# PRAIRIE PASS DECOMMISSIONING AND RECLAMATION PLAN

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| **To:** | Adams County Community & Economic Development Department |
| **From:** | Prairie Pass LLC |
| **Subject:** | Prairie Pass Energy Storage Project Decommissioning and Reclamation Plan |
| **Date:** | April 14, 2026 |

During the conceptual review meeting with Adams County, the County's project review team determined that the Prairie Pass Energy Storage Project (Project) would require one Conditional Use Permit (CUP) approval for the Battery Energy Storage System, and one CUP for the proposed Project Substation. As conditions of approval for the two CUPs, Adams County required that Prairie Pass LLC (applicant) prepare a Decommissioning and Reclamation Plan (plan) outlining the eventual dismantling and restoration of the battery energy storage system (BESS) facility, which is to be reviewed and approved by Adams County. The intent of this Decommissioning and Reclamation Plan is to provide a comprehensive plan for ensuring that the land will be responsibly restored to the conditions that existed prior to the facility's construction once the facility is no longer in operation. This plan has been prepared in accordance with the requirements of the Adams County Development Standards and Regulations.

# 1 Decommissioning Plan

## 1.1 Overview

At the end of the Project's life, the BESS would be recycled as described in the following sections. Most parts of the proposed system are recyclable. Battery cells include lithium, which can be recycled or repurposed. Battery enclosures include steel or aluminum, with concrete or steel pile foundations that can also be recycled. Local recyclers are available to recycle metal, scrap equipment, and parts that do not have free-flowing oil for salvage. All solid, hazardous waste will be disposed of in accordance with local, state, and federal waste disposal regulations.

What little fuels, hydraulic fluids, and oils that may exist on site would be transferred directly to a tanker truck from the respective tanks and vessels. Storage tanks and vessels would be rinsed and transferred to tanker trucks. Fluids used for routine maintenance such as lubricants, paints, and solvents, would be kept in a locked utility structure on site with integral secondary containment that meets applicable requirements for hazardous waste storage until removal for proper disposal or for use elsewhere. Enclosures used to store hazardous materials would be inspected regularly for any signs of failure or leakage. Transportation of the removed hazardous materials would comply with applicable regulations for transporting hazardous materials as established by the U.S. Department of Transportation, Environmental Protection Agency, Colorado Department of Transportation, Colorado Department of Public Health & Environment, and any other agencies or regulations as identified.

## 1.2 Decommissioning Procedures

The activities involved in the facility closure will depend on the expected future use of the site. Certain facility equipment and features may be left in place at the property owner's request, such as transmission facilities, roads, and drainage features. At the time of decommissioning, a plan will be submitted to the County proposing the

equipment that will be removed and, if applicable, equipment that will remain, based on expected future use of the site.

While the County does not have specific decommissioning guidance for BESS facilities, it does include decommissioning guidance related to solar energy systems that may apply to the Project site. Section 4-11-02-06-01 of the Adams County Development Standards and Regulations states:

> Any solar energy system which is no longer producing energy or has been abandoned shall be removed, not including a temporary cease in production for maintenance or force majeure. The owner or operator shall physically remove the installation within 150 days after the date of discontinued operations. The owner or operator shall notify the Adams County Community & Economic Development Department by certified mail within 30 calendar days of the proposed date of discontinued operations and plans for removal. Decommissioning shall consist of:
>
> 1. Physical removal of all solar energy systems, structures, and equipment from the site.
> 2. Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations.
> 3. For ground-mounted solar energy systems, stabilization, or re-vegetation of the site as necessary to minimize erosion. Adams County may allow the owner or operator to leave landscaping or designated below-grade foundations in order to minimize erosion and disruption to vegetation.

