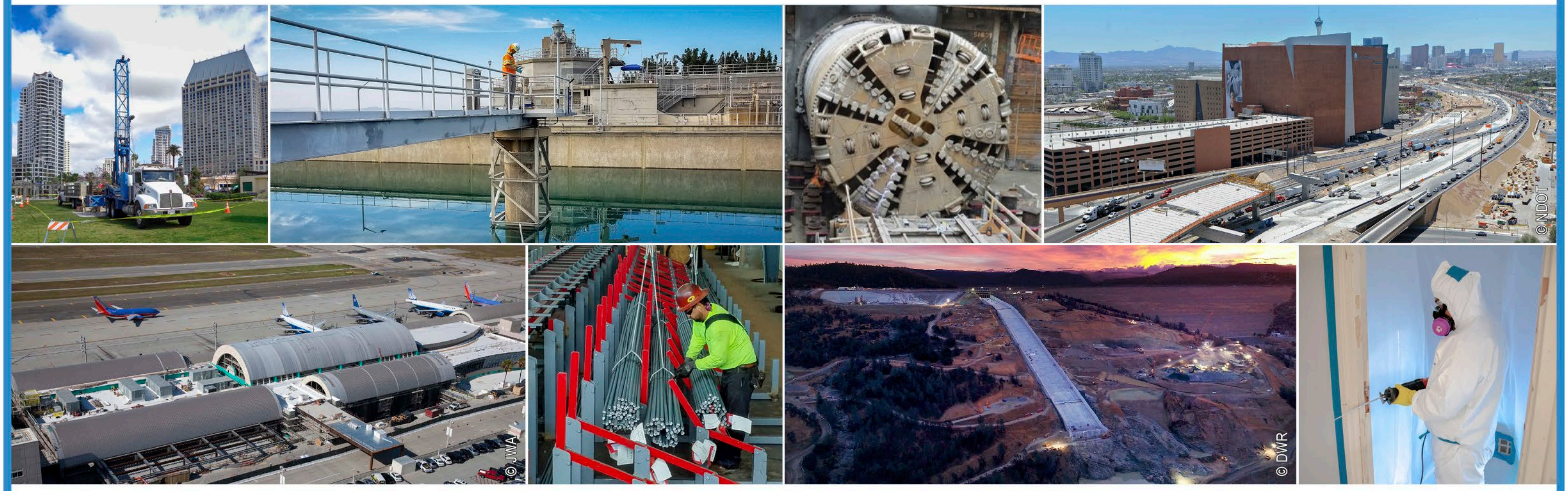
Geotechnical Evaluation

Proposed Salisbury Park North
11920 N Motsenbocker Road
Parker, Colorado

Hord Coplan Macht
1800 Wazee Street, Suite 450 | Denver, Colorado 80204

May 21, 2024 | Project No. 502725001



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Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

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1 INTRODUCTION

In accordance with your authorization and our proposal dated April 19, 2023, we have performed a geotechnical evaluation for the proposed expansion to Salisbury Park North located at 11920 N Motsenbocker Road in Parker, Colorado. The approximate location of the site is depicted on Figure 1.

The purpose of our study was to evaluate the subsurface conditions and to provide design and construction recommendations regarding geotechnical aspects of the proposed project. This report presents the findings of our subsurface exploration program, results of our laboratory testing, conclusions regarding the subsurface conditions at the site, and geotechnical recommendations for design and construction of this project.

2 SCOPE OF SERVICES

The scope of our services for the project generally included:

- Review of readily available background information including aerial photographs, published geologic maps, and in-house geotechnical data pertaining to the project site and vicinity.

- Perform site reconnaissance to observe and document the site conditions, establish the boring locations in the field, and arrange for the mark-out of publicly owned underground utilities through Utility Notification Center of Colorado.

- Drilling, logging, and sampling of 23 small-diameter exploratory borings within the project site. The borings were advanced to depths of up to approximately 30 feet below the ground surface (bgs). The boring logs are presented in Appendix A. Boring locations are presented on Figure 2.

- Converting one of the borings (Boring B-10) into a temporary groundwater monitoring well using 2-inch diameter solid and slotted pipe, silica sand, and bentonite. Returning to the site periodically after drilling operations to obtain delayed groundwater readings within the temporary groundwater monitoring well.

- Performance 5 percolation tests at the locations provided by Hord Coplan Macht. The percolation tests consisted of drilling one exploratory boring to a depth of 10 feet to identify the soil profile, and three percolation test holes to a depth of 1, 3, and 5 feet. The sidewalls of the percolation tests were cleaned and clear of smearing, and approximately 2 inches of open graded gravel was be placed at the bottom of the holes to prevent siltation of native soils. Approximately, one foot of water was added and the hole was pre-soaked overnight. After the pre-soak, the percolation test consisted of placing approximately 6 inches of water in the test holes, and measuring the height to the top of water surface over approximately 30-minute intervals over a 4-hour period. At each test location, the percolation rate was reported as the drop in water level that occurs during the final two 30-minute period in minutes per inch.

- Performance of laboratory tests on selected samples obtained from the borings to evaluate engineering properties including in-situ moisture content and dry density, Atterberg limits, percent fines passing the No. 200 sieve, gradation and hydrometer analysis, swell/consolidation potential, and soil corrosivity characteristics (including pH, resistivity, water soluble sulfates and chlorides). The results of the in-situ moisture content and dry density laboratory testing are presented on the boring logs and the remainder of the laboratory testing results are presented in Appendix B.

- Compilation and analysis of the data obtained.
- Preparation of this report presenting our findings, conclusions, and geotechnical engineering recommendations regarding the design and construction of the project.

3 SITE DESCRIPTION AND BACKGROUND INFORMATION

The project site consists of approximately 90-acres of undeveloped land owned by the Town of Parker approximately ½ mile west of South Parker Road. The Town of Parker is planning to expand the existing Salisbury Park at the site. The current extents of the existing Salisbury Park are located to the south and east of the project site and includes sports fields, an equestrian park and hiking trails. An outdoor storage facility, vacant land, and single-family residential homes are to the west, a tree farm and commercial buildings are to the north. Cherry Creek flows west to east along the northeast portion of the site. Soil and other construction material are stockpiled on the southeast corner of the site. The approximate location of the site is depicted on Figure 1.

Ninyo & Moore reviewed publicly available Google Earth aerial imagery dating back to 1937. Based on review of publicly available historical images, the project site has historically been used for agricultural purposes, most recently a sod farm and tree nursery. The existing Salisbury Park to the south was constructed between 1999 and 2002. During Ninyo & Moore's initial site assessment performed on June 26, 2023, the site topography was generally observed to slope towards Cherry Creek to the northwest side of the site, with an average elevation of approximately 5,860 feet on the southwest corner and 5,845 feet on the northeast corner. The site was also vegetated with several grass species.

4 PROPOSED CONSTRUCTION

Based on the Salisbury Park North Conceptual plan by Hord Coplan Macht dated 2023, the project will involve the construction of baseball and softball fields, a batting cage, a bike park, pavilions, playground areas, concession and restroom buildings, maintenance and storage buildings, pedestrian bridges and walkways, tennis and pickleball courts, overlook areas and parking area and drive lanes.

We anticipate cuts and fills of approximately five feet will be required in the sports field area and retaining walls less than five feet tall may be constructed in the overlook areas and pavilion areas. Based on the Soils Report Structural Design Criteria prepared by JVA Consulting Engineers, dated April 11, 2023, we understand that park structures will be single story and lightly-loaded.

5 FIELD EXPLORATION AND LABORATORY TESTING

On September 7, 8, 11, 12 and 21, 2023, Ninyo & Moore conducted subsurface exploration services at the project site to evaluate the existing subsurface conditions and to collect soil samples for visual observation and laboratory testing. The evaluation consisted of the drilling, logging, and sampling of 23 exploratory borings and 5 percolation tests using a truck-mounted drill rig equipped with four-to-eight inch diameter, continuous-flight, solid-stem augers. Borings were drilled to depths of up to approximately 30 feet, and percolation test holes were drilled to depths of 1-foot, 3-feet, and 5-feet. Relatively undisturbed and disturbed soil samples were collected at selected intervals. The approximate locations of the borings are presented on Figure 2. The borings logs are presented in Appendix A.

The soil samples collected from our drilling activities were transported to the Ninyo & Moore laboratory for geotechnical laboratory analysis. Selected samples were analyzed to evaluate engineering properties including in-situ moisture content and dry density, Atterberg limits, percent fines passing the No. 200 sieve, gradation and hydrometer analysis, swell/consolidation potential, and soil corrosivity characteristics (including pH, resistivity, water soluble sulfates and chlorides). The results of the in-situ moisture content and dry density tests are presented on the boring logs in Appendix A. A description of each laboratory test method and the remainder of the laboratory test results are presented in Appendix B.

6 GEOLOGY AND SUBSURFACE CONDITIONS

The geology and subsurface conditions at this site are described in the following sections.

6.1 Geologic Setting

The site is located in Parker, Colorado, approximately 18 miles east of the Rocky Mountains, within the Colorado Piedmont section of the Great Plains Physiographic Province.

The Laramide Orogeny uplifted the Rocky Mountains during the late Cretaceous and early Tertiary Periods. Subsequent erosion deposited sediments east of the Rocky Mountains, including the Denver and Dawson Formation. As a result of regional uplift approximately 5 to 10 million years ago, streams down-cut and excavated into the Great Plains forming the Colorado Piedmont section (Trimble, 1980).

The surficial geology of the site vicinity is mapped by Maberry and Lindvall (1972) as Piney Creek Alluvium (Q_p) and Post Piney Creek Alluvium (Q_{pp}). The Piney Creek Alluvium is present on the west and south side of the site and is composed of interbedded clay, silt, and sand with minor gravel. The Post Piney Creek Alluvium is present on the northeast side and is composed of sand

and silt with isolated areas of organic clay. The alluvium is underlain by the Dawson Formation of the Cretaceous period, which consists of interbedded claystone and sandstone.

6.2 Subsurface Conditions

Our understanding of the subsurface conditions at the project site is based on our field exploration, laboratory testing, and our experience with the general geology of the area. The following sections provide a generalized description of the subsurface materials encountered. More detailed descriptions are presented on the boring logs in Appendix A.

6.2.1 Fill Materials

Fill material is anticipated to be present across the site with varying thickness. Fill material was encountered at the surface of Borings B-1 through B-7, B-9, B-10, B-11, B-13 through B-17, and P-2 and extended to depths ranging from approximately 1 to 5 feet bgs.

The fill material generally consisted of various shades of brown, dry to moist, lean clay to fat clay with varying amounts of sand, gravel, and organics. At the time of report preparation, information regarding the degree of compaction during fill placement was not provided to Ninyo & Moore for review. As a result, the fill material is considered undocumented.

Selected samples of the fill tested in our laboratory had in-place moisture contents between approximately 4.8 and 27.3 percent and dry densities ranging between approximately 85.4 and 126.0 pounds per cubic foot (pcf).

6.2.2 Alluvial Deposits

Alluvial deposits were encountered beneath fill materials or surficial topsoil in the borings and extended to the borings’ termination depths ranging from approximately 10 to 30 feet bgs. The alluvium encountered generally consisted of varying shades of brown, dry to moist, stiff to hard, lean clay with varying amount of sand and gray to brown, fine to coarse sand with varying amounts of clay and gravel. Clay was generally encountered underneath the fill predominantly on the west and south sides of the site in Borings B-1, B-2, B-4, B-7, B-12, B-13, B-16, B-17, B-18, B-19, B-20, B-21, B-22, B-23, P-1, P-2, and P-3 and extended to depths ranging from approximately 9 feet to the termination depth of the borings of approximately 30 feet. In these areas, sand with varying amounts of clay was generally encountered underlaying the fill and clay and extended to the termination depths of the borings of approximately 30 feet. Along the north / northeast portions of the site in Borings B-3, B-4, B-5, B-6, B-8, B-9, B-10, B-11, B-14, B-15, and P-4, fine to coarse sand with varying amounts of clay and gravel was encountered below the fill .

Selected samples of the alluvium tested in our laboratory had in-place moisture contents between approximately 0.3 and 33.9 percent and dry densities ranging between approximately 81.1 and 132.1 pcf.

6.2.3 Dawson Formation

Dawson Formation bedrock was encountered underlaying clay soils in Boring B-17 on the southwest corner of the site and extended to the boring's termination depth at approximately 30 feet bgs. The bedrock generally consisted of gray and brown moderately soft to moderately hard, claystone.

Based on the results of the laboratory testing, selected samples of the Dawson Formation had in-place moisture contents of 22.8 percent and dry densities between approximately 105.0 and 1106.5 pcf.

6.3 Percolation

Ninyo & Moore personnel performed field percolation testing at five locations at the site. The percolation tests were performed in general accordance with local standards. The approximate location of the percolation tests is presented on Figure 2. The results of our percolation testing are presented in Table 1:

Table 1 – Summary of Percolation Test Results

Test Location	Soil Description	Average Percolation Rate (min/in)
P-1	Lean Clay	87

The above reported value is the measured value and does not include a Factor of Safety. Ninyo & Moore recommends that a Factor of Safety of at least 2.0 be used for design of stormwater management systems. Percolation test results are presented in Appendix C.

6.4 Groundwater

Groundwater was observed in the test borings at the time of drilling at depths ranging between 4 and 16 feet bgs. In general, groundwater was observed at lower elevation within the Post Piney Creek Alluvium near Cherry Creek on the northeast side of the site. Boring B-10 was drilled to a depth of approximately 30 feet, and a temporary groundwater monitoring well was installed. A delayed groundwater level within the monitoring well was performed on October 31, 2023. At that time, groundwater was observed in the well at a depth of approximately 0.7 feet bgs.

Standing water was observed at the ground surface near the middle of the site during our initial site visit on June 26, 2023. The presence of water at the surface was likely caused by surface water runoff getting perched on the low permeability clay fill and alluvium deposits after heavy precipitation events.

Groundwater levels will fluctuate due to seasonal variations in the amount of rainfall, runoff, water level of nearby streams, groundwater withdrawal from adjacent sites, and other factors. In addition, perched water can develop in following periods of heavy or prolonged precipitation, commonly at the soil and bedrock interface. The possibility of groundwater level fluctuations and perched water should be considered when developing the design and construction plans for the project. In general, groundwater is not anticipated to be a constraint to the construction of park facilities but dewatering should be expected for installation of below grade utility lines and foundations within approximately three feet of the static groundwater table.

7 GEOLOGIC HAZARDS

The following sections describe regional geologic hazards including faulting and seismicity, expansive soils, compressible / collapsible soils, and mine subsidence.

7.1 Faulting and Seismic Design Considerations

Historically, several minor earthquakes have been recorded along the Front Range. Based on our field observations and our review of readily available published geological maps and literature, there are no known active faults underlying or adjacent to the subject site.

The Golden Fault lies approximately 28 miles northwest of the site. The fault is considered to be late Quaternary in age and has not shown displacement in Holocene time, as Pleistocene deposits overlie the fault (approximately 75 to 125 thousand years before the present [Kirkham, 1977]). Therefore, the probability of damage at the site from seismically induced ground surface rupture from this fault is considered to be low.

The Rocky Mountain Arsenal Fault lies approximately 27 miles north of the site (Kirkham and Rogers, 1981). The most recent significant seismic movements associated with the Rocky Mountain Arsenal Fault occurred in the 1960's, with recorded earthquake magnitudes up to 5.5. United States Geological Survey (USGS) investigators concluded that a strong correlation existed between the seismic activity of this fault and pressure injection of liquid waste into a disposal well located at the nearby Rocky Mountain Arsenal. Pressure injection in the disposal well was discontinued in 1966 and only minor seismic movements along the fault have been recorded since. The risk of this fault giving rise to damaging, earthquake-induced ground motions at the site during the design life of the proposed structure is considered to be relatively low, based on the previously recorded low seismic magnitudes.

Design of the proposed improvements should be performed in accordance with the requirements of the governing jurisdictions and applicable building codes. Table 2 presents the seismic design parameters in accordance with the 2021 International Building Code (IBC) guidelines and adjusted maximum considered earthquake spectral response acceleration parameters evaluated using a web-based ground motion calculator (OSHPD, 2023).

Table 2 – 2021 IBC Seismic Design Criteria

Site Coefficients and Spectral Response Acceleration Parameters	Values
Class	D
Risk Category	II
Coefficient, F_a	1.6
Coefficient, F_v	2.4
Mapped Spectral Response Acceleration at 0.2-second Period, S_s	0.202 g
Mapped Spectral Response Acceleration at 1.0-second Period, S_1	0.056 g
Spectral Response Acceleration at 0.2-second Period Adjusted for Site Class, S_{MS}	0.324 g
Spectral Response Acceleration at 1.0-second Period Adjusted for Site Class, S_{M1}	0.135 g
Design Spectral Response Acceleration at 0.2-second Period, S_{DS}	0.216 g
Design Spectral Response Acceleration at 1.0-second Period, S_{D1}	0.090 g

7.2 Expansive Soils

One of the more significant geologic hazards in the Front Range area is the presence of swelling clays in bedrock or surficial deposits. Wetting and drying of bedrock or surficial deposits containing swelling clays can result in expansion and collapse of those units, which can cause major damage to structures. A review of a Colorado Geological Survey map delineating areas based on their relative potential for swelling in the Denver area by Hart (1973-1974) indicates the soil and bedrock materials in the site vicinity generally exhibit low swell potential.

In order to evaluate swell potential of the subsurface soils, relatively undisturbed samples were selected for one-dimensional swell/consolidation tests at approximate representative field conditions in general accordance with The American Society for Testing and Materials (ASTM) D4546. Laboratory test results are presented in Appendix B.

Selected samples were tested for swell percent against a surcharge pressures of 200 pounds per square-foot (psf) in order to evaluate pavement risk. Based on the results of our laboratory testing, the selected sample tested exhibited swell potential ranging from nil to 19.3 percent. On-site soils expected to be encountered during project development would have a pavement performance risk category of “LOW” to “HIGH” based on the criteria presented in Table 3.

Table 3 – Pavement Performance Risk Categories

Pavement Performance Risk Category	Representative Percent Swell (200 psf Surcharge)
NONE	0
LOW	0 to <1
MODERATE	1 to <5
HIGH	5 to 20
VERY HIGH	> 20

NOTE: The information provided in this table is based on Colorado Department of Transportation (CDOT) Pavement Design Manual (2021), Chapter 4.

In order to evaluate slab-on-grade performance, selected samples were tested for swell/consolidation at representative field or post-construction surcharge pressures of 500 psf and higher. Based on the results of our laboratory testing, the selected sample tested exhibited swell potential ranging from nil to 5.1-percent. Based on our experience and the results of our laboratory testing, the soils expected to be encountered during project development would have a slab performance risk category of “LOW” to “HIGH” based on the criteria presented in Table 4.

Table 4 – Slab Performance Risk Categories

Slab Performance Risk Category	Representative Percent Swell (500 psf Surcharge)	Representative Percent Swell (1,000 psf Surcharge)
LOW	0 to <3	0 to <2
MODERATE	3 to <5	2 to <4
HIGH	5 to <8	4 to <6
VERY HIGH	> 8	> 6

NOTE: Based on Colorado Association of Geotechnical Engineers (CAGE), Guidelines for Slab Performance Risk Evaluation and Residential Basement Floor System Recommendations (Denver Metropolitan Area, 1996).

Based on our experience with similar sites and similar site geology and observed groundwater levels, a depth of wetting value of 12 feet was estimated for this site. The depth of wetting is the depth of the active zone of soil or bedrock which can contribute, or has the potential to produce heave following the continued introduction of water.

Based on these results, assuming no remedial grading is performed at the site, building foundations, floor slabs, pavements, and exterior flatwork type improvements would be subject to movements of approximately 3 to 11 inches of vertical heave as the post-construction wetting of the site soils and bedrock takes place.

The most expansive soil was observed in fill material in test Boring B-11 on the southeast corner of the site, however, the fill and native clay soils exhibited expansive characteristics throughout the site. Due to the expansive and undocumented characteristics of the fill, Ninyo & Moore recommends that the undocumented fill be completely removed under park structures where encountered, requiring overexcavations depths of up to five feet.

Overexcavating (removing and replacing) of the site soils to create layers of engineered fill material with controlled moisture, density, and reduced swell potential is the most commonly used remedial grading technique in the Colorado Front Range. Such process increases the moisture content of the site soils and bedrock to near optimum moisture contents and reduces the soil/bedrock affinity for additional water, which in turn reduces its swell potential. The remedial grading recommendations provided in this report are intendent to reduce the post-construction movement potential of the site soils under the proposed buildings to approximately 1-inch and reduce the angular distortions to approximately ½-inch vertical over approximately 40 feet horizontal.

The movement potential could increase to approximately 2 inches or more if the site drainage recommendations are not followed and wetting of the site soils below the improvements continue to depths of 12 or more feet.

8 CONCLUSIONS

Based on the results of our subsurface evaluation, laboratory testing, and data analysis, it is our opinion that the proposed construction is feasible from a geotechnical standpoint. Geotechnical considerations include the following:

- Fill material was encountered at the surface in each boring extending to depths ranging from approximately 1 to 5 feet bgs. The fill material generally consisted of various shades of brown, dry to moist, lean to fat clay with varying amounts of sand, gravel, and organics. Information regarding ground preparation, remedial excavation, and the degree of compaction during placement, is unknown to this firm. As a result, the fill material is considered undocumented. Additionally, the fill material was expansive based on our laboratory testing program.

- Compression and/or heave of fill material associated with existing site improvements and past grading activities could occur. Without original documentation of fill placement at this site, the fill materials encountered are considered undocumented and could provide risk of movement of the building slabs and foundations. This risk cannot be eliminated without removal and recompaction of the existing fill materials as engineered fill below the building foundations and slabs.

- Alluvial deposits were encountered beneath fill materials in the borings and extended to the borings' termination depths of up to approximately 30 feet bgs. Clay was generally encountered underneath the fill predominantly on the west and south sides of the site in Borings B-1, B-2, B-4, B-7, B-12, B-13, B-16, B-17, B-18, B-19, B-20, B-21, B-22, B-23, P-1, P-2, and P-3 and extended to depths ranging from approximately 9 feet to the termination depth of the borings of approximately 30 feet. In these areas, sand with varying amounts of clay was generally encountered underlaying the fill and clay and extended to the termination depths of the borings of approximately 30 feet. Along the north / northeast portions of the site in Borings B-3, B-4, B-5, B-6, B-8, B-9, B-10, B-11, B-14, B-15, and P-4, fine to coarse sand with varying amounts of clay and gravel was encountered below the fill.

    - Groundwater was observed in the test borings at the time of drilling at depths ranging between 4 and 16 feet bgs. In general, groundwater was observed at lower elevation within the Post Piney Creek Alluvium near Cherry Creek on the northeast side of the site. Boring B-10 was drilled to a depth of approximately 30 feet, and a temporary groundwater monitoring well was installed. A delayed groundwater level within the monitoring well was performed on October 31, 2023. At that time, groundwater was observed in the well at a depth of approximately 0.7 feet bgs.

- Standing water was observed at the ground surface near the middle of the site during our initial site visit on June 26, 2023. The presence of water at the surface was likely caused by surface water runoff getting perched on the low permeability clay fill and alluvium deposits after heavy precipitation events.

- Groundwater levels will fluctuate due to seasonal variations in the amount of rainfall, runoff, water level of nearby streams, groundwater withdrawal from adjacent sites, and other factors. In addition, perched water can develop in following periods of heavy or prolonged precipitation. The possibility of groundwater level fluctuations and perched water should be considered when developing the design and construction plans for the project. Shallow, groundwater may be a constraint to the construction of park facilities, depending on grading plan; however, dewatering should be expected for installation of deep utility trenches.

- Based on the results of our laboratory soil classifications and our experience with similar soils, the soils expected to be encountered during project development exhibit pavement performance risk category of "LOW" to "HIGH", on a scale that ranges between none, low, moderate, high, and very high.

- Based on our experience and the results of our laboratory testing, the soils expected to be encountered during project development would have a slab performance risk category of "LOW" to "HIGH", on a scale that ranges between low, moderate, high, and very high.

- The on-site overburden deposits (fill and alluvium) should generally be excavated with medium- to heavy-duty earthmoving or excavation equipment in good operating condition.

- Fill materials encountered within the proposed structure footprints should be removed and recompacted per the recommendations within this report prior to overlot grading or the placement of grade-raise fill. Organic fill materials should not be re-used as engineered fill. Deeper areas of fill may be present below the ground surface in areas that were not explored, and the project budget should account for the need for additional removal and recompaction of existing fill material below the proposed buildings. If compaction test reports are provided for the fill placed, Ninyo & Moore can review compaction results, in addition to frequency of testing, to evaluate the suitability of existing fill below the proposed buildings and can consider modifying earthwork recommendations set forth in this report, accordingly.

- Single-story park structures may be supported on shallow foundation systems consisting of spread-footings bearing on a relatively uniform thickness of moisture-conditioned and compacted engineered fill extending to 12 or more inches below the bottom of the footings. Structures supported on spread-footing foundations may be provided with slab-on-grade floors bearing on 2 or more feet of moisture conditioned and compacted engineered fill. The limits of this fill prism should extend 5 or more feet beyond the foundation footprint. If undocumented fill is encountered at depths exceeding 12 inches below the bottom of the footings, it should be removed and replaced with structural fill.

- The proposed tennis and pickleball courts could be constructed with post-tensioned slab-on-grades bearing on 2 or more feet of moisture-conditioned and compacted engineered fill extending from the bottom of the slab-on-grade turn down edges. As an alternative, the courts could be constructed as a traditional slab-on-grade courts bearing on 3 or more feet of moisture-conditioned and compacted engineered fill.

- Site soils generated from on-site excavation activities consisting of existing fill material and alluvium deposits that are free of deleterious materials, and do not contain particles larger than 3 inches in diameter, and have a plasticity index less than 20 can generally be used as engineered fill considered they are placed and compacted as described in Section 9.1.5.

- Asphalt and concrete pavements, flatwork (curb and gutter, sidewalk), and other landscape structures may be placed on 12 or more inches of moisture conditioned and compacted engineered fill.

- Based on our laboratory data and our experience with similar materials at adjacent sites, the sulfate content of the tested soils presents a low risk of sulfate attack to concrete. Recommendations regarding concrete that can be used on this project (in contact with site soils) are provided in Section 9.8.1.

- Based on our laboratory data and our experience with similar materials at adjacent sites, the subgrade soils at the site have a moderate to very severe potential for corrosivity to ferrous metals. Special consideration should be given to the use of heavy gauge, corrosion-protected, underground steel pipe or culverts, if any are planned. As an alternative, plastic pipe or reinforced concrete pipe could be considered. A corrosion specialist should be consulted for further recommendations.

9 RECOMMENDATIONS

The following sections present our geotechnical recommendations for the design and construction of the project. The recommendations below were based on our understanding of the project, the results of our subsurface exploration, and our experience with similar projects.

If the final building layouts or associated infrastructure improvements are changed from their current state, it is important that Ninyo & Moore be notified and given an opportunity to re-evaluate our recommendations prior to bidding the project for construction.

9.1 Earthwork

The following sections provide our earthwork recommendations for this project. In general, Town of Parker and/or project specific earthwork specifications are expected to apply, unless noted.

9.1.1 Excavations

Our evaluation of the excavation characteristics of the on-site materials is based on the results of our subsurface exploration, our site observations, and our experience with similar materials. The on-site surface and near surface fill material and alluvium deposits may generally be excavated with medium- to heavy-duty earthmoving or excavation equipment in good operating condition.

Considering the site has experienced grading, there may be buried concrete remnants, areas of deeper fill, or other features present below the ground surface which were not encountered within our borings.

Groundwater was encountered at depths ranging from 4 to 16 feet bgs during of our subsurface exploration.. A delayed groundwater level within the temporary groundwater monitoring well installed in Boring B-10 was performed on October 31, 2023. At that time, groundwater was observed in the well at a depth of approximately 0.7 feet bgs. Depending on grading plans, groundwater may be encountered during site excavations. Groundwater should also be anticipated in deep utility excavations. Groundwater levels will fluctuate due to seasonal variations from precipitation, irrigation, groundwater withdrawal or injection, and other factors

In addition to the groundwater levels observed, standing water was observed at the ground surface near the middle of the site during our initial site visit on June 26, 2023. The presence of water at the surface was likely caused by surface water runoff getting perched on the low permeability clay fill and alluvium deposits after heavy precipitation events. However, wet or saturated soils may be encountered at relatively shallow depths across the site.

Equipment and procedures that do not cause significant disturbance to the excavation bottoms should be used. Excavators and backhoes with buckets having large claws to loosen the soil should be avoided when excavating the bottom 6 to 12 inches of excavations as such equipment may disturb the excavation bases.

The contractor should provide safely sloped excavations or an adequately constructed and braced shoring system, in compliance with Occupational Safety and Health Administration (OSHA) (OSHA, 2005) guidelines, for employees working in an excavation that may expose employees to the danger of moving ground. If material is stored or equipment is operated near an excavation, stronger shoring should be used to resist the extra pressure due to superimposed loads.

9.1.2 Temporary Excavations

Temporary excavations will be needed for this project to construct foundations and utilities. Based on our experience with similar projects, we anticipate that the soil conditions and stability of the excavation sidewalls will vary with depth. Soils with higher fines content may stand vertically for a short time (less than 12 hours) with little sloughing. However, as the soil dries after excavation or as the excavations are exposed to rainfall, sloughing may occur. Soils with low cohesion (e.g., predominately sandy or gravelly material), may slough or cave during excavation, especially if wet or saturated.

The contractor should provide safely sloped excavations or an adequately constructed and braced shoring system, in compliance with Occupational Safety and Health Administration regulations (OSHA, 2005), for employees working in excavations that may expose them to the danger of moving ground. Reducing the inclination of the sidewalls of the excavations, where feasible, may increase the stability of the excavations. If construction or earth material is stored, or equipment is operated near an excavation, flatter slope geometry or shoring should be used during construction.

In our opinion, the site soils should generally be considered a Type C soil when applying OSHA regulations. For these soil conditions, OSHA recommends a temporary slope inclination of 1½ H (Horizontal):1V (Vertical) or flatter for excavations 20 feet or less in depth.

Appropriate slope inclinations should be evaluated in the field by an OSHA-qualified “Competent Person” based on the conditions encountered.

9.1.3 Site and Remedial Grading

Prior to grading, the ground surface in proposed structure and improvement areas should be cleared of any surface obstructions, debris, topsoil, organics (including vegetation) and other deleterious material. Materials generated from clearing operations should be removed from the project site for disposal (e.g. at a legal landfill site). Obstructions that extend below finish grade, if present, should be removed and resulting voids filled with compacted, engineered fill or Controlled Low Strength Material (CLSM).

Fill materials encountered within the building footprints should be removed and recompacted per the recommendations within this report prior to overlot grading or the placement of grade-raise fill. Deeper areas of fill or buried construction or organic debris may be present below the ground surface in areas that were not explored, and the project budget should account for the need for additional removal and recompaction of existing fill material below the proposed buildings. If compaction test reports are provided for the fill placed, Ninyo & Moore can review compaction results, in addition to frequency of testing, to evaluate the suitability of existing fill below the proposed buildings and can consider modifying earthwork recommendations set forth in this report, accordingly.

Single-story park structures may be supported on shallow foundation systems consisting of spread-footings bearing on a relatively uniform thickness of moisture-conditioned and compacted engineered fill extending to 12 or more inches below the bottom of the footings. If these structures are supported on spread-footing foundations, they may be provided with slab-on-grade floors bearing on 2 or more feet of moisture conditioned and compacted engineered fill. The limits of this fill prism should extend 5 or more feet beyond the foundation footprint.

The proposed tennis and pickleball courts, could be constructed with post-tensioned slab-on-grades bearing on 2 or more feet of moisture-conditioned and compacted engineered fill extending from the bottom of the slab-on-grade turn down edges. As an alternative, the courts could be constructed as a traditional slab-on-grade courts bearing on 3 or more feet of moisture-conditioned and compacted engineered fill.

There are risks associated with supporting pavements, exterior flatwork, and other landscaping structures over existing fill material and swelling soils without providing complete removal and replacement with moisture-conditioned and compacted engineered fill. Generally, the costs associated with remediating pavement subgrade for undocumented fill materials and swelling soils are cost prohibitive. Therefore, the following recommendation for pavement, exterior flatwork, and landscape structure support are provided assuming the owner is willing to accept some risk of poor performance as a result of post-construction movements associated with the fill materials that remain in areas outside the proposed building footprints.

