

**GEOLOGIC HAZARDS EVALUATION AND
PRELIMINARY GEOTECHNICAL INVESTIGATION
105 ACRE CONEXUS SITE
OLD DENVER ROAD AND 2ND STREET
MONUMENT, COLORADO**

Prepared for:

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CTL|T Project No. CS19248-115

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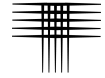


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SCOPE

This report presents the results of our Geologic Hazards Evaluation and Preliminary Geotechnical Investigation for an approximately 105 Acre development known as Conexus, southeast of Old Denver Road and 2nd Street in Monument, Colorado. The investigated parcel is planned for light industrial and commercial development. Our purpose was to evaluate the property for the occurrence of geologic hazards and general subsurface conditions that influence development and to provide preliminary geotechnical design concepts. This report includes descriptions of our interpretation of site geology, a summary of subsurface and groundwater conditions found in our exploratory borings, our opinion of the potential influence of the geologic hazards and subsurface conditions on the planned development, and preliminary geotechnical design and construction recommendations.

The report was prepared based on conditions interpreted from field reconnaissance mapping of the site, conditions found in our exploratory borings, results of laboratory tests, engineering analysis, and our experience. The criteria presented are applicable for planning and preliminary design. Grading plans, building locations, finish floor elevations, and structural information were not available at the time of this report. The geotechnical exploration and laboratory testing information contained in this report can be used as a supplement for future design-level investigations; CTL can provide final geotechnical investigation services, including additional borings, as a separate scope of work. Evaluation of the property for the possible presence of potentially hazardous materials (environmental site assessment) is beyond the scope of our investigation. Assessment of the site for the potential for wildfire hazards, corrosive soils, erosion problems, or flooding is also beyond the scope of this investigation.

The following section summarizes the report. A more complete description of the conditions found, our interpretations, and our recommendations are included in the report.

SUMMARY

1. Geologic hazards identified on this parcel include the occurrence of localized expansive soils, hard bedrock at depth, erosion, and regional issues of seismicity and naturally occurring radioactive materials. These conditions can be mitigated with engineering design and construction methods commonly employed in the area.
2. The soils encountered in the ten (10) exploratory borings drilled at the site consisted of predominantly natural clean to silty and clayey sand. Localized areas of fine-grained soils were encountered in the southern half of the site. A 7.5-foot thick layer of highly expansive clay was encountered at a depth of 4.5 feet in boring TH-7. A 6-foot thick layer of very sandy silt to very silty sand was identified at a depth of 7 feet in boring TH-9. Sandstone bedrock was found underlying the natural soils in the borings at 13 to 23 below the surface and extended to the maximum depth explored of 30 feet below the existing ground surface.
3. At the time of drilling, groundwater was measured in four of our exploratory borings ranging in depth from about 25 to 29 feet below the existing ground surface.
4. We believe site grading and utility installation for the proposed development can be accomplished using conventional, heavy-duty construction equipment.
5. We anticipate spread footing foundations will be appropriate for lightly to moderately loaded buildings. Where loose or expansive soils are encountered at or near footing and floor slab elevations following grading, it will likely be necessary to sub-excavate this material and then replace the expansive soils with moisture conditioned, densely compacted fill, prior to footing construction. Methods of mitigation are described in the report.
6. The natural sands and dense fills constructed using sands should provide good support for the lightly to moderately loaded slabs-on-grade. Localized areas of near surface highly expansive clays present a very high risk to slabs-on-grade. Methods of mitigation are discussed in the report.
7. Overall plans should provide for the rapid conveyance of surface runoff to the storm sewer system.

SITE CONDITIONS

The investigated site consists of about 105 acres of undeveloped land situated southeast of the intersection of Old Denver Road and 2nd Street in Monument, Colorado. The site is bound by I-25 on the east and Old Denver Highway to the west. The

parcels covered by this report are within the northern section of the overall Conexus development. The Santa Fe Trail is present between the property and the Old Denver Highway on the west. Natural drainages are present to the north and south of the site and we understand these areas will become dedicated open space. A utility easement with various underground utilities as well as overhead power lines extends east to west across the central portion of the property. The site is currently utilized for cattle grazing. A colony of black tailed prairie dogs also occupy the site. Sporadic areas of prairie dog mounds were observed primarily in the southern portion of the site. Vegetation on the site consists of grasses with occasional cacti. The site plan and a vicinity map are shown in Fig. 1. The site plan shows the drainage tract and overhead power line locations.

The ground surface at the site generally slopes downward toward the southwest at grades of less than 3 percent. Figure 1 shows the existing topography at the site.

PROPOSED DEVELOPMENT

Development plans were not available at the time of this investigation. We understand the site is planned to be developed with light industrial and commercial buildings, however zoning indicates medium to high density residential development could also be constructed. We assume the buildings will most likely be one to three stories in height, probably without habitable, below-grade areas (basements). Some of the structures will likely include loading docks. Paved access driveways and parking areas will be constructed as part of the overall development.

We expect cuts and fills on the order of about five feet will be needed to establish building pads within most of the development. Some 10 foot thick cuts and fills are likely. The development will be serviced by a municipal sanitary sewer collection system and potable water distribution system.

SUBSURFACE INVESTIGATION

Subsurface conditions across the site were investigated by drilling ten (10), widely-spaced exploratory borings to depths of 30 feet at the approximate locations shown in Fig. 1. Our firm performed a Preliminary Geotechnical Investigation (CTL|T Job No. CS-18785-115; report dated August 1, 2017) for a 24 acre portion of the Conexus site that lies to the south of the 105 acre site. The subsurface soils and bedrock encountered on the 24 acre site were similar to what was encountered during this investigation.

Graphical logs of conditions found in our exploratory borings, the results of field penetration resistance tests, and some laboratory data are in Appendix A. Swell-consolidation and sieve analysis test results are presented in Appendix B and summarized in Table B-1.

Soil and bedrock samples obtained during this study were returned to our laboratory and visually classified. Laboratory testing was then assigned to representative samples. Testing included moisture content and dry density, swell-consolidation, Atterberg limits, sieve analysis, and water-soluble sulfate content tests. The swell test samples were wetted under applied loads that approximated the overburden pressure (the weight of overlying soil and bedrock).

SUBSURFACE CONDITIONS

The soils encountered in the exploratory borings drilled at the site during this study consisted of predominantly natural, clean to silty sand with sporadic areas of clayey sand, very sandy silt, and clay underlain by sandstone bedrock. The bedrock was encountered at depths between 13 and 23 feet below the existing ground surface. Some of the pertinent engineering characteristics of the soils and bedrock encountered, and groundwater conditions are discussed in the following paragraphs.

Sands

Natural, clean and slightly silty to silty sand with sporadic layers of clayey sand that varied in thickness was encountered at the surface and extended to depths be-

tween 13 and 23 feet. The natural sand was loose to very dense based on the results of field penetration resistance tests. Five samples of the sand contained 4 to 17 percent clay and silt-size particles (passing the No. 200 sieve). Our experience indicates the sands are typically non-expansive when wetted.

Silts and Clays

In boring TH-7, a 7.5-foot thick layer of highly expansive clay was encountered at a depth of 4.5 feet. The clay was very stiff based on the results of field penetration resistance tests. In boring TH-9, a 6-foot thick layer of very sandy silt to very silty sand was encountered at a depth of 7.5 feet. One sample of the clay tested contained 93 percent silt and clay-sized particles and exhibited measured swell of 15.0 percent when wetted under approximate overburden pressure. A sample of the silty sand contained 50 percent silt and clay-sized particles (passing the No. 200 sieve) indicative of borderline silt and sand material. The silt was stiff based on the results of field penetration resistance tests. The silt and clay soils may be present sporadically in other areas of the site.

Bedrock

Silty to clayey sandstone bedrock was found in each of the borings, underlying the natural soils at depths of about 13 to 23 feet below the existing ground surface. The sandstone is weakly to moderately cemented. Field penetration resistance test results indicated the bedrock was hard to very hard. Our experience indicates the silty sandstone typically exhibits negligible expansion while the clayey sandstone can exhibit low to moderate swell potential.

Groundwater

At the time of drilling, groundwater was measured at depths in four of our exploratory borings at depths ranging from 25 to 29 feet below the ground surface. The borings were backfilled immediately after drilling. Water levels should be expected to fluctuate in response to altered surface drainage patterns, seasonal precipitation, and irrigation of landscaping. Our borings were drilled in the early summer season months