Pre-closure activities include final closure and reclamation planning, which identifies measures to be taken to restore the site to near pre-construction conditions. This includes but is not limited to the following:

- Complete an analysis of the Project materials and their composition to identify those specific components that may be recycled, re-used, scrapped, or sent to disposal sites; as well as identifying specific recycling facilities and disposal sites for materials.
    - Decommissioning shall include the physical removal of components, structures, and equipment from the site. This includes gravel, concrete pads, roads, fencing and any other site perimeter barriers, which may remain in place if requested. Otherwise, all roads, fences, and fence components will be removed and disposed of, and any holes or voids caused by poles, concrete pads, or other equipment will be filled in with soil to restore the property to a condition reasonably similar to its condition prior to the development of the site.
- Approximately one year prior to the planned decommissioning of the facility, the applicant will coordinate with local officials to obtain permits and develop plans for the transportation of materials and equipment to and from the site.
- Develop specifications for demolition and reclamation, which will serve as the basis for contractor bids for decommissioning the Project and establish the scope of demolition and reclamation, including developing reclamation plans in compliance with local, state, and federal regulations.
- Appropriate temporary (construction-related) erosion and sedimentation controlled Best Management Practices (BMPs) will be applied during the decommissioning phase of the Project. The BMPs will be inspected on a regular basis to ensure proper functionality.

  - Soil management and re-contouring operations will be conducted to minimize the surface area disturbance and implement the activities in the safest and most efficient manner and in accordance with applicable local requirements.
  - To account for post-decommissioning dust control, areas of exposed soils will be revegetated, consistent with the expected future use of the site and County requirements. To the extent that revegetation is necessary, vegetation will incorporate drought-tolerant, native species and xeric groundcover in accordance with Xeriscaping standards from Adams County Regulations Section 4-19-05 to minimize irrigation needs and promote water efficiency. Turf areas will be avoided except where functional. Mulching and soil amendments will be applied to retain moisture and reduce evaporation, and efficient irrigation methods may be used temporarily to establish vegetation. The dry grass vegetation will be reestablished to prevent the spread of weeds. Mulching or palliatives may be used for temporary dust control until vegetation is established.

- Upon completion of the decommissioning process, a one-year restoration monitoring period will begin. Monitoring will ensure that grading and drainage implemented is successful in stabilizing water flow patterns and that the cover vegetation (using drought-tolerant, native species consistent with Adams County Xeriscaping standards to the extent feasible) will be reestablished to prevent the spread of weeds and minimize irrigation needs. Corrective actions will be implemented if such monitoring determines adverse conditions are present because of inadequate restoration.

## 1.3 Equipment to be Used for the Decommissioning of the BESS

The decommissioning of the BESS will be carried out using traditional heavy construction equipment similar to equipment that was used to construct the BESS. This includes, but is not limited to, front-end loaders, bulldozers, cranes, excavators, water tankers, and trucks. Semi-trucks will be the main equipment used to haul off and transport materials to off-site salvage or recycle centers.

## 1.4 Dust Mitigation

During the decommissioning of the BESS, water tankers will be used to help control dust while activities related to the decommissioning occur. Additionally, the applicant will use BMPs to limit fugitive dust from being airborne and impacting surrounding properties. The dust mitigation efforts will be monitored by on-site personnel on a regular basis to ensure compliance. Water spray will be applied, as needed, to unpaved areas with care taken to not over-apply and create muddy conditions. Speeds of vehicles operating on site will also be limited to 15 mph or less to minimize dust.

# 2 Decommissioning and Reclamation Costs

## 2.1 Cost Estimates

If necessary, a bond will be posted according to a defined schedule and shall include all costs associated with the dismantlement, recycling, and safe disposal of facility components and site reclamation activities. These costs will be determined referencing the following items/assumptions:

- Project drawings
- Equipment specifications.
- The specified appropriate project management and mobilization to adhere to the Project schedule.
- All work is to be done in a single phase.
- Includes recycling of steel, aluminum, and copper.
- Batteries will be properly decommissioned and removed from site in accordance with relevant codes and standards.
- Includes restoration of the site back to like conditions before the BESS was installed.
- Electrical permit fees.
- Removal and disposal of fencing and/or other site perimeter barriers.
- Removal of electrical distribution equipment, transformers, and electrical equipment pads.
- Removal of electrical DC string wiring and AC underground.
- Site restoration.
- Safety and protection as required. Waste disposal fees and containers.
- Temporary Restrooms and site facilities for workers.

The cost would exclude:

- All utility specific tie in work to disconnect the site outside of property.
- Engineering, fees, errors, omissions additional design intent not clearly delivered or identified on the referenced drawings.
- Import or export of soils.