Asphalt and concrete pavements, flatwork (curb and gutter, sidewalk), and other landscape structures may be placed on 12 or more inches of moisture conditioned and compacted engineered fill.

Additionally, depending on the time of year construction occurs, unstable subgrade conditions may be encountered during general construction operations. Subgrade conditions should be observed by Ninyo & Moore during construction. Where unstable subgrade conditions develop, stabilization measures will need to be employed. Stabilization methods should be provided by the grading contractor, as needed, and may include the use of geogrids, geotextiles, pushing oversized rock into the subgrade, and chemical stabilization. The subgrade stabilization methods proposed should be discussed with the geotechnical engineer prior to implementation. The stabilization method selected should consider the effects of such stabilization on future utility installation and/or repair work.

The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations, and care should be taken to maintain the moisture content of the subgrade prior to construction of foundations, floor slabs, pavements, and exterior flatwork. If the subgrade should become desiccated, saturated, frozen, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to slab and pavement construction.

The geotechnical consultant should be retained to observe the remedial excavations, and the elevations of the excavation bottoms should be surveyed by the project civil engineer prior to fill placement.

9.1.4 Re-Use of Site Soils

Soils generated from on-site excavation activities in the existing fill material and alluvium deposits that are free of deleterious materials and organic matter, do not contain particles larger than 3 inches in diameter can generally be used as engineered fill as evaluated by the geotechnical consultant provided they are compacted and moisture conditioned as recommended in this report.

Fragments of rock, cobbles, and inert construction debris (e.g., concrete or asphalt) larger than 3 inches in diameter may be incorporated into the project fills in non-structural areas and below the anticipated utility installation depths. A Geotechnical Engineer should be consulted regarding appropriate recommendations for usage of such materials on a case-by-case basis when such materials have been observed during earthwork. Care should be taken to avoid nesting of oversized materials during placement.

An evaluation of the potential for contamination by hazardous materials associated with the site soils was beyond the scope of this study.

9.1.5 Fill Placement and Compaction

Fine-grained soils (on-site soils that classify as CL and CH) used as engineered fill should be moisture-conditioned to moisture contents between optimum and 3 percent over optimum moisture content. Granular soils (on-site soils that classify as SC, SW-SC, SP, SM or import soils) used as engineered fill should be moisture-conditioned to moisture contents within 2 percent of optimum moisture content. Engineered fill should be compacted to a relative compaction of 95 percent or more as evaluated by ASTM D698. The contractor should be prepared either to dry or moisten fill material, as needed, prior to compaction.

The engineered fill should be compacted by appropriate mechanical methods. Lift thickness for fill will be dependent upon the type of compaction equipment utilized. Backfill should be placed in lifts not exceeding 8 inches in loose thickness in areas compacted by other-than hand operated machines. Backfill should be placed in lifts not exceeding 6 inches in loose thickness in areas compacted by hand operated machines.

Fill materials should not be placed, worked, rolled while they are frozen, thawing, or during poor/inclement weather conditions.

Compaction areas should be kept separate, and no lift should be covered by another until relative compaction and moisture content within the recommended ranges are obtained.

9.1.6 Imported Fill Material

Imported soil for use as engineered fill should have less than 40 percent passing the No. 200 sieve, a very low swell potential (approximately 1 percent or less when wetted against a surcharge pressure of 500 psf), and a low plasticity index (less than 20). Imported soil should not contain organic matter, clay lumps, bedrock (claystone, sandstone, etc.) fragments, debris, other deleterious matter, or rocks or hard chunks larger than approximately 3 inches' nominal diameter.

Imported soil for use as engineered fill should exhibit low corrosion potential. Imported soil placed in contact with ferrous materials should have a saturated soil resistivity of 2,000 ohm-cm or more and a chloride content of 25 parts per million or less. Soils in contact with concrete should exhibit a soluble sulfate content less than 0.1 percent.

We further recommend that proposed import material be evaluated by the Ninyo & Moore at the borrow source for its suitability prior to importation to the project site. Import soils should be moisture-conditioned, placed, and compacted in accordance with Section 9.1.5.

9.1.7 Utility Installation

The contractor should take care to achieve and maintain adequate compaction of the backfill soils around manholes, valve risers and other vertical pipeline elements where settlements commonly are observed. Use of “flowable fill,” (e.g. a controlled low strength mix, or a similar material) should be considered in lieu of compacted soil backfill for areas with low tolerances for surface settlements. This would also reduce the permeability of the utility trenches.

Pipe bedding materials, placement and compaction should meet the specifications of the pipe manufacturer and applicable municipal standards. Materials proposed for use as pipe bedding should be tested for suitability prior to use.

Special care should be exercised to avoid damaging the pipe or other structures during the compaction of the backfill. In addition, the underside (or haunches) of the buried pipe should be supported on bedding material that is compacted as described above. This may need to be performed with placement by hand or small-scale compaction equipment.

Groundwater should be anticipated in deep utility trenches and foundations near the ground water table, and dewatering should be expected. Surface drainage should direct water away from utility trench alignments. Where topography, site constraints or other factors limit or preclude adequate surface drainage, the granular bedding materials should be surrounded by non-woven filter fabric (e.g., Mirafi® 140N or the equivalent) to reduce migration of fines into the bedding which can result in severe, isolated settlements.

Development of site grading plans should consider the subsurface transfer of water in utility trenches and the pipe bedding. Sandy pipe bedding materials can function as efficient conduits for re-distribution of natural and applied waters in the subsurface. Cut-off walls in utility trenches or other water-stopping measures should be implemented to reduce the rates and volumes of water transmitted along utility alignments and toward buildings, pavements and other structures where excessive wetting of the underlying soils will be damaging. Incorporation of water cut-offs and/or outlet mechanisms for saturated bedding materials into development plans could be beneficial to the project. These measures also will reduce the risk of loss of fine-grained backfill soils into the bedding material with resultant surface settlement. Cut-off walls could be constructed using 2 or more feet thick clay earth material or 1 or more feet thick CLSM extending 12 or more inches into undisturbed soil on each side and bottom of the trench, and extending 2 or feet above the utility pipe. The placement locations for such cut off walls should be decided by the project civil engineer based on susceptibility of the utility bedding to groundwater intrusion and at a minimum include the placement of cut-off walls within 5 feet of the building exterior to discourage water transmittal along utility alignments toward the building.

9.2 Post-Tensioned Slab-On-Grade Foundations

Post-tensioned slab-on-grade foundations could be utilized for the tennis and pickleball courts, or to support the proposed site structures. Post-tensioned slab-on-grade foundations should be designed by the project's structural engineer in accordance with the 2021 IBC and the Post-Tensioning Institute (PTI) (PTI, 2008), 3rd Edition of the Design of Post-Tensioned Slabs-on-Ground. Remedial grading, as outlined in Section 9.1.3, will need to be performed prior to construction of post-tensioned foundations.

PTI design parameters were estimated based on the stratigraphic information described in our boring logs, and using the procedures outlined in the referenced PTI manual (PTI, 2008). Due to soil variability throughout the project site, conservative design parameters were utilized.

Differential vertical swell has been estimated for center lift and edge lift conditions for use in designing foundation slabs for the stratigraphy encountered in our borings. These values were calculated using a computer program titled VOLFLO Win 1.5 and the parameters are presented on Table 5:

Table 5 – PTI Parameters

Parameter	Design Value
Allowable Net Bearing Capacity	3,000 psf
Approximate Thornthwaite Moisture Index	-20
Constant Soil Suction (estimated)	3.9 pF
Depth of Seasonal Moisture Variation (estimated)	About 12 feet
Percent Finer than 2 Microns (percent)	40 (Layer 1), 20 (Layer 2)
Soil Fabric Factor	1.0
Frost Depth	3 feet

The Estimated Edge Moisture Variation Distance (e_m) due to shrinking soils (center lift condition) is approximately 9.0 feet, while the Estimated Edge Moisture Variation Distance due to swelling soils (edge lift condition) is approximately 4.6 feet. These values were calculated based on the guidelines provided in the referenced PTI manual (PTI, 2008). The Estimated Differential Soil Movement (y_m) as calculated based on the Post Equilibrium Case guidelines provided in the referenced PTI manual (PTI, 2008), where pF varies from 2.9 to 3.9 and 3.9 to 4.5, are presented on Table 6.

Table 6 – PTI Post Equilibrium Parameters

Condition	y_m (in)	Change in Suction Design Envelope
Center Lift (Shrinking)	-0.97	Wet to Constant
Edge Lift (Swelling)	0.46	Constant to Dry

The y_m was calculated based on the Post Construction Case guidelines provided in the PTI Manual, where pF varies from 2.9 to 4.5 are presented on Table 7.

Table 7 – PTI Post Construction Parameters

Condition	y_m (in)	Change in Suction Design Envelope
Center Lift (Shrinking)	-1.51	Wet to Dry
Edge Lift (Swelling)	2.31	Dry to Wet

The parameters provided above include estimated differential soil movement for two cases: post-equilibrium and post-construction. The post-construction case tends to be conservative as wetting around the foundations is taken into account in the calculations. Provided the drainage recommendations, as indicated in Section 9.12, are followed, it is our opinion post-equilibrium values could be used. The Structural Engineer should select which case is appropriate for the design. Exterior slab edges should be placed 3 or more feet below the lowest exterior finished grade (where frost protection is needed). Interior partitions and bearing walls resting on the post-tensioned slabs should be designed to account for slab flexure as evaluated by the Structural Engineer. Utility lines entering the slab should be provided with positive bond breaks that allow 2 or more inch of differential movement.

The estimated moisture variation distance around the differential soil movements presented above do not consider the effects of non-climatic factors (e.g. tree location, landscaping, etc. depth of exterior grade beams or other moisture retardant, etc.). The final PTI design should take into account such features, which may exist, or be anticipated.

The need for a moisture-retarding system should be considered by the structural engineer or architect, based on the moisture sensitivity of the anticipated flooring. The placement of a vapor retarder is recommended in areas where moisture-sensitive floor coverings are anticipated.

9.3 Spread Footing Foundations

It is our opinion the proposed single-story park structures could be supported on spread footing foundations bearing on moisture-conditioned and compacted engineered fill as described in

Section 9.1.3. Perimeter footings should extend 3 or more feet below the lowest exterior finished grade (for frost protection). Continuous wall footings should have a width of 18 or more inches and column footings should have a width of 24 or more inches. Footings should be reinforced in accordance with the recommendations of the Structural Engineer.

Footings bearing on engineered fill as described in Section 9.1.3 may be designed using a net allowable soil bearing pressure of 3,000 psf for static conditions. The bearing capacity may be increased by one-third when considering loads of short duration such as wind or seismic forces. The foundations should preferably be proportioned such that the resultant force from design loads, including lateral loads, falls within the kern (i.e., middle one-third of the footing base).

Uplift resistance can be developed from the weight of the footings, the effective weight of any overlying soil, and the weight of the supported structure itself. The effective unit weight of the soil can be assumed to be 120 pounds pcf above the groundwater level. Soil uplift resistance may be calculated as the weight of the soil prism defined by a diagonal line extending from the perimeter of the foundation to the ground surface at an angle (θ) of up to 20 degrees from the vertical. Under large moment and/or shear loading, the effective size of the uplift soil prism may be reduced. An appropriate safety factor should be applied.

The base of foundation excavations should be free of water and loose soil prior to placing concrete. Concrete should be placed soon after subgrade compaction to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed, or saturated, the affected soil should be moisture conditioned and recompacted. It is recommended that Ninyo & Moore be retained to observe, test, and evaluate the soil foundation bearing materials.

Based on the results of our subsurface exploration, we estimate total and differential settlement of up to about 1-inch and ½-inch, respectively, may occur. Distortions of about ½-inch (vertical) over 50 feet (horizontal) are possible.

9.4 Slab-On-Grade Floors

Slab-on-grade floors could be utilized in conjunction with spread footing foundations for park structures. Slab-on-grade courts could also be utilized for the tennis and pickleball courts. The design of the floor slabs (including jointing and reinforcement) is the responsibility of the structural engineer. Joints should be constructed at intervals designed by the Structural Engineer to help reduce the random cracking of the slab. Recommendations based on structural considerations for slab thickness, jointing, and steel reinforcement should be developed by the Structural Engineer in accordance with American Concrete Institute recommendations. Soils underlying the slabs should be moisture conditioned and compacted in accordance with the recommendations presented in Section 9.1.3 of this report.

The slab typically will experience some deflection due to loads placed on the slab and the reaction of the soils underlying the slab. A design coefficient of subgrade reaction, **K**, of 125 pounds per square inch per inch (psi/in) can be used for design of the floor system. These design coefficient of subgrade reactions may be used for evaluating such deflections for the building slabs. These values are based on a unit square foot area and can be adjusted for large slabs. Adjusted values of the modulus of subgrade reaction, **Kb**, can be obtained from the following equation for slabs of various widths (where B is the width of the foundation in feet):

$$\mathbf{Kb = K[(B+1)/2B]^2 \qquad (psi/in)}$$

Floor slabs should be separated from bearing walls and columns with expansion joints, which allow unrestrained vertical movement. Joints should be observed periodically, particularly during the first several years after construction. Slab movement can cause previously free-slipping joints to bind. Measures should be taken so that slab isolation is maintained in order to reduce the likelihood of damage to walls and other interior improvements. Utility lines entering the slab should be provided with positive bond breaks that allow 2 or more inches of differential movement.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates that any differential movement between the walls and slabs will probably be observed in adjacent slab expansion joints or floor slab cracks that occur beyond the length of the structural dowels. The Structural Engineer should account for this potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Non load-bearing interior partitions resting on floor slabs should be provided with slip joints so that if the slabs move, the movement cannot be transmitted to the upper structure, including wallboards and door frames. A slip joint that allows 2 or more inches of vertical movement is recommended for placement at the bottoms of the interior partitions. If slip joints are placed at the tops of walls, in the event that the floor slabs move, it is expected that the wall will show signs of distress, especially where the floors meet the exterior wall. Interior plumbing lines that penetrate interior partition walls, where the slip joints are placed at the top of the walls, should be provided with flexible connections that can handle 2 or more inches of vertical movement.

The need for a moisture-retarding system should be considered by the structural engineer or architect based on the moisture sensitivity of the anticipated flooring. The placement of a vapor retarder is recommended in areas where moisture-sensitive floor coverings are anticipated.

9.5 Lateral Earth Pressures

Earth pressures are used to compute the lateral forces acting on retaining walls. These pressures can be classified as at-rest, active, and passive. The direction and magnitude of the soil/wall movement just before failure affects the resulting pressure condition. At-rest conditions exist when there is no movement, such as for a restrained wall. Active stresses are exerted when the wall moves out and the soil moves toward the wall away from the soil mass, thereby mobilizing the shear strength of the soil. Passive stresses exist when the wall moves toward the soil mass.

The site soils encountered generally classified as lean clay to fat clay with varying amounts of sand and sand with varying amounts of clay. Assuming these soil types will be used to backfill cast-in-place concrete retaining walls, an angle of internal friction (ϕ) of 25 degrees and a unit weight of 110 pcf was utilized for the on-site clay soils, and an angle of internal friction (ϕ) of 30 degrees and a unit weight of 120 was utilized for the on-site sand soils. The pressures listed in Table 8 are for static conditions and horizontal backfill.

Table 8 – Lateral Earth (Equivalent Fluid) Pressures

Soil Condition	Active Pressure (pcf)	At-rest Pressure (pcf)	Passive Pressure (pcf)
Site Clay Soils (horizontal backfill)	45	64	271
Site Sand Soils (horizontal backfill)	40	60	360

The maximum passive pressure for site soils should be limited to 2,700 psf for clay soils and 3,600 psf for sandy soils. This is assuming the ground is horizontal for a distance of 10 feet or three times the height generating the passive pressure. The passive pressure values may be increased by one-third when considering loads of short duration such as wind and seismic forces. For frictional resistance to lateral loads, we recommend that an ultimate coefficient of friction of 0.35 be used between soil and concrete.

The use of heavy compaction equipment adjacent to a below-grade wall could result in lateral earth pressures well in excess of those predicted in Table 8. We recommend that the upper 24 inches of soil that is not protected by pavement or a concrete slab, be neglected when calculating passive resistance. This zone, where applicable, should be backfilled with cohesive soils to minimize infiltration of surface water into the backfill.

Retaining walls should be provided with a drain system behind the walls. The drain system should include free-draining backfill materials and perforated drains as depicted on Figure 3. Solid outlet pipes should be connected to the perforated drains and then routed to a suitable area for discharge of accumulated water. The portions of retaining walls supporting backfill should be coated with an appropriate waterproofing compound or covered with a similar material to inhibit infiltration of moisture through the walls. It is the responsibility of the project structural engineer and/or the retaining wall contractor to provide specifications for waterproofing materials and proper methods of application.

In addition to the installation of a drain system behind the walls, design and installation of a swale is recommended behind the retaining walls to control surface runoff. The swale termination locations should not discharge the collected water on exterior flatwork or pavements. A lined or vegetated swale can be considered for this purpose and project civil engineer should be consulted for additional design details.

To reduce the potential for water- and sulfate/salt-related damage to the foundation walls and efflorescent development, particular care should be taken in selection of the appropriate type of waterproofing material to be utilized and in the application of this material.

9.6 Pavements

Pavement section alternatives are included herein for standard duty pavement (automobile parking areas and drive lanes), and heavy-duty pavement (truck drive lanes and fire lanes). Specific traffic loadings for the project were not available at the time of report preparation.

The pavement sections recommended below were developed in general accordance with the guidelines and procedures of the American Association of State Highway and Transportation Officials (AASHTO), (AASHTO, 1993), Colorado Department of Transportation (CDOT), and the Town of Parker Roadway Design and Construction Criteria Manual (2020).

9.6.1 Pavement Subgrade Characterization

The current subgrade soils encountered in our borings typically consisted of lean clay to fat clay with varying amounts of sand in the upper 5 feet which classify as A-6, A-7-6 soils in accordance with the AASHTO classification system. As a result, we utilized a design R-Value of 10 for pavement subgrade soils.

9.6.2 Traffic Loading

As stated previously, specific traffic loadings for the project were not available at the time of report preparation. Based on our experience with similar developments and in accordance with Table 6-1 pf the Town of Parker Roadway Design and Construction Criteria Manual

(2020), an equivalent 18-kip single axle load value of 73,000 and 110,000 was assumed for flexible and rigid pavements, respectively. If design traffic loadings differ significantly from this assumed value, we should be notified to re-evaluate the pavement recommendations below.

9.6.3 Pavement Design Parameters

The pavement design for this site was based on guidelines and procedures of the American Association of State Highway and Transportation Officials (AASHTO), (AASHTO, 1993), CDOT, and the Town of Parker. The below pavement sections are appropriate for occasional vehicle loads of 80-kips in accordance with Town of Parker Fire Criteria.

The design of flexible pavements was based on the following input parameters:

Initial Serviceability:	4.5
Terminal Serviceability:	2.0
Reliability	80%
Overall Standard Deviation:	0.45
Resilient Modulus:	3,563 psi (R-Value of 10)

The design of rigid pavements was based on the following input parameters:

Initial Serviceability:	4.5
Terminal Serviceability:	2.0
Reliability	80%
28-Day Mean PCC Modulus Rupture:	650 psi
28-Day Mean Modulus of Elasticity:	3.6×10^6 psi
Mean Effective k value:	125 psi/in
Overall Standard Deviation:	0.35
Load Transfer Coefficient:	4.2
Overall Drainage Coefficient:	1.0

9.6.4 Pavement Thickness

Based on the above-mentioned guidelines, procedures, and input parameters, Table 9 provides our recommended pavement section thicknesses supported on prepared pavement subgrade as described in Section 9.1.3.

Table 9 – Recommended Pavement Thickness

Traffic Type	Full Depth AC and Full Depth PCCP (inches)	Composite AC / ABC (inches)	Composite PCCP / ABC (inches)
Local Residential	-- [1]	5.0 / 6.0 [2]	7.0 / 4.0 [2]

Notes: AC = Asphalt Concrete, ABC = Aggregate Base Course, PCCP = Portland Cement Concrete Pavement

[1] Not allowed per Town of Parker Standards

[2] Town of Parker Minimum Pavement Section for Local Roads

We recommend PCCP be utilized in entrance and exit sections, dumpster pads, or other areas where extensive wheel maneuvering is expected. The dumpster pad should be large enough to support the wheels of the truck, which will bear the load of the dumpster.

We understand that most site concrete will be pedestrian walks and privately maintained roads and will likely not need to meet Town of Parker Minimum pavement sections for local roads. Based on the soil characteristics, the minimum concrete pavement section for privately maintained roads is 5.0 inches. We also recommend that the concrete pavement be underlain by 4 inches of ABC for subgrade stabilization.

Where practical, we recommend "early-entry" cutting of crack-control joints in PCCP. Cutting of PCCP in its 'green" state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Ninyo & Moore has observed dishing in some AC parking lots. Dishing is observed in frequently-used parking stalls (such as near the front of buildings), and occurs under the wheel footprint in these stalls. The use of higher-grade AC, or surfacing these areas with PCCP, could be considered. The dishing is exacerbated by factors such as irrigated islands or planter areas, and sheet surface drainage to the front of structures.

9.6.5 Pavement Subgrade Preparation

For both the PCCP and AC pavement sections recommended above, we recommend the underlying subgrade soils be prepared as described in Section 9.1.3 of this report.

The contractor should be prepared either to dry the subgrade materials or moisten them, as needed, prior to compaction. Some site soils may pump or deflect during compaction if moisture levels are not carefully monitored. The contractor should be prepared to process and compact such soils to establish a stable platform for paving, including the use of chemical stabilization or geotextiles, where needed.

As stated in Section 9.1.3, if the subgrade should become desiccated, saturated, frozen, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to pavement construction.

Immediately prior to paving, the subgrade should be proof rolled with a heavily loaded, pneumatic tired vehicle and checked for moisture. Areas that show excessive deflection during proof rolling should be excavated and replaced and/or stabilized. Areas allowed to pond prior to paving may need to be re-worked prior to proof rolling.

9.6.6 Pavement Materials

The AC pavement shall consist of a bituminous plant mix composed of a mixture of high-quality aggregate and bituminous material, which meets the requirements of a job-mix formula established by a qualified engineer. The asphalt material used should be based on a SuperPave Gyratory Design Revolution of 75. Lower lifts should be constructed using an asphalt mix Grading S and asphalt cement binder grade PG 58-28. The top lift should be constructed using an asphalt mix Grading SX and asphalt cement binder grade PG 64-22. Pavement layer thickness should be between 2 and 3 inches for the lower lifts and 2 to 2.5 inches for the top lift. The geotechnical engineer should be retained to review the proposed pavement mix designs, grading, and lift thicknesses prior to construction.

PCCP should consist of a plant mix composed of a mixture of aggregate, Portland cement and appropriate admixtures meeting the requirements of the Town of Parker. Concrete should have a modulus of rupture of third point loading of 650 psi or more. The concrete should be air-entrained with approximately 6 percent air and should have a cement content of six or more sacks per cubic yard. Allowable slump should be approximately 4 inches.

Thickened edges should be used along outside edges of PCCP. The edge thickness should be 2 inches or more than the recommended PCCP thickness and taper to the recommended PCCP thickness 36 inches inward from the edge. Integral curbs may be used in lieu of thickened edges.

PCCP should have longitudinal and transverse joints that meet the applicable requirements of the Town of Parker.

9.6.7 Pavement Maintenance

The collection and diversion of surface drainage away from paved areas is vital to satisfactory performance of the pavements. The subsurface and surface drainage systems should be carefully designed to facilitate removal of the water from paved areas and subgrade soils. Allowing surface waters to pond on pavements will cause premature pavement deterioration. Where topography, site constraints or other factors limit or preclude adequate surface drainage, pavements should be provided with edge drains to reduce loss of subgrade support. The long-term performance of the pavement also can be improved greatly by backfilling and compaction behind curbs, gutters, and sidewalks so that ponding is not permitted and water infiltration is reduced.

Landscape irrigation in planters adjacent to pavements and in “island” planters within paved areas should be carefully monitored or differential heave and/or rutting of the nearby pavements will result. Drip irrigation systems are recommended for such planters to reduce over-spray and water infiltration beyond the planters. We recommend edge drains where the profile/slopes are less than 1 percent.

The standard care of practice in pavement design describes the recommended flexible pavement section as a “20-year” design pavement; however, many pavements will not remain in satisfactory condition without routine, preventive maintenance and rehabilitation procedures performed during the life of the pavement. Preventive pavement treatments are surface rehabilitation and operations applied to improve or extend the functional life of a pavement. These treatments preserve, rather than improve, the structural capacity of the pavement structure. In the event the existing pavement is not structurally sound, the preventive maintenance will have no long-lasting effect. Therefore, a routine maintenance program to seal joints and cracks, and repair distressed areas is recommended.

The cost associated with the sealing of joints at the time of initial construction should be discussed among the project ownership, design, and construction team members prior to construction. The cost associated with the maintenance of these joints should be included in the pavement maintenance program. These joints, regardless of the performance of a sealing program at the time of initial construction, will widen and will need to be resealed periodically.

9.7 Concrete Flatwork

We recommend that exterior concrete flatwork be supported on improved subgrade as described in Section 9.1.3 of this report. Exterior walkways and flatwork should be four or more inches thick and may be designed to support truck-mounted snow plows, provided they are constructed on a suitable subgrade with a passing proof roll. The slab edges should be deepened by two or more inches where exterior slabs-on-grade are placed adjacent to landscaping areas and taper to the recommended thickness 36 inches inward from the edge.

Ground-supported flatwork, such as walkways, will be subject to post-construction soil-related movements resulting from varying soil moisture content, heave/settlement, frost, etc. Thus, where these types of elements abut rigid building foundations or isolated/suspended structures, differential movements should be anticipated. We recommend that flexible joints be provided where such elements abut the main structure to allow for differential movement at these locations.

Positive drainage should be established and maintained adjacent to flatwork. Water should not be allowed to pond on flatwork.

In no case should exterior flatwork extend under any portion of the buildings where there is less than 2 inches of clearance between the flatwork and any building element. Exterior flatwork in contact with brick, rock facades, or any other element of the building can cause damage to the structure if the flatwork experiences movements.

To reduce the potential manifestation of distress to exterior concrete flatwork due to movement of the underlying soil, we recommend that such flatwork be installed with crack-control and expansion joints at appropriate spacing as designed by the structural engineer and in accordance with Town of Parker specifications.

9.8 Corrosion Considerations

The corrosion potential of on-site soils to concrete and buried metal was evaluated in the laboratory using selected samples obtained from the exploratory borings. Laboratory testing was performed to assess the effects of sulfate on concrete and the effects of soil resistivity on buried metal. Results of these tests are presented in Appendix B. Recommendations regarding concrete to be utilized in construction of proposed improvements and for buried metal pipes are provided in the following sections.

9.8.1 Concrete

The test for water-soluble sulfate content of the soils was performed using CDOT Test Method CP-L 2104. Using this procedure on select bulk soil samples, soluble sulfates were undetectable. The laboratory test results are presented in Appendix B.

Based on Table 601-2 of the CDOT 2022 Standard Specifications for Road and Bridge Construction, the on-site soils represent a Class 0 and Class 1 severity of sulfate exposure to concrete on a scale that ranges between Class 0 to Class 3. Therefore, we recommend that the concrete used for this project should meet one of the below outlined requirements.

- ASTM C 150 Type I, II or V
- ASTM C 595 Type IP, IP(MS) or IP(HS)
- ASTM C 1157 Type GU, MS or HS
- ASTM C 150 Type III cement if it is allowed, as in Class E concrete

The Structural Engineer should ultimately select the concrete design strength based on the project specific loading conditions. However, higher strength concrete may be selected for increased durability, resistance to slab curling and shrinkage cracking. We recommend the use of concrete with a design 28-day compressive strength of 4,000 psi or more, for concrete slabs at this site. Concrete exposed to the elements should be air-entrained.

9.8.2 Buried Metal Pipes

The corrosion potential of the on-site materials was analyzed to evaluate its potential effects on buried metals. Corrosion potential was evaluated using the results of laboratory testing of samples obtained during the subsurface evaluation that were considered representative of soils at the subject site.

Resistivity was measured to be approximately 2,000 ohm-cm for our selected sample. The results of the laboratory testing indicate the on-site materials could be moderately to severely corrosive to ferrous metals based on the criteria in Table 9. Therefore, special consideration should be given to the use of heavy gauge, corrosion protected, underground steel pipe or culverts, if any are planned. As an alternative, plastic pipe or reinforced concrete pipe could be considered. A corrosion specialist should be consulted for further recommendations. The laboratory test results are presented in Appendix B.

Table 10 – Corrosion Potential to Steel

Resistivity (Ohm-cm)	Corrosivity Potential to Steel
0 - 500	Very Severe
500 – 2,000	Severe
2,000 – 10,000	Moderate
10,000 – 30,000	Mild
>30,000	Low

9.9 Scaling

Climatic conditions in the project area including relatively low humidity, large temperature changes and repeated freeze-thaw cycles, may cause surficial scaling and spalling of exterior concrete. Occurrence of surficial scaling and spalling can be aggravated by poor workmanship during construction, such as "over-finishing" concrete surfaces and the use of de-icing salts on exterior concrete flatwork, particularly during the first winter after construction. The use of de-icing salts on nearby roadways, which can be transferred by vehicle traffic onto newly placed concrete, can be sufficient to induce scaling.

The measures below can be beneficial for reducing concrete scaling. However, because of the other factors involved, including workmanship, surface damage to concrete can develop even though the measures provided below were followed. The mix design criteria should be coordinated with other project requirements including the criteria for soluble sulfate resistance presented in Section 9.8.1.

- Curing concrete in accordance with applicable codes and guidelines.
- Maintaining a water/cement ratio of 0.45 by weight for exterior concrete mixes.
- Including Type F fly ash in exterior concrete mixes as 20 percent of the cementitious material.
- Specifying a 28-day, compressive strength of 4,500 or more psi for exterior concrete that may be exposed to de-icing salts.
- Avoiding the use of de-icing salts through the first winter after construction.
- If colored concrete is being proposed for use at this site, Ninyo & Moore should be consulted for additional recommendations.

9.10 Frost Heave

Site soils are susceptible to frost heave if allowed to become saturated and exposed to freezing temperatures and repeated freeze/thaw cycling. The formation of ice in the underlying soils can result in two or more inches of heave of pavements, flatwork and other hardscaping in sustained cold weather. A portion of this movement may be recovered when the soils thaw, but due to loss of soil density some degree of displacement will remain. Frost heave of hardscaping could also result in areas where the subgrade soils were placed on engineered fill.

In areas where hardscape movements are a design concern (i.e. exterior flatwork located adjacent to the building within the doorway swing zone), replacement of the subgrade soils with 3 or more feet of clean, coarse sand or gravel, or supporting the element on foundations similar to the building, or spanning over a void should be considered.

9.11 Construction in Cold or Wet Weather

During construction, the site should be graded such that surface water can drain readily away from the building areas. Given the soil conditions, it is important to avoid ponding of water in or near excavations. Water that accumulates in excavations should be promptly pumped out or otherwise removed and these areas should be allowed to dry out before resuming construction. Berms, ditches, and similar means should be used to decrease stormwater entering the work area and to efficiently convey it off site.

Earthwork activities undertaken during the cold weather season may be difficult and should be done by an experienced contractor. Fill should not be placed on top of frozen soils. The frozen soils should be removed prior to the placement of fill or other construction material. Frozen soil should not be used as engineered fill or backfill. The frozen soil may be reused (provided it meets the selection criteria) once it has thawed completely. In addition, compaction of the soils may be more difficult due to the viscosity change in water at lower temperatures.

If construction proceeds during cold weather, foundations, slabs, or other concrete elements should not be placed on frozen subgrade soil. Frozen soil should either be removed from beneath concrete elements, or thawed and recompacted. To limit the potential for soil freezing, the time passing between excavation and construction should be minimized. Blankets, straw, soil cover, or heating may be used to discourage the soil from freezing.

9.12 Site Drainage

Infiltration of water into subsurface soils can lead to soil movement and associated distress, and chemically and physically related deterioration of concrete structures. To reduce the potential for infiltration of moisture into subsurface soils at the site, we recommend the following:

- Positive drainage should be established and maintained away from the proposed buildings. Positive drainage may be established by providing a surface gradient for paved areas of 2 to 5 percent or more for a distance of 10 feet or more away from structures. Where concrete flatwork is placed adjacent to structures and other considerations are required by law, such as ADA requirements, slopes of 1 percent or more are considered acceptable. For unpaved areas, positive drainage may be established by a slope of 5 to 10 percent for 10 feet or more away from structures, where possible.