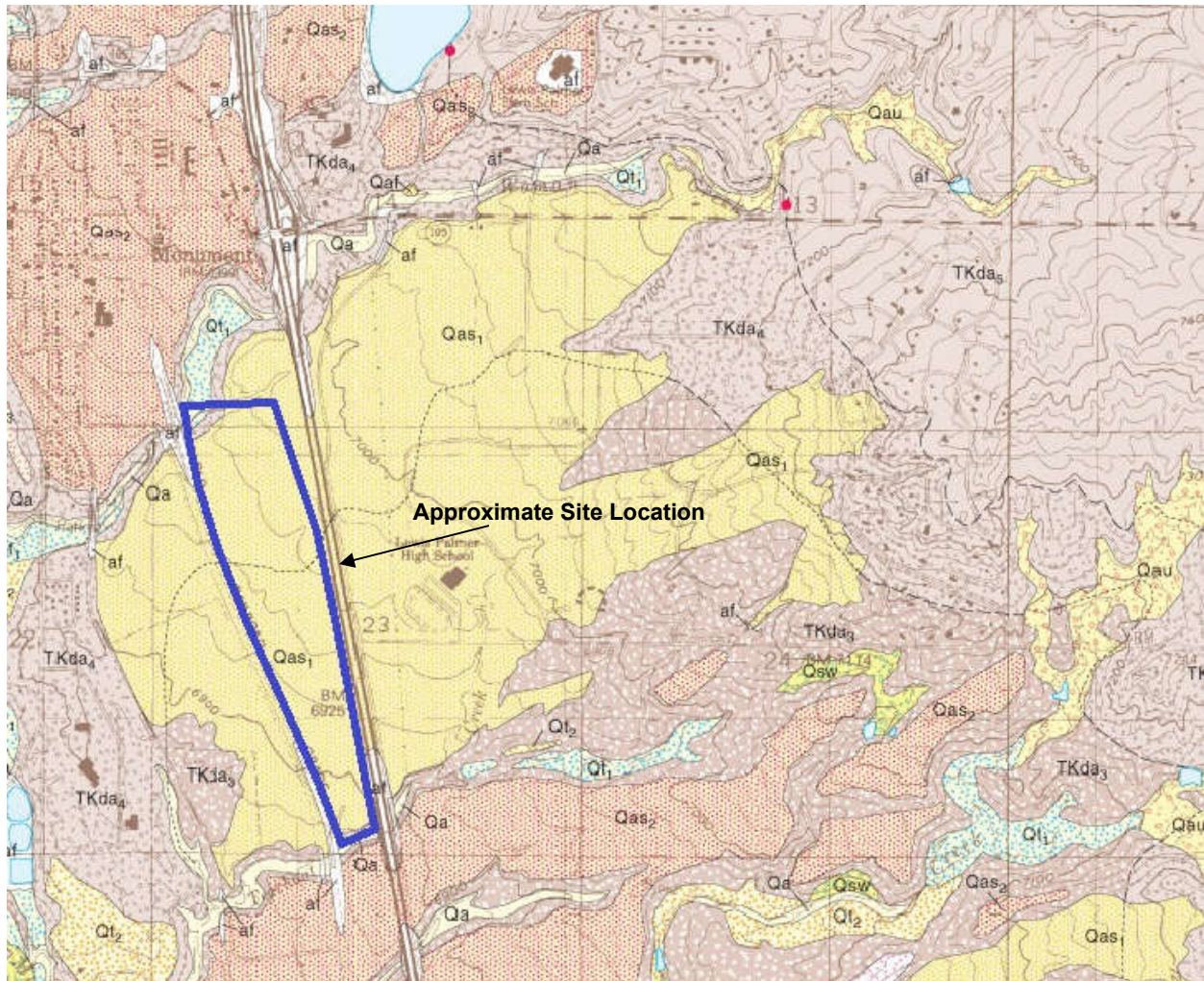
when groundwater levels are typically nearing seasonal highs. Conditions are favorable for the formation of a perched groundwater table at the bedrock surface. A seasonal rise of 3 to 5 feet is “normal” for this area.

GEOLOGIC SETTING

The site lies in the Colorado Piedmont section of the Great Plains physiographic province. While the Laramide Orogeny was occurring that uplifted the Rocky Mountains during the late Cretaceous and early Tertiary, energetic braided streams were delivering a mixture of coarse gravel, sand, and finer silt and clay particles, derived primarily from Precambrian Pikes Peak Granite, to the Colorado Piedmont that would become the Dawson Formation. The upper part of the Dawson Formation shares similar characteristics with the Upper Arapahoe, Denver, and Dawson Formations mapped in the Denver area. The source area for these granitic arkosic materials of the Dawson Formation was immediately west across the mountain-front fault system called the Rampart Range Fault. The coarser materials are cross bedded, filled broad channels and generally cut into the finer grained lower portions of the Dawson Formation. Interbedded with the thick channel deposits are occasional massive structureless beds deposited by mud flows. (Thorson and Madole, 2003)

SITE GEOLOGY

The geology of this 105 acre site was evaluated through the review of published geologic maps and through the drilling of the ten exploratory borings widely spaced across the site. Information from these sources was used to produce our interpretation of surficial geologic conditions, as shown in Fig. 2. An excerpt from the Colorado Geological Survey’s “Geologic Map of the Monument Quadrangle, El Paso County, Colorado” (dated 2003) is presented below. Our subsurface investigation and observations generally confirm the mapping. The following sections discuss the mapped units.



Excerpt from CGS 2003, Geologic Map of the Monument Quadrangle, El Paso County, Colorado

Surficial Deposits

About 13 to 23 feet of soil deposits was found to overlie sandstone bedrock of the Dawson Formation as indicated by our borings. The various deposits are described in more detail in the following sections.

Younger Alluvial Slope Deposits – Map Unit Qas: Sheetwash and stream deposited alluvium consisting of very pale brown to brown, poorly sorted sand and sandy fine pebble gravel. This unit comprises almost the entire site with the exception of the extreme northwest corner and south end.

Channel and flood-plain alluvium – Map Unit Qa: Stream deposits of sand, silt, and clay that may have gravel in places.

Bedrock

Dawson Formation - Map Unit TKda₃: The site is underlain by sandstone of the Dawson formation. The depth of the bedrock encountered in our borings ranges from 13 to 23 feet below the existing ground surface at the site. The bedrock consists of predominantly silty sandstone with occasional beds of clayey sandstone. The bedrock was judged to be hard to very hard based on field penetration resistivity testing. The clayey sandstone portion of this formation can exhibit expansion potentials ranging from low to moderate, while the silty sandstone is typically non-expansive.

POTENTIAL GEOLOGIC HAZARDS AND ENGINEERING CONSTRAINTS

We did not identify geologic hazards that we believe preclude development of the site. The conditions identified at the site that may pose hazards or constraints to development include erosion and expansive soil and bedrock. Regional geologic conditions that impact the site include seismicity and radioactivity. We believe each of these conditions can be mitigated with engineering design and construction methods commonly employed in this area. These conditions are discussed in greater detail in the sections that follow.

Our interpretation of the engineering geologic conditions is presented in Fig. 3. The site is shown as containing Map Units 1A, 7A, and 7B per the classification system described in Robinson's "El Paso County, Colorado - Potential Geologic Hazards and Surficial Deposits, Environmental and Engineering Geologic Maps and Tables for Land Use," 1977.

Map Unit 1A: describes stable alluvium, colluvium, and bedrock on flat to gentle to gentle slopes between 0 to 5%. Almost the entire site is located within the unit.

Map Unit 7A: describes the physiographic flood plain where erosion and deposition presently occur and is generally subject to recurrent flooding. Includes 100-year flood plain along major streams where flood plain studies have been conducted. This unit is located along the drainage to the south and will become dedicated open space.

Map Unit 7B: describes drainage areas that originate onsite and are subject to intermittent surface runoff and seasonally high groundwater. This unit is located near the drainage to the south and will likely become part of a dedicated open space area.

Erosion

The site contains soil and bedrock that are susceptible to the effects of wind and water erosion. Concentrated water flow can result in erosion. The surficial soils on slopes less than 20 percent are relatively stable and resistant to erosion where vegetation is established. Disturbance of the vegetative cover and long-term exposure to the erosive power of wind and water increases the potential for erosion. Maintaining vegetative cover and providing engineered surface drainage will reduce the potential for erosion from wind and water.

Expansive Soil and Bedrock

The near-surface soils are sandy and are considered generally low-swelling or non-expansive with the exception of very localized highly expansive clay encountered in the southern portion of the site. There is a possibility of encountering the highly expansive clay sporadically across the site. Hazards associated with expansive materials can be mitigated through currently used engineered foundation and floor slab systems, sometimes in conjunction with ground modification such as sub-excavation and treatment or replacement. Geotechnical investigations conducted for each building site should address procedures for mitigating issues associated with expansive soils and bedrock, if present at shallow depths that may impact foundations and floor slabs.

Groundwater

Groundwater was encountered during drilling in four of our exploratory borings at depths between 25 and 29 feet. Perched groundwater can form after development due to landscape irrigation and disruption of natural drainage patterns. This condition can be mitigated by installing drain systems around below-grade spaces and providing a pumped or gravity outfall.

Flooding

The site is mapped by FEMA in the Flood Insurance Rate Maps as lying within Zone X (Outside the 500 year flood plain). FEMA mapping indicates the drainages to the north and south lie within the 100 year flood plain, but these areas are beyond the site boundaries where development will occur. The project Civil Engineer should address flooding and drainage of the site.

Seismicity

This area, like most of central Colorado, is subject to a degree of seismic activity. Geologic evidence indicates that movement along some Front Range faults has occurred during the last two million years (Quaternary). This includes the Rampart Range Fault, which are located approximately 3 miles west of the site. We believe the soils on the property classify as Site Class D according to the 2015 International Building Code (2015 IBC). Where shallow bedrock is present, Site Class C may be appropriate.

Radon and Radioactivity

We believe there are not unusual hazards associated with naturally occurring sources of radioactivity on this site. The principal radioactive hazard produced by soil deposits commonly found in the Colorado Springs area is radon gas. Higher concentrations of radon gas normally occur in residential structures that have been sealed to prevent exchange of outside air. Commercial buildings are normally well ventilated. Radon tends to collect in below-grade areas due to limited outside air exchange and interior ventilation. Passive and active mitigation systems 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 negative pressure system below the floor and sealing the joints and cracks in concrete slabs and foundation walls. If the occurrence of radon is a concern, we recommend the structures be tested after they are enclosed, and mitigation systems can be installed to reduce the risk.

SITE DEVELOPMENT CONSIDERATIONS

From a geotechnical standpoint, the site is well suited for the proposed development. The most significant constraint to development is the presence of highly expansive clay that was encountered in one of our borings within the southern portion of the site. As the project is in the preliminary planning stage grading and site development plans were not available at the time of our investigation; however, we expect relatively minor grading will be required to create level building pads and the associated access roadways, parking lots, and driveways. Based on the results of this investigation, the near surface materials are predominantly granular and will generally provide good support for spread footing foundations, slabs-on-grade, and pavements. Where clay soils are encountered, sub-excavation and reworking of these materials will be necessary.

Site Grading

The site is naturally sloped downward toward the south and west. Site grading will be necessary to establish level building pads. We believe site grading can be accomplished using conventional heavy-duty earthmoving equipment. Guideline specifications for site grading are presented in Appendix C.

Vegetation 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. Loose soils were found in the upper 5 feet of boring TH-6.

Prairie Dog burrow holes were observed at the site. The burrow holes typically lead to tunnels that are 3 to 7 feet deep or more with dome shaped fill mounds present around the burrow entrances. Burrow holes may affect site improvements. Therefore, we recommend removing and/or backfilling the prairie dog holes that are encountered during site grading, as much as practical.

The onsite soils are generally suitable for use as grading fill, and excavation backfill, provided they are free of debris, vegetation/organics, and other deleterious materials. If imported fill is necessary, it should ideally consist of granular material with 100 percent passing the 2-inch sieve and less than 35 percent material passing the No. 200 sieve.

The ground surface in areas to receive fill should be scarified deeply, moisture conditioned and compact 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.