April 14, 2026:

- Jupiter Power sent a draft ERP, HMA, and Fire Masterplan to Chief Todd Godek and Captain Chris Swainson for their preliminary review.

March 12, 2026:

- After further developing the site plan, a meeting was held again with Chief Godek and Inspector Swainson to discuss updates to the site plan and go through safety protocols in more depth. An HMA and ERP were developed and were sent to the department in the weeks following the meeting.

August 14, 2025:

- Project introduction meeting with Captain Godek and other members of the Brighton FD to introduce the Prairie Pass Energy Storage project and to discuss expectations for the codes and safety standards that should be applied to the facility.
- Members from Fire and Risk Alliance were in attendance to answer code-specific questions from the FD

Jupiter Power has continued to maintain communications with the Brighton FD through project development and intends to further maintain that dialogue throughout the project lifespan.

# Geotechnical Evaluation

# Prairie Pass BESS

## Adams County, Colorado

Dudek

1001 Bannock Street, Suite 231 | Denver, Colorado 80301

February 16, 2026 | Project No. 503390001

Geotechnical | Environmental | Construction Inspection & Testing | Forensic Engineering & Expert Witness

Geophysics | Engineering Geology | Laboratory Testing | Industrial Hygiene | Occupational Safety | Air Quality | GIS

Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

# Geotechnical Evaluation
# Prairie Pass BESS
## Adams County, Colorado

Ms. Michelle Leis
Dudek
1001 Bannock Street, Suite 231
Denver, Colorado 80204

February 16, 2026 | Project No. 503390001


**Kelley Lange, EI**
Project Engineer

**Brian F. Gisi, PE**
Principal Engineer

KL/BFG

Distribution: (1) Addressee (via e-mail)

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# 1. INTRODUCTION

In accordance with your request and authorization of our proposal dated December 11, 2025, we have performed a geotechnical evaluation for the Prairie Pass utility scale battery energy storage system (BESS) project to be located in Adams County, Colorado.

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 and pile load testing, results of our laboratory testing, conclusions regarding the subsurface conditions at the site, and geotechnical recommendations for the design and construction of this project.

# 2. SCOPE OF SERVICES

The scope of our services for the project generally included:

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

- Site reconnaissance to document site conditions and establish boring and pile load test locations, and arrange for the mark-out of publicly owned underground utilities through Utility Notification Center of Colorado of the boring locations prior to drilling.

- Drilling, logging, and sampling of 31 borings to depths of up to approximately 40 feet below the ground surface (bgs). The purposes of the borings were to further evaluate the general subsurface soil conditions at the project site and to collect soil samples for laboratory testing. The boring logs are presented in Appendix A.

- Performance of laboratory tests on selected soil samples obtained from the borings to evaluate in-place moisture content and dry density, plasticity (Atterberg limit), percent material passing the No. 200 sieve and gradation, swell/consolidation potential, maximum Proctor density, and California Bearing Ratio (CBR). The results of the laboratory testing are presented in Appendix B.

- Performance of eight sets of 5 laboratory thermal resistivity tests at the site on representative soil samples obtained from the site in accordance with IEEE Standard 442-2017. For each set, three (3) thermal resistivity tests were performed at 90% compaction and at three (3) different moisture contents. In addition, one (1) thermal resistivity test for each set was performed at both 95% and 98% compaction. The results are presented with the laboratory test results in Appendix B.

- Performance of chemical laboratory testing on the bulk samples collected at the field resistivity locations to evaluate soil pH, Sulfate and Chloride, laboratory electrical resistivity, and oxidation reduction (redox) potential. The results of the laboratory testing are presented in Appendix C.

- Performance of 8 field resistivity tests (Wenner four-pin method) at the site. Tests were performed using a probe spacing of approximately 2, 4, 6, 8, 10, 25, 50, 75, and 100 feet.

Resistivity tests along two perpendicular traverses were performed at each location. Resistivity test transect locations are depicted on Figure 2. The results of the field resistivity tests are presented in Appendix D.

- Procure the piles from a local steel mill that were cut to the specified lengths and layout the piles at each test location.