- Adequate surface drainage should be provided to channel surface water away from on-site structures and off paved surfaces to a suitable outlet such as a storm drain. Adequate surface drainage may be enhanced by utilization of graded swales, area drains, and other drainage devices. Surface run-off should not be allowed to pond near structures.

- Building roof drains should have downspouts tightlined to an appropriate outlet, such as a storm drain or the street, away from structures, pavements, and flatwork. If tightlining of the downspouts is not practicable, they should discharge 5 feet or more away from structures and onto surfaces that slope away from the structure. Downspouts should not be allowed to discharge onto the ground surface adjacent to building foundations or on exterior walkways.

- The possibility of moisture infiltration beneath a structure, in the event of plumbing leaks, should be considered in the design and construction of underground water and sewer conduits. Permitting increases in moisture to the building supporting soils may result in a decrease in bearing capacity and an increase in settlement, heave, and/or differential movement. Incorporating a perimeter drainage system around the building foundations that will aid in reduction of the moisture infiltration of subsurface soils may be considered.

- Irrigated plants should not be placed within 5 feet of the buildings. Low-water use (drip irrigated) landscaping should be utilized on site, particularly between 5 and 10 feet of the building exterior and within 5 feet of the exterior site improvements, including areas of concrete flatwork. Irrigation heads should be oriented so that they spray away from the building.

- Utility trenches should be backfilled with compacted, low permeability fill (i.e. permeability of 5-10 cm/s or less) within 5 feet of the building. Planters, if any, should be maintained 10 feet or more from the building and constructed with closed bottoms or with drainage systems to drain excess irrigation away from the buildings.

9.13 Construction Observation and Testing

A qualified geotechnical consultant should perform appropriate observation and testing services during grading and construction operations. These services should include observation of any soft, loose, or otherwise unsuitable soils, evaluation of subgrade conditions where soil removals are performed, evaluation of the suitability of proposed borrow materials for use as fill, evaluation of the stability of open temporary excavations, evaluation of the results of any subgrade stabilization or dewatering activities, and performance of observation and testing services during placement and compaction of engineered fill and backfill soils.

The geotechnical consultant should also perform observation and testing services during placement of concrete, mortar, grout, asphalt, and steel reinforcement. If another geotechnical consultant is selected to perform observation and testing services for the project, we request that the selected consultant provide a letter to the owner, with a copy to Ninyo & Moore, indicating that they fully understand our recommendations and that they are in full agreement with the recommendations contained in this report. Qualified subcontractors utilizing appropriate techniques and construction materials should perform construction of the proposed improvements.

9.14 Plan Review

The recommendations presented in this report are based on Salisbury Park North Conceptual Site Plan prepared by Hord Coplan Macht (2023) and on the findings of our geotechnical evaluation. When finished, project plans and specifications should be reviewed by the geotechnical consultant prior to submitting the plans and specifications for bid. Additional field exploration and laboratory testing may be needed upon review of the project design plans.

9.15 Pre-Construction Meeting

We recommend a pre-construction meeting be held. The owner or the owner's representative, the architect, the contractor, and the geotechnical consultant should be in attendance to discuss the plans and the project.

10 LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

This report is intended for design purposes only. It does not provide sufficient data to prepare an accurate bid by contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

11 REFERENCES

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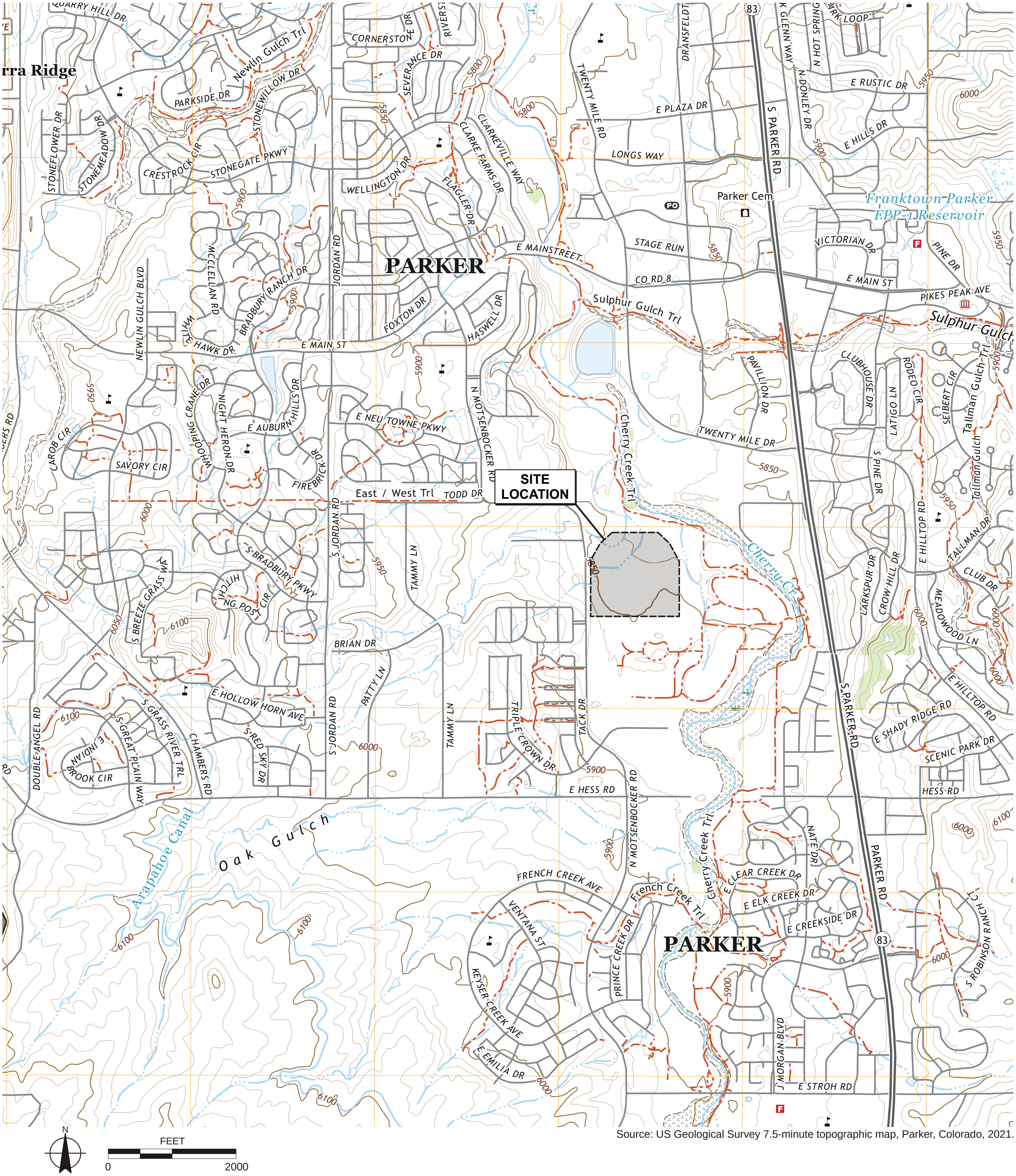
FIGURES



Source: US Geological Survey 7.5-minute topographic map, Parker, Colorado, 2021.

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

FIGURE 1

SITE LOCATION

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD
PARKER, COLORADO

502725001 | 10/23

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

bsm file no: 2725vmap1023

SOURCE: HORD, COPLAN, MACHT, 2023.
NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

bsm file no: 2725blm1023

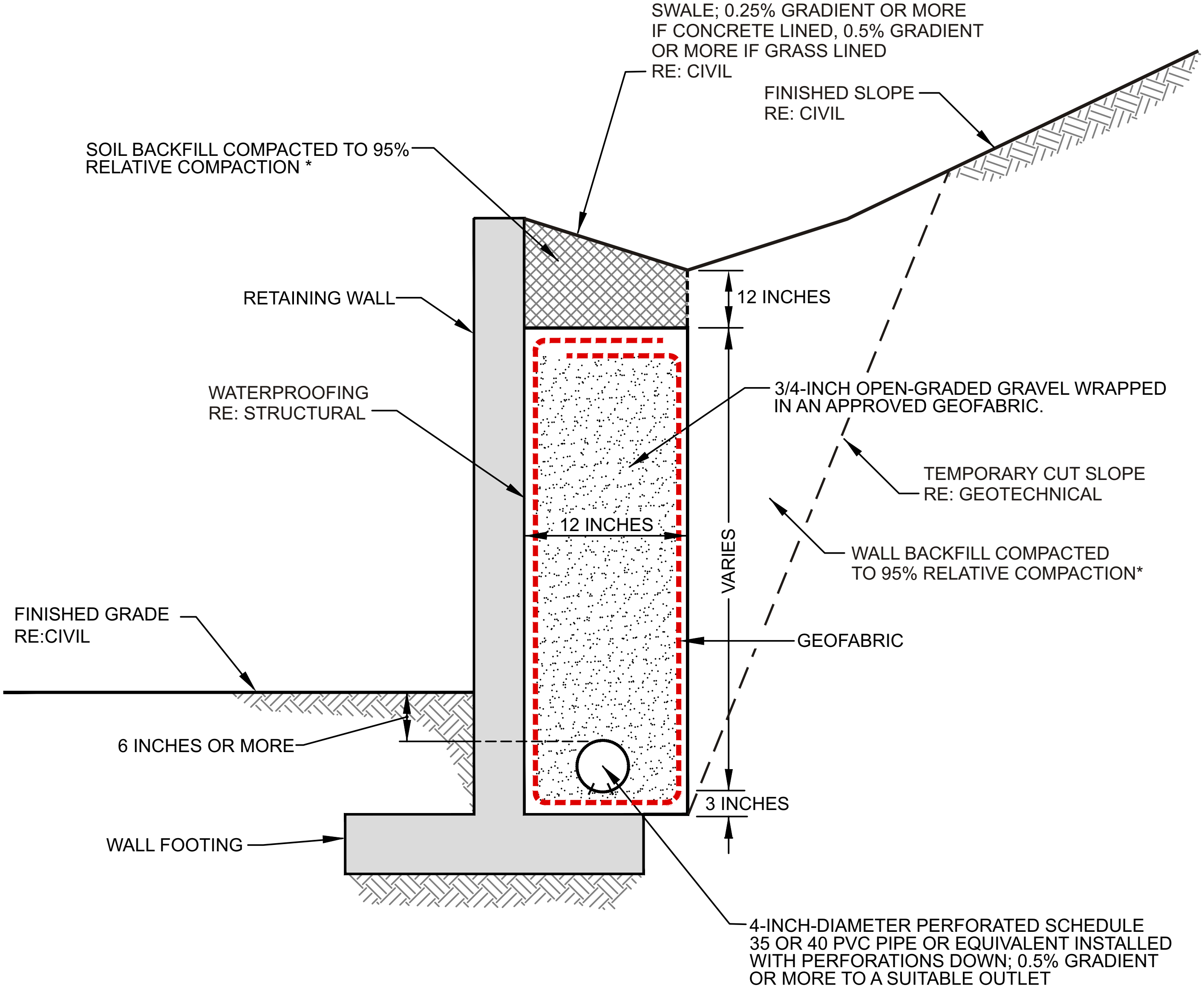
FIGURE 2

BORING LOCATIONS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD
PARKER, COLORADO

502725001 | 10/23

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants



*BASED ON ASTM D698

NOT TO SCALE

FIGURE 3

RETAINING WALL DRAINAGE DETAIL

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD
PARKER, COLORADO

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

502725001 | 11/23

bsm file no: 2552dtl1222

APPENDIX A

Boring Logs

APPENDIX A

BORING LOGS

Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

Bulk Samples

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

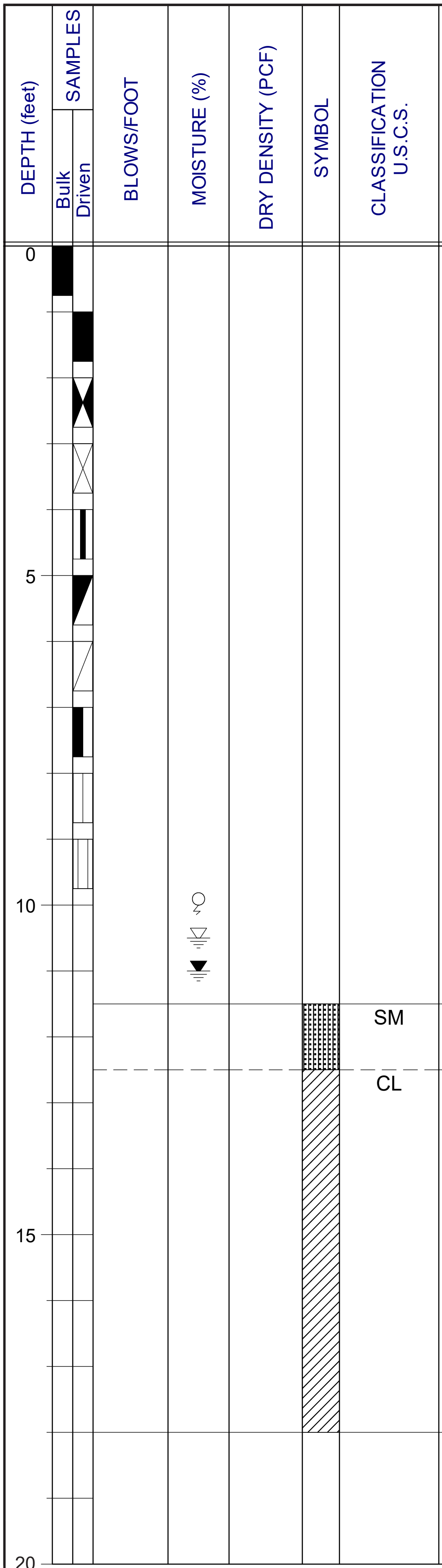
Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following methods.

The California Drive Sampler

The sampler, with an external diameter of 2.4 inches, was lined with four, 4-inch long, thin brass rings with inside diameters of approximately 1.9 inches. The sample barrel was driven into the ground with the weight of a hammer in general accordance with ASTM D3550. The driving weight was permitted to fall freely. The approximate length of the fall, the weight of the hammer, and the number of blows per foot of driving are presented on the boring logs as an index to the relative resistance of the materials sampled. The samples were removed from the sample barrel in the brass liners, sealed, and transported to the laboratory for testing.

BORING LOG EXPLANATION SHEET



Bulk sample.

Modified split-barrel drive sampler.

2-inch inner diameter split-barrel drive sampler.

No recovery with modified split-barrel drive sampler or 2-inch inner diameter split-barrel drive sampler.

Sample retained by others.

Standard penetration test (SPT).

No recovery with SPT.

Shelby tube sample. Distance pushed in inches/length of sample recovered in inches.

No recovery with Shelby tube sampler.

Continuous push sample.

Seepage.

Groundwater encountered during drilling.

Groundwater measured after drilling.

<u>MAJOR MATERIAL TYPE (SOIL):</u>
Solid line denotes unit change.

Dashed line denotes material change.

Attitudes: Strike/Dip
b: Bedding
c: Contact
j: Joint
f: Fracture
F: Fault
cs: Clay Seam
s: Shear
bss: Basal Slide Surface
sf: Shear Fracture
sz: Shear Zone
sbs: Shear Bedding Surface

The total depth line is a solid line that is drawn at the bottom of the boring.

FIGURE 1

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BORING LOGS

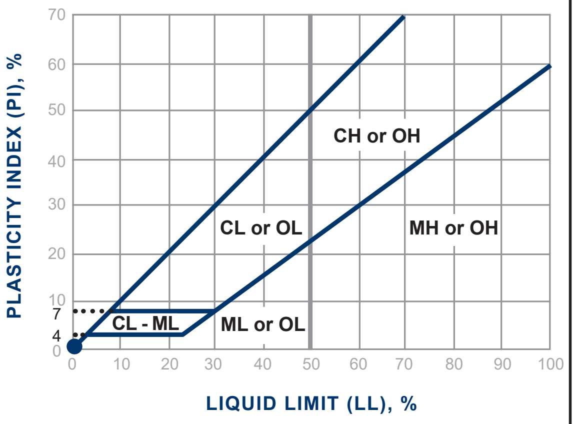
Soil Classification Chart Per ASTM D 2488

Primary Divisions			Secondary Divisions	
			Group Symbol	Group Name
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	**GRAVEL** more than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVEL less than 5% fines	GW	well-graded GRAVEL
			GP	poorly graded GRAVEL
		GRAVEL with DUAL CLASSIFICATIONS 5% to 12% fines	GW-GM	well-graded GRAVEL with silt
			GP-GM	poorly graded GRAVEL with silt
			GW-GC	well-graded GRAVEL with clay
			GP-GC	poorly graded GRAVEL with clay
		GRAVEL with FINES more than 12% fines	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND 50% or more of coarse fraction passes No. 4 sieve	CLEAN SAND less than 5% fines	SW	well-graded SAND
			SP	poorly graded SAND
		SAND with DUAL CLASSIFICATIONS 5% to 12% fines	SW-SM	well-graded SAND with silt
			SP-SM	poorly graded SAND with silt
			SW-SC	well-graded SAND with clay
			SP-SC	poorly graded SAND with clay
		SAND with FINES more than 12% fines	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS 50% or more passes No. 200 sieve	**SILT and CLAY** liquid limit less than 50%	INORGANIC	CL	lean CLAY
			ML	SILT
			CL-ML	silty CLAY
		ORGANIC	OL (PI > 4)	organic CLAY
			OL (PI < 4)	organic SILT
	SILT and CLAY liquid limit 50% or more	INORGANIC	CH	fat CLAY
			MH	elastic SILT
		ORGANIC	OH (plots on or above “A”-line)	organic CLAY
			OH (plots below “A”-line)	organic SILT
	Highly Organic Soils		PT	Peat

Grain Size

Description		Sieve Size	Grain Size	Approximate Size
Boulders		> 12”	> 12”	Larger than basketball-sized
Cobbles		3 - 12”	3 - 12”	Fist-sized to basketball-sized
Gravel	Coarse	3/4 - 3”	3/4 - 3”	Thumb-sized to fist-sized
	Fine	#4 - 3/4”	0.19 - 0.75”	Pea-sized to thumb-sized
Sand	Coarse	#10 - #4	0.079 - 0.19”	Rock-salt-sized to pea-sized
	Medium	#40 - #10	0.017 - 0.079”	Sugar-sized to rock-salt-sized
	Fine	#200 - #40	0.0029 - 0.017”	Flour-sized to sugar-sized
Fines		Passing #200	< 0.0029”	Flour-sized and smaller

Plasticity Chart



Apparent Density - Coarse-Grained Soil

Apparent Density	Spooling Cable or Cathead		Automatic Trip Hammer	
	SPT (blows/foot)	Modified Split Barrel (blows/foot)	SPT (blows/foot)	Modified Split Barrel (blows/foot)
Very Loose	≤ 4	≤ 8	≤ 3	≤ 5
Loose	5 - 10	9 - 21	4 - 7	6 - 14
Medium Dense	11 - 30	22 - 63	8 - 20	15 - 42
Dense	31 - 50	64 - 105	21 - 33	43 - 70
Very Dense	> 50	> 105	> 33	> 70

Consistency - Fine-Grained Soil

Consistency	Spooling Cable or Cathead		Automatic Trip Hammer	
	SPT (blows/foot)	Modified Split Barrel (blows/foot)	SPT (blows/foot)	Modified Split Barrel (blows/foot)
Very Soft	< 2	< 3	< 1	< 2
Soft	2 - 4	3 - 5	1 - 3	2 - 3
Firm	5 - 8	6 - 10	4 - 5	4 - 6
Stiff	9 - 15	11 - 20	6 - 10	7 - 13
Very Stiff	16 - 30	21 - 39	11 - 20	14 - 26
Hard	> 30	> 39	> 20	> 26

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USCS METHOD OF SOIL CLASSIFICATION

DATE DRILLED 9/7/2023 BORING NO. B-1
GROUND ELEVATION 5,850'± SHEET 1 OF 1
METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY SLS LOGGED BY SLS REVIEWED BY SS

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■							TOPSOIL: Approximately 2 inches thick.
	■	⧗	25	16.7	108.2	▩		FILL: Dark brown, moist, lean CLAY with sand; trace organics.
	■	⧗	16	17.4	102.5	▨	CL	ALLUVIUM: Brown, dry, stiff, sandy lean CLAY.
		⧗	22			▨		Dry to moist.
10						▨		
				▽		▨		@12.5': Groundwater encountered during drilling.
		⧗	11	22.9	102.7	▨		Brownish gray; wet.
		⧗	10	20.2	108.5	▨		
20						▨		
		⧗	10	30.2	93.2	▨		
		⧗	11	21.0	106.4	▨		
30								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 12.5 feet. Backfilled with on-site soil at the end of day on 9/7/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40								

FIGURE A- 1

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Geotechnical & Environmental Sciences Consultants

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 11/23

DATE DRILLED 9/7/2023 BORING NO. B-2

GROUND ELEVATION 5,847'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY SS

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 2 inches thick.
			24	13.1	114.3			FILL: Brown, dry, sandy lean CLAY.
			16	18.1	106.9		CL	ALLUVIUM: Brownish orange, moist, stiff, sandy lean CLAY.
10			14	▽ 13.5				Wet. @9': Groundwater encountered during drilling.
			12	29.8	93.2		CL	Grayish orange, wet, stiff, lean CLAY with sand.
20			12	29.9	93.1			
			11					
			13					
30								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 9 feet. Backfilled with on-site soil after drilling on 9/7/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40								

FIGURE A- 2

DATE DRILLED 9/7/2023 BORING NO. B-3

GROUND ELEVATION 5,847'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY SS

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▨		TOPSOIL: Approximately 2 inches thick.
	■	⧗	21	18.1	108.1	▨		FILL: Brownish orange, dry, sandy lean CLAY.
	■	⧗	14	18.0	106.3	▨	SC	ALLUVIUM: Orangish tan, moist, loose, clayey SAND.
				▽		▨		@8': Groundwater encountered during drilling.
10		⧗	31			▨	SW-SC	Orangish tan, wet, medium dense, fine to coarse SAND with clay; trace gravel.
		⧗	50	9.5	121.6	▨		
20		⧗	15	9.8	124.8	▨		Orangish gray and brown; loose.
		⧗	13	9.7	114.3	▨		
30		⧗	15	7.6	132.1	▨		Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 8 feet. Backfilled with on-site soil after drilling on 9/7/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40								

FIGURE A- 3

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SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 11/23

DATE DRILLED 9/7/2023 BORING NO. B-4

GROUND ELEVATION 5,845'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▨		TOPSOIL: Approximately 2 inches thick.
	■	⧗	21	4.8	109.7	▨		FILL: Black, dry, sandy lean CLAY.
	■					⁙	SP	ALLUVIUM: Tan, dry to wet, loose, fine to coarse SAND; trace clay and gravel.
	■	⧗	17	10.8	114.1	⁙		
				▽		⁙		@6.5': Groundwater encountered during drilling.
10		⧗	38	6.5	123.1	⁙		Gray; wet; medium dense.
		⧗	31	8.4		⁙		
20		⧗	17	14.3	113.3	⁙		Loose.
		⧗	7	6.4		⁙		Very loose.
30		⧗	16			⁙		Loose.
40								

Total Depth: 30 feet.
Groundwater was encountered during drilling at approximately 6.5 feet.
Backfilled with on-site soil after drilling on 9/7/2023.

Notes:
Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 4

DATE DRILLED 9/7/2023 BORING NO. B-5

GROUND ELEVATION 5,843'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■							TOPSOIL: Approximately 2 inches thick.
	■	⧗	11	20.8	103.5	▩		FILL: Black, dry to moist, sandy lean CLAY; trace organics.
	■	⧗	14	13.5 ▽	110.2	▨	SP-SC	ALLUVIUM: Gray, wet, loose, fine to coarse SAND with clay. @5': Groundwater encountered during drilling.
10		⧗	13			▨		
		⧗	24	12.1	120.7	▨		Medium dense.
20		⧗	43	8.3	114.7	▨		
		⧗	50/6"	10.5	119.0	▨		Dense.
30		⧗	23			▨		Medium dense.
								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 5 feet. Backfilled with on-site soil after drilling on 9/7/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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FIGURE A- 5

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DATE DRILLED 9/7/2023 BORING NO. B-6

GROUND ELEVATION 5,843'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▨		TOPSOIL: Approximately 2 inches thick.
	■	⧗	8	20.3	126.0	▨		FILL: Gray, dry to moist, sandy lean CLAY.
	■	⧗	18	10.5 ▽	105.2	▨	SP-SC	ALLUVIUM: Grayish orange, wet, loose, fine to coarse SAND with clay. @5': Groundwater encountered during drilling.
10		⧗	6	6.7		▨		Very loose.
		⧗	22	10.5	121.5	▨		Medium dense.
20		⧗	50/10"	9.5	121.5	▨		
		⧗	50/10"	9.6	117.0	▨		
30		⧗	32	8.5		▨		Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 5 feet. Backfilled with on-site soil after drilling on 9/7/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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FIGURE A- 6

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DATE DRILLED 9/7/2023 BORING NO. B-7

GROUND ELEVATION 5,851'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▨		TOPSOIL: Approximately 2 inches thick.
	■	⧗	18	17.1	103.5	▨		FILL: Brown, dry, stiff, lean CLAY; trace sand.
	■	⧗	13	24.1	97.8	▨	CL	ALLUVIUM: Orangish brown, dry to moist, stiff, sandy lean CLAY with iron staining.
10		⧗	27	13.6	114.2	▨	SC	Orangish tan, moist, medium dense, clayey SAND.
				▽		▨		@13': Groundwater encountered during drilling.
		⧗	50/7"	13.8		▨		Wet; dense.
20		⧗	20	12.8	115.8	▨		Loose.
		⧗	46	8.1	130.4	▨		Medium dense.
30		⧗	46			▨		Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 13 feet. Backfilled with on-site soil after drilling on 9/7/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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FIGURE A- 7

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DATE DRILLED 9/8/2023 BORING NO. B-8
GROUND ELEVATION 5,845'± SHEET 1 OF 1
METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					SP	TOPSOIL: Approximately 4 inches thick. ALLUVIUM: Gray, moist to wet, loose, fine to coarse SAND; trace clay and gravel.
	■	⧓	12				
	■	⧓	18	11.3 ▽			Wet. @5': Groundwater encountered during drilling.
		⧓	34	11.0	118.8		Medium dense.
10							
		⧓	45	9.9	121.1		
		⧓	32	10.6	121.8		
20							
						SP-SC	Tan and gray, wet, dense, fine to coarse SAND with clay; trace gravel.
		⧓	50/11"	8.7	121.6		
		⧓	50/8"	10.8	121.0		
30							Total Depth: 29.7 feet. Groundwater was encountered during drilling at approximately 5 feet. Backfilled with on-site soil after drilling on 9/8/2023.
40							

Notes:
Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 8

DATE DRILLED 9/8/2023 BORING NO. B-9

GROUND ELEVATION 5,854'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 4 inches thick.
	■	⧗	9	17.4	106.6	▩		FILL: Black, moist, sandy lean CLAY.
	■	⧗	7	▽ 6.1		▨	SP-SC	@4': Groundwater encountered during drilling. ALLUVIUM: Grayish tan, wet, very loose, fine to coarse SAND with clay; trace gravel.
10		⧗	12			▨		Loose.
		⧗	28	12.0	114.2	▨		Gray; medium dense.
20		⧗	33	11.4	118.9	▨		
		⧗	43	9.3	115.1	▨		
30		⧗	50/6"	8.0	120.6	▨		Dense.
40								

Total Depth: 29.5 feet.
Groundwater was encountered during drilling at approximately 4 feet.
Backfilled with on-site soil after drilling on 9/8/2023.

Notes:
Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 9

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DATE DRILLED 9/8/2023 BORING NO. B-10

GROUND ELEVATION 5,845'± SHEET 1 OF 2

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0					TOPSOIL: Approximately 4 inches thick.
					FILL: Black, moist, clayey SAND; trace gravel and organics.
	11	15.0	108.3		
				SP	ALLUVIUM: Grayish tan, wet, medium dense, fine to coarse SAND; trace clay and gravel.
	26	10.2	118.0		@4': Groundwater encountered during drilling.
10	50/ 11"	9.2	126.0		
	38	11.2	120.2		
20	42	9.0	116.3		
	50/7"	10.3	118.6		
30	50/ 11"	7.5	116.3		Total Depth: 29.9 feet. Groundwater was encountered during drilling at approximately 4 feet. Borehole completed as a temporary groundwater monitoring well.
					Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.
					The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40					Well Construction:

FIGURE A- 10

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DATE DRILLED 9/8/2023 BORING NO. B-10

GROUND ELEVATION 5,845'± SHEET 2 OF 2

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	WELL CONSTRUCTION	DESCRIPTION/INTERPRETATION
40									2" diameter PVC casing from 0 to 10 feet. 2" diameter PVC 0.01" slotted casing from 10 to 29.9 feet. Bentonite chips from 0 to 1 feet. Washed silica sand from 3 to 10 feet. J-plug casing cap and plug. 8" diameter flush mounted well cover.
50									
60									
70									
80									

DATE DRILLED 9/8/2023 BORING NO. B-11
GROUND ELEVATION 5,856'± SHEET 1 OF 1
METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 4 inches thick.
	■	⧓	28			▩		FILL: Black, dry, sandy fat CLAY.
	■	⧓	23	1.7	102.4	░	SP	ALLUVIUM: Tan and gray, moist, medium dense, fine to coarse SAND; trace clay and gravel.
		⧓	23	1.9	105.1	░		
10						░		
				▽		░		@13': Groundwater encountered during drilling.
		⧓	50/9"	6.9	120.4	░		Dense.
		⧓	43	7.1	121.8	░		Medium dense.
20						░		
		⧓	50/9"	5.3	115.0	░		Dense.
		⧓	50/5"	6.9	120.6	░		
30								Total Depth: 29.4 feet. Groundwater was encountered during drilling at approximately 13 feet. Backfilled with on-site soil after drilling on 9/8/2023.
40								

Notes:
Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 12

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DATE DRILLED 9/8/2023 BORING NO. B-12
GROUND ELEVATION 5,859'± SHEET 1 OF 1
METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■							TOPSOIL: Approximately 2 inches thick.
	■						CL	FILL: Brown, dry, sandy lean CLAY; trace organics.
	■	⧗	25	7.5	110.0			ALLUVIUM: Tan, dry to moist, stiff to very stiff, sandy lean CLAY.
	■	⧗	39	6.8				
10		⧗	17	27.1	95.8			
		⧗	23	15.9	103.9			Moist to wet.
				▽			SP	Tan and white, wet, medium dense, fine to coarse SAND with clay; trace gravel. @16': Groundwater encountered during drilling.
20		⧗	50/10"	7.1	132.0			
		⧗	37					
30		⧗	50/7"	7.6	120.7			Dense.
40								

Total Depth: 29.6 feet.
Groundwater was encountered during drilling at approximately 16 feet.
Backfilled with on-site soil after drilling on 9/8/2023.