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 of the sand soils and fill. Slopes should be revegetated as soon as possible to control erosion by wind and water. Concentrated water flows over slopes should be avoided.

Placement and compaction of the grading fill should be periodically observed and tested by our representative during construction.

Buried Utilities

Based on the subsurface conditions encountered in our exploratory borings, we anticipate most of the materials encountered during utility trench excavation will consist of clean to silty sands and clayey sands. Utility trench excavation can likely be accom-

plished using heavy-duty track hoes. Throughout the majority of the site, the bedrock encountered in our borings was at depths below what we would expect for most utility excavation. Localized deep utility excavations may encounter hard bedrock requiring more aggressive excavation techniques.

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 soils will classify as Type C. Temporary excavations in Type C materials require a maximum slope inclination of 1.5:1 (horizontal to vertical) in the absence of groundwater, unless the excavation is shored or braced. 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 and ventilation in crawl space areas beneath structural floors.

The surficial sands are non-expansive and relatively dense. While we do not anticipate widespread areas of expansive soils or bedrock, localized pockets of highly

expansive near surface clay soils are present. In addition, localized layers of loose sand soils are also present.

We believe spread footing foundations will be appropriate for lightly to moderately loaded buildings. For preliminary planning purposes, spread footings with an allowable bearing pressure of 3,000 psf is anticipated for design. Where loose or expansive soils are found, sub-excavation and replacement with moisture conditioned, densely compacted fill may be appropriate.

We anticipate slab-on-grade floors will be the desired floor system for light industrial/commercial buildings. The surficial sands are relatively dense and should provide good slab support for lightly loaded (50 psf or less) to moderately loaded (100 psf or less) slabs-on-grade with a low risk of poor performance. It should be understood that expansive soils can cause heave and damage of slab-on-grade floors. Where loose or expansive soils are present at or near finished floor elevations after grading, sub-excavation and replacement below the slab may be appropriate to enhance floor system performance. Where highly expansive clay soils are present as found in boring TH-7, up to 10 feet of sub-excavation could be required to reduce the performance risk to low.

PAVEMENTS

The natural sand soils are expected to be the predominant pavement subgrade materials at this site. We anticipate pavement sections on the order of 3 to 4 inches of asphalt over 6 or more inches of aggregate base course will be appropriate for drive lanes and parking lots. A composite section of 4 to 5 inches of asphalt over 6 to 8 inches of base course may be needed for the major access driveways that will be subjected to heavy truck traffic. A subgrade investigation and pavement design should be performed after designs are finalized and site grading is complete.

CONCRETE

Concrete in contact with soil can be subject to sulfate attack. We measured the water-soluble sulfate concentration in one sample from this site at less than 0.1 percent.

Sulfate concentrations less than 0.1 percent indicate Class 0 exposure to sulfate attack for concrete in contact with the subsoils, according to ACI 201.2R-01, as published in the 2008 American Concrete Institute (ACI) Manual of Concrete Practice. For this level of sulfate concentration, the ACI indicates Type I or Type I/II cement can be used for concrete in contact with the subsoils. In our experience, superficial damage may occur to the exposed surfaces of highly permeable concrete, even though sulfate levels are relatively low. To control this risk and to resist freeze-thaw deterioration, the water-to-cementitious material 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 subjected to freeze-thaw cycles should be air entrained.

SURFACE DRAINAGE AND IRRIGATION

The performance of structures, flatwork, and roads within the development will be influenced by surface drainage. When developing an overall drainage scheme, consideration should be given to drainage around each structure and from pavement areas. Drainage should be planned such that surface runoff is directed away from foundations and is not allowed to pond adjacent to or between structures or over pavements. Ideally, slopes of at least 6 inches in the first 10 feet should be planned for the areas surrounding buildings, where possible. Roof downspouts and other water collection systems should discharge well beyond the limits of all backfill around the structures.

Proper control of surface runoff is also important to prevent the erosion of surface soils. Concentrated flows should not be directed over unprotected slopes. Permanent slopes should be seeded or mulched to reduce the potential for erosion. Backfill soils behind the curb and gutter adjacent to access roadways, parking lots, and in utility trenches within individual lots should be compacted. If surface drainage between preliminary development and construction phases is neglected, performance of the roadways, flatwork, and foundations may be compromised.

FURTHER INVESTIGATIONS

After site development plans have been formalized, we recommend additional design-level geotechnical investigations be completed. Such investigations will be required to determine the appropriate foundation and floor systems for the buildings based upon the proposed site grading and finished floor elevations.

LIMITATIONS

The recommendations and conclusions presented in this report were prepared based on conditions disclosed by our exploratory borings, geologic reconnaissance, engineering analyses, and our experience. Variations in the subsurface conditions not indicated by the borings are possible and should be expected.

We believe this report was prepared with that level of skill and care ordinarily used by geologists and geotechnical engineers practicing under similar circumstances. No warranty, express or implied, is made.

Should you have any questions regarding the contents of this report or the project from a geotechnical engineering point-of-view, please call.

CTL | THOMPSON INC

Jeffrey M. Jones, P.E.
Staff Engineer



Reviewed by:

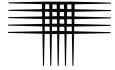
William C. Hoffmann Jr.

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Senior Principal Engineer

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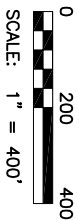
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Via email: DAM@schuckcommunities.com



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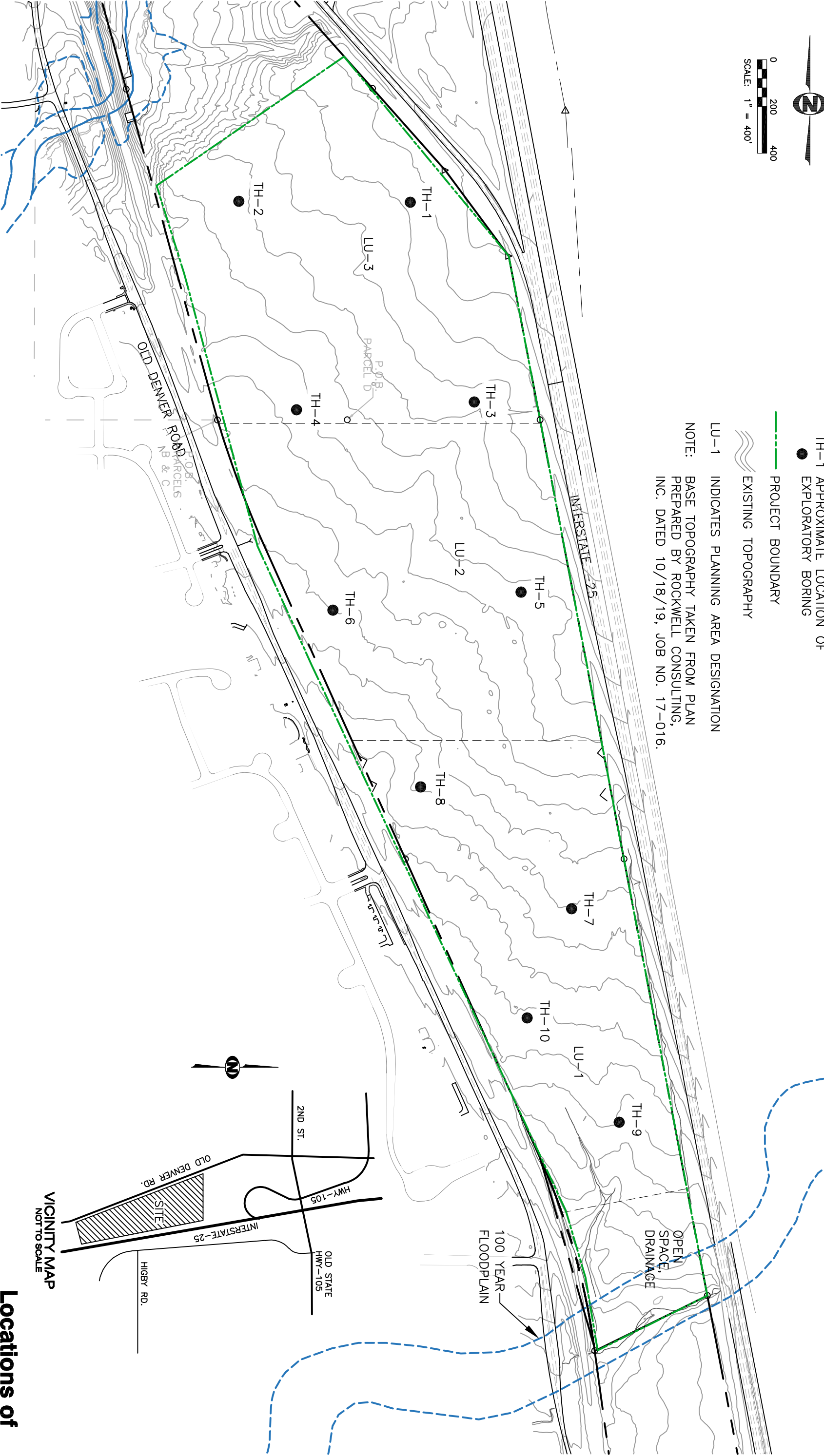
TH-1 APPROXIMATE LOCATION OF
EXPLORATORY BORING

PROJECT BOUNDARY

EXISTING TOPOGRAPHY

LU-1 INDICATES PLANNING AREA DESIGNATION

NOTE: BASE TOPOGRAPHY TAKEN FROM PLAN
PREPARED BY ROCKWELL CONSULTING,
INC. DATED 10/18/19, JOB NO. 17-016.





- LEGEND:
- PROJECT BOUNDARY
 - EXISTING TOPOGRAPHY
 - LU-1 INDICATES PLANNING AREA DESIGNATION

- Qas** YOUNGER ALLUVIAL SLOPES. SHEETWASH AND STREAM DEPOSITED ALLUVIUM VERY PALE BROWN TO BROWN, POORLY SORTED SAND AND SANDY FINE PEBBLE GRAVEL
- Qa** CHANNEL AND FLOOR-PLAIN ALLUVIUM INCLUDES STREAM DEPOSITS OF SAND SILT AND CLAY THAT MAY HAVE GRAVEL IN PLACES. UNIT INCLUDES AREAS PRONE TO EROSION AND/OR DEPOSITION DURING FLOOD STAGE.
- qt** TERRACE ALLUVIUM PALE BROWN AND BROWN TO GRAYS BROWN BEDS OF SAND, SILTY, FINE SAND, SANDY SILT, CLAYEY SILT AND GRAVEL.