- Drive a total of 24 piles (at a frequency of two W6x9 per location) to embedment depths of approximately 7 and 10 feet bgs for axial and lateral load testing. Actual piles lengths were approximately 12 inches longer than the embedment depths to allow for the load testing equipment set up. The piles were installed 48 or more hours prior to testing using a track-driven hydraulic ram. Pile locations are depicted on Figure 2.

- Prepare a tabulated summary of the pile driving results. The pile driving results documented during the pile installation are presented in Appendix E.

- Rigging and installation of hydraulic jacks, load cells and other measuring equipment for testing the piles using a 12,000-pound, all-terrain, reach forklift.

- Calibration and installation of dial gauges, load cells, and other measurement equipment in preparation for pile load testing.

- Performance of axial compression, axial tension, and lateral tests on the piles at the 10 locations across the project site in general accordance with ASTM D1143, D3689, and D3966, respectively. Compressional loading was directed downward (compression). axial loading was directed upward (pull-out), and lateral loading was performed parallel to the strong axis of the pile.

- Monitoring and recording of time, load, displacement (measured at the time of load increase and after the 30-second hold time), and measurement of the permanent deformation during the testing program. An electronic gauge with 1/1,000-inch precision was placed on the test piles to provide measurements during lateral and axial testing. The results of the load testing performed in the field is provided in Appendix F.

- Removal and disposal of the piles.

- Compilation and analysis of the data obtained.

- Preparation of this report presenting our findings, conclusions, and geotechnical recommendations regarding design and construction of the project.

## 3. SITE DESCRIPTION AND BACKGROUND REVIEW

The site is located at the southeast corner of County Road (CR) 27, also known as Cavanaugh Road, and East 128th Avenue in Adams County, Colorado. The site is approximately 36-acres and is currently used for agricultural purposes with an existing residence at the northeast corner of the site.

## 4. PROPOSED CONSTRUCTION

The project consists of constructing an approximately 300-Megawatt (MW) utility scale battery energy storage system (BESS). The project will connect to the existing substation located south of

the project site. Based on the information provided by Jupiter Power, each BESS container will weigh 49 tons and will require 6 anchor points. Based on this information, each anchor will require a capacity of 8.2 tons. Aside from the BESS structures, gravel roadways throughout the site and around the BESS structures are anticipated.

## 5. FIELD EXPLORATION AND LABORATORY TESTING

Between December 31, 2025 and January 6, 2026, 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 31 exploratory borings using a truck-mounted drill rig equipped with 4-inch diameter, continuous-flight, solid-stem augers. The borings were advanced within the project site to depths of up to approximately 40 feet bgs. Relatively undisturbed and disturbed soil samples were collected at selected intervals. The locations of the borings are presented on Figure 2. The borings logs are presented in Appendix A.

Boring coordinates and ground elevations were measured in the field using a Trimble Model DA2-BT survey-unit with a global navigation satellite system (GNSS) output of NAD83 (2011) and referencing Geoid model GEOID18. The boring coordinates and elevations, as well as bedrock elevations, are provided in Appendix A.

The soil samples collected from the 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, swell/consolidation potential, maximum dry density and optimum moisture content (standard Proctor), and California Bearing Ratio (CBR). The results of the in-situ moisture content and dry density tests are presented on the boring logs in Appendix A. Descriptions of the laboratory test methods and the remainder of the test results are presented in Appendix B.

Eight sets of five laboratory thermal resistivity tests were also performed at the site on representative soil samples obtained from the site in accordance with IEEE Standard 442-2017. In order to produce a dry-out curve, for each set, three (3) thermal resistivity tests were performed at 90% compaction and at three (3) different moisture contents. In addition, one (1) thermal resistivity test was performed for each set at both 95% and 98% compaction. The results of the laboratory thermal resistivity testing is included in Appendix B.

Laboratory chemical testing was also performed including electrical resistivity and chemical considerations (pH, reduction-oxidation potential, sulfate content, sodium content, sodium sulfate

content, total salts, and soluble sodium chlorides). The results of the chemical testing are provided in Appendix C.

# 6. FIELD RESISTIVITY AND BULK SAMPