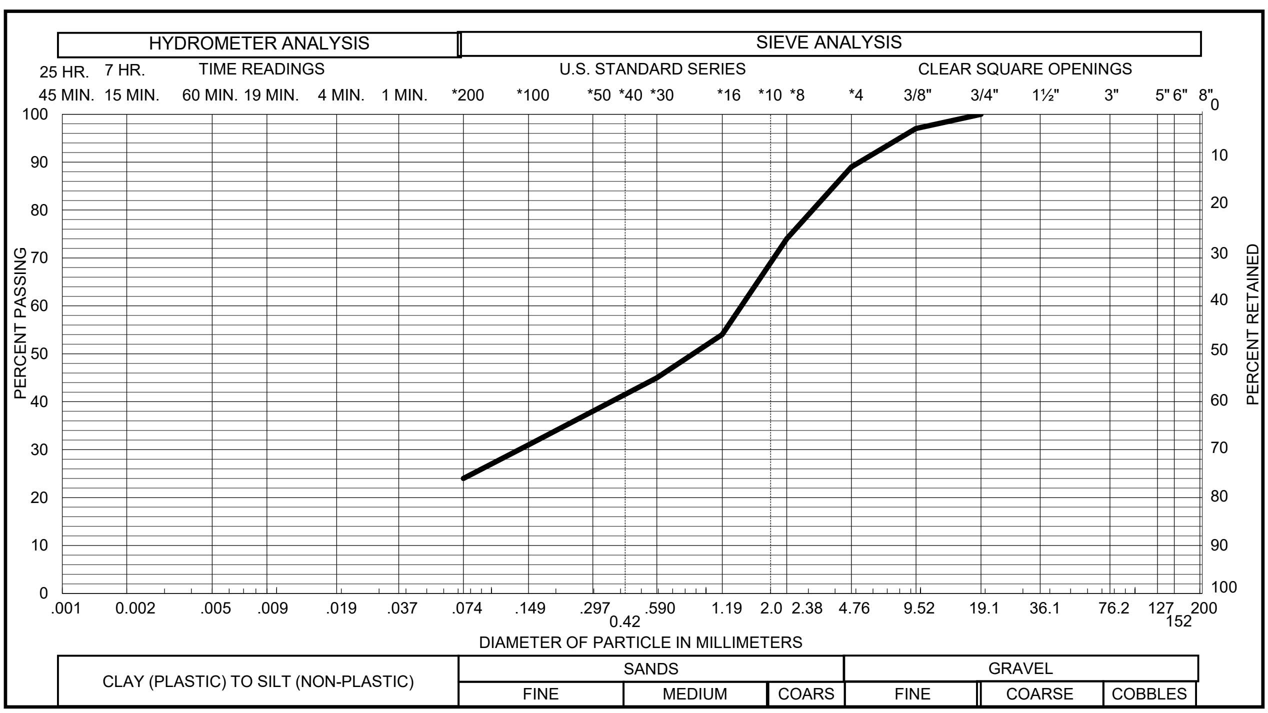
Gradation Test Results

FIG. B-10



Sample of SAND, CLAYEY (SC)
From TH - 11 AT 19 FEET

GRAVEL	3 %	SAND	80 %
SILT & CLAY	17 %	LIQUID LIMIT	
PLASTICITY INDEX			



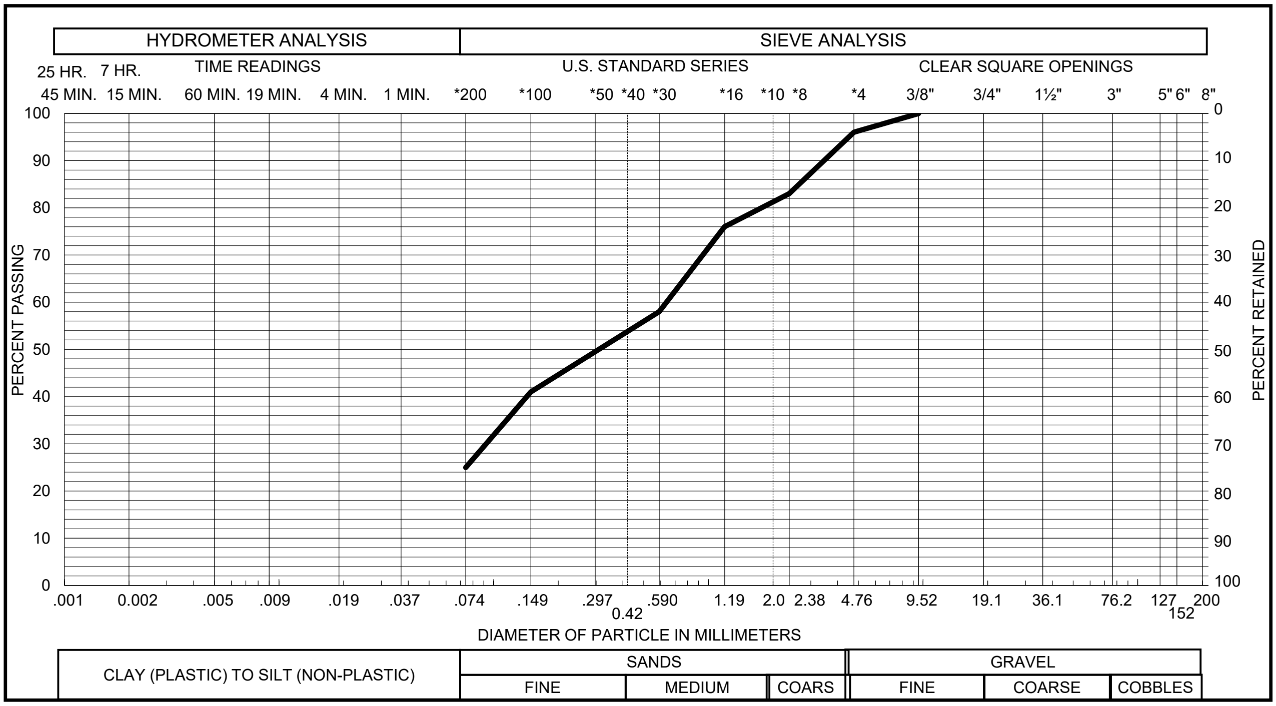
Sample of SAND, CLAYEY (SC)
From TH - 12 AT 9 FEET