- NOTES: 1) BASE TOPOGRAPHY TAKEN FROM PLAN PREPARED BY ROCKWELL CONSULTING, INC. DATED 10/18/19, JOB NO. 17-016.
- 2) THE EXTENT OF THE GEOLOGIC MAP UNITS IS BASED ON A SUBJECTIVE ANALYSIS OF TOPOGRAPHY, REVIEW OF GEOLOGIC MAPS, AND SITE OBSERVATIONS.



LEGEND:

— PROJECT BOUNDARY I-A

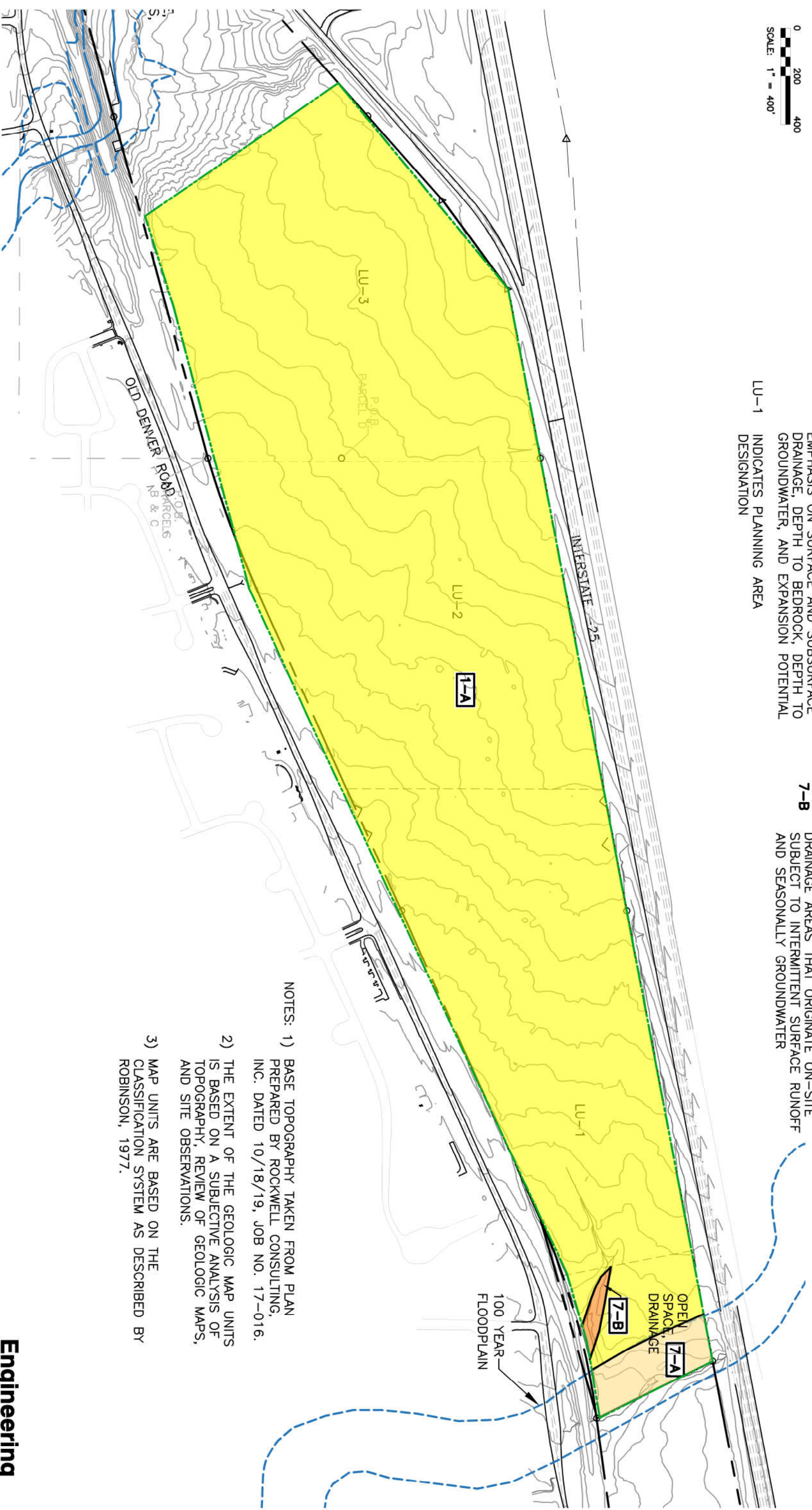
EXISTING TOPOGRAPHY

STABLE ALLUVIUM ON GENTLE SLOPES (<6%). GRADES ARE STEEPER ADJACENT TO DRAINAGES (<15%) DEPTH TO BEDROCK IS GENERALLY MORE THAN 10 FEET BELOW THE GROUND SURFACE AS INDICATES BY OUR TEST HOLES. EMPHASIS ON SURFACE AND SUBSURFACE DRAINAGE, DEPTH TO BEDROCK, DEPTH TO GROUNDWATER, AND EXPANSION POTENTIAL

7-A PHYSIOGRAPHIC FLOODPLAIN WHERE EROSION AND DEPOSITION PRESENTLY OCCUR AND IS GENERALLY SUBJECT TO RECURRENT FLOODING. TYPICALLY HAVE HIGH GROUNDWATER

7-B DRAINAGE AREAS THAT ORIGINATE ON-SITE SUBJECT TO INTERMITTENT SURFACE RUNOFF AND SEASONALLY GROUNDWATER

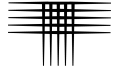
LU-1 INDICATES PLANNING AREA DESIGNATION



NOTES: 1) BASE TOPOGRAPHY TAKEN FROM PLAN PREPARED BY ROCKWELL CONSULTING, INC. DATED 10/18/19, JOB NO. 17-016.

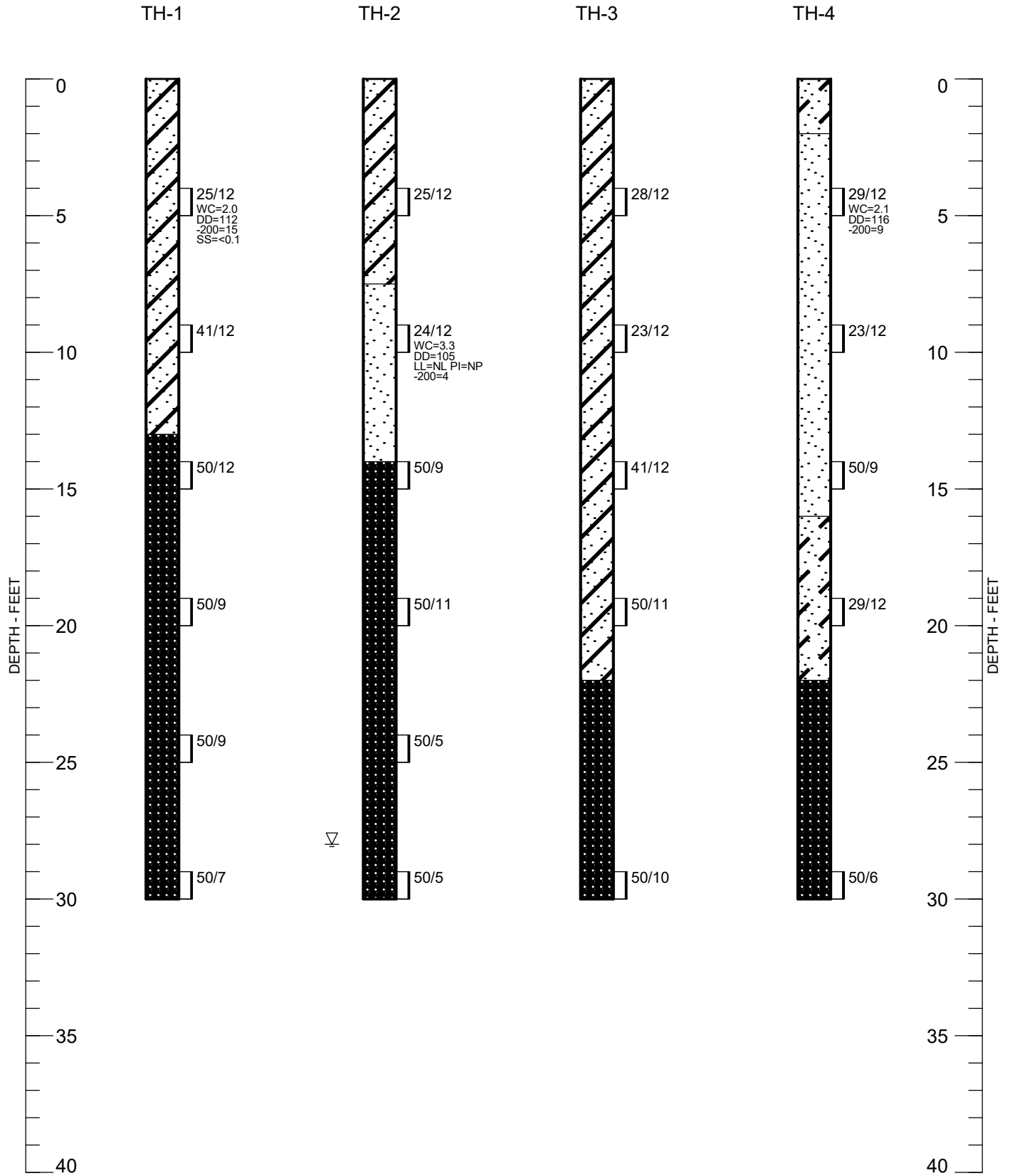
2) THE EXTENT OF THE GEOLOGIC MAP UNITS IS BASED ON A SUBJECTIVE ANALYSIS OF TOPOGRAPHY, REVIEW OF GEOLOGIC MAPS, AND SITE OBSERVATIONS.

3) MAP UNITS ARE BASED ON THE CLASSIFICATION SYSTEM AS DESCRIBED BY ROBINSON, 1977.

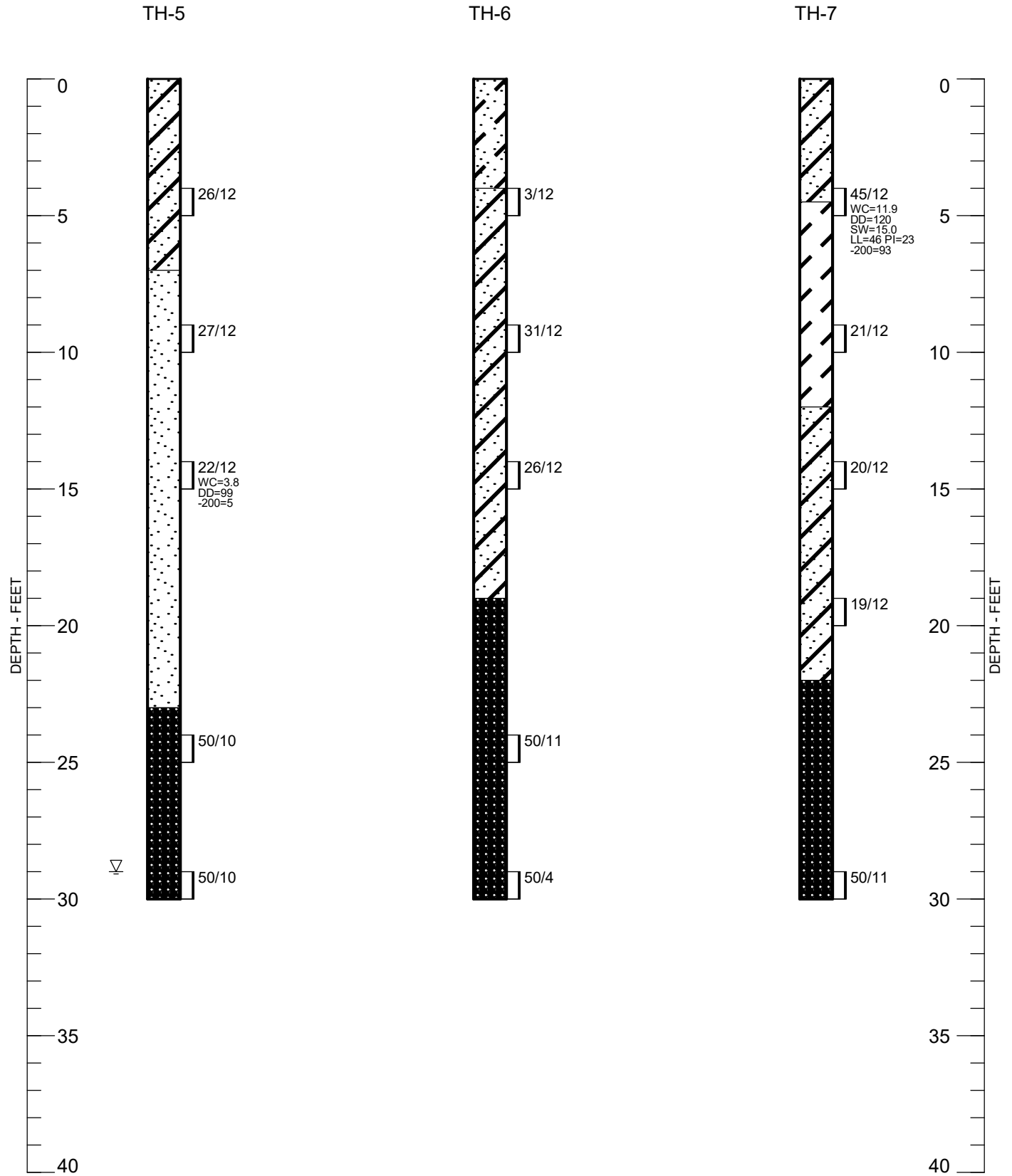


APPENDIX A

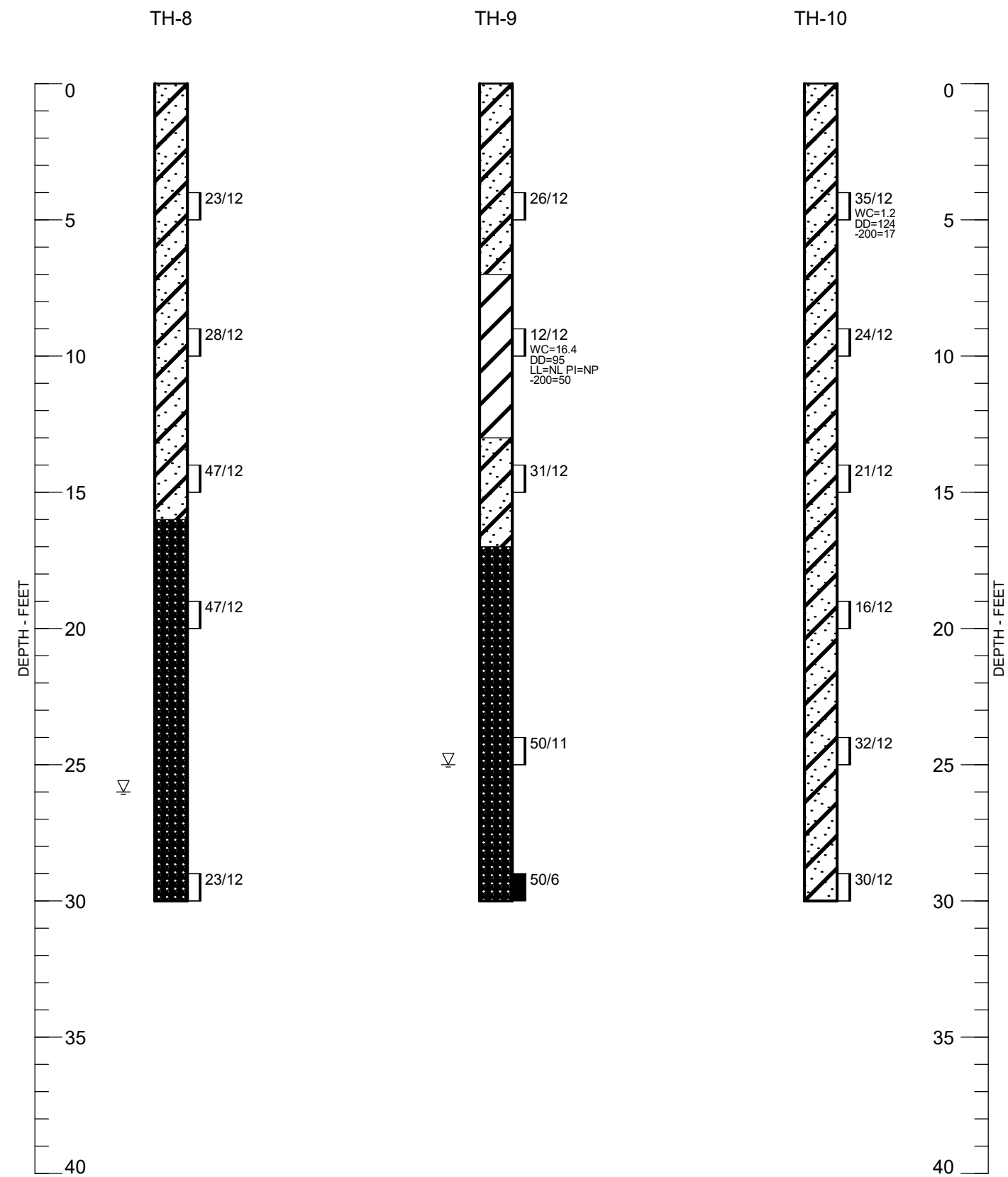
SUMMARY LOGS OF EXPLORATORY BORINGS



SUMMARY LOGS OF EXPLORATORY BORINGS



SUMMARY LOGS OF EXPLORATORY BORINGS



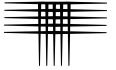
LEGEND:

- CLAY, VERY STIFF, SLIGHTLY MOIST, LIGHT BROWN (CL).
- SAND, CLAYEY, MEDIUM DENSE, SLIGHTLY MOIST, LIGHT BROWN, RUST (SC).
- SAND, SILTY TO VERY SILTY, LOOSE TO VERY DENSE, SLIGHTLY MOIST, LIGHT BROWN (SM).
- SAND, CLEAN TO SLIGHTLY SILTY, MEDIUM DENSE TO VERY DENSE, SLIGHTLY MOIST, LIGHT BROWN (SP, SP-SM).
- SILT, VERY SANDY TO SAND, VERY SILTY, STIFF, MOIST, REDDISH BROWN (ML-SM).
- BEDROCK, SANDSTONE, SILTY TO CLAYEY, HARD TO VERY HARD, WEAKLY TO MODERATELY CEMENTED, SLIGHTLY MOIST TO MOIST, LIGHT BROWN.
- DRIVE SAMPLE. THE SYMBOL 25/12 INDICATES 25 BLOWS OF AN AUTOMATIC 140-POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE A 2.5-INCH O.D. SAMPLER 12 INCHES.
- WATER LEVEL MEASURED AT TIME OF DRILLING.