Notes:
Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 13

DATE DRILLED 9/8/2023 BORING NO. B-13

GROUND ELEVATION 5,852'± SHEET 1 OF 1

METHOD OF DRILLING Truck Rig, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY SLS LOGGED BY SLS REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 4 inches thick.
	■	⧗	11	9.6	105.3	▨	CL	FILL: Black, dry to moist, sandy lean CLAY.
	■					▨		ALLUVIUM: Grayish tan, moist to wet, stiff, sandy lean CLAY.
	■	⧗	17	10.3	105.4	▨		
		⧗	19	∇ 14.5	105.1	▨		@9.5': Groundwater encountered during drilling.
10						▨		
		⧗	31			░	SP-SC	Grayish tan, wet, medium dense, fine to coarse SAND with clay.
		⧗	26	5.4	123.5	░		
20						░		
		⧗	21	7.2	117.4	░		
		⧗	50/9"	10.5	123.4	░		
30								Total Depth: 29.8 feet. Groundwater was encountered during drilling at approximately 9.5 feet. Backfilled with on-site soil after drilling on 9/8/2023.
								Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.
								The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40								

DATE DRILLED 9/21/2023 BORING NO. B-14

GROUND ELEVATION 5,853'± SHEET 1 OF 1

METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▩		FILL: Dark gray, dry to moist, lean CLAY; trace sand and calcium mineralizations.
	■	⧗	16	17.2	86.4	▩		
	■	⧗	15	4.6	104.9	░	SP	ALLUVIUM: Brown, dry to moist, loose, fine to coarse SAND; trace clay and gravel.
10		⧗	17	3.4	101.5	░		Reddish brown; moist.
				▽		░		@13': Groundwater encountered during drilling.
		⧗	21			░		Yellow with red; wet.
20		⧗	28	10.3	120.1	░		Medium dense.
		⧗	50/11"	10.0	118.0	░		
30		⧗	29	9.0	119.3	░		Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 13 feet. Backfilled with on-site soil after drilling on 9/21/2023.
40								

Notes:

Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

DATE DRILLED 9/21/2023 BORING NO. B-15
GROUND ELEVATION 5,851'± SHEET 1 OF 1
METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▩		FILL: Gray, moist, lean CLAY; trace sand and calcium carbonate.
	■	⧓	11	27.3	85.4	▩		
	■	⧓	12			▩		
						░	SP	ALLUVIUM: Yellowish brown, dry, loose, fine to coarse SAND; trace clay and gravel.
		⧓	10	2.1	111.6	░		
10						░		
				▽		░		@12': Groundwater encountered during drilling.
		⧓	25	7.1	121.1	░		Wet; medium dense.
		⧓	27	7.7	121.1	░		Gray.
20						░		
		⊠				░		
		⧓	46	10.2	120.2	░		Reddish yellow.
30								Total Depth: 30 feet. Groundwater was encounterd during drilling at approximately 12 feet. Backfilled with on-site soil after drilling on 9/21/2023.
40								

Notes:
Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 16

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DATE DRILLED 9/11/2023 BORING NO. B-16

GROUND ELEVATION 5,855'± SHEET 1 OF 1

METHOD OF DRILLING CME 50, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 12 inches thick.
	■	⧗	15	6.3	118.1	▩		FILL: Grayish brown, dry to moist, clayey SAND with gravel.
	■					▨	CL	ALLUVIUM: Gray to brown, dry to moist, very stiff, sandy lean CLAY.
	■	⧗	23	22.7	97.9	▨		
10		⧗	18	21.8	104.1	▨		Stiff.
				▽		▨		@13': Groundwater encountered during drilling.
		⧗	5	21.9	104.1	▨		Soft.
20		⧗	16	19.9	108.8	▨		Wet; stiff.
		⧗	11			▨		
30		⧗	15	14.7	123.4	▨		
								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 13 feet. Backfilled with on-site soil after drilling on 9/11/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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FIGURE A- 17

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DATE DRILLED 9/11/2023 BORING NO. B-17
GROUND ELEVATION 5,862'± SHEET 1 OF 1
METHOD OF DRILLING CME 50, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 12 inches thick.
	■	⧗	25	10.7	122.8			FILL: Grayish brown, moist, sandy lean CLAY.
	■						CL	ALLUVIUM: Gray, moist, firm, lean CLAY; trace sand.
	■	⧗	9	23.3	95.2			
10		⧗	11	26.8	90.5			Stiff.
				▽				@13': Groundwater encountered during drilling.
		⧗	37					Wet; very stiff.
20		⧗	50	22.8	106.5			DAWSON FORMATION: Grayish brown, moist, moderately soft, CLAYSTONE.
		⧗	50/8"	22.8	105.0			Moderately hard; trace iron staining.
		⧗	50/9"					
30								Total Depth: 29.8 feet. Groundwater was encountered during drilling at approximately 13 feet. Backfilled with on-site soil after drilling on 9/11/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
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FIGURE A- 18

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DATE DRILLED 9/12/2023 BORING NO. B-18

GROUND ELEVATION 5,854'± SHEET 1 OF 1

METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 8 inches thick.
	■	⧗	21	13.2	99.9	▨	CL	ALLUVIUM: Gray, dry to moist, very stiff, lean CLAY with sand.
	■	⧗	27	17.8	102.8	▨		With iron staining.
10		⧗	15	17.5	108.5	▨		
				▽		▨		@13': Groundwater encountered during drilling.
		⧗	35	13.2	109.8	▨	SP-SC	Yellowish brown with red, wet, medium dense, fine to coarse SAND with clay.
20		☒	6			▨		
		⧗	32	8.5	120.9	▨		
		☒				▨		
30								Total Depth: 29 feet. Groundwater was encountered during drilling at approximately 13 feet. Backfilled with on-site soil after drilling on 9/12/2023.
40								

Notes:

Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

DATE DRILLED 9/12/2023 BORING NO. B-19
GROUND ELEVATION 5,856'± SHEET 1 OF 1
METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 6 inches thick.
	■	⧗	18	12.6	91.5	▨	CL	ALLUVIUM: Gray, dry to moist, stiff, lean CLAY with sand.
	■	⧗	24	18.7	107.8	▨		Gray and orange; very stiff; with iron staining.
		⧗	24	0.3		▨	SP-SC	Yellowish brown with red, dry, medium dense, fine to coarse SAND with clay.
10								
				▽				@12': Groundwater encountered during drilling.
	■							Loose; wet.
	■			15.4				
20								
	■							
	■			16.5				
								Total Depth: 29 feet. Groundwater was encountered during drilling at approximately 12 feet. Backfilled with on-site soil after drilling on 9/12/2023.
30								
40								

Notes:
Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

DATE DRILLED 9/12/2023 BORING NO. B-20
GROUND ELEVATION 5,854'± SHEET 1 OF 1
METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 4 inches thick.
	■						CL	ALLUVIUM: Brown, moist, stiff, sandy lean CLAY; trace gravel.
	■	⧗	18	15.8	102.4			
	■	⧗	18	22.7	100.8			Gray with orange; with calcium mineralizations.
10		⧗	8	22.2	103.2			Firm.
				▽				@12': Groundwater encountered during drilling.
		⧗	9	21.9	100.6			Wet.
20		⧗	18	9.0	124.6		SW-SC	Orangish brown, moist to wet, loose, fine to coarse SAND with clay; trace gravel.
		⧗	17	5.8	119.7			Dark brown.
30		⧗	11	21.8			CL	Dark brown, moist, stiff, sandy lean CLAY.
								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 12 feet. Backfilled with on-site soil after drilling on 9/12/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40								

FIGURE A- 21

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SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 11/23

DATE DRILLED 9/12/2023 BORING NO. B-21

GROUND ELEVATION 5,851'± SHEET 1 OF 1

METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 6 inches thick.
	■	⧗	20	16.2	101.7	▨	CL	ALLUVIUM: Brownish gray, dry to moist, stiff, lean CLAY with rootlets and calcium mineralizations.
	■	⧗	22	22.2	103.9			Gray; moist; very stiff.
		⧗	9	▽ 16.0	113.4			@9': Groundwater encountered during drilling.
10						░	SP	Yellowish brown, moist, loose, fine to coarse SAND; trace clay and gravel.
		⧗	13	20.7	104.2			
		⧗	14	11.5	115.0			Yellowish brown; wet.
20								
		☒						
		☒	10	21.5				
30								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 9 feet. Backfilled with on-site soil after drilling on 9/12/2023.
40								

Notes:

Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 22

DATE DRILLED 9/12/2023 BORING NO. B-22

GROUND ELEVATION 5,851'± SHEET 1 OF 1

METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▨	CL	ALLUVIUM: Brown, dry to moist, stiff, lean CLAY; trace sand and rootlets.
	■	⧗	17	18.0		▨		
	■	⧗	21	23.0	90.8	▨		Gray; moist; very stiff; with calcium mineralizations.
		⧗	7	▽ 28.0	93.9	▨		@9': Groundwater encountered during drilling. Firm.
10						▨		
		⧗	10	21.9	105.3	▨	CL	Brown, moist, firm, sandy lean CLAY.
		⧗	5	23.1	102.8	▨		Soft.
20						▨		
		⧗	8	33.1	88.6	▨		Firm.
		⧗	10	29.7	92.6	▨		Grayish brown.
30								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 9 feet. Backfilled with on-site soil after drilling on 9/21/2023.
40								

Notes:

Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 23

DATE DRILLED 9/12/2023 BORING NO. B-23

GROUND ELEVATION 5,848'± SHEET 1 OF 1

METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0							CL	ALLUVIUM: Brown, dry to moist, stiff, lean CLAY; trace sand.
			20	16.0				
			17	26.5	86.7			Grayish brown; moist.
10			7	▽ 26.8	94.3			Brown; moist to wet; firm. @9': Groundwater encountered during drilling.
			7	18.5	105.5			
20			6	29.8	93.0			
							SP-SC	Orangish brown, wet, loose, fine to coarse SAND with clay.
			7					
			7	33.9	86.5		CL	Gray, wet, firm, lean CLAY with sand.
30								Total Depth: 30 feet. Groundwater was encountered during drilling at approximately 9 feet. Backfilled with on-site soil after drilling on 9/21/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
40								

FIGURE A- 24

DATE DRILLED 9/11/2023 BORING NO. P-1

GROUND ELEVATION 5,851'± SHEET 1 OF 1

METHOD OF DRILLING CME 50, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 12 inches thick.
	■	⧗	16	14.0	98.9	▨	CL	ALLUVIUM: Brown, dry to moist, stiff, lean CLAY; trace sand.
	■	⧗	15	20.7	104.6	▨		Gray; moist; trace calcium mineralizations.
						▨	CL	Gray, moist, firm, sandy lean CLAY.
		⧗	9	26.8	89.2	▨		
10								Total Depth: 10 feet. Groundwater was not encountered during drilling. Backfilled with on-site soil after drilling on 9/11/2023.
20								
30								
40								

Notes:
Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

DATE DRILLED 9/11/2023 BORING NO. P-2

GROUND ELEVATION 5,850'± SHEET 1 OF 1

METHOD OF DRILLING CME 50, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0	■					▨		TOPSOIL: Approximately 2 inches thick.
	■	⧗	34	10.4	119.9	▨		FILL: Dark brown, dry to moist, medium dense, clayey SAND with rootlets.
	■					▨	CL	ALLUVIUM: Brown, moist, stiff, lean CLAY; trace sand.
	■	⧗	18	19.1	107.5	▨		
						▨	CL	Dark brown, moist, firm, sandy lean CLAY.
		⧗	9	28.5	92.3	▨		
10								Total Depth: 10 feet. Groundwater was not encountered during drilling. Backfilled with on-site soil after drilling on 9/11/2023.
20								
30								
40								

Notes:

Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

DATE DRILLED 9/11/2023 BORING NO. P-3

GROUND ELEVATION 5,850'± SHEET 1 OF 1

METHOD OF DRILLING CME 50, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 12 inches thick.
	■	⧓	12	15.2	108.0	▨	CL	ALLUVIUM: Brown and gray, moist, firm, sandy lean CLAY.
	■	⧓	13	19.5	104.6	▨		
				▽		▨		@6': Groundwater encountered during drilling.
						░	SW	Reddish brown, wet, medium dense, fine to coarse SAND; trace clay and gravel.
		⧓	32	1.8		░		
10								Total Depth: 10 feet. Groundwater was encountered during drilling at approximately 6 feet. Backfilled with on-site soil after drilling on 9/11/2023.
20								
30								
40								

Notes:

Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

DATE DRILLED 9/11/2023 BORING NO. P-4

GROUND ELEVATION 5,842'± SHEET 1 OF 1

METHOD OF DRILLING CME 50, 4" Solid Stem Auger (Dakota Drilling)

DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"

SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 12 inches thick.
	■	⧗	7	9.4	102.8	▨	SC	ALLUVIUM: Gray, moist, very loose, clayey SAND.
	■	⧗	7	10.7 ▽	113.2	░	SP	Reddish gray, wet, very loose, fine to coarse SAND; trace clay and gravel. @5': Groundwater was encountered during drilling at approximately 5 feet.
		☒	2					
10								Total Depth: 10 feet. Groundwater was encountered during drilling at approximately 5 feet. Backfilled with on-site soil after drilling on 9/11/2023. Notes: Groundwater may rise to a level higher than that measured in borehole due to seasonal variations in precipitation and several other factors as discussed in the report. The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.
20								
30								
40								

FIGURE A- 28

DATE DRILLED 9/12/2023 BORING NO. P-5
GROUND ELEVATION 5,858'± SHEET 1 OF 1
METHOD OF DRILLING CME 55, 4" Solid Stem Auger (Dakota Drilling)
DRIVE WEIGHT 140 lbs. (Spooling Cathead) DROP 30"
SAMPLED BY MEO LOGGED BY MEO REVIEWED BY BFG

DEPTH (feet)	SAMPLES Bulk	SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DESCRIPTION/INTERPRETATION
0								TOPSOIL: Approximately 4 inches thick.
	■					▨	CL	ALLUVIUM: Gray with orange, dry to moist, stiff, sandy lean CLAY with iron staining.
	■	⧗	10	13.3	96.4	▨		
	■	⧗	32	9.0	113.9	▨		
						░	SC	Gray with orange, dry to moist, medium dense, clayey SAND with iron staining.
		⧗	24	8.7	107.8	░		
10								Total Depth: 10 feet. Groundwater was not encountered during drilling. Backfilled with on-site soil after drilling on 9/12/2023.
20								
30								
40								

Notes:
Groundwater, though not encountered at the time of drilling, may rise to a higher level due to seasonal variations in precipitation and several other factors as discussed in the report.

The ground elevation shown above is an estimation only. It is based on our interpretations of published maps and other documents reviewed for the purposes of this evaluation. It is not sufficiently accurate for preparing construction bids and design documents.

FIGURE A- 29

APPENDIX B

Laboratory Testing

APPENDIX B

LABORATORY TESTING

Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D2488. Soil classifications are indicated on the logs of the exploratory borings in Appendix A.

In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory excavations were evaluated in general accordance with ASTM D2937 and ASTM D2216. The test results are presented on the logs of the exploratory excavations in Appendix A.

Atterberg Limits

Tests were performed on selected representative soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D4318. These test results were utilized to evaluate the soil classification in accordance with the USCS. The test results are incorporated in the logs in Appendix A, and are summarized on Figures B-1 and B-2.

200 Wash

An evaluation of the percentage of particles finer than the No. 200 sieve in a selected soil sample was performed in general accordance with ASTM D1140. The results of the tests are presented on Figures B-3 through B-5.

Gradation and Hydrometer Analysis

Gradation analysis and hydrometer analysis tests were performed on select representative soil samples in general accordance with ASTM D422. The test results were utilized in evaluating the soil classifications in accordance with the Unified Soil Classification System. The grain-size distribution curves are shown on Figure B-6 through B-26.

Consolidation/Swell Tests

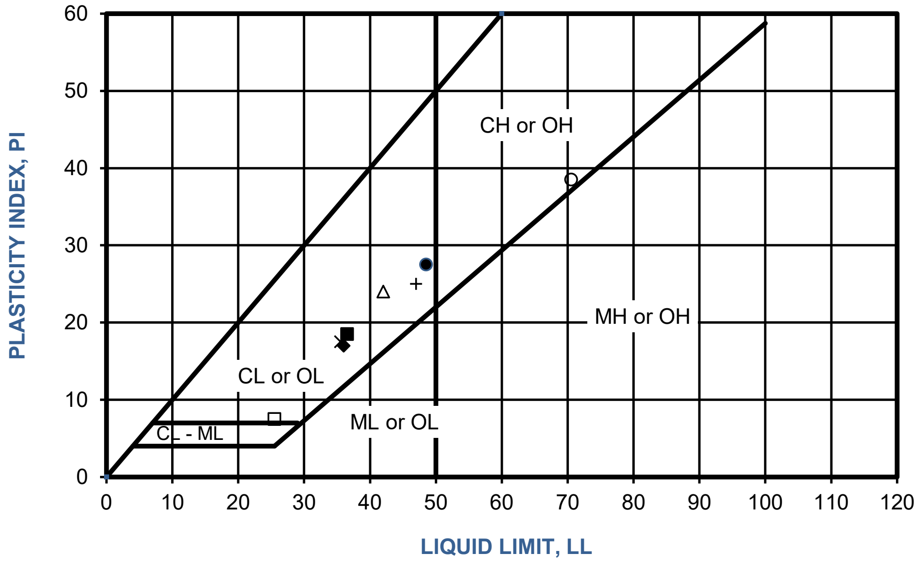
The swell potential of selected materials was evaluated in general accordance with ASTM D4546, Method B. Relatively undisturbed specimens were loaded with a specified surcharge before inundation with tap water. Readings of volumetric swell were recorded until completion of primary swell. The results of the tests are presented on Figures B-27 through B-40.

Soil Corrosivity Tests

Soil pH and resistivity tests were performed on representative samples in general accordance with ASTM D4972 and AASHTO T288, respectively. The soluble sulfate of a selected sample was evaluated in general accordance with CDOT Test Method CP-L 2103. The chloride content of a selected sample was evaluated in general accordance with CDOT Test Method CP-L 2104. The test results are presented on Figure B-41.

SYMBOL	LOCATION	DEPTH (ft)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	EQUIVALENT USCS
●	B-2	19.0-20.0	49	21	28	CL	CL
■	B-5	1.0-2.0	37	18	19	CL	CL
◆	B-6	1.0-2.0	36	19	17	CL	CL
○	B-11	1.0-2.0	71	32	39	CH	CH
□	B-12	1.0-2.0	26	18	8	CL	CL
Δ	B-13	9.0-10.0	42	18	24	CL	CL
X	B-16	9.0-10.0	36	18	18	CL	CL
+	B-19	4.0-5.0	47	22	25	CL	CL

NP - INDICATES NON-PLASTIC



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

FIGURE B-1

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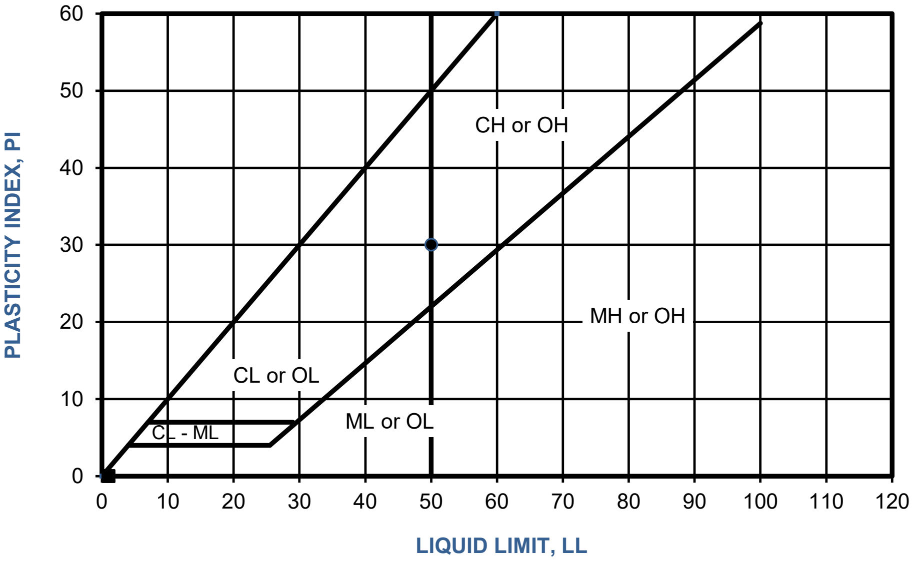
ATTERBERG LIMITS TEST RESULTS
SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23

SYMBOL	LOCATION	DEPTH (ft)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve)	EQUIVALENT USCS
●	B-21	1.0-2.0	50	20	30	CH	CH

NP - INDICATES NON-PLASTIC



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

FIGURE B-2

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ATTERBERG LIMITS TEST RESULTS
SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23

SAMPLE LOCATION	SAMPLE DEPTH (ft)	DESCRIPTION	PERCENT PASSING NO. 4	PERCENT PASSING NO. 200	EQUIVALENT USCS
B-3	4.0-5.0	Brownish Orange Clayey SAND	100	45	SC
B-5	14.0-15.0	Gray Fine to Course SAND with Clay; Trace Gravel	92	11	SP-SC
B-6	14.0-15.0	Grayish Orange Fine to Course SAND with Clay; Trace Gravel	91	8	SP-SC
B-7	1.0-2.0	Brownish White Lean CLAY; Trace Sand	100	88	CL
B-8	24.0-24.9	Gray Fine to Course SAND with Clay; Trace Gravel	89	5	SP-SC
B-9	19.0-20.0	Tan and Gray Fine to Course SAND with Clay; Trace Gravel	97	6	SP-SC
B-10	1.0-2.0	Black Clayey SAND; Trace Gravel	99	47	SC
B-11	19.0-20.0	Tan SAND; Trace Gravel	91	3	SP
B-14	1.0-2.0	Dark Gray Lean Clay; Trace Sand	100	88	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1140

FIGURE B-3

NO. 200 SIEVE ANALYSIS TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO

SAMPLE LOCATION	SAMPLE DEPTH (ft)	DESCRIPTION	PERCENT PASSING NO. 4	PERCENT PASSING NO. 200	EQUIVALENT USCS
B-15	1.0-2.0	Gray Lean CLAY; Trace Sand	100	93	CL
B-16	24.0-25.0	Brown Sandy Lean CLAY; Trace Gravel	99	61	CL
B-17	4.0-5.0	Gray Lean CLAY	100	94	CL
B-20	9.0-10.0	Gray Sandy Lean CLAY; Trace Gravel	99	59	CL
B-22	1.0-2.0	Brown Lean CLAY; Trace Sand	100	94	CL
P-1	1.0-2.0	Brown Lean CLAY; Trace Sand	100	92	CL
P-2	1.0-2.0	Dark Brown Clayey SAND; Trace Gravel	98	49	SC
P-2	4.0-5.0	Brown Lean CLAY; Trace Sand	100	88	CL
P-3	4.0-5.0	Brown and Gray Sandy Lean CLAY	100	63	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1140

FIGURE B-4

NO. 200 SIEVE ANALYSIS TEST RESULTS

SAMPLE LOCATION	SAMPLE DEPTH (ft)	DESCRIPTION	PERCENT PASSING NO. 4	PERCENT PASSING NO. 200	EQUIVALENT USCS
P-5	1.0-2.0	Gray and Orange Sandy Lean CLAY	100	67	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1140

FIGURE B-5

NO. 200 SIEVE ANALYSIS TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO

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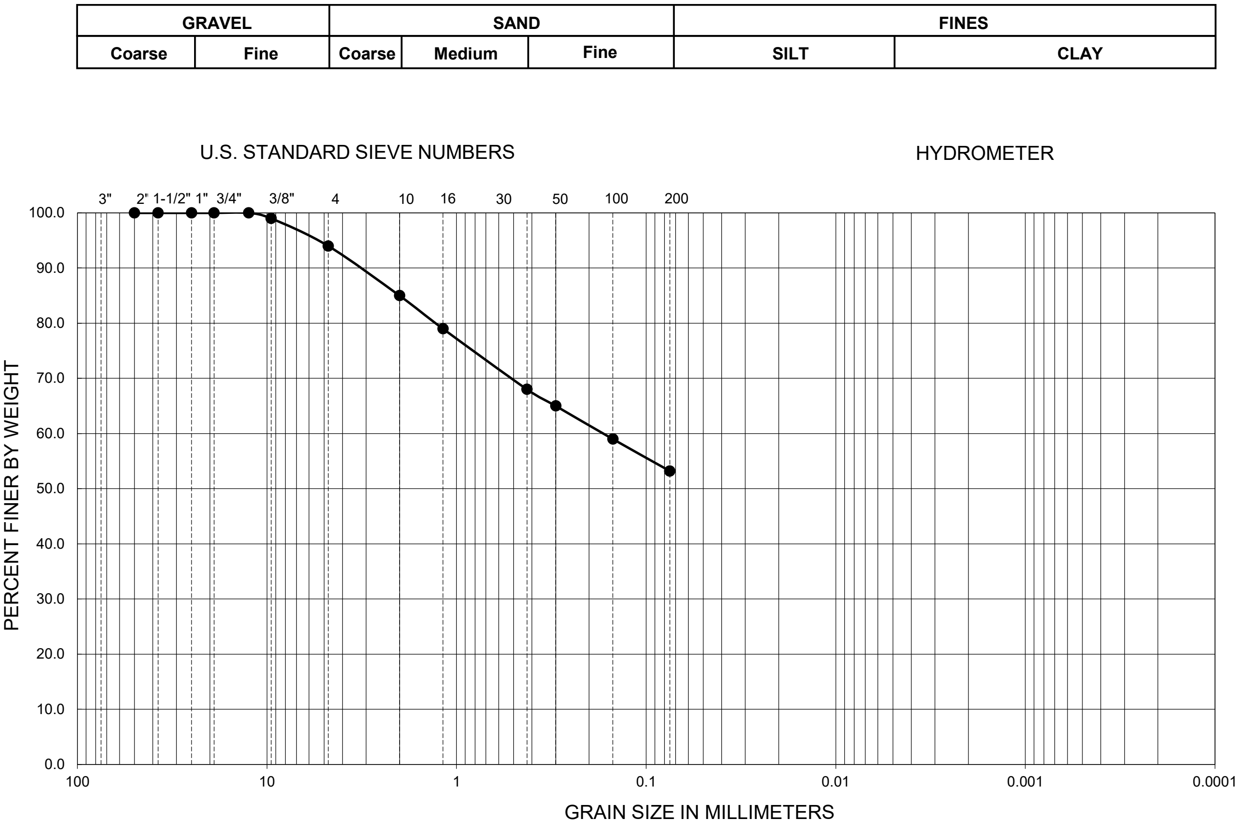

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-1	29.0-30.0	--	--	--	--	--	--	--	--	53	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 6913

FIGURE B-6

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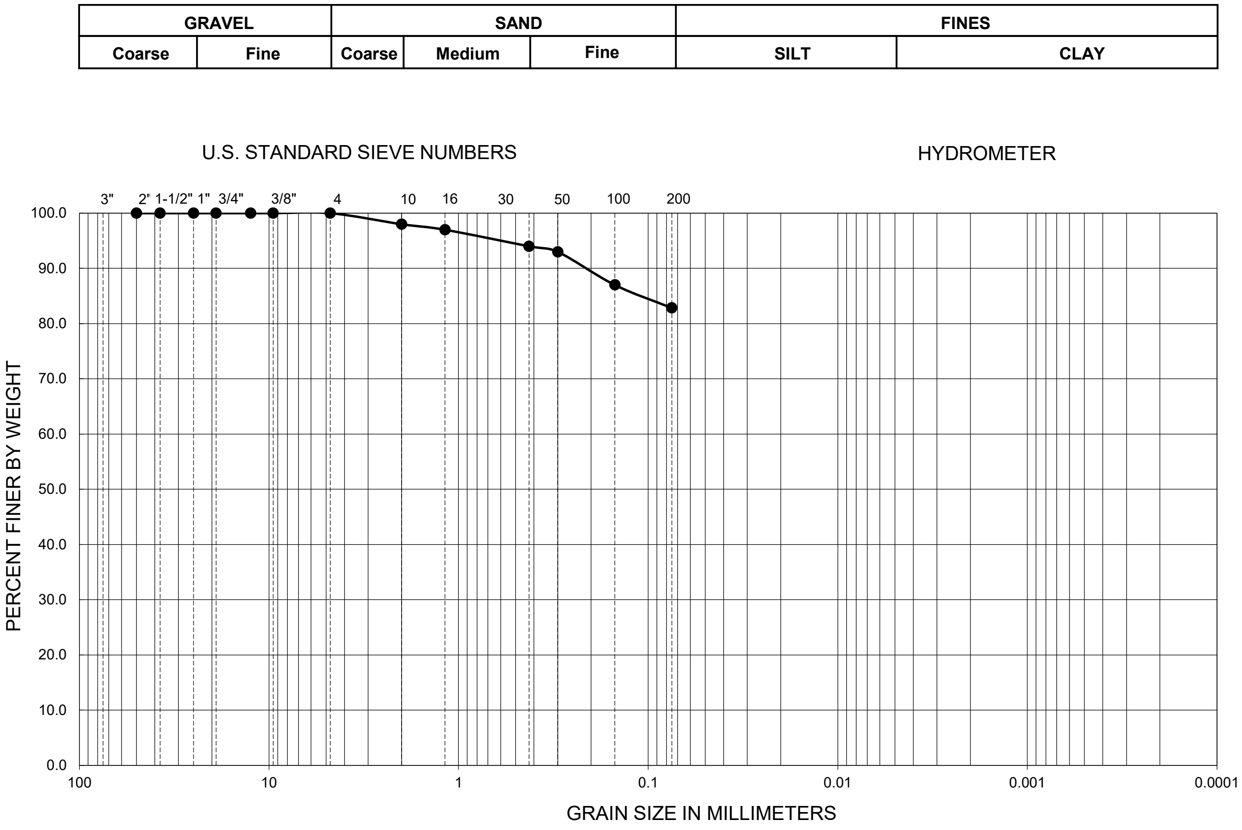
GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-2	14.0-15.0	--	--	--	--	--	--	--	--	83	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 6913

FIGURE B-7

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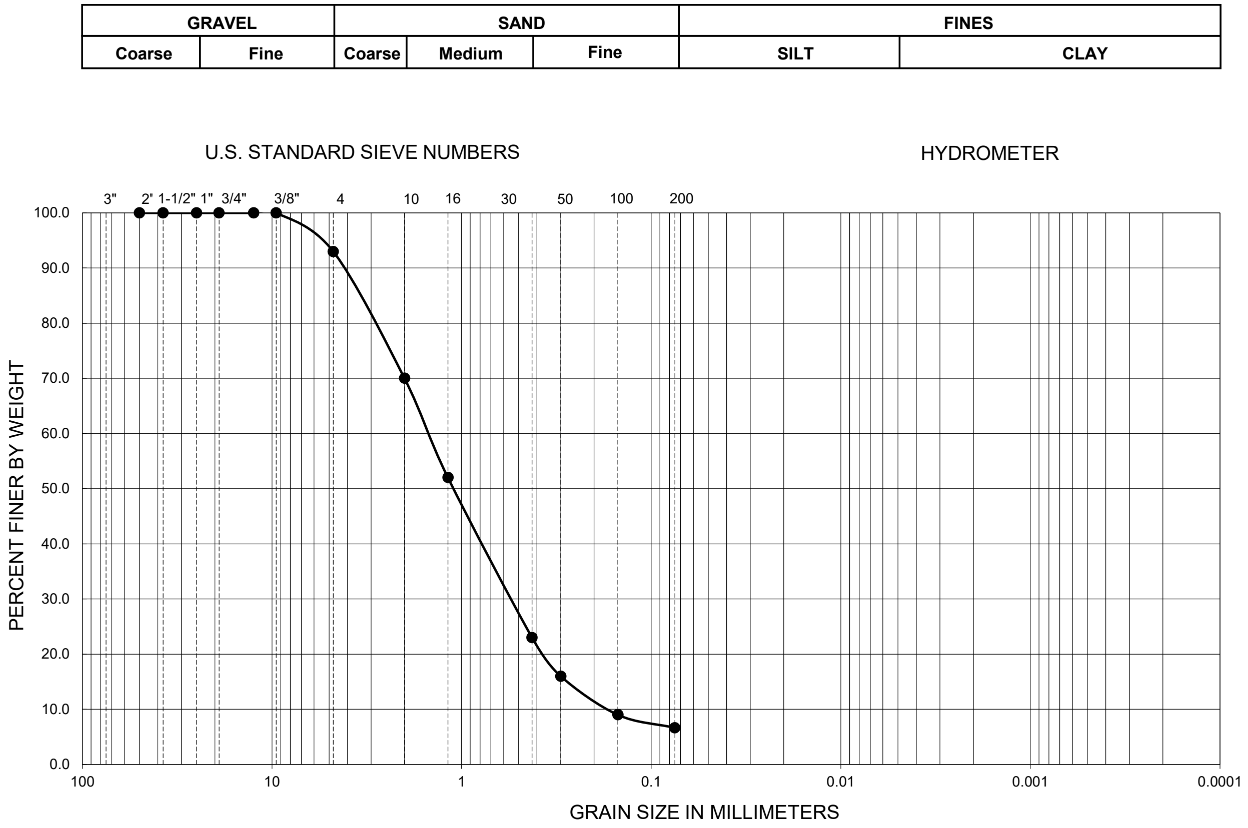
GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-3	19.0-20.0	--	--	--	0.18	0.55	1.60	8.9	1.1	6.7	SW-SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 6913

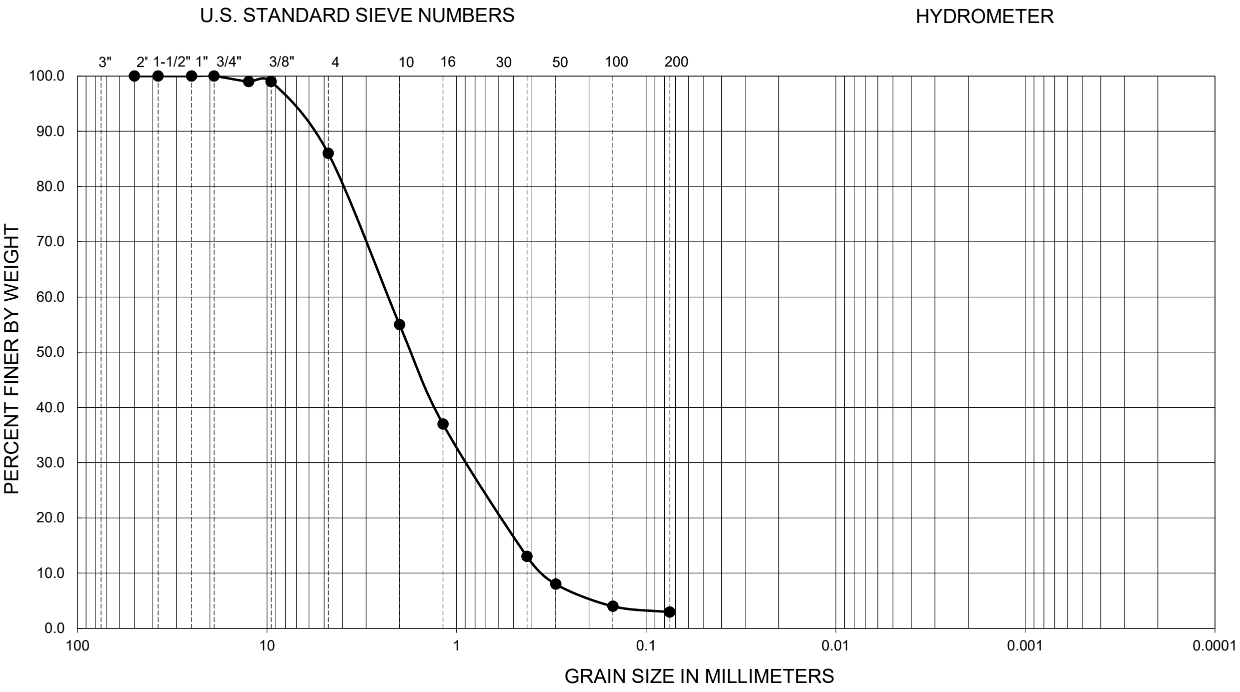
FIGURE B-8

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-4	9.0-10.0	--	--	--	0.37	0.90	2.40	6.5	0.9	2.9	SP

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FIGURE B-9

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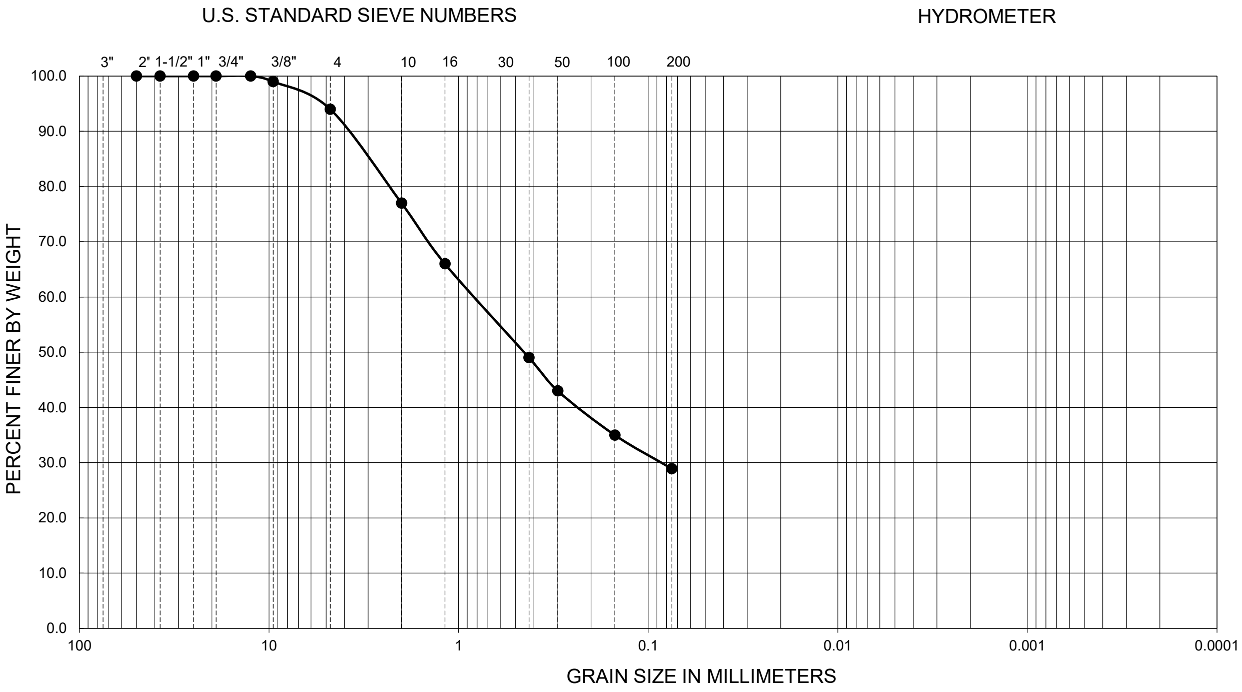
GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-7	14.0-14.6	--	--	--	--	--	--	--	--	29	SC

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FIGURE B-10

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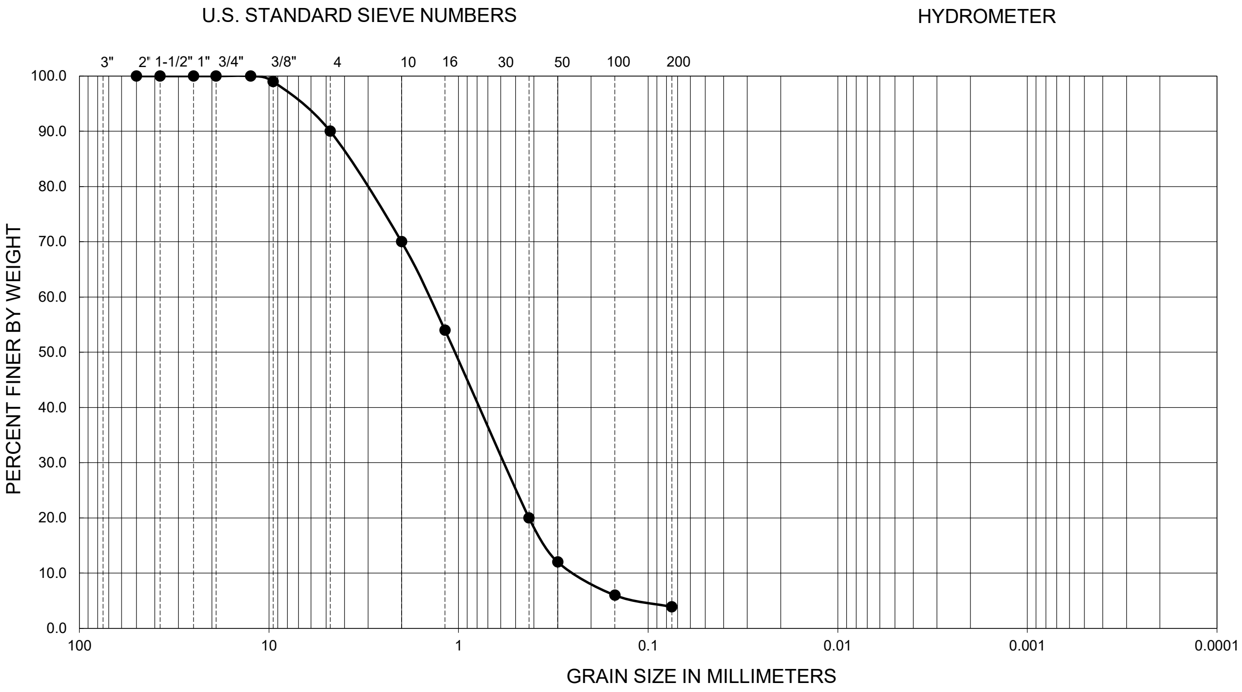
GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23

GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-8	14.0-15.0	--	--	--	0.26	0.58	1.60	6.2	0.8	3.9	SP

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FIGURE B-11

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GRADATION TEST RESULTS
SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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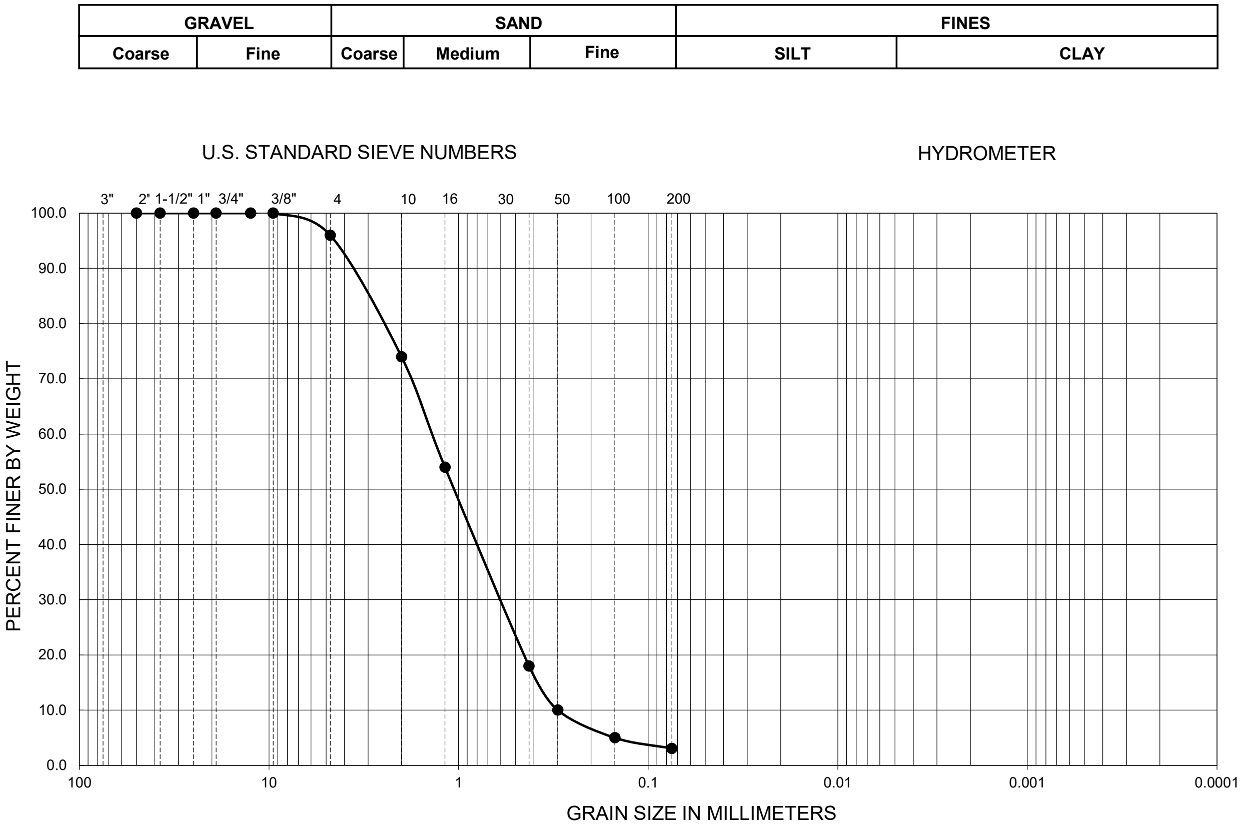

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-10	14.0-15.0	--	--	--	0.30	0.60	1.50	5.0	0.8	3.1	SP

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FIGURE B-12

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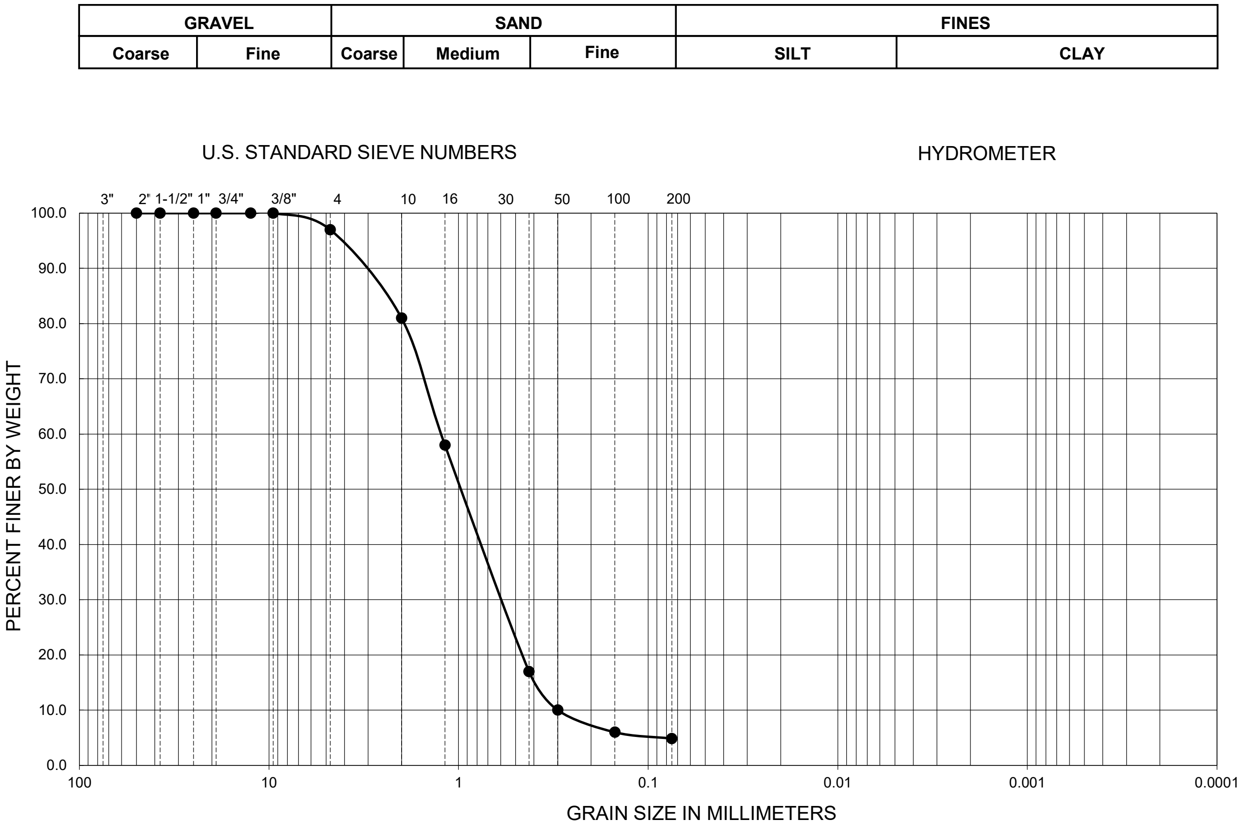
GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
502725001 | 10/23



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-14	9.0-10.0	--	--	--	0.30	0.60	1.40	4.7	0.9	4.9	SP

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FIGURE B-13

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GRADATION TEST RESULTS
SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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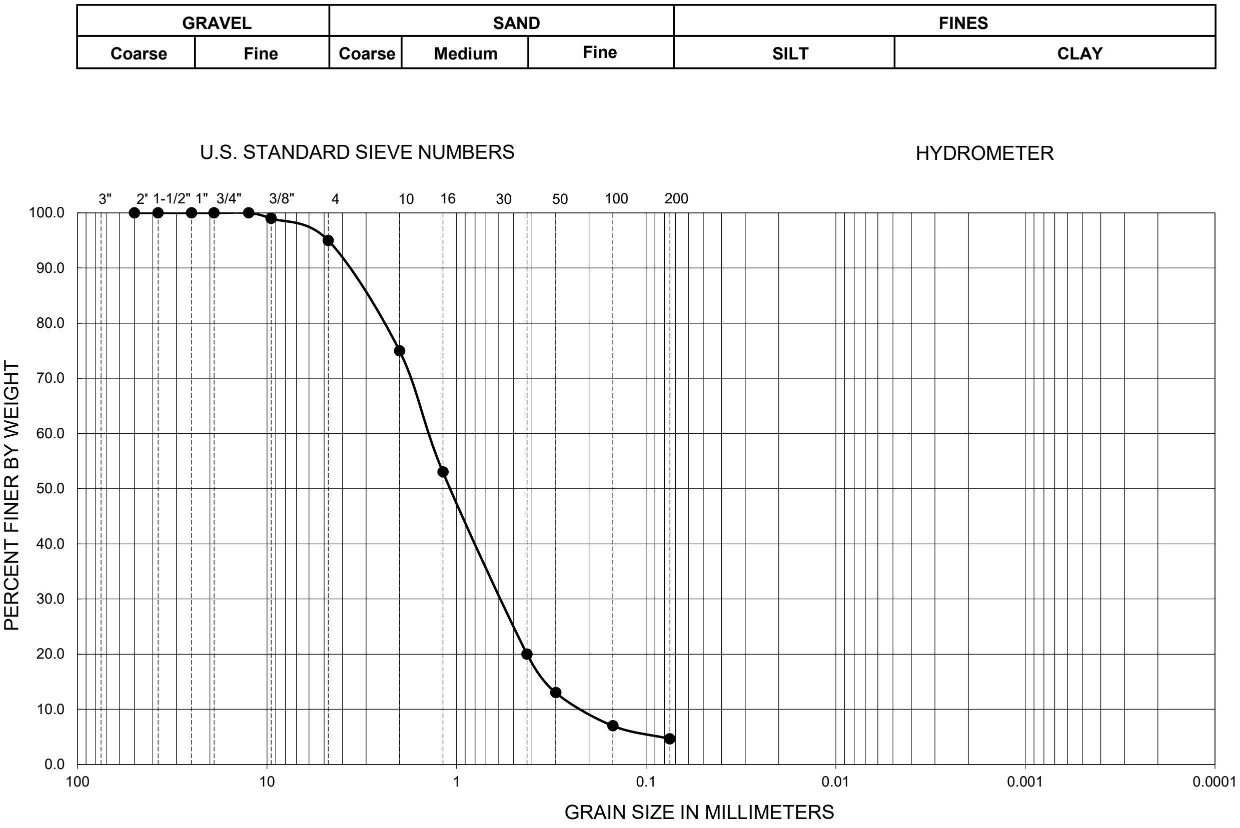

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-15	14.0-15.0	--	--	--	0.22	0.50	1.50	6.8	0.8	4.7	SP

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FIGURE B-14

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GRADATION TEST RESULTS
SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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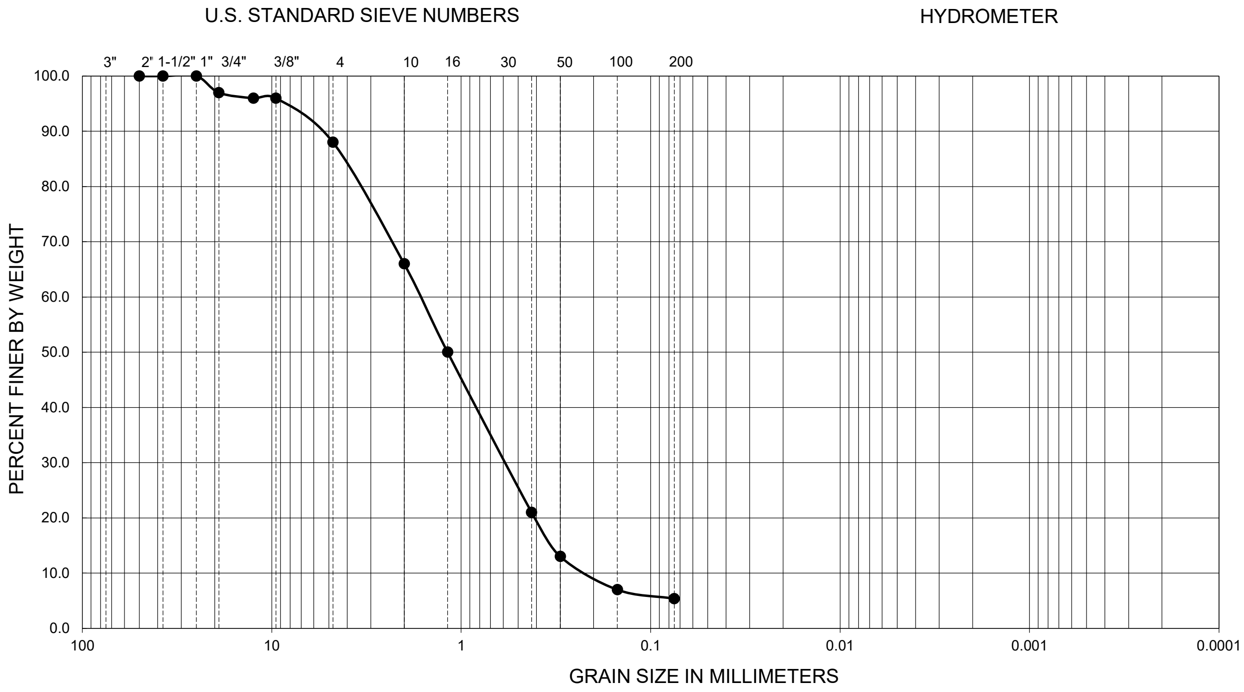
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	B-20	24.0-25.0	--	--	--	0.24	0.59	1.25	5.2	1.2	5.4	SW-SC

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FIGURE B-15

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GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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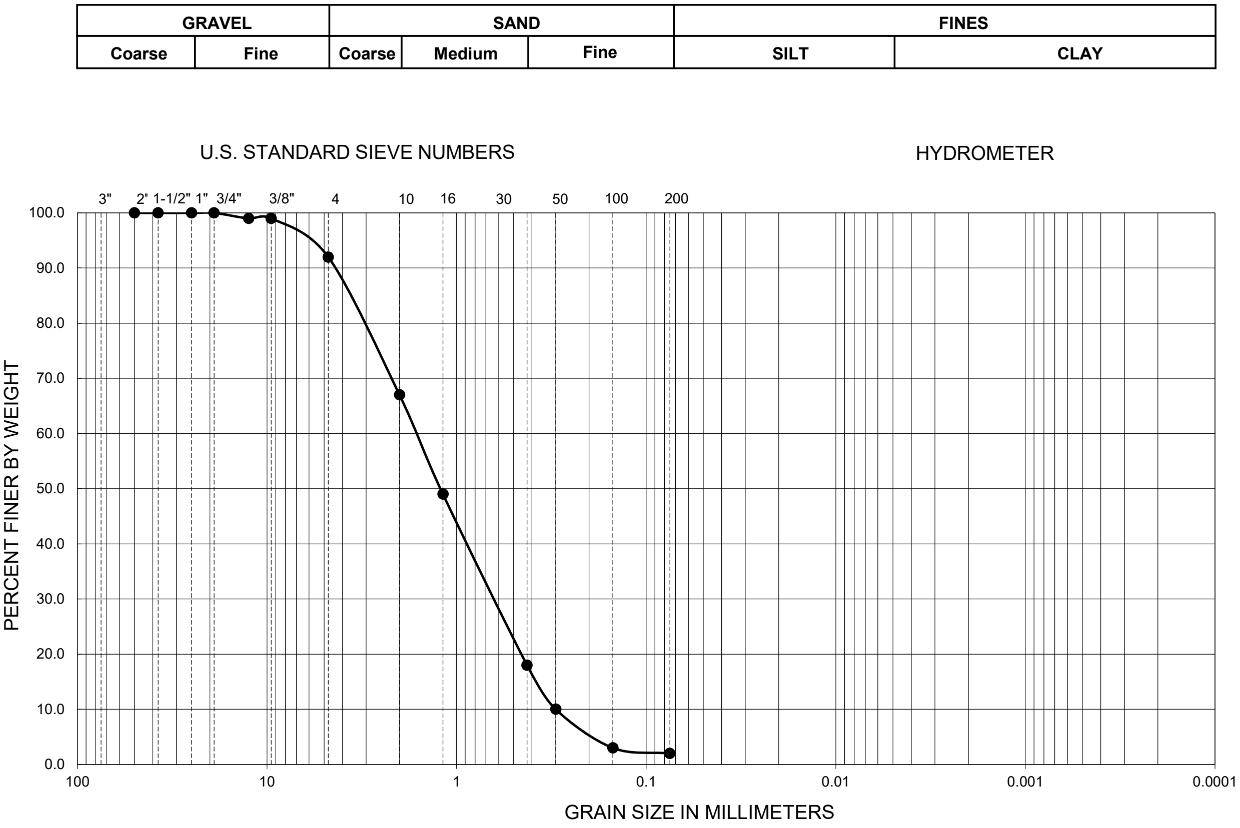

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D$_{10}$	D$_{30}$	D$_{60}$	C$_u$	C$_c$	Passing No. 200 (percent)	Equivalent USCS
●	B-21	19.0-20.0	--	--	--	0.30	0.63	1.60	5.3	0.8	2	SP

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FIGURE B-16

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GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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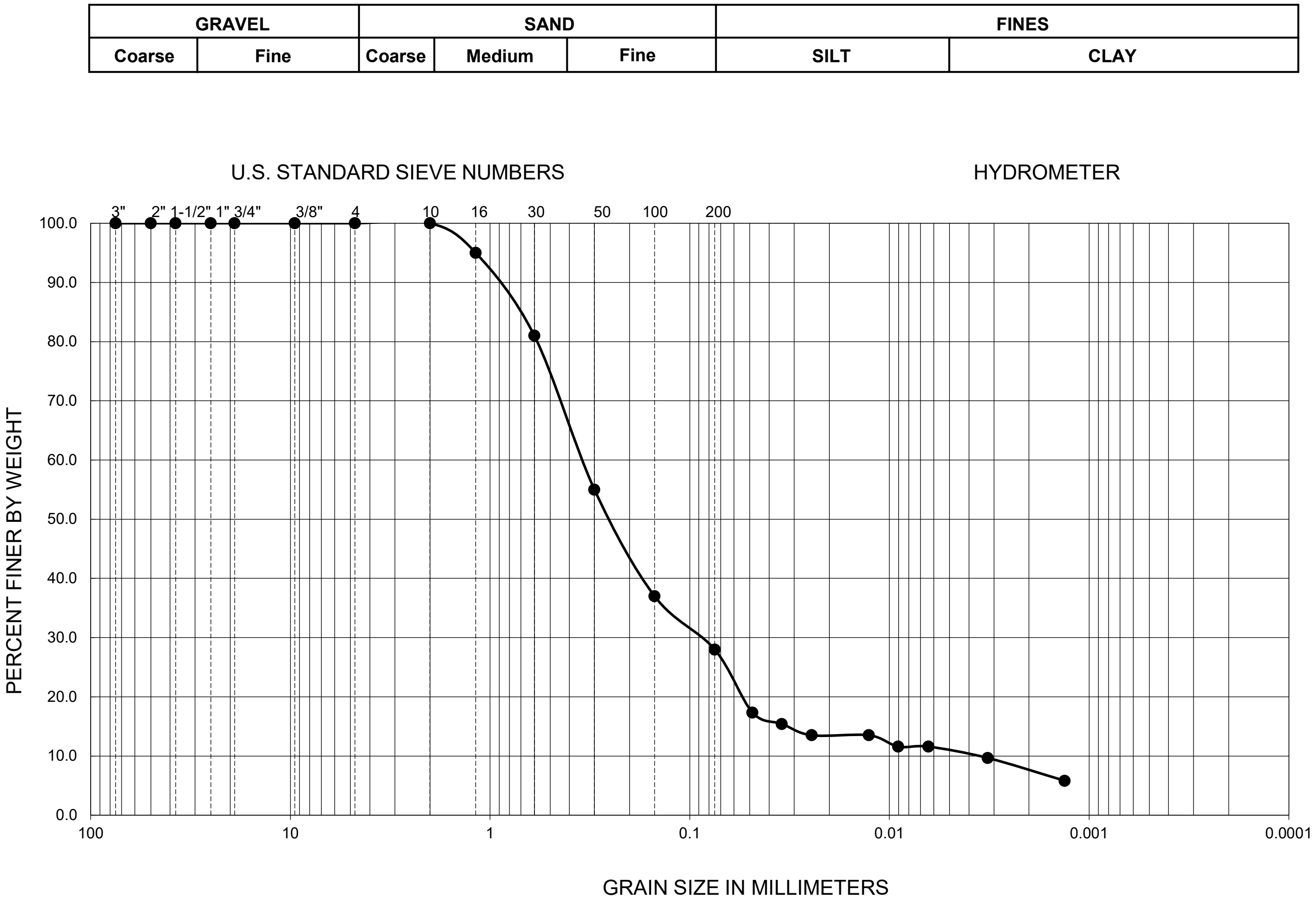

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-8 thru B-13	0.0-5.0	--	--	--	--	--	--	--	--	28	SC

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 7928

FIGURE B-17

GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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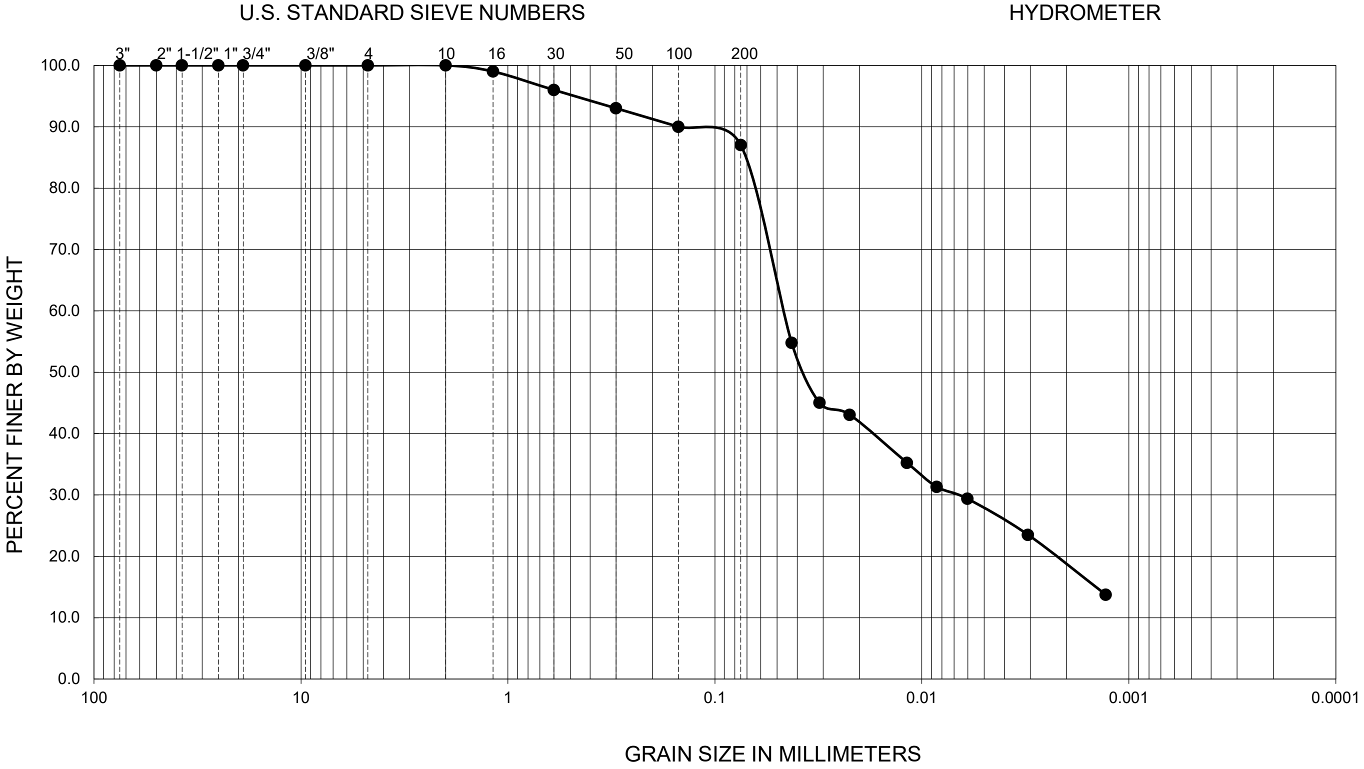
GRAVEL		SAND			FINES	
Coarse	Fine	Coarse	Medium	Fine	SILT	CLAY



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (%)	USCS
●	B-14, B-15, B-22, B-23	0.0-5.0	--	--	--	--	--	--	--	--	87	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 7928

FIGURE B-18

GRADATION TEST RESULTS

SALISBURY PARK NORTH
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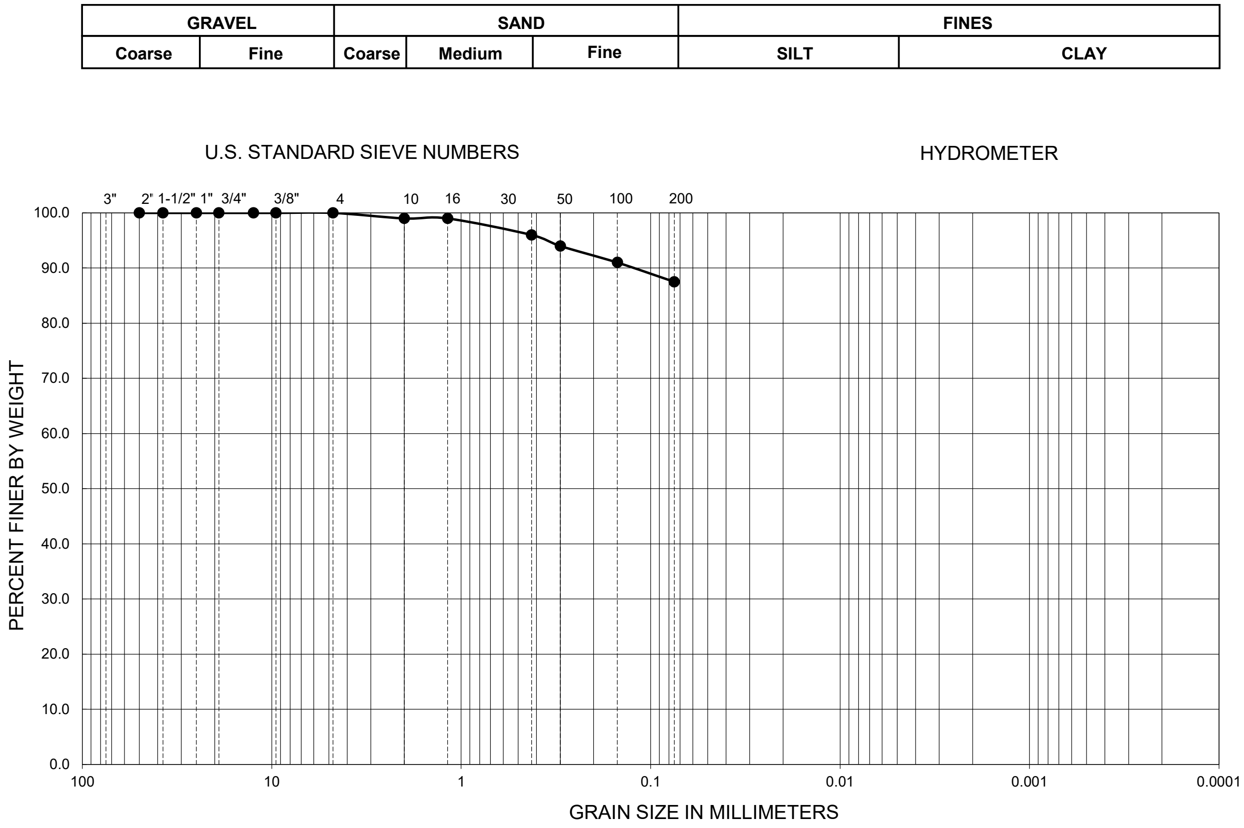

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-1	4.0-5.0	--	--	--	--	--	--	--	--	88	CL

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FIGURE B-19

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GRADATION TEST RESULTS
SALISBURY PARK NORTH
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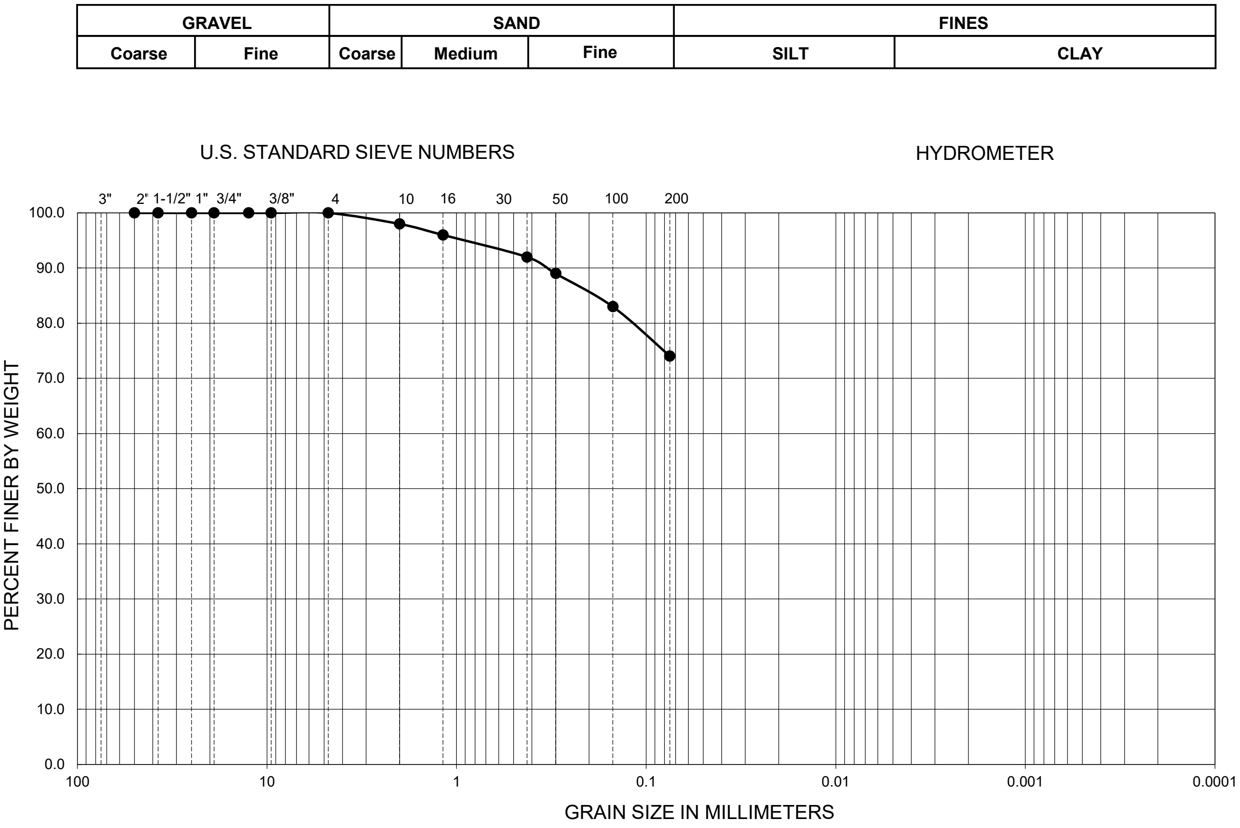

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-1	9.0-10.0	--	--	--	--	--	--	--	--	74	CL

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FIGURE B-20

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GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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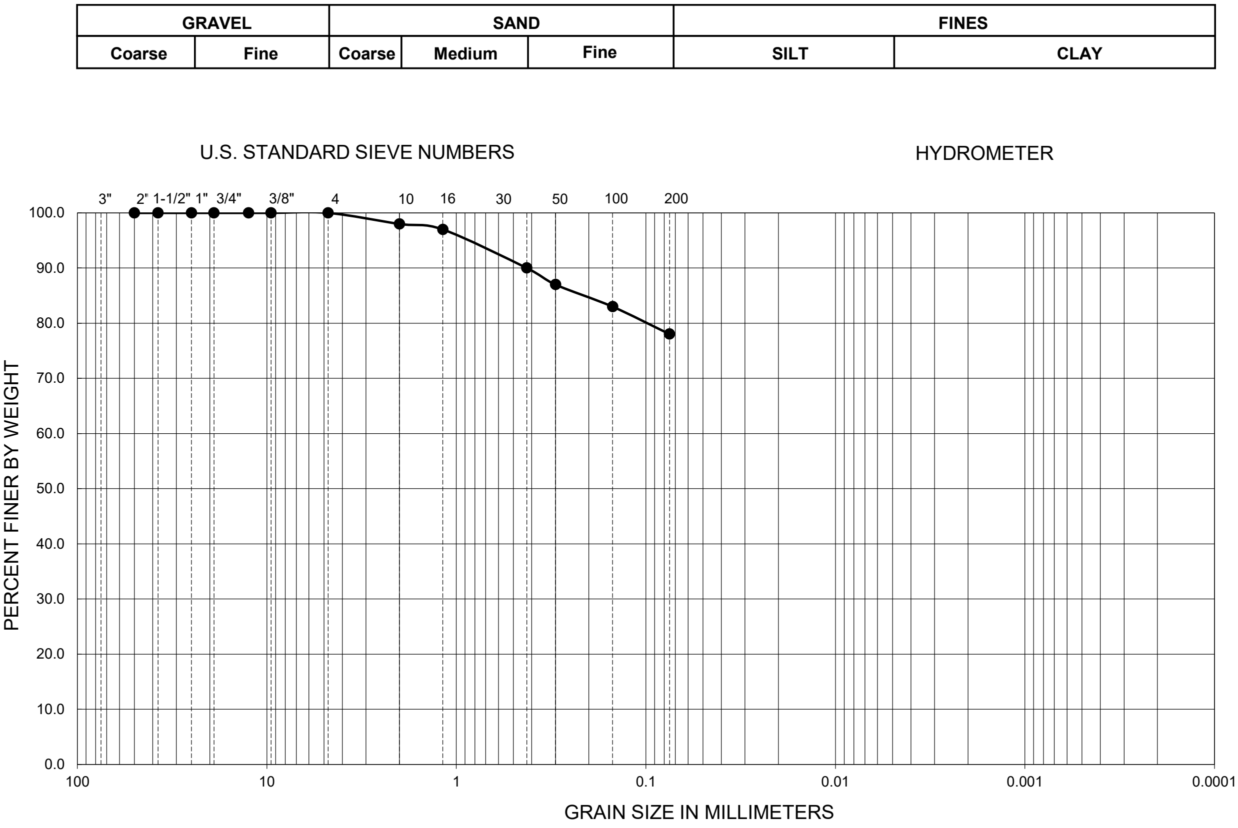

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-2	9.0-10.0	--	--	--	--	--	--	--	--	78	CL

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FIGURE B-21

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GRADATION TEST RESULTS

SALISBURY PARK NORTH
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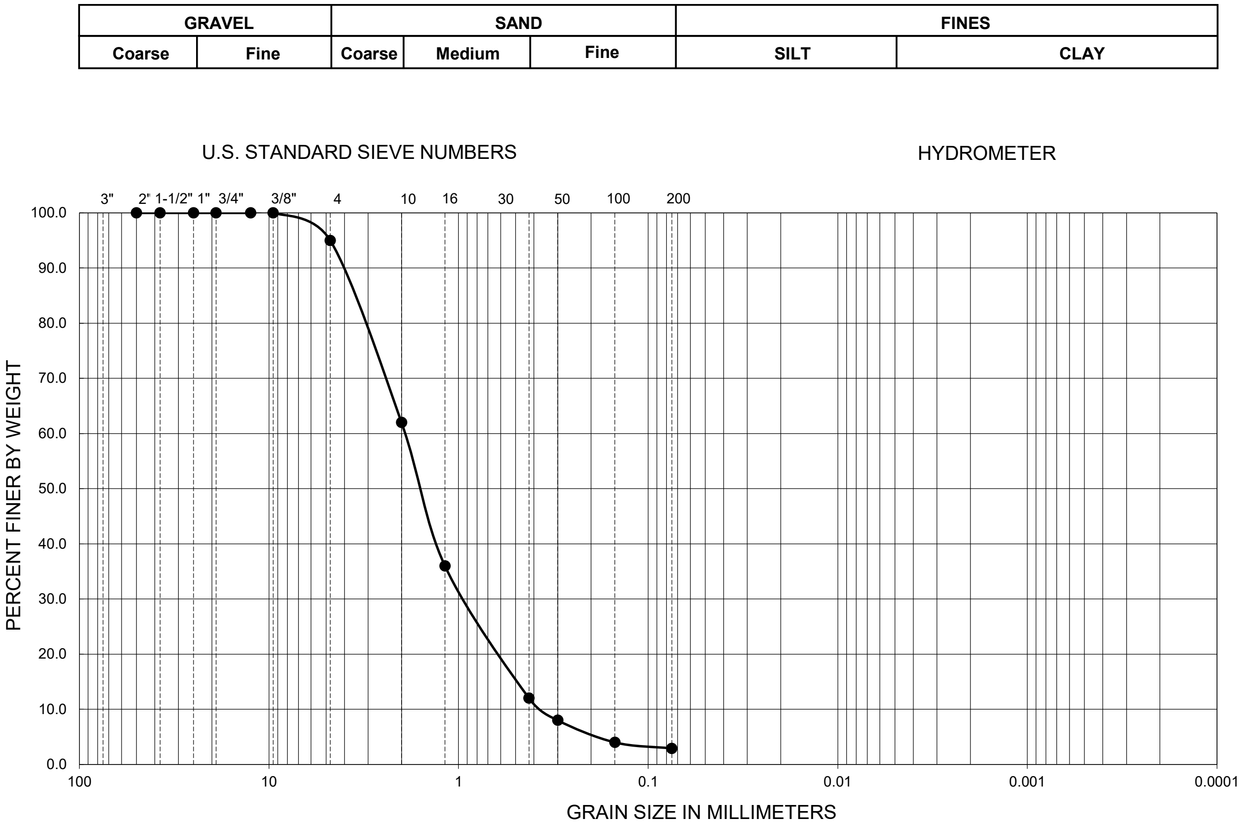

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-3	9.0-10.0	--	--	--	0.38	0.93	1.90	5.0	1.2	2.9	SW

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FIGURE B-22

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GRADATION TEST RESULTS
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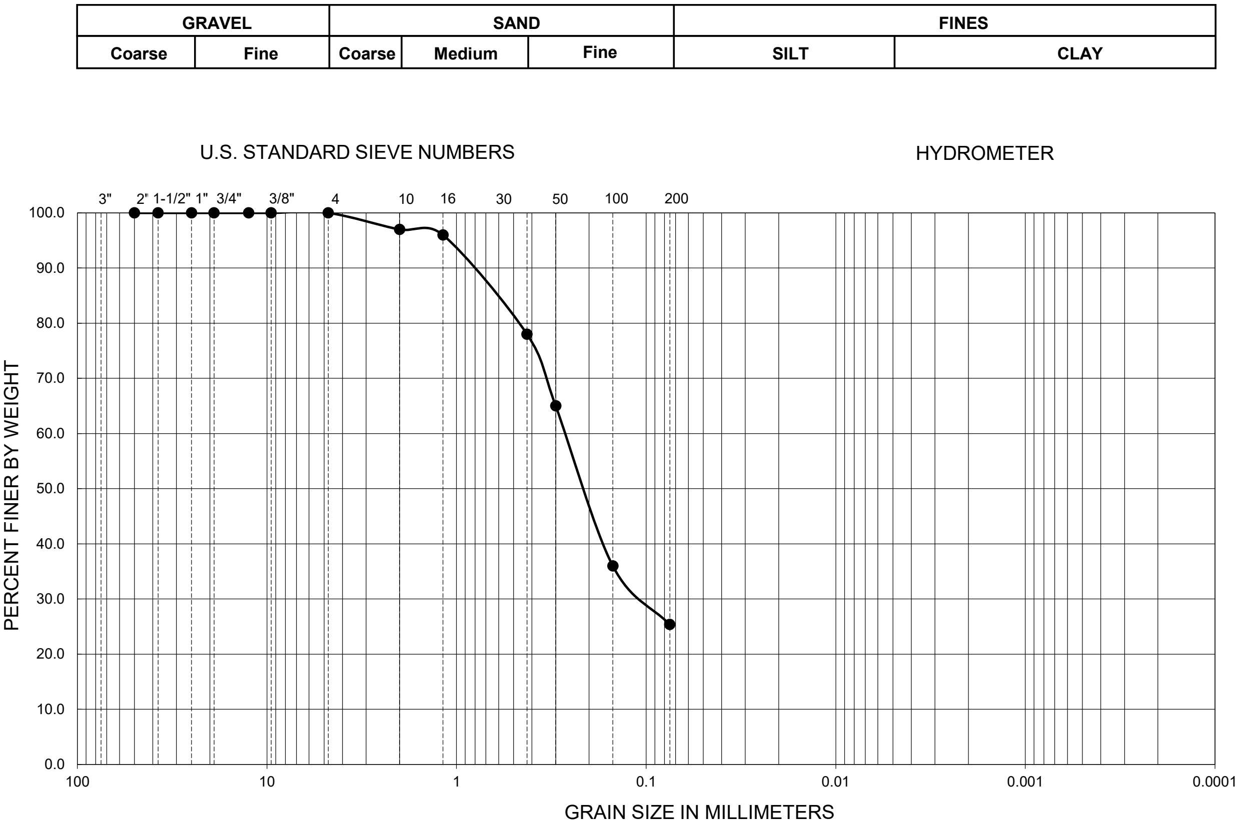

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-4	1.0-2.0	--	--	--	--	--	--	--	--	25	SC

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FIGURE B-23

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GRADATION TEST RESULTS

SALISBURY PARK NORTH
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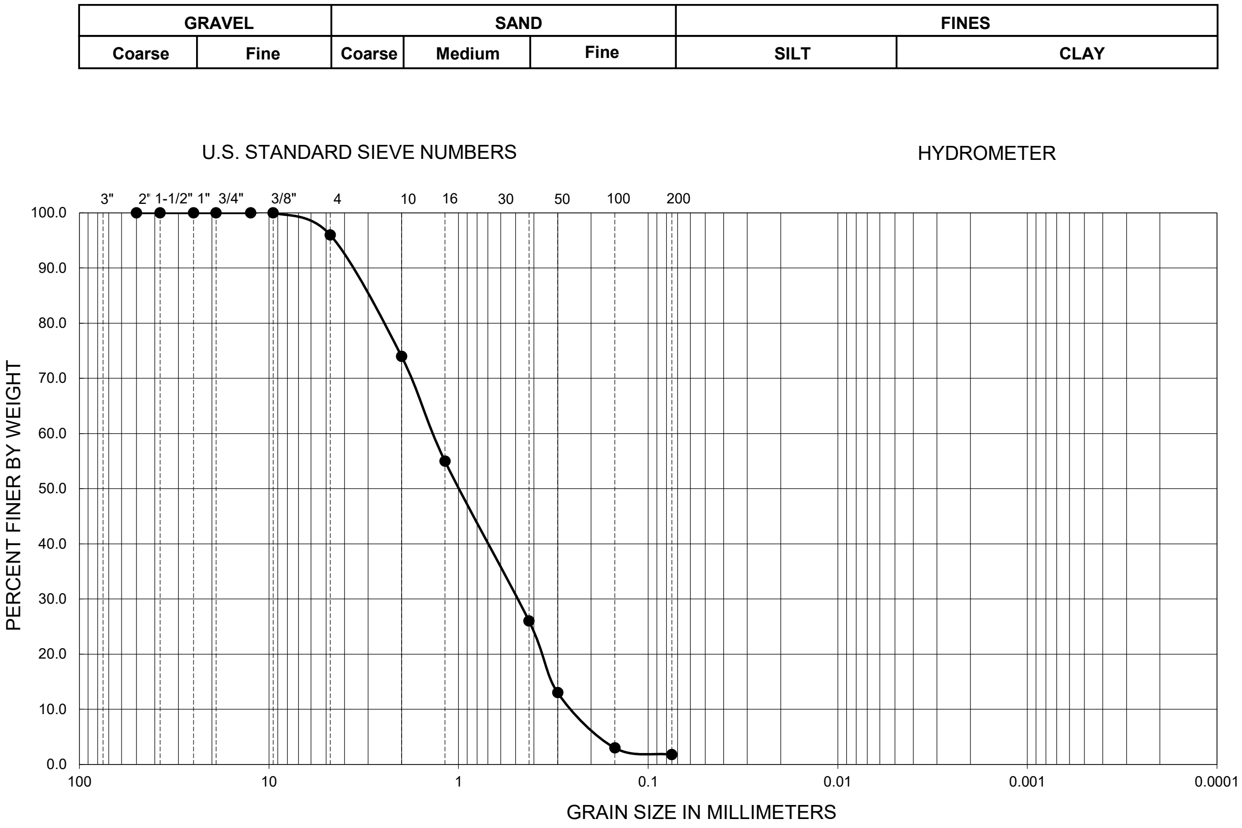

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-4	4.0-5.0	--	--	--	0.26	0.50	1.50	5.8	0.6	1.8	SP

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FIGURE B-24

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GRADATION TEST RESULTS

SALISBURY PARK NORTH
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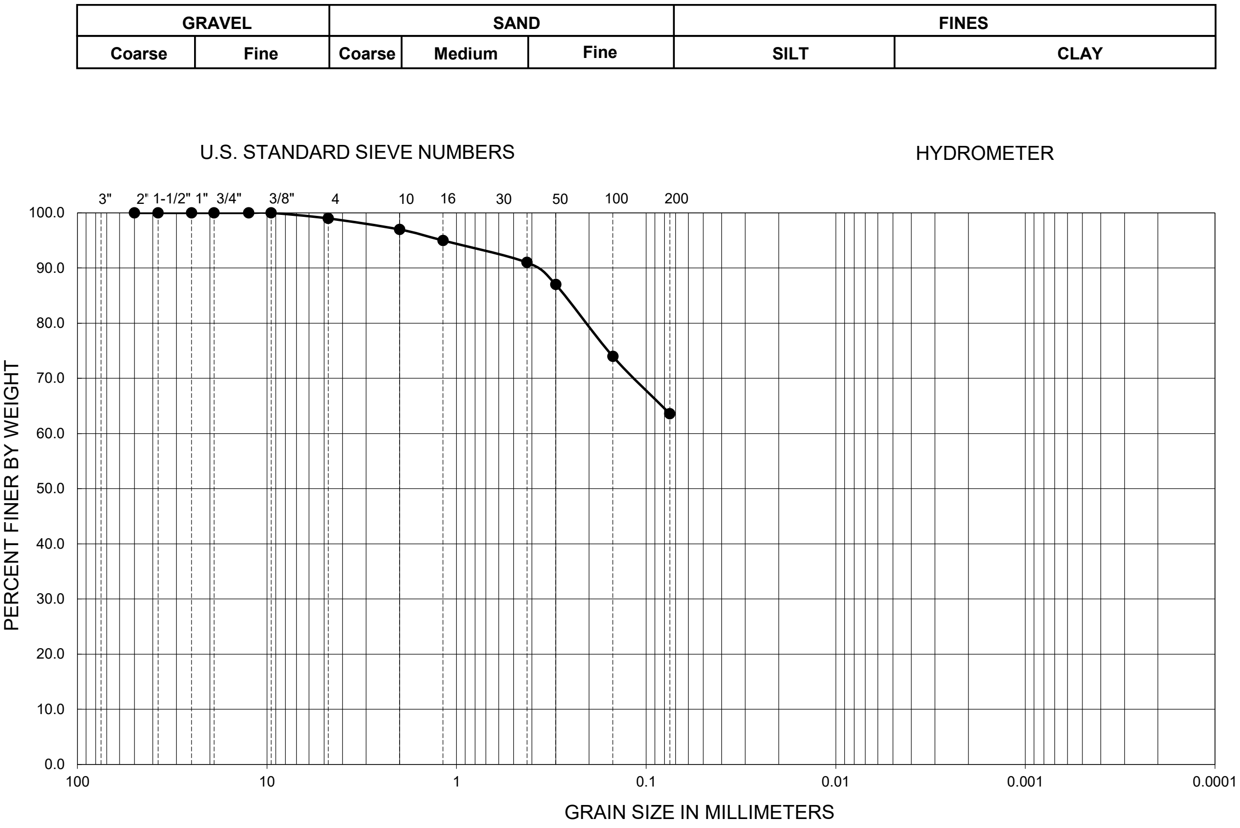
502725001 | 10/23



Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-5	4.0-5.0	--	--	--	--	--	--	--	--	64	CL

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FIGURE B-25

GRADATION TEST RESULTS

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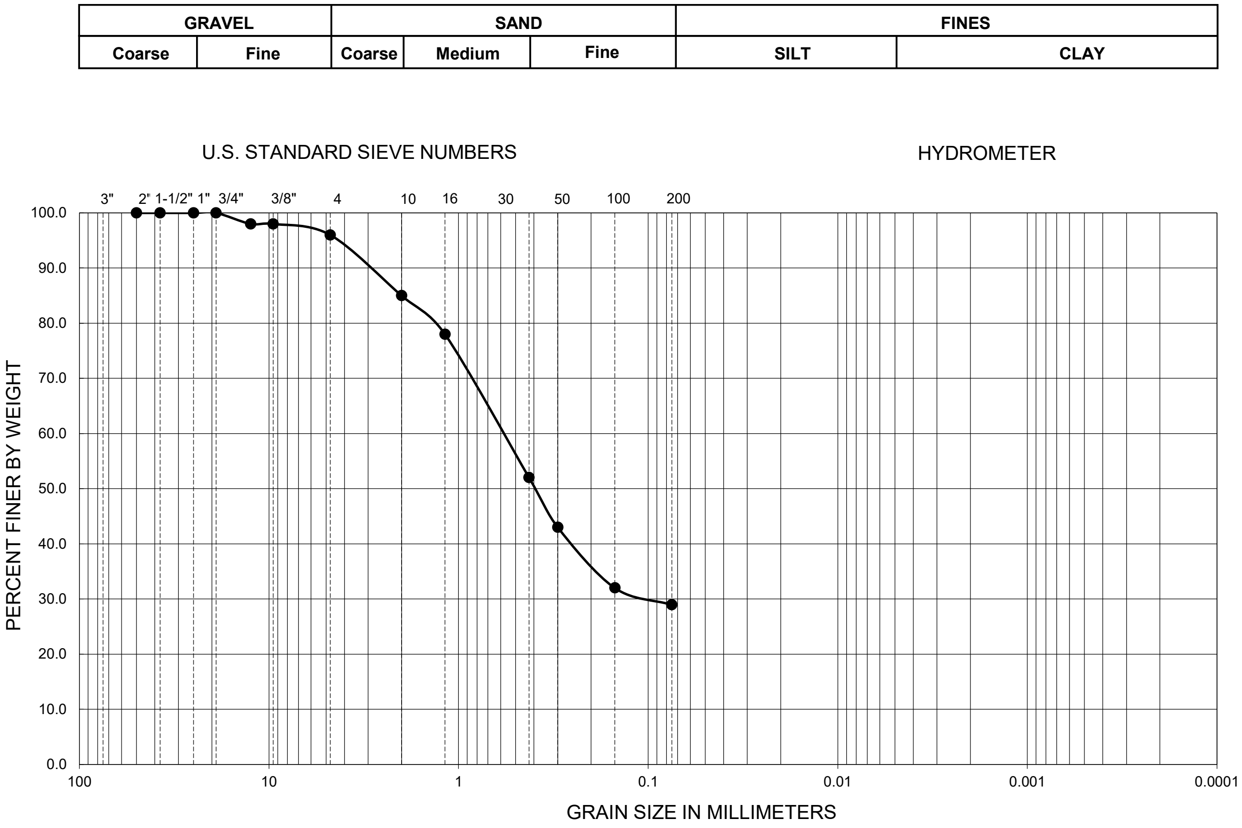

Symbol	Sample Location	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D_{10}	D_{30}	D_{60}	C_u	C_c	Passing No. 200 (percent)	Equivalent USCS
●	P-5	9.0-10.0	--	--	--	--	--	--	--	--	29	SC

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FIGURE B-26

GRADATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO

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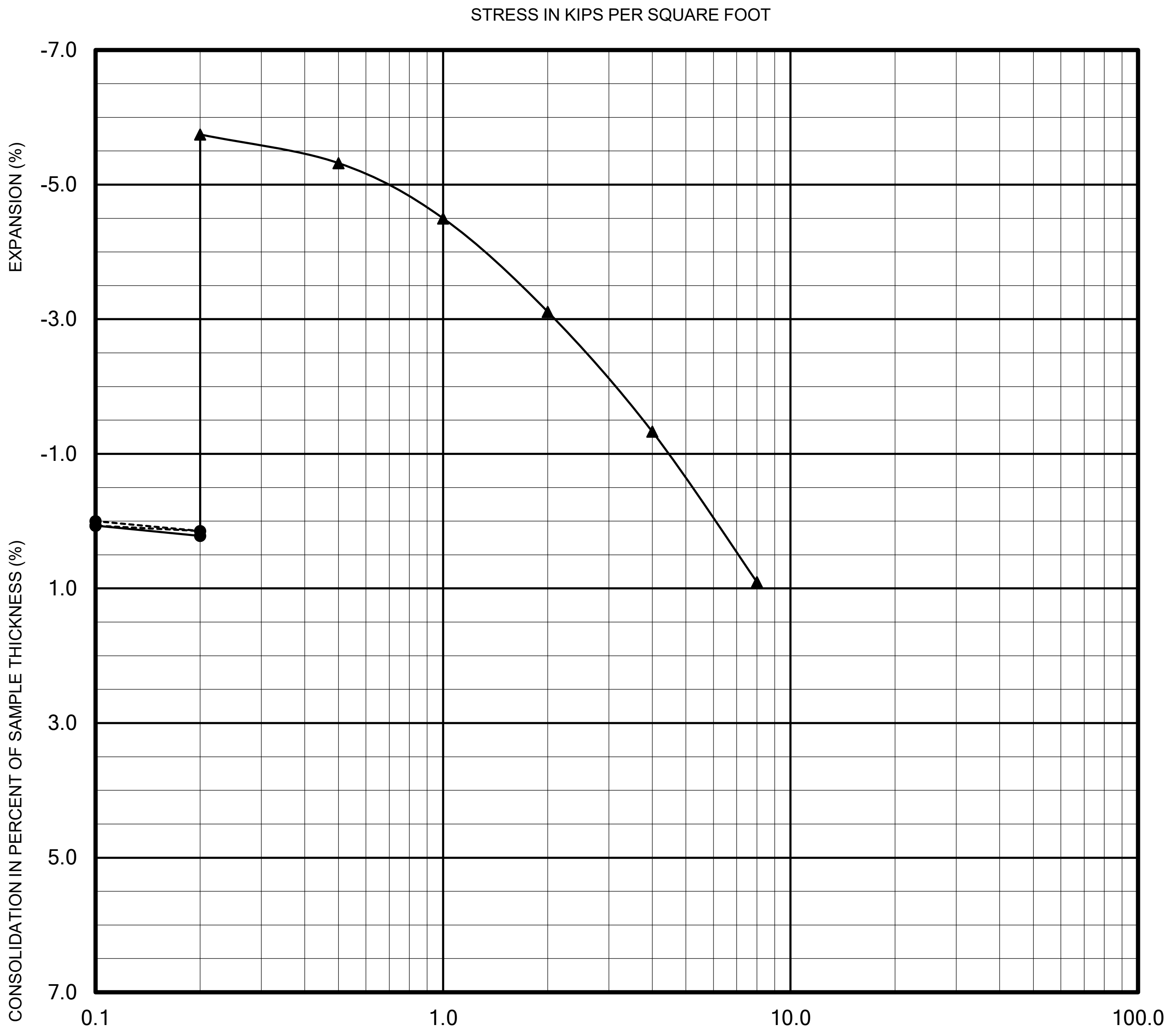

- -●- -	Seating Cycle
—●—	Loading Prior to Inundation
—▲—	Loading After Inundation
- -▲- -	Rebound Cycle

Moisture Increase (%):	5.5
Swell Percentage (%):	6.0
Swell Pressure (psf):	6,300

Sample Location: B-1
Depth (ft): 1.0-2.0
Soil Type: CL (Fill)

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

FIGURE B-27

CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
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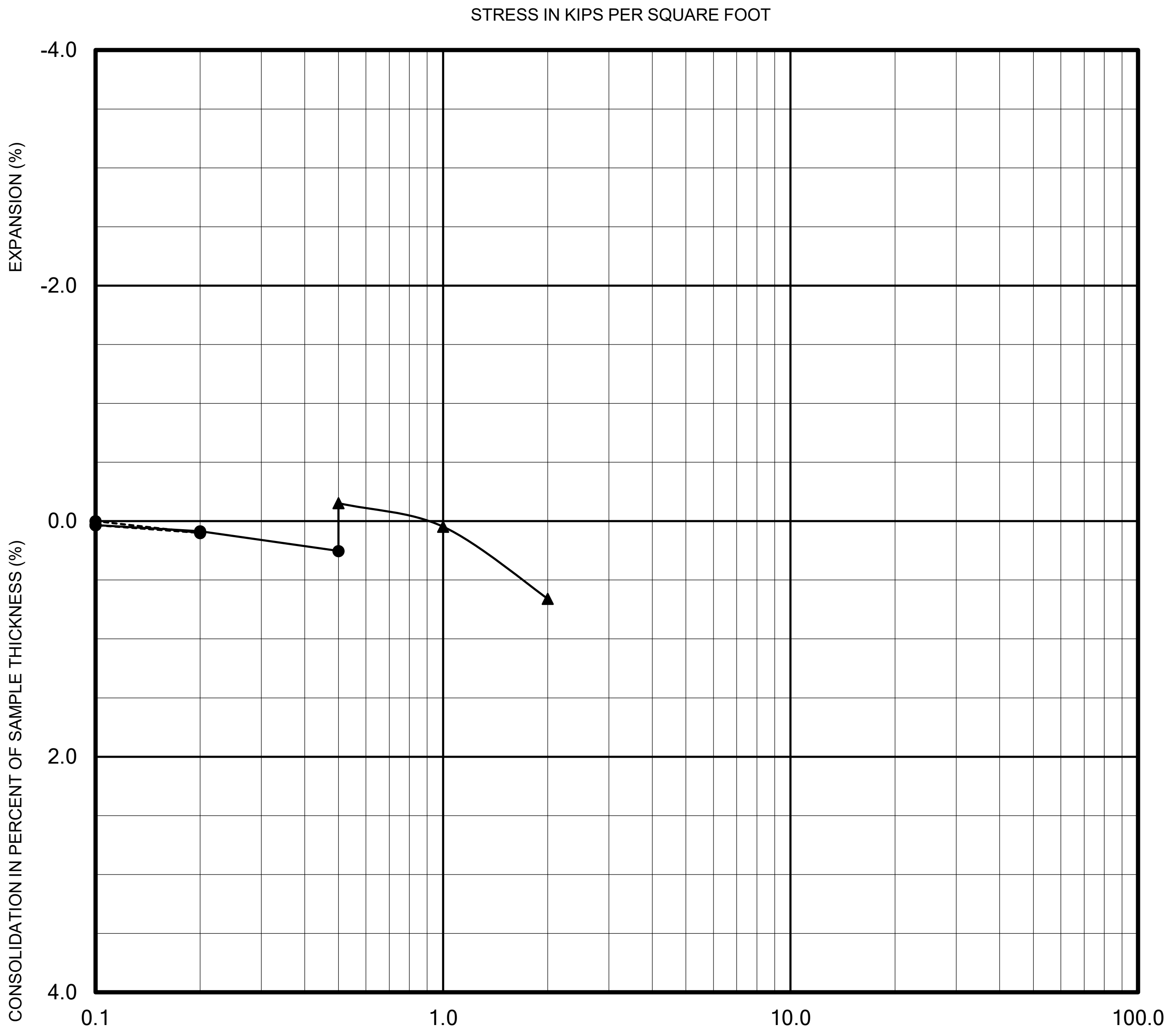

- ●--- Seating Cycle
- —●— Loading Prior to Inundation
- —▲— Loading After Inundation
- –▲– Rebound Cycle

Moisture Increase (%):	6.4
Swell Percentage (%):	0.4
Swell Pressure (psf):	850

Sample Location: B-1
Depth (ft): 4.0-5.0
Soil Type: CL

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FIGURE B-28

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CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
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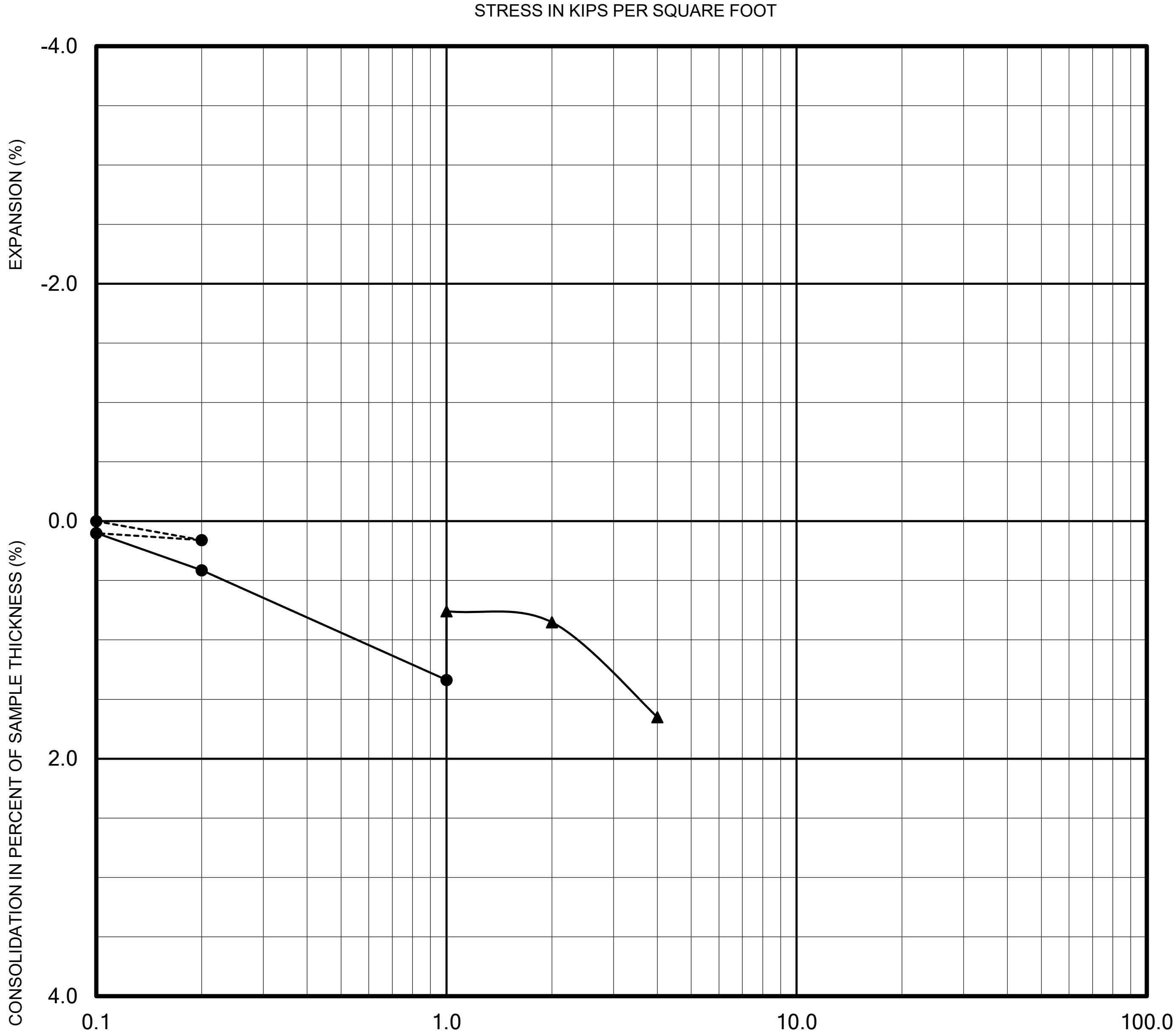

Moisture Increase (%): 1.5
Swell Percentage (%): 0.6
Swell Pressure (psf): 2,200

Sample Location: B-1
Depth (ft): 9.0-10.0
Soil Type: CL

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FIGURE B-29

CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
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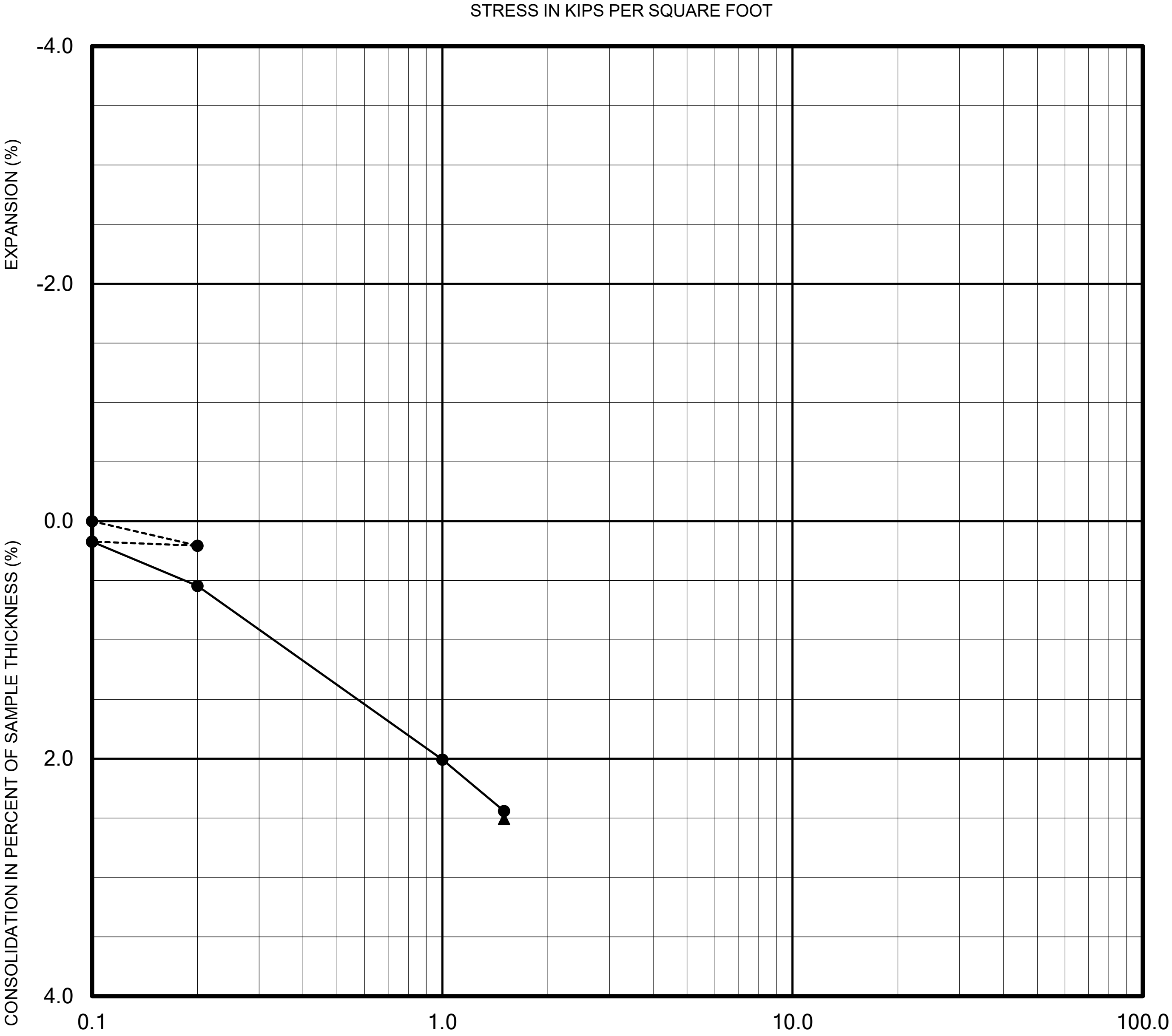

- - -●- - - Seating Cycle
——●—— Loading Prior to Inundation
——▲—— Loading After Inundation
- -▲- - Rebound Cycle

Moisture Increase (%): 1.0
Swell Percentage (%): -0.1
Swell Pressure (psf): --

Sample Location: B-1
Depth (ft): 14.0-15.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

FIGURE B-30

CONSOLIDATION TEST RESULTS

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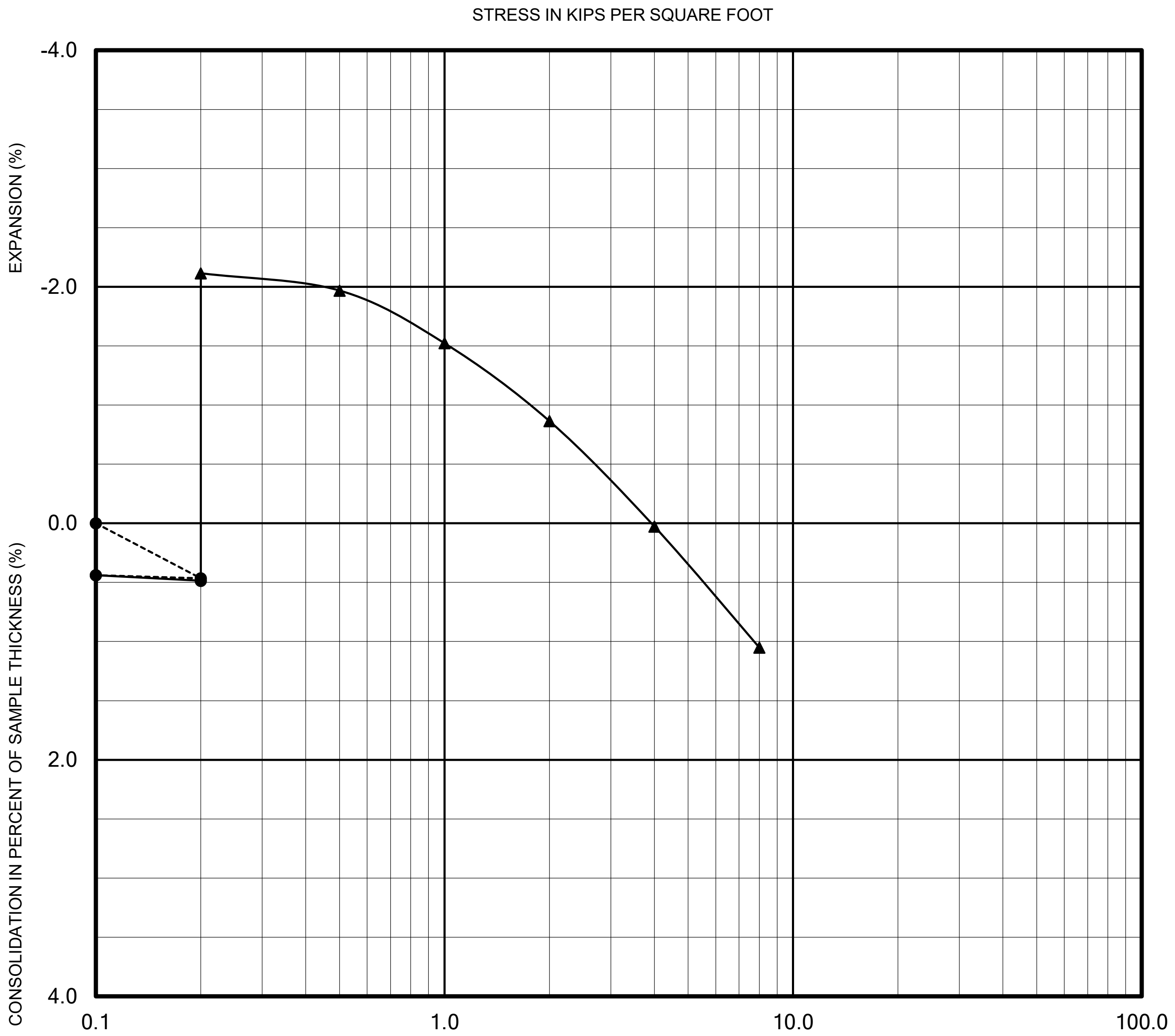

Moisture Increase (%):	5.7
Swell Percentage (%):	2.6
Swell Pressure (psf):	5,400

Sample Location: B-2
Depth (ft): 1.0-2.0
Soil Type: CL (Fill)

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FIGURE B-31

CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
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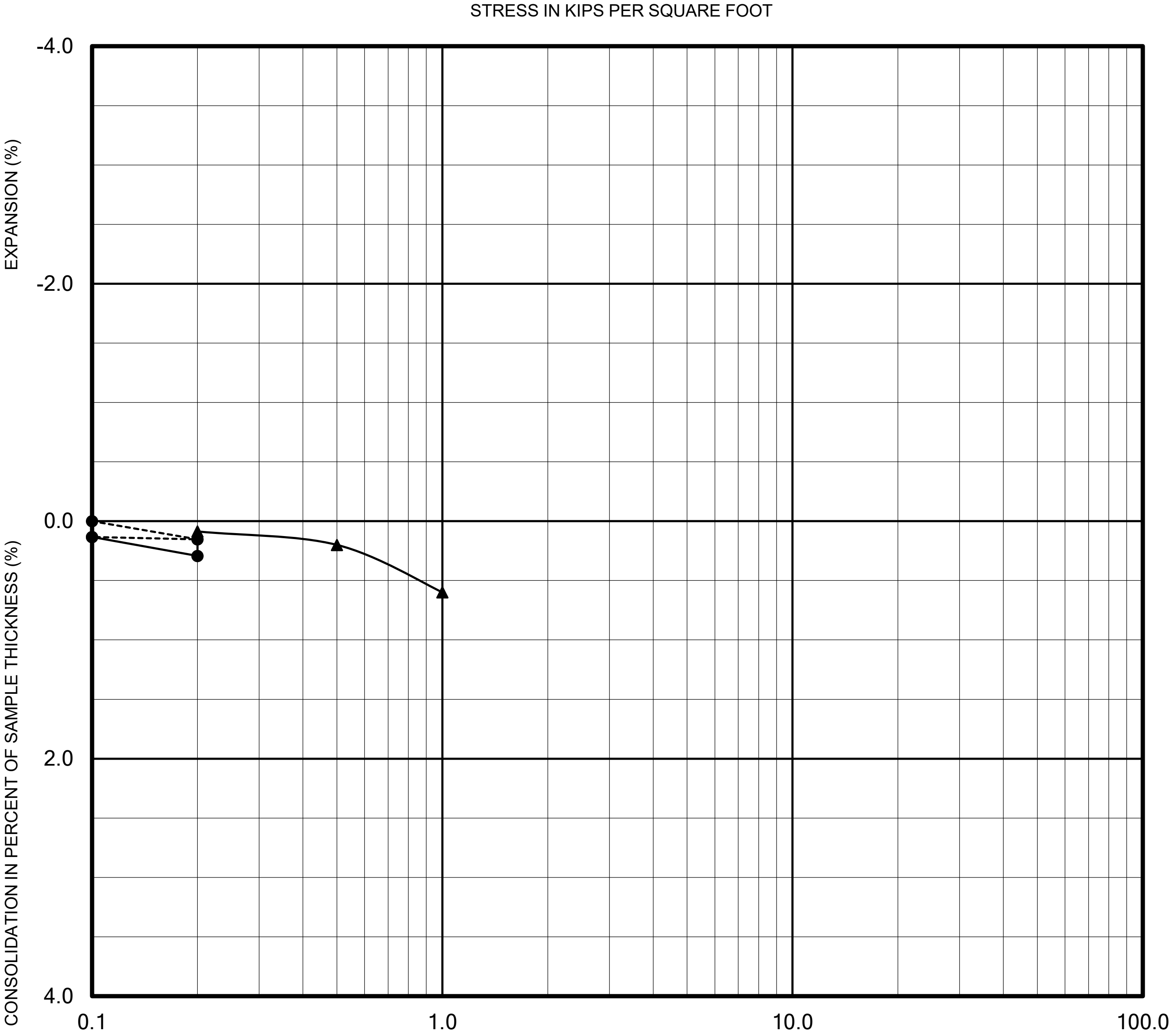

--●---	Seating Cycle
——●——	Loading Prior to Inundation
——▲——	Loading After Inundation
--▲---	Rebound Cycle

Moisture Increase (%):	1.5
Swell Percentage (%):	0.2
Swell Pressure (psf):	430

Sample Location: B-5
Depth (ft): 1.0-2.0
Soil Type: CL (Fill)

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FIGURE B-32

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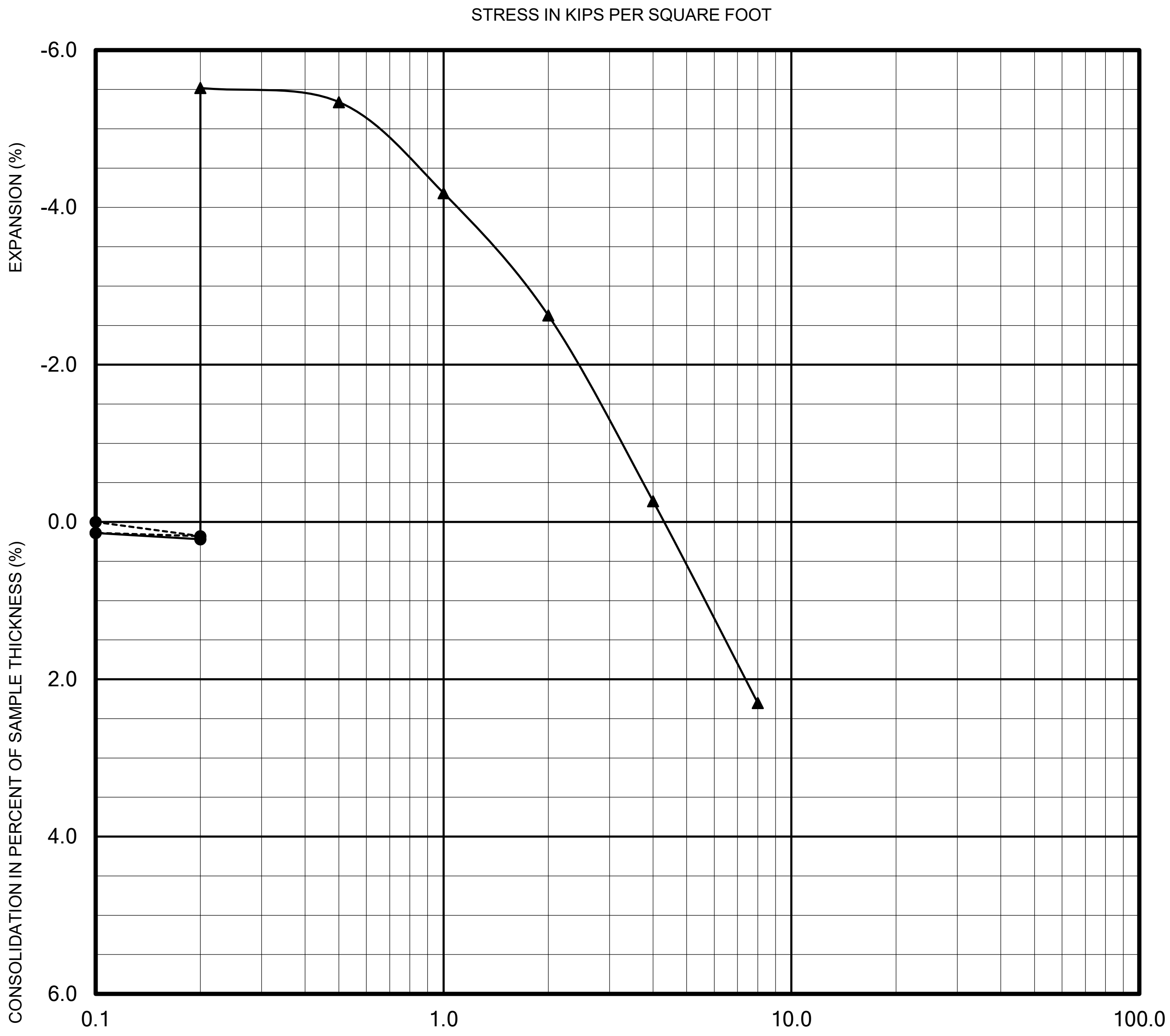
CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO



--●-- Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
--▲-- Rebound Cycle

Moisture Increase (%):	9.0
Swell Percentage (%):	5.7
Swell Pressure (psf):	4,400

Sample Location: B-7
Depth (ft): 1.0-2.0
Soil Type: CL

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FIGURE B-33

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CONSOLIDATION TEST RESULTS

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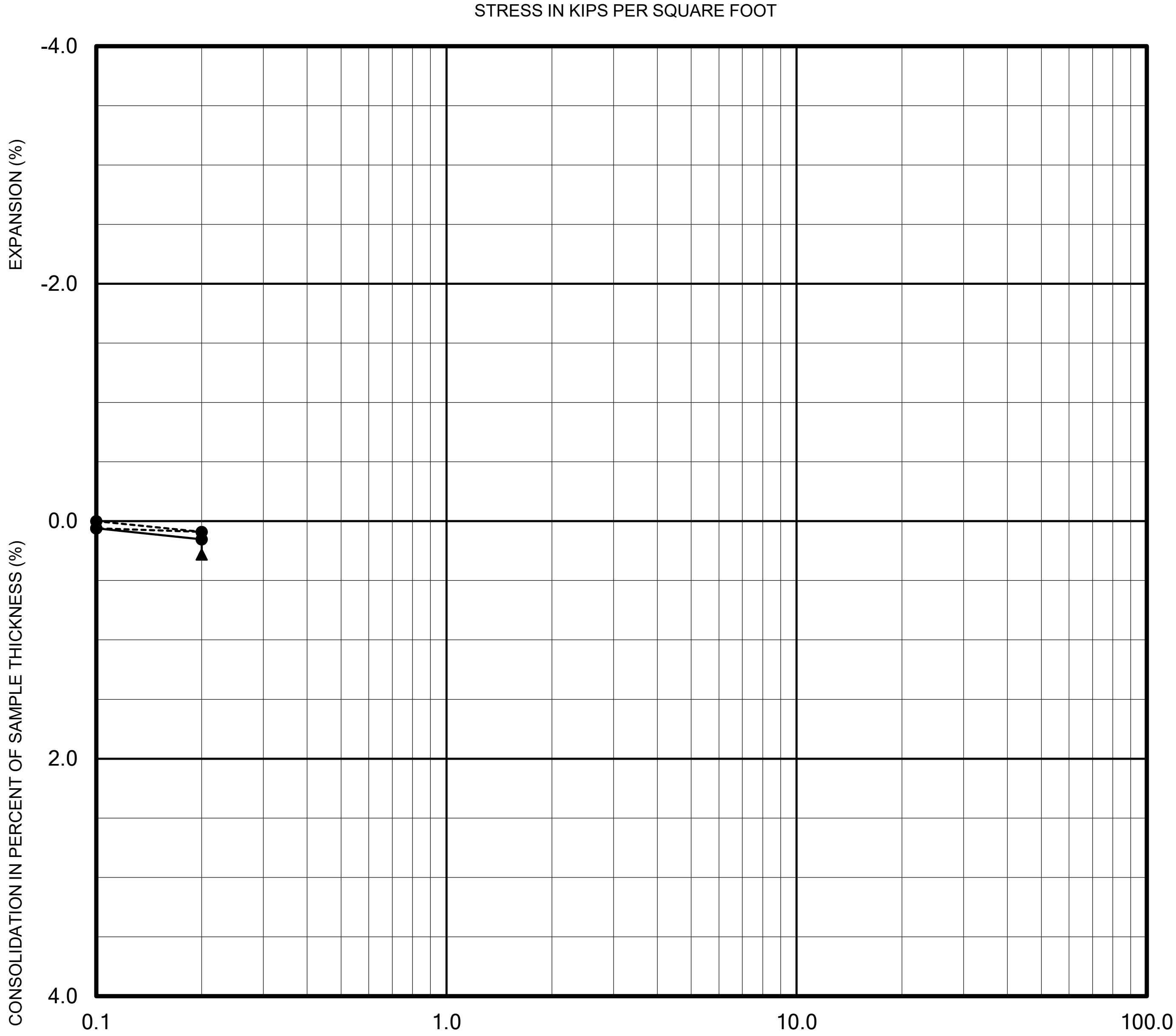

--●-- Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
--▲-- Rebound Cycle

Moisture Increase (%):	1.2
Swell Percentage (%):	-0.1
Swell Pressure (psf):	--

Sample Location: B-9
Depth (ft): 1.0-2.0
Soil Type: CL (Fill)

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FIGURE B-34

CONSOLIDATION TEST RESULTS

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SALISBURY PARK NORTH
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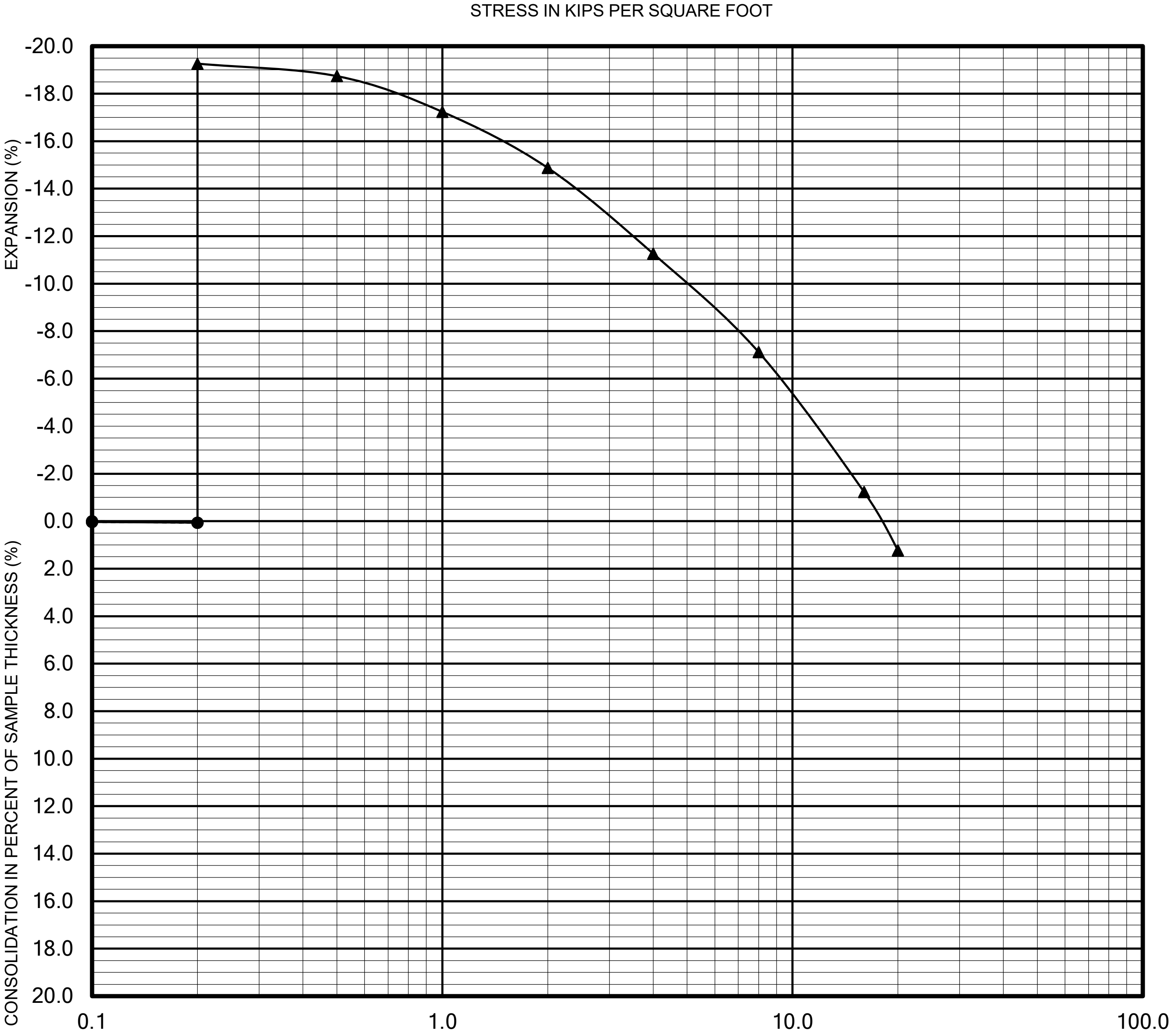

- - ● - - Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
- ▲ - Rebound Cycle

Moisture Increase (%):	10.6
Swell Percentage (%):	19.3
Swell Pressure (psf):	18,000

Sample Location: B-11
Depth (ft): 1.0-2.0
Soil Type: CH (Fill)

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FIGURE B-35

CONSOLIDATION TEST RESULTS

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11920 MOTSENBOCKER ROAD, PARKER, COLORADO
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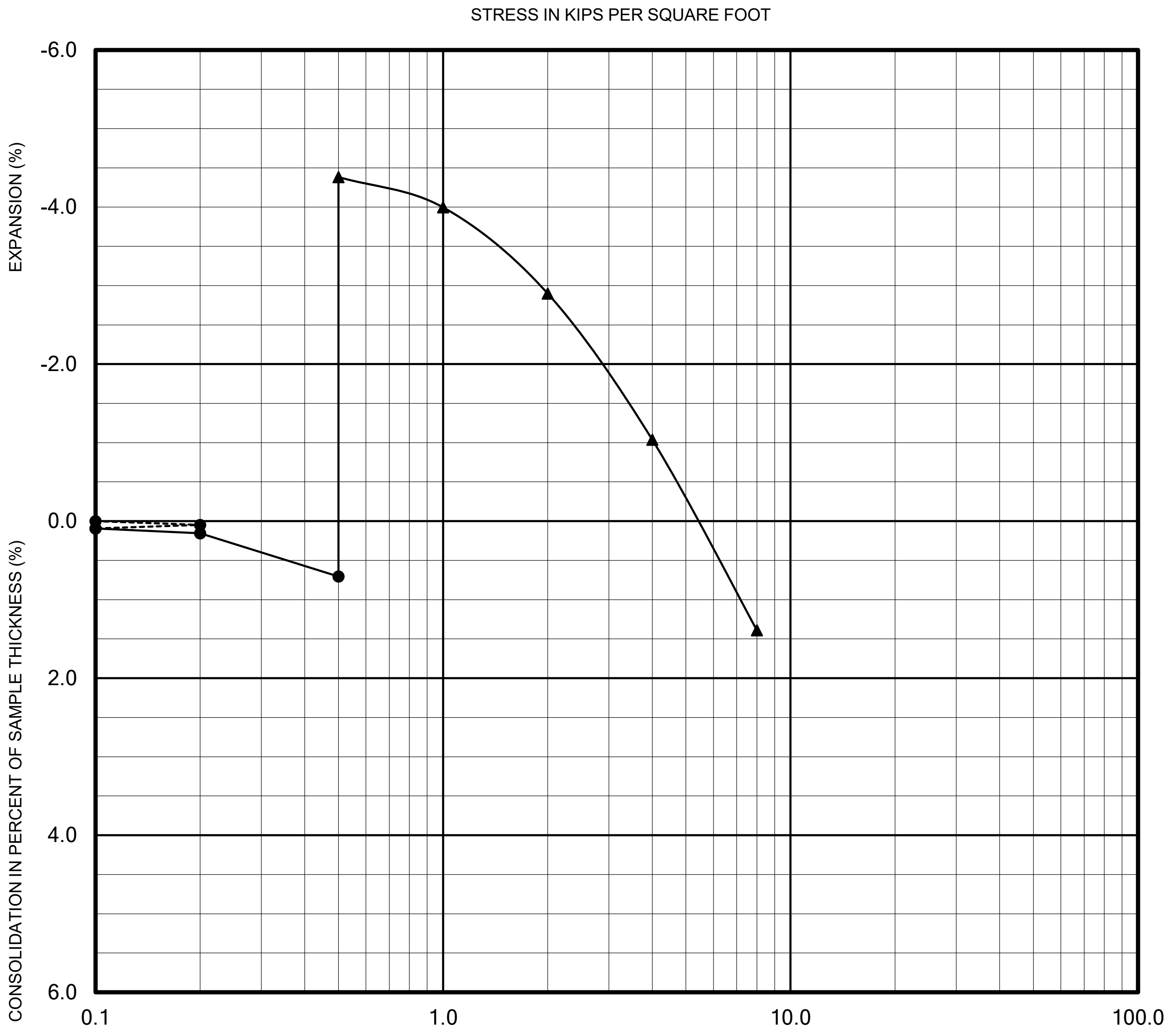

--●-- Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
--▲-- Rebound Cycle

Moisture Increase (%):	6.7
Swell Percentage (%):	5.1
Swell Pressure (psf):	6,100

Sample Location: B-18
Depth (ft): 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

FIGURE B-36

CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO

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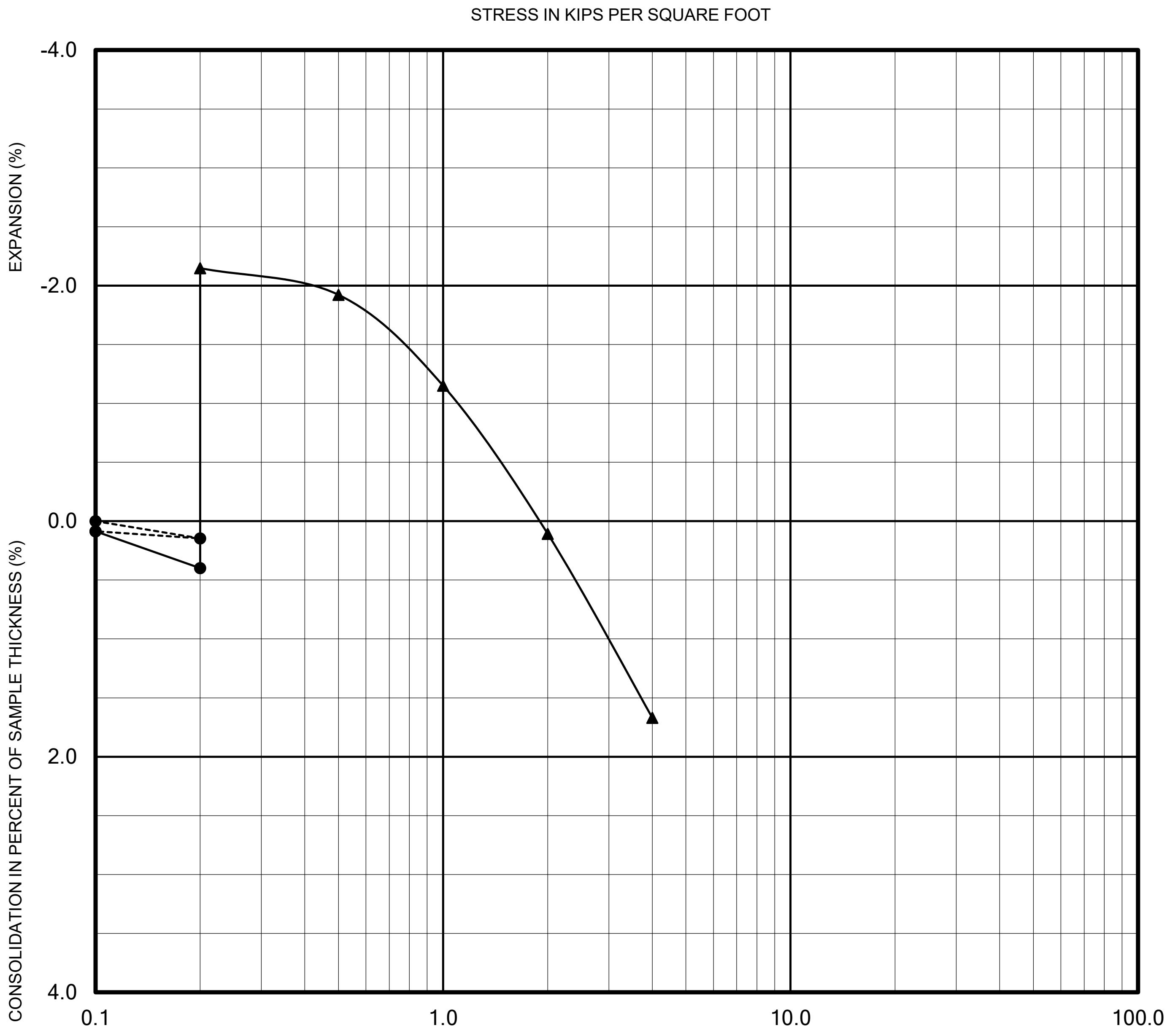

- - -●- - - Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
- -▲- - Rebound Cycle

Moisture Increase (%): 6.7
Swell Percentage (%): 2.5
Swell Pressure (psf): 2,100

Sample Location: B-20
Depth (ft): 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

FIGURE B-37

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CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO

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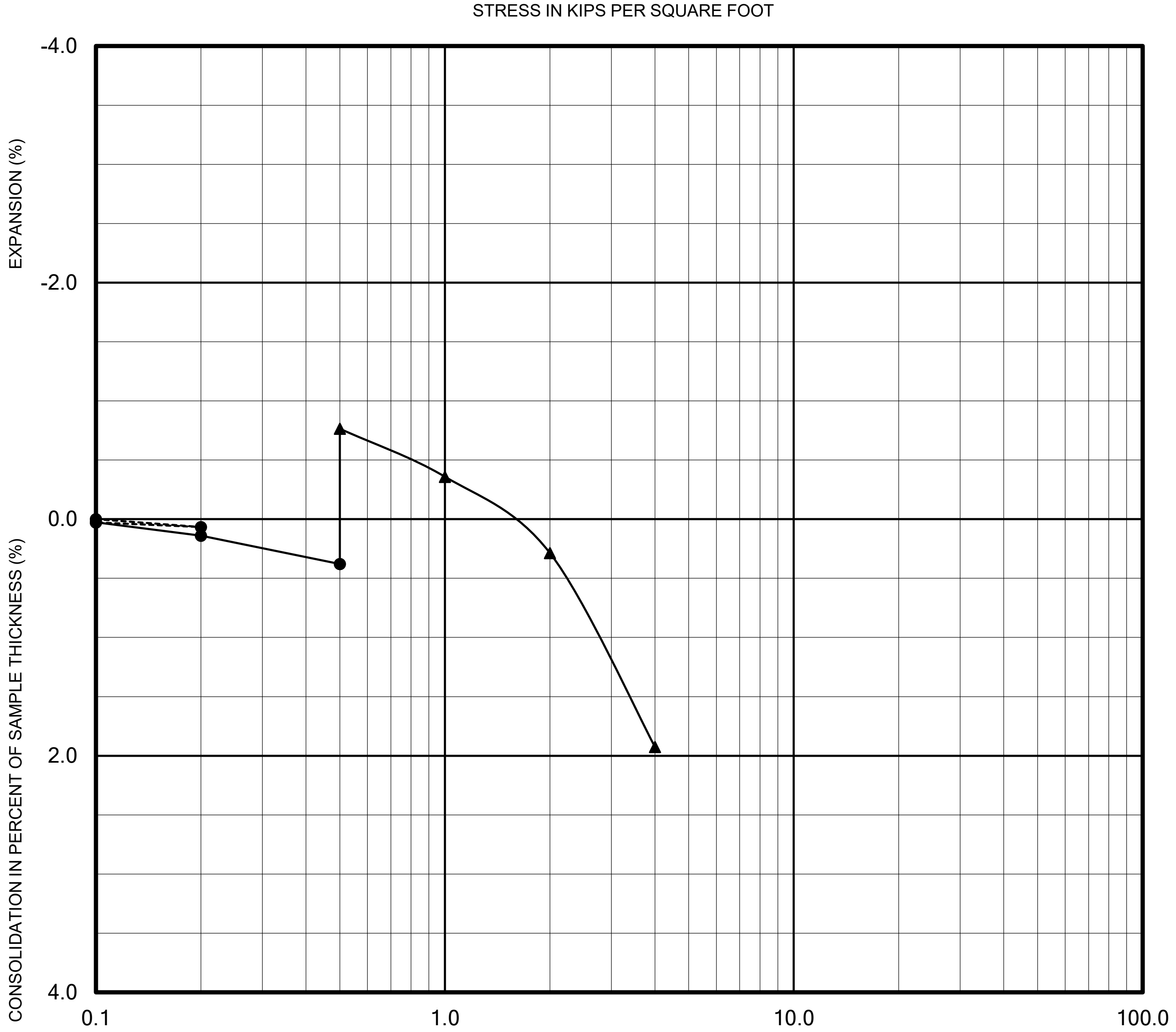

--●-- Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
--▲-- Rebound Cycle

Moisture Increase (%):	4.2
Swell Percentage (%):	1.1
Swell Pressure (psf):	1,600

Sample Location: B-22
Depth (ft): 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

FIGURE B-38

CONSOLIDATION TEST RESULTS

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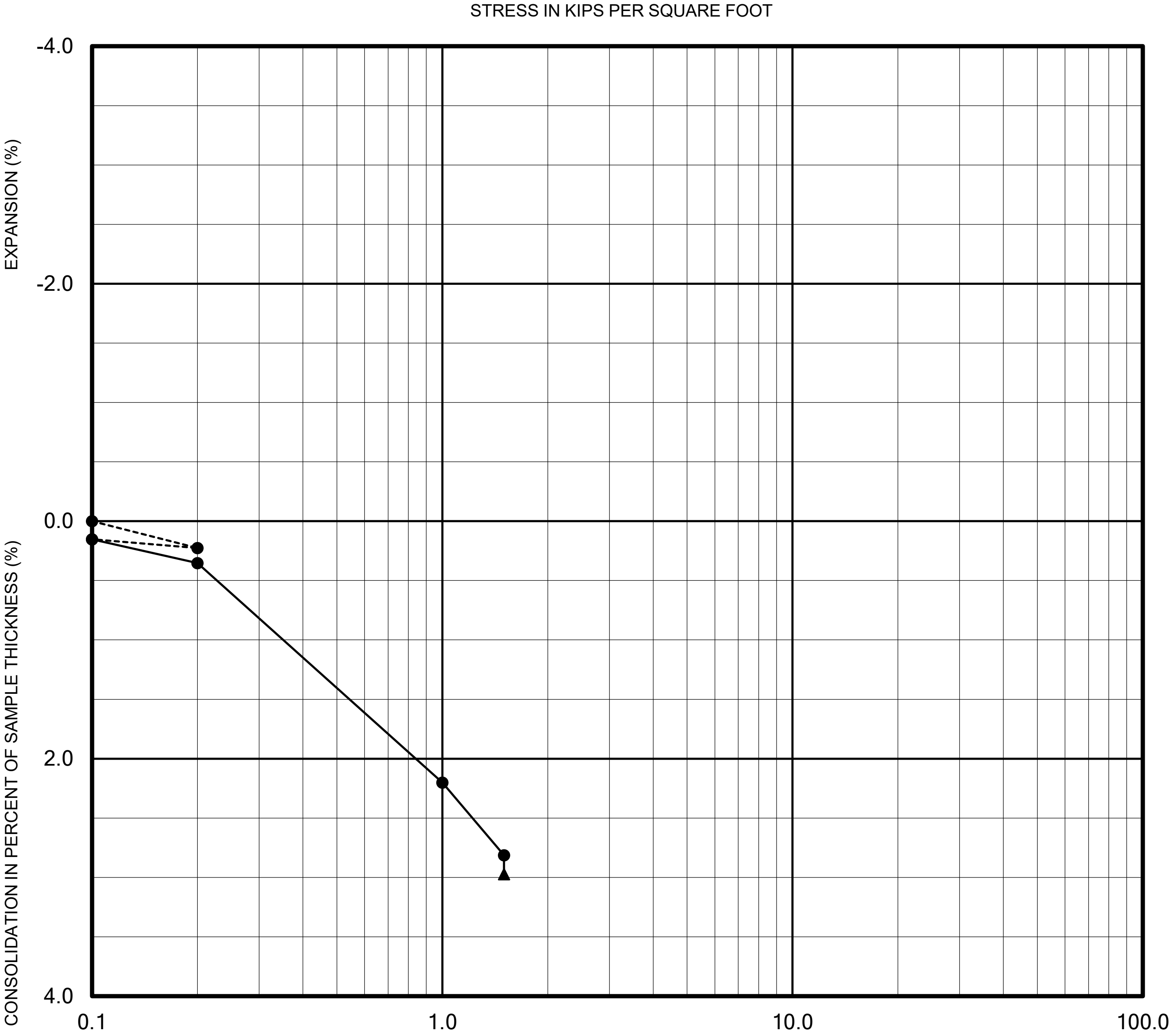
SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO



Moisture Increase (%):	0.3
Swell Percentage (%):	-0.2
Swell Pressure (psf):	--

Sample Location: B-22
Depth (ft): 14.0-15.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

FIGURE B-39

CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
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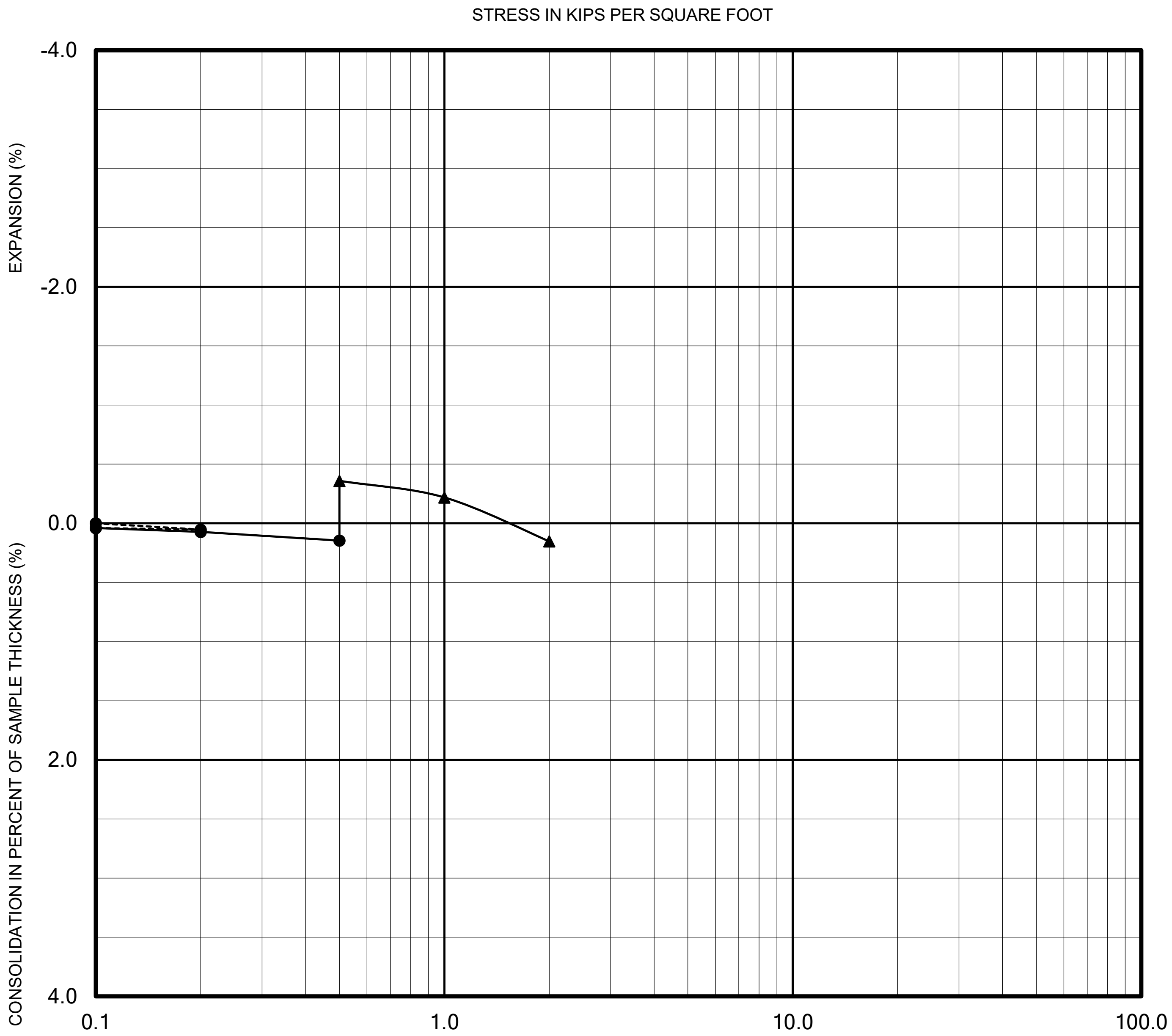

- - -●- - - Seating Cycle
—●— Loading Prior to Inundation
—▲— Loading After Inundation
- -▲- - Rebound Cycle

Moisture Increase (%): 3.2
Swell Percentage (%): 0.5
Swell Pressure (psf): 1,500

Sample Location: B-23
Depth (ft): 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

FIGURE B-40

CONSOLIDATION TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO

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SAMPLE LOCATION	SAMPLE DEPTH (ft)	pH [1]	RESISTIVITY [2] (ohm-cm)	SULFATE CONTENT [3]		CHLORIDE CONTENT [4] (ppm)
				(ppm)	(%)	
B-1, B-2, B-3, B-4, B-5, B-6, B-7	0.0-5.0	8.7	2,100	16	0.002	45
B-8, B-9, B-10, B-11, B-12, B-13	0.0-5.0	8.4	510	60	0.006	35
B-14, B-15, B-22, B-23	0.0-5.0	8.2	780	330	0.033	35
B-18, B-19, B-20, B-21	0.0-5.0	8.0	490	47	0.005	180
B-16, B-17, P-1, P-2, P-3, P-4	0.0-5.0	8.3	2,200	250	0.025	55

[1] PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4972

[2] PERFORMED IN GENERAL ACCORDANCE WITH AASHTO T288

[3] PERFORMED IN GENERAL ACCORDANCE WITH CDOT TEST METHOD CP-L 2103

[4] PERFORMED IN GENERAL ACCORDANCE WITH CDOT TEST METHOD CP-L 2104

FIGURE B-41

CORROSIVITY TEST RESULTS

SALISBURY PARK NORTH
11920 MOTSENBOCKER ROAD, PARKER, COLORADO

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APPENDIX C

Percolation Test Results

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PERCOLATION TEST RESULTS
P-1

Project Number: 502725001
Project: Salisbury Park
Location: Parker, CO

Test Date: 9/12/2023
Tested By: SLS
Elevation: 5,851'

Hole Number	Hole Depth	Time Interval	Initial Water Level Height at Start	Final Water Level Height at End	Drop in Water Level	Average Percolation Rate	Time Start	Time Stop
	(inches)	(minutes)	(inches)	(inches)	(inches)	(min/in)	(hh:mm)	(hh:mm)
P-1-1	12	30	6.00	5.0000	1.00	30.00	9:55	10:25
Height of Sand/Gravel		30	6.00	5.5000	0.50	60.00	10:25	10:55
added at bottom (in):	1"	30	6.00	5.5000	0.50	60.00	10:55	11:25
		30	6.00	5.0000	1.00	30.00	11:25	11:55
		30	6.00	4.7500	1.25	24.00	11:55	12:25
		30	6.00	4.7500	1.25	24.00	12:25	12:55
		30	6.00	5.5000	0.50	60.00	12:55	1:25
		30	6.00	5.7500	0.25	120.00	1:25	1:55
P-1-2	32	30	6.00	6.0000	0.00		9:57	10:27
Height of Sand/Gravel		30	6.00	5.7500	0.25	120.00	10:27	10:57
added at bottom (in):	1"	30	6.00	5.0000	1.00	30.00	10:57	11:27
		30	6.00	5.5000	0.50	60.00	11:27	11:57
		30	6.00	5.0000	1.00	30.00	11:57	12:27
		30	6.00	4.7500	1.25	24.00	12:27	12:57
		30	6.00	5.5000	0.50	60.00	12:57	1:27
		30	6.00	5.7500	0.25	120.00	1:27	1:57
P-1-3	60	30	6.00	5.0000	1.00	30.00	9:52	10:22
Height of Sand/Gravel		30	6.00	5.7500	0.25	120.00	10:22	10:52
added at bottom (in):	1"	30	6.00	5.7500	0.25	120.00	10:52	11:22
		30	6.00	6.0000	0.00		11:22	11:52
		30	6.00	4.7500	1.25	24.00	11:52	12:22
		30	6.00	5.7500	0.25	120.00	12:22	12:52
		30	6.00	6.0000	0.00	240.00	12:52	1:22
		30	6.00	5.7500	0.25	120.00	1:22	1:52

Average Percolation Rate = 120 min/in

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PERCOLATION TEST RESULTS
P-2

Project Number: 502725001
Project: Salisbury Park
Location: Parker, CO

Test Date: 9/12/2023
Tested By: SLS
Elevation: 5,850'

Hole Number	Hole Depth	Time Interval	Initial Water Level Height at Start	Final Water Level Height at End	Drop in Water Level	Average Percolation Rate	Time Start	Time Stop
	(inches)	(minutes)	(inches)	(inches)	(inches)	(min/in)	(hh:mm)	(hh:mm)
P-2-1	12"	30	6.00	5.5000	0.50	60.00	9:55	10:25
Height of Sand/Gravel		30	6.00	5.5000	0.50	60.00	10:25	10:55
added at bottom (in):	1"	30	6.00	5.5000	0.50	60.00	10:55	11:25
		30	6.00	4.5000	1.50	20.00	11:25	11:55
		30	6.00	3.7500	2.25	13.33	11:55	12:25
		30	6.00	3.0000	3.00		12:25	12:55
		30	6.00	5.0000	1.00	30.00	12:55	1:25
		30	6.00	5.7500	0.25	120.00	1:25	1:55
P-2-2	35"	30	6.00	5.7500	0.25		9:57	10:27
Height of Sand/Gravel		30	6.00	6.0000	0.00		10:27	10:57
added at bottom (in):	1"	30	6.00	6.0000	0.00		10:57	11:27
		30	6.00	4.7500	1.25	24.00	11:27	11:57
		30	6.00	6.0000	0.00		11:57	12:27
		30	6.00	4.2500	1.75	17.14	12:27	12:57
		30	6.00	6.0000	0.00	240.00	12:57	1:27
		30	6.00	6.0000	0.00	240.00	1:27	1:57
P-2-3	59"	30	6.00	5.0000	1.00	30.00	9:52	10:22
Height of Sand/Gravel		30	6.00	6.0000	0.00		10:22	10:52
added at bottom (in):	1"	30	6.00	6.0000	0.00		10:52	11:22
		30	6.00	5.0000	1.00	30.00	11:22	11:52
		30	6.00	4.7500	1.25	24.00	11:52	12:22
		30	6.00	6.0000	0.00		12:22	12:52
		30	6.00	5.2500	0.75	40.00	12:52	1:22
		30	6.00	6.0000	0.00	240.00	1:22	1:52

Average Percolation Rate = 152 min/in

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PERCOLATION TEST RESULTS
P-3

Project Number: 502725001
Project: Salisbury Park
Location: Parker, CO

Test Date: 9/12/2023
Tested By: SLS
Elevation: 5,580'

Hole Number	Hole Depth	Time Interval	Initial Water Level Height at Start	Final Water Level Height at End	Drop in Water Level	Average Percolation Rate	Time Start	Time Stop
	(inches)	(minutes)	(inches)	(inches)	(inches)	(min/in)	(hh:mm)	(hh:mm)
P-3-1	12"	30	6.00	5.7500	0.25	120.00	12:34	1:04
Height of Sand/Gravel		30	6.00	6.0000	0.00		1:04	1:34
added at bottom (in):	1"	30	6.00	6.0000	0.00		1:34	2:04
		30	6.00	6.0000	0.00		2:04	2:34
		30	6.00	5.7500	0.25	120.00	2:34	3:04
		30	6.00	5.7500	0.25		3:04	3:34
		30	6.00	5.5000	0.50	60.00	3:34	4:04
		30	6.00	5.5000	0.50	240.00	4:04	4:34
P-3-2	33"	30	6.00	4.2500	1.75		12:37	1:07
Height of Sand/Gravel		30	6.00	5.7500	0.25	120.00	1:07	1:37
added at bottom (in):	3"	30	6.00	6.0000	0.00		1:37	2:07
		30	6.00	6.0000	0.00		2:07	2:37
		30	6.00	5.7500	0.25	120.00	2:37	3:07
		30	6.00	5.5000	0.50	60.00	3:07	3:37
		30	6.00	5.0000	1.00	30.00	3:37	4:07
		30	6.00	5.5000	0.50	60.00	4:07	4:37
P-3-3	59"	30	6.00	6.0000	0.00		12:39	1:09
Height of Sand/Gravel		30	6.00	5.7500	0.25	120.00	1:09	1:39
added at bottom (in):	1"	30	6.00	6.0000	0.00		1:39	2:09
		30	6.00	5.7500	0.25	120.00	2:09	2:39
		30	6.00	6.0000	0.00		2:39	3:09
		30	6.00	6.0000	0.00		3:09	3:39
		30	6.00	6.0000	0.00	240.00	3:39	4:09
		30	6.00	6.0000	0.00	240.00	4:09	4:39

Average Percolation Rate = 145 min/in

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PERCOLATION TEST RESULTS
P-4

Project Number: 502725001
Project: Salisbury Park
Location: Parker, CO

Test Date: 9/12/2023
Tested By: SLS
Elevation: 5,842'

Hole Number	Hole Depth	Time Interval	Initial Water Level Height at Start	Final Water Level Height at End	Drop in Water Level	Average Percolation Rate	Time Start	Time Stop
	(inches)	(minutes)	(inches)	(inches)	(inches)	(min/in)	(hh:mm)	(hh:mm)
P-4-1	14"	30	6.00	4.50	1.50		1:12	1:42
Height of Sand/Gravel		30	6.00	5.75	0.25	120	1:42	2:12
added at bottom (in):		30	6.00	4.50	1.50		2:12	2:42
		30	6.00	5.50	0.50	60	2:42	3:12
		30	6.00	5.50	0.50		3:12	3:42
		30	6.00	6.00	0.00		3:42	4:12
		30	6.00	5.00	1.00	30	4:12	4:42
		30	6.00	5.50	0.50	60	4:42	5:12
P-4-2	34"	30	6.00	5.50	0.50		1:15	1:45
Height of Sand/Gravel		30	6.00	3.75	2.25	13	1:45	2:!5
added at bottom (in):	2"	30	6.00	3.50	2.50		2:15	2:45
		30	6.00	3.75	2.25	13	2:45	3:15
		30	6.00	3.50	2.50	12	3:15	3:45
		30	6.00	4.50	1.50	20	3:45	4:15
		30	6.00	5.00	1.00	30	4:15	4:45
		30	6.00	5.75	0.25	120	4:45	5:15
P-4-3	56"	30	6.00	5.75	0.25	120	1:17	1:47
Height of Sand/Gravel		30	6.00	4.75	1.25	24	1:47	2:17
added at bottom (in):	4"	30	6.00	4.75	1.25	24	2:17	2:47
		30	6.00	2.00	4.00	8	2:47	3:19
		30	6.00	2.50	3.50	9	3:19	3:29
		30	6.00	2.00	4.00	8	3:29	3:39
		30	6.00	3.00	3.00	10	3:39	3:49
		30	6.00	2.00	4.00	8	3:49	3:59
		30	6.00	3.00	3.00	10	3:59	4:09
		30	6.00	5.00	1.00	30	4:09	4:19

Average Percolation Rate = 47 min/in

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PERCOLATION TEST RESULTS
P-5

Project Number: 502725001
Project: Salisbury Park
Location: Parker, CO

Test Date: 10/3/2023
Tested By: MEO
Elevation: 5,858'

Hole Number	**Hole Depth**	**Time Interval**	**Initial Water Level Height at Start**	**Final Water Level Height at End**	**Drop in Water Level**	**Average Percolation Rate**	**Time Start**	**Time Stop**
	(inches)	(minutes)	(inches)	(inches)	(inches)	(min/in)	(hh:mm)	(hh:mm)
P-5-1	12	30	6.00	5.50	0.50	60	12:10	12:40
Height of Sand/Gravel		30	6.00	5.50	0.50	60	12:40	1:10
added at bottom (in):	2.0	30	6.00	5.75	0.25	120	1:10	1:40
		30	6.00	5.75	0.25	120	1:40	2:10
		30	6.00	5.50	0.50	60	2:10	2:40
		30	6.00	5.75	0.25	120	2:40	3:10
		30	6.00	5.75	0.25	120	3:10	3:40
		30	6.00	5.50	0.50	60	3:40	4:10
P-5-2	36	30	6.00	5.50	0.25	120	12:12	12:42
Height of Sand/Gravel		30	6.00	5.50	0.50	60	12:42	1:12
added at bottom (in):	2.0	30	6.00	5.75	0.25	120	1:12	1:42
		30	6.00	5.75	0.25	120	1:42	2:12
		30	6.00	5.63	0.38	80	2:12	2:42
		30	6.00	5.63	0.37	81	2:42	3:12
		30	6.00	5.75	0.25	120	3:12	3:42
		30	6.00	5.75	0.25	120	3:42	4:12
P-5-3	60	30	6.00	5.75	0.25	120	12:14	12:44
Height of Sand/Gravel		30	6.00	5.75	0.25	120	12:44	1:14
added at bottom (in):	2.0	30	6.00	5.89	0.12	261	1:14	1:44
		30	6.00	5.89	0.12	261	1:44	2:14
		30	6.00	6.00	0.00		2:14	2:44
		30	6.00	5.89	0.12	261	2:44	3:14
		30	6.00	5.89	0.12	261	3:14	3:44
		30	6.00	5.89	0.12	261	3:44	4:14

Average Percolation Rate = 157 min/in

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