GRAVEL	11 %	SAND	65 %
SILT & CLAY	24 %	LIQUID LIMIT	
PLASTICITY INDEX			

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

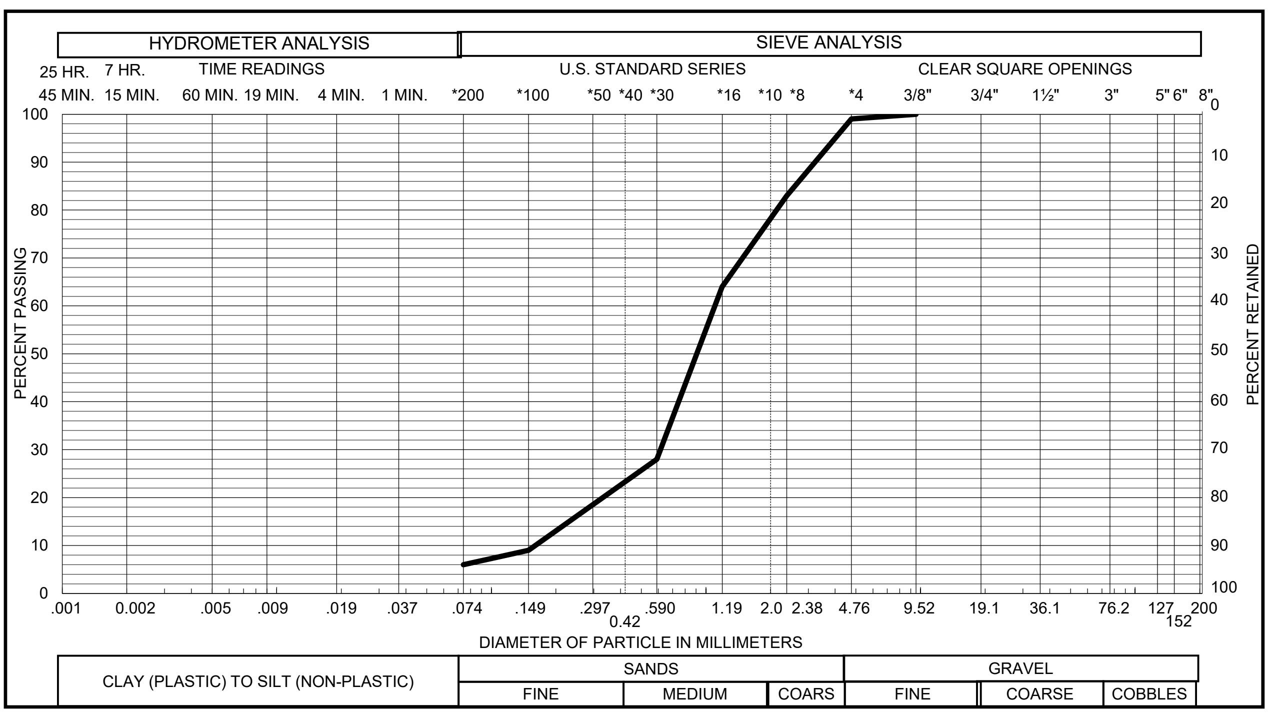
Gradation Test Results

FIG. B-11



Sample of SAND, SILTY (SM)
From TH - 13 AT 4 FEET

GRAVEL 4 % SAND 71 %
SILT & CLAY 25 % LIQUID LIMIT
PLASTICITY INDEX



Sample of SAND, SLIGHTLY SILTY (SW-SM)
From TH - 14 AT 4 FEET

GRAVEL 1 % SAND 93 %
SILT & CLAY 6 % LIQUID LIMIT
PLASTICITY INDEX

VINTAGE COMMUNITIES, INC.
PETERSON ROAD SUBDIVISION
CTL|T PROJECT NO. CS19836-115

Gradation Test Results

FIG. B-12

TABLE B-1

SUMMARY OF LABORATORY TESTING
CTL|T PROJECT NO. CS19836-115

BORING	DEPTH (FEET)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	SWELL TEST RESULTS*: SWELL (%)	SWELL TEST RESULTS*: APPLIED PRESSURE (PSF)	SWELL TEST RESULTS*: SWELL PRESSURE (PSF)	PASSING NO. 200 SIEVE (%)	WATER SOLUBLE SULFATES (%)	DESCRIPTION
TH-1	9	8.4	116						9		SAND, SLIGHTLY CLAYEY (SW-SC)
TH-1	29	9.7	113						7		SAND, SLIGHTLY SILTY (SW-SM)
TH-2	4	2.2		NV	NP				6		SAND, SLIGHTLY SILTY (SW-SM)
TH-2	14	9.3	116						6		SAND, SLIGHTLY SILTY (SP-SM)
TH-3	9	11.0	123						16	<0.1	SAND, CLAYEY (SC)
TH-3	24	4.4	112						5		SAND, SLIGHTLY SILTY (SP-SM)
TH-4	4	9.0	112	22	5				22		SAND, CLAYEY (SC)
TH-4	14	10.4	117						16		SAND, CLAYEY (SC)
TH-4	19	19.7	99			0.0	2400	-	41		SAND, VERY CLAYEY (SC)
TH-5	4	10.8	110			0.3	500	-			FILL, SAND, SLIGHTLY CLAYEY
TH-5	9	15.5	110			-0.1	1100	-			SAND, SLIGHTLY CLAYEY (SP-SC)
TH-6	4	10.8	123	25	6				33	<0.1	FILL, SAND, CLAYEY
TH-6	19	14.6	110			0.0	2400	-			SAND, VERY CLAYEY (SC)
TH-7	4	10.3	114	24	5				21		SAND, CLAYEY (SC)
TH-7	19	21.1	106			0.0	2400	-	43		SAND, VERY CLAYEY (SC)
TH-8	4	6.7	127	20	2				28		FILL, SAND, CLAYEY
TH-8	14	8.6	114						10		SAND, SLIGHTLY SILTY (SP-SM)
TH-8	24	6.1	110						14		SAND, SILTY (SM)
TH-9	4	4.4							5	<0.1	FILL, SAND, SLIGHTLY CLAYEY
TH-9	24	7.8							11		SAND, SLIGHTLY SILTY (SP-SM)
TH-10	4	9.6	111			1.0	500	-			FILL, SAND, CLAYEY
TH-10	19	18.0	100			0.4	2400	-			SAND, VERY CLAYEY (SC)
TH-11	9	9.0	118						12		SAND, SLIGHTLY CLAYEY (SP-SC)
TH-11	14	5.8	118			0.1	1800	-			SAND, CLAYEY (SC)
TH-11	19	8.6	113						17		SAND, CLAYEY (SC)
TH-12	4	4.3							9		FILL, SAND, SLIGHTLY CLAYEY
TH-12	9	14.4	113						24		SAND, CLAYEY (SC)
TH-13	4	10.9	105	NV	NP				25		SAND, SILTY (SM)
TH-13	9	10.5	121						11		SAND, SLIGHTLY CLAYEY (SP-SC)
TH-14	4	4.8	108	NV	NP				6		SAND, SLIGHTLY SILTY (SW-SM)
TH-14	9	12.7	117						8		SAND, SLIGHTLY SILTY (SP-SM)
TH-15	4	11.1	117			-0.1	500	-	31		FILL, SAND, CLAYEY
TH-15	9	12.4	121						11		SAND, SLIGHTLY CLAYEY (SP-SC)
TH-15	19	18.1	106			-0.1	2400	-	37		SAND, VERY CLAYEY (SC)
TH-16	4	8.5	117						15	<0.1	FILL, SAND, CLAYEY
TH-16	14	10.7	121						5		SAND, SLIGHTLY CLAYEY (SP-SC)

* SWELL MEASURED UNDER ESTIMATED IN-SITU OVERBURDEN PRESSURE.
NEGATIVE VALUE INDICATES COMPRESSION.

APPENDIX C

GUIDELINE SITE GRADING SPECIFICATIONS
PETERSON ROAD SUBDIVISION
COLORADO SPRINGS, COLORADO

GUIDELINE SITE GRADING SPECIFICATIONS

PETERSON ROAD SUBDIVISION
COLORADO SPRINGS, COLORADO

1. DESCRIPTION

This item consists of the excavation, transportation, placement and compaction of materials from locations indicated on the plans, or staked by the Engineer, as necessary to achieve preliminary pavement and building pad elevations. These specifications also apply to compaction of materials that may be placed outside of the project.

2. GENERAL

The Soils Engineer will be the Owner's representative. The Soils Engineer will approve fill materials, method of placement, moisture contents and percent compaction.

3. CLEARING JOB SITE

The Contractor shall remove all trees, brush and rubbish before excavation or fill placement is begun. The Contractor shall dispose of the cleared material to provide the Owner with a clean, neat appearing job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures of any kind.

4. SCARIFYING AREA TO BE FILLED

All topsoil, vegetable matter, and existing fill shall be removed from the ground surface upon which fill is to be placed. The surface shall then be plowed or scarified until the surface is free from ruts, hummocks or other uneven features that would prevent uniform compaction by the equipment to be used.

5. PLACEMENT OF FILL ON NATURAL SLOPES

Where natural slopes are steeper than 20 percent (5:1, horizontal to vertical) and fill placement is required, horizontal benches shall be cut into the hillside. The benches shall be at least 12 feet wide or 1-1/2 times the width of the compaction equipment and be provided at a vertical spacing of not more than 5 feet (minimum of two benches). Larger bench widths may be required by the Engineer. Fill shall be placed on completed benches as outlined within this specification.

6. COMPACTING AREA TO BE FILLED

After the foundation for the fill has been cleared and scarified, it shall be disced or bladed until it is free from large clods, brought to a workable moisture content and compacted.

7. FILL MATERIALS

Fill soils shall be free from vegetable matter or other deleterious substances and shall not contain rocks or lumps having a diameter greater than six (6) inches. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer or imported to the site.

8. MOISTURE CONTENT

For fill material classifying as CH or CL, the fill shall be moisture treated to between 1 and 4 percent above optimum moisture content as determined by ASTM D 698, if it is to be placed within 15 feet of the final grade. For deep cohesive fill (greater than 15 feet below final grade), it shall be moisture conditioned to within ±2 percent of optimum. Soils classifying as SM, SC, SW, SP, GP, GC and GM shall be moisture treated to within 2 percent of optimum moisture content as determined by ASTM D 1557. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas.

The Contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Soils Engineer, it is not possible to obtain uniform moisture content by adding water on the fill surface. The Contractor may be required to rake or disc the fill soils to provide uniform moisture content throughout the soils.

The application of water to embankment materials shall be made with any type of watering equipment approved by the Soils Engineer, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are washed out.

Should too much water be added to any part of the fill, such that the material is too wet to permit the desired compaction to be obtained, all work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework wet material in an approved manner to hasten its drying.

9. COMPACTION OF FILL AREAS

Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Granular fill placed less than 15 feet below final grade shall be compacted to at least 95 percent of maximum dry density as determined in accordance with ASTM D 1557. Cohesive fills placed less than 15 feet below final grade shall be compacted to at least 95 percent of maximum dry density as determined in accordance with ASTM D 698. For deep, cohesive fill (to be placed 15 feet or deeper below final grade), the material shall be compacted to at least 98 percent of maximum standard Proctor dry density (ASTM D 698). Granular fill placed more than 15 feet below final grade shall be compacted to at least 95 percent of maximum modified Proctor dry density (ASTM D 1557). Deep fills shall be placed within 2 percent of optimum moisture content. Fill materials shall be placed such that the thickness of loose materials does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction, as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Soils Engineer for soils classifying as claystone, CL, CH or SC. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Soils Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area. Compaction equipment shall make sufficient trips to ensure that the required density is obtained.

10. COMPACTION OF SLOPES

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and there is no appreciable amount of loose soil on the slopes. Compaction of slopes may be done progressively in increments of 3 to 5 feet in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 3:1 (horizontal to vertical).

11. DENSITY TESTS

Field density tests will be made by the Soils Engineer at locations and depths of his/her choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests will be taken in compacted material below the disturbed surface. When density tests indicate the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved. The criteria for acceptance of fill shall be:

A. Moisture

The allowable ranges for moisture content of the fill materials specified above in "Moisture Content" are based on design considerations. The moisture shall be controlled by the Contractor so that moisture content of the compacted earth fill, as determined by tests performed by the Soils Engineer, shall be within the limits given. The Soils Engineer will inform the Contractor when the placement moisture is less than or exceeds the limits specified above and the Contractor shall immediately make adjustments in procedures as necessary to maintain placement moisture content within the specified limits.

B. Density

1. The average dry density of all material shall not be less than the dry density specified.
2. No more than 20 percent of the material represented by the samples tested shall be at dry densities less than the dry density specified.
3. Material represented by samples tested having a dry density more than 2 percent below the specified dry density will be rejected. Such rejected materials shall be reworked until a dry density equal to or greater than the specified dry density is obtained.

12. SEASONAL LIMITS

No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Soils Engineer indicates the moisture content and density of previously placed materials are as specified.

13. NOTICE REGARDING START OF GRADING

The Contractor shall submit notification to the Soils Engineer and owner advising them of the start of grading operations at least three (3) days in advance of the starting date. Notification shall also be submitted at least three days in advance of any resumption dates when grading operations have been stopped for any reason other than adverse weather conditions.

14. REPORTING OF FIELD DENSITY TESTS

Density tests made by the Soils Engineer, as specified under “Density Tests” above, will be submitted progressively to the Owner. Dry density, moisture content and percent compaction will be reported for each test taken.

APPENDIX D
HISTORICAL AERIALS

Historical Aerial Photographs

Target Property:

Meadowbrook Crossing

Colorado Springs, El Paso, Colorado 80915

Prepared For:

CTL Thompson- Colorado Springs

Order #: 93489
Job #: 204304
Project #: CS18831-200
Date: 9/22/2017

Target Property Summary

Meadowbrook Crossing

Colorado Springs, El Paso, Colorado 80915

USGS Quadrangle: ***Elsmere***
Target Property Geometry: ***Area***

Target Property Longitude(s)/Latitude(s):
(-104.692454338, 38.844395584), (-104.693119526, 38.845080787), (-104.693312645, 38.845281333), (-104.693655968, 38.845615575), (-104.693977833, 38.845339825), (-104.696316719, 38.845331469), (-104.696863890, 38.844713118), (-104.696885347, 38.843894211), (-104.693323374, 38.843860786)

Aerial Research Summary

Date	Source	Scale	Frame
2015	USDA	1" = 500'	N/A
2013	USDA	1" = 500'	N/A
2011	USDA	1" = 500'	N/A
2004	USDA	1" = 500'	N/A
09/04/1999	USGS	1" = 500'	N/A
06/27/1993	USGS	1" = 500'	6670-27
10/25/1983	USGS	1" = 500'	491-62
06/25/1975	USGS	1" = 500'	14-20
10/08/1969	USGS	1" = 500'	2-88
10/06/1960	USGS	1" = 500'	4-135
10/28/1953	AMS	1" = 500'	2012
07/24/1947	USGS	1" = 500'	2-56
09/14/1937	ASCS	1" = 500'	40-33

W N E S

Meadowbrook Crossing
USDA
2015

GeoSearch

JOB #: 204304 - 09/22/2017

N
W
E
S

Meadowbrook Crossing
USDA
2013

GeoSearch

N
W
E
S

Meadowbrook Crossing
USDA
2011

GeoSearch

N
W
E
S

Meadowbrook Crossing
USDA
2004

GeoSearch

JOB #: 204304 - 09/22/2017

N
W E
S

Meadowbrook Crossing
USGS
09/04/1999

GeoSearch

N
W E
S

Meadowbrook Crossing
USGS
06/27/1993

GeoSearch

N
W
E
S

Meadowbrook Crossing
USGS
10/25/1983

GeoSearch

JOB #: 204304 - 09/22/2017

N
W E
S

Meadowbrook Crossing
USGS
06/25/1975

GeoSearch

N
W
E
S

Meadowbrook Crossing
USGS
10/08/1969

GeoSearch

N
W E
S

Meadowbrook Crossing
USGS
10/06/1960

GeoSearch

N
W E
S

Meadowbrook Crossing
AMS
10/28/1953

GeoSearch

N
W E
S

Meadowbrook Crossing
USGS
07/24/1947

N
W
E
S

Meadowbrook Crossing
ASCS
09/14/1937

GeoSearch