NOTES:

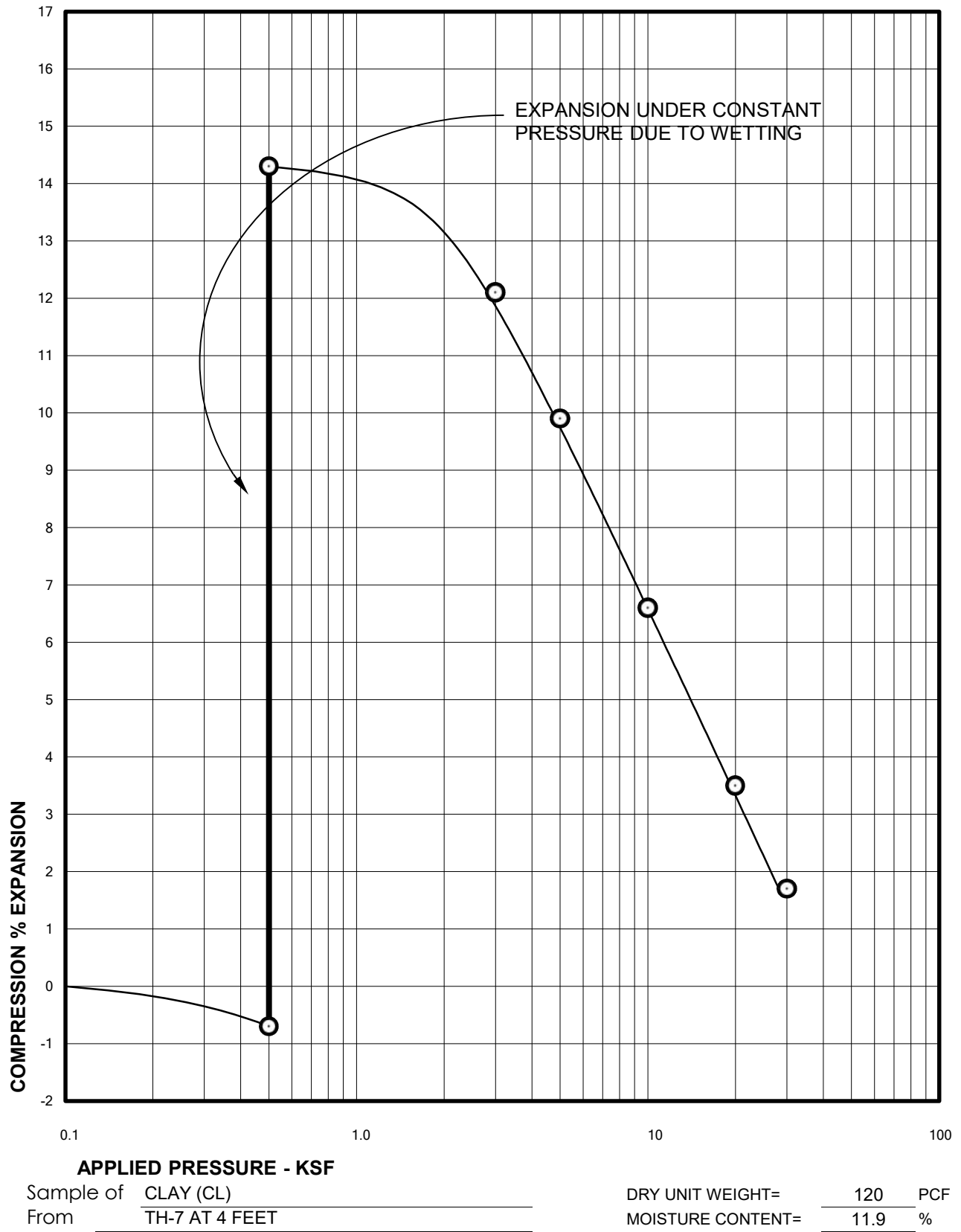
- THE BORINGS WERE DRILLED ON MAY 15 AND JUNE 3, 2020 USING 4-INCH DIAMETER, CONTINUOUS-FLIGHT SOLID-STEM AUGER AND TRUCK-MOUNTED CME-55 DRILL RIG.
- WC - INDICATES MOISTURE CONTENT (%).
DD - INDICATES DRY DENSITY (PCF).
SW - INDICATES SWELL WHEN WETTED UNDER APPLIED PRESSURE (%).
COM- INDICATES COMPRESSION WHEN WETTED UNDER APPLIED PRESSURE (%).
LL - INDICATES LIQUID LIMIT.
PI - INDICATES PLASTICITY INDEX.
-200 - INDICATES PASSING NO. 200 SIEVE (%).
SS - INDICATES WATER-SOLUBLE SULFATE CONTENT (%).
- THESE LOGS ARE SUBJECT TO THE EXPLANATIONS, LIMITATIONS AND CONCLUSIONS CONTAINED IN THIS REPORT.

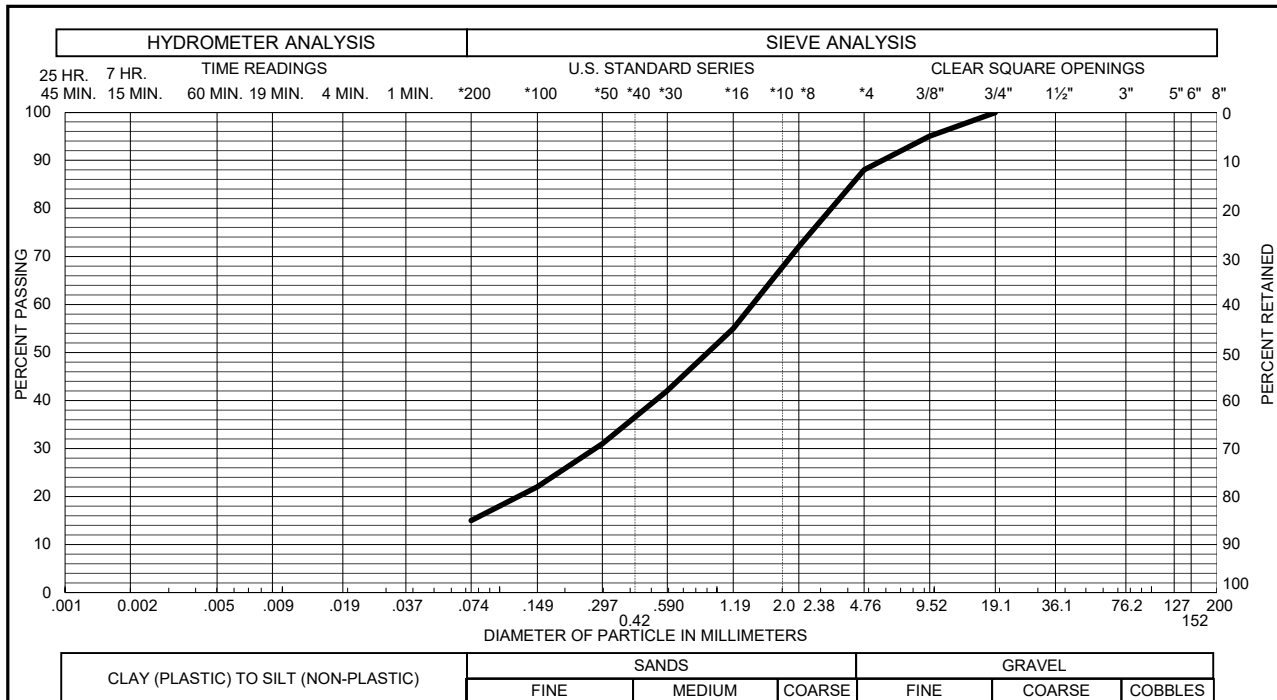
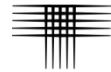
SUMMARY LOGS OF EXPLORATORY BORINGS



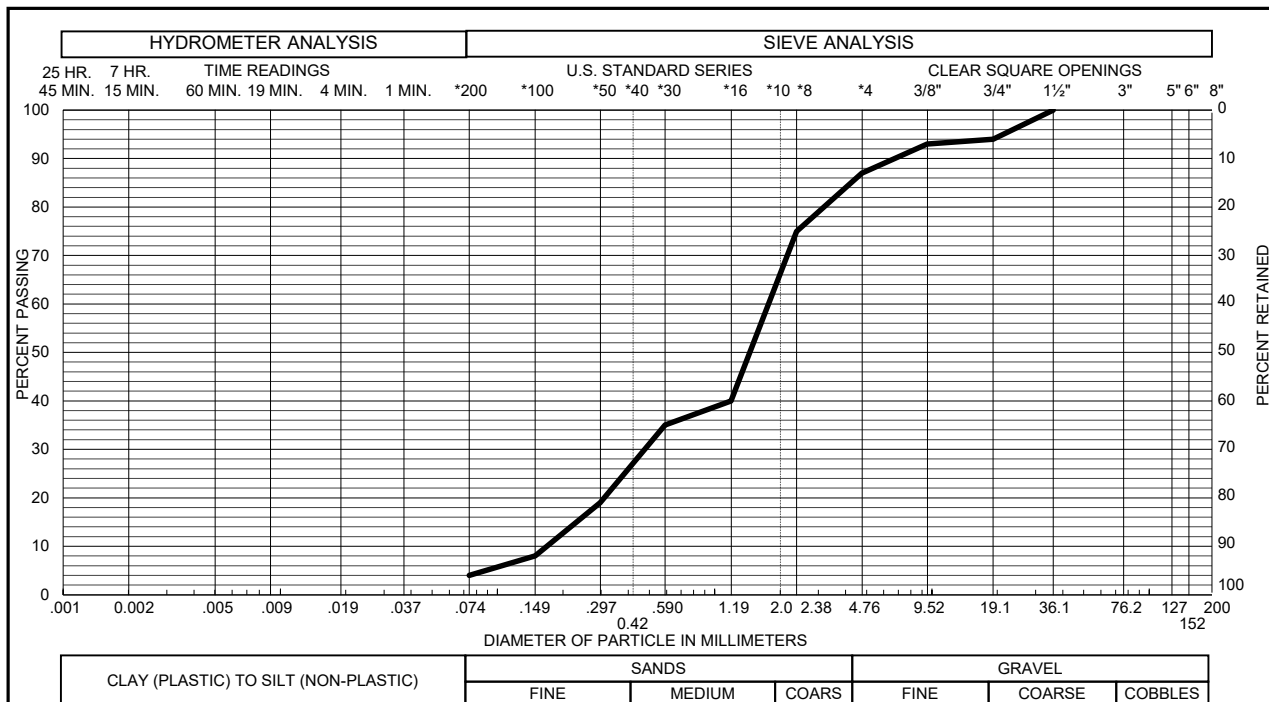
APPENDIX B

LABORATORY TEST RESULTS, TABLE B-1: SUMMARY OF LABORATORY TESTING





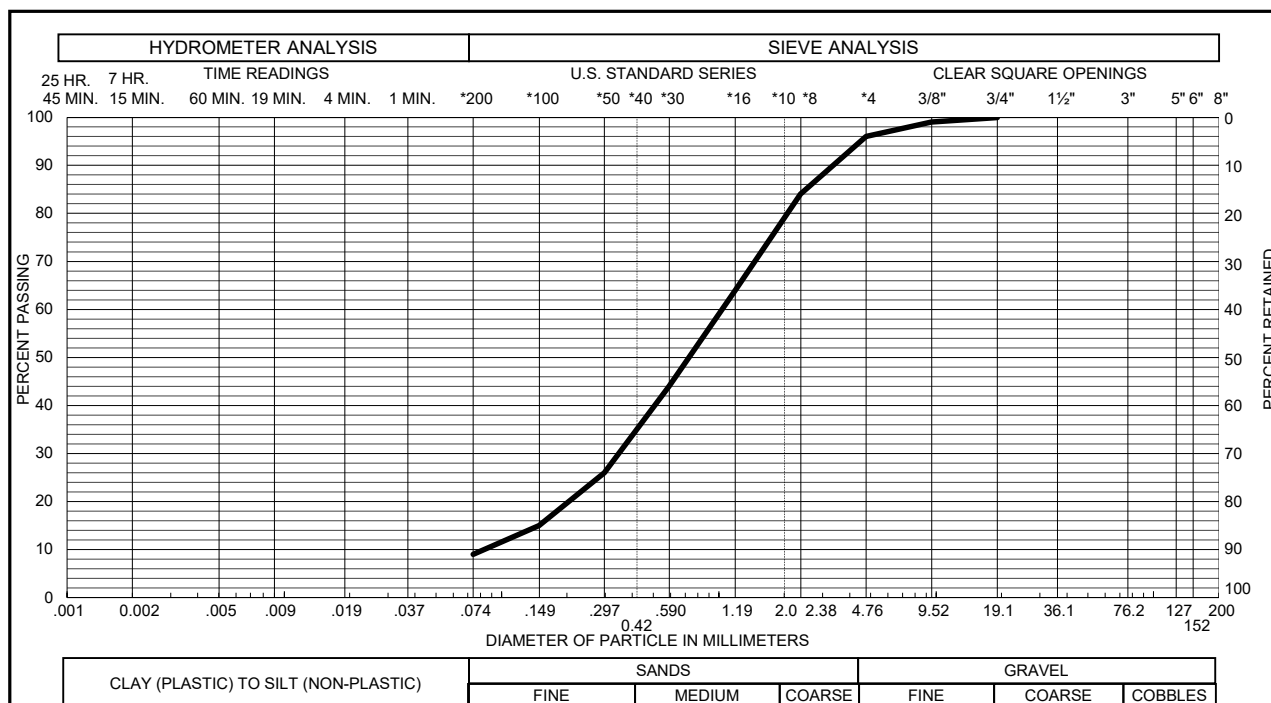
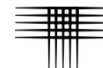
Sample of SAND, SILTY (SM) GRAVEL 12 % SAND 73 %
From TH - 1 AT 4 FEET SILT & CLAY 15 % LIQUID LIMIT
PLASTICITY INDEX



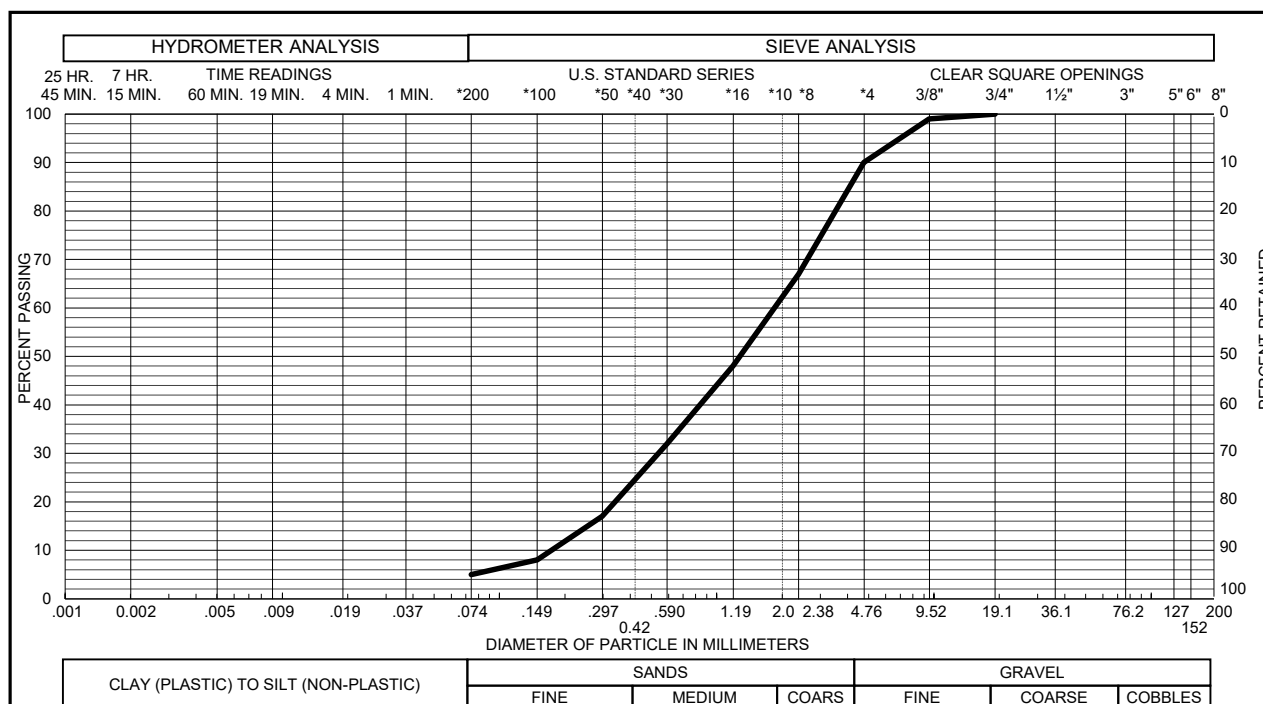
Sample of SAND (SP) GRAVEL 13 % SAND 83 %
From TH - 2 AT 9 FEET SILT & CLAY 4 % LIQUID LIMIT
PLASTICITY INDEX

Gradation Test Results

FIG. B-2



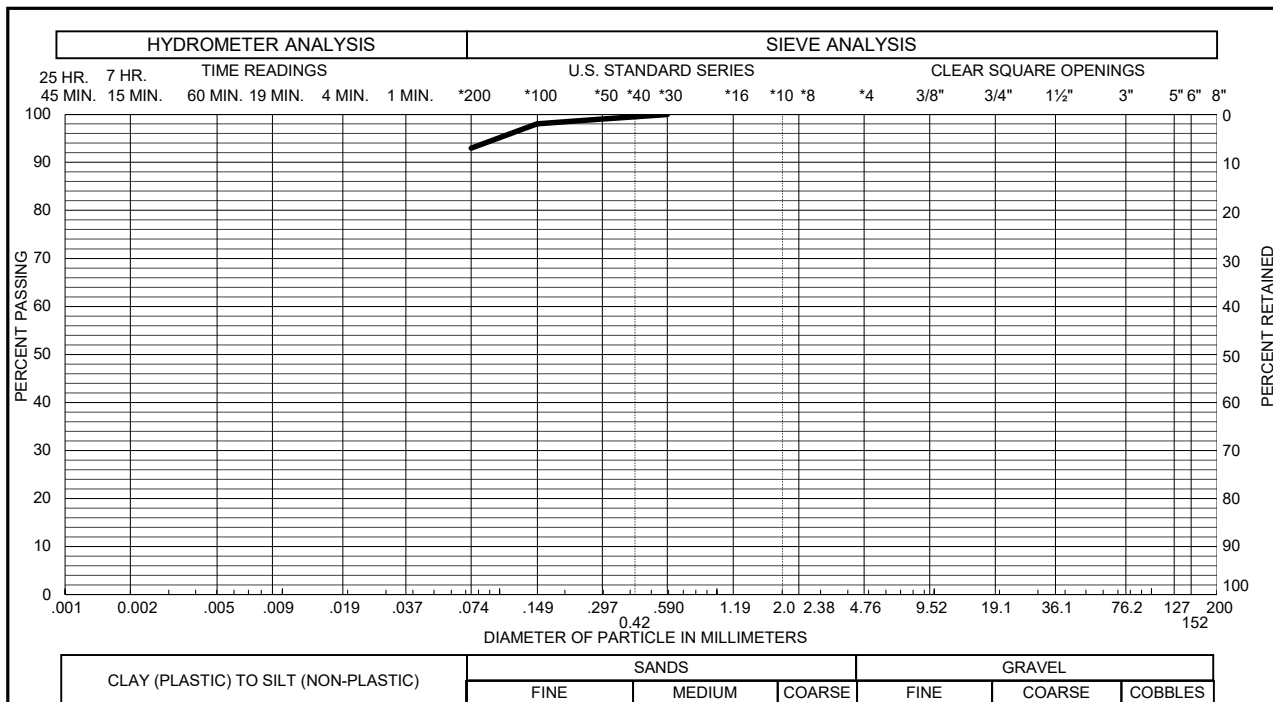
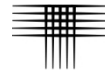
Sample of SAND, SLIGHTLY SILTY (SP-SM) GRAVEL 4 % SAND 87 %
From TH - 4 AT 4 FEET SILT & CLAY 9 % LIQUID LIMIT
PLASTICITY INDEX



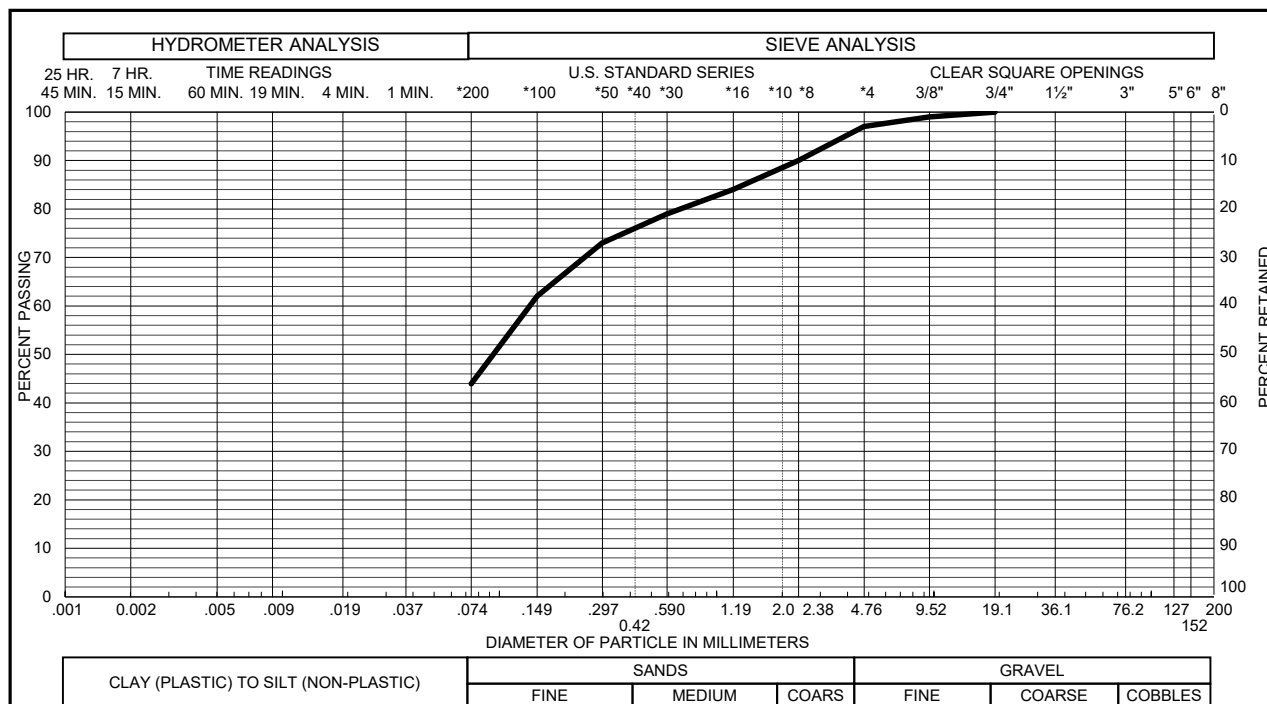
Sample of SAND, SLIGHTLY SILTY (SP-SM) GRAVEL 10 % SAND 85 %
From TH - 5 AT 14 FEET SILT & CLAY 5 % LIQUID LIMIT
PLASTICITY INDEX

Gradation Test Results

FIG. B-3



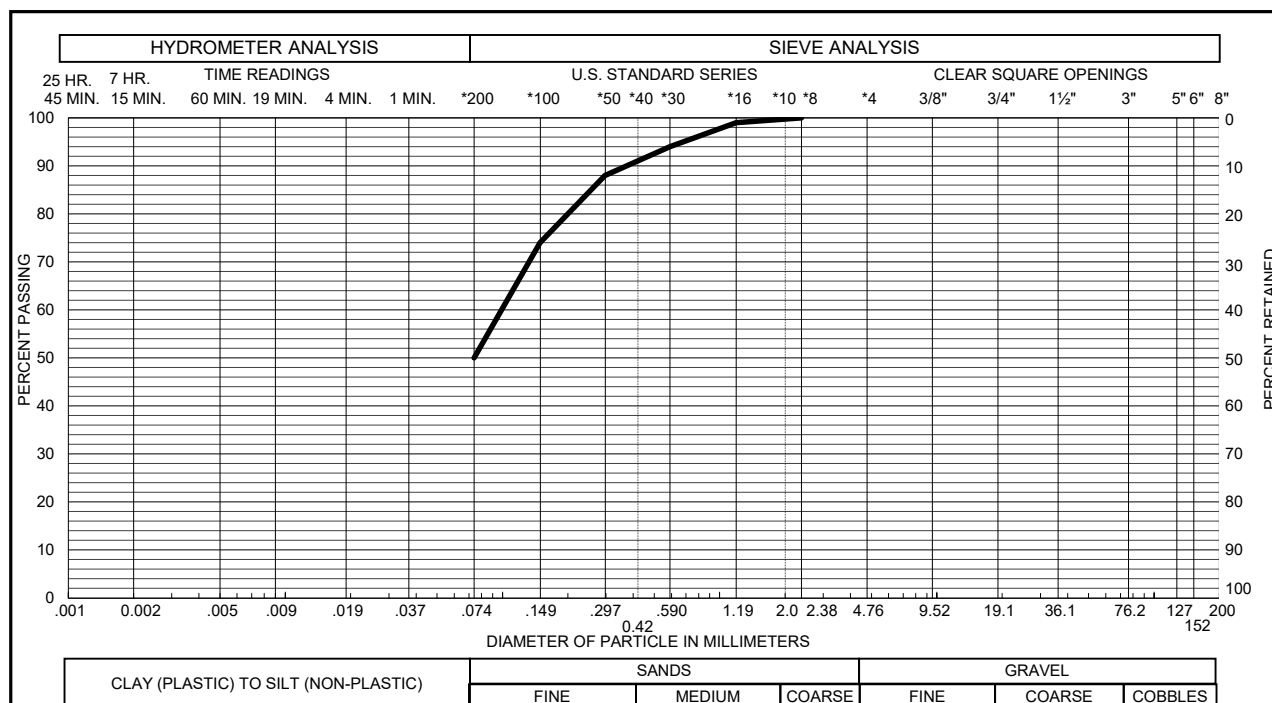
Sample of CLAY (CL) GRAVEL 0 % SAND 7 %
From TH - 7 AT 4 FEET SILT & CLAY 93 % LIQUID LIMIT 46
PLASTICITY INDEX 23



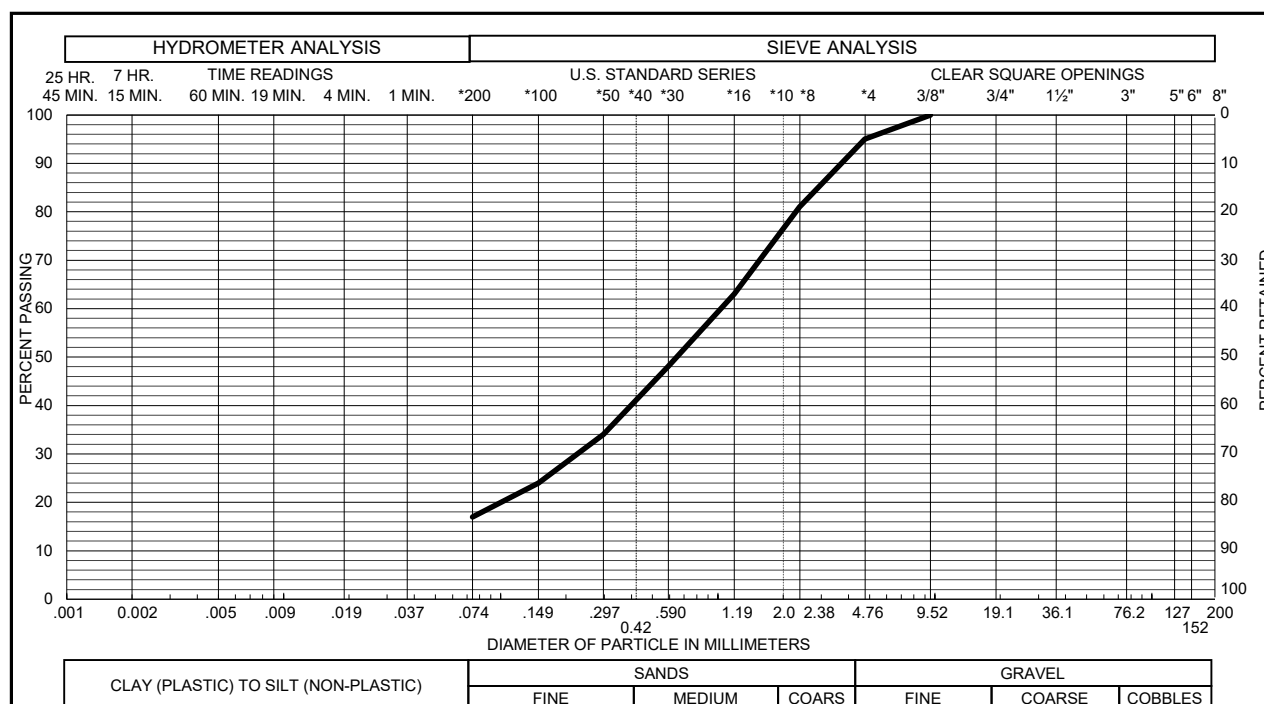
Sample of SAND, VERY SILTY (SM) GRAVEL 3 % SAND 53 %
From TH - 8 AT 4 FEET SILT & CLAY 44 % LIQUID LIMIT
PLASTICITY INDEX

Gradation Test Results

FIG. B-4



Sample of SILT, VERY SANDY TO SAND, VERY SILTY (ML-SM) GRAVEL 0 % SAND 50 %
From TH - 9 AT 9 FEET SILT & CLAY 50 % LIQUID LIMIT _____
PLASTICITY INDEX _____



Sample of SAND, SILTY (SM) GRAVEL 5 % SAND 78 %
From TH - 10 AT 4 FEET SILT & CLAY 17 % LIQUID LIMIT _____
PLASTICITY INDEX _____

Gradation Test Results

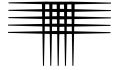
FIG. B-5

TABLE B - I



SUMMARY OF LABORATORY TEST RESULTS

BORING	DEPTH (ft)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	SWELL TEST DATA		ATTERBERG LIMITS		SOLUBLE SULFATE CONTENT (%)	PASSING NO. 200 SIEVE (%)	SOIL TYPE
				SWELL (%)	APPLIED PRESSURE (psf)	LIQUID LIMIT	PLASTICITY INDEX			
TH-1	4	2.0	112					<0.1	15	SAND, SILTY (SM)
TH-2	9	3.3	105			NL	NP		4	SAND (SP)
TH-4	4	2.1	116						9	SAND, SLIGHTLY SILTY (SP-SM)
TH-5	14	3.8	99						5	SAND, SLIGHTLY SILTY (SP-SM)
TH-7	4	11.9	120	15.0	500	46	23		93	CLAY (CL)
TH-8	4	5.5	100						44	SAND, VERY SILTY (SM)
TH-9	9	16.4	95			NL	NP		50	SILT, VERY SANDY TO SAND, VERY SILTY (ML-SM)
TH-10	4	1.2	124						17	SAND, SILTY (SM)



APPENDIX C

GUIDELINE SITE GRADING SPECIFICATIONS 105 ACRE CONEXUS SITE MONUMENT, COLORADO

GUIDELINE SITE GRADING SPECIFICATIONS

105 ACRE CONEXUS SITE MONUMENT, 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 sheepfoot 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 insure 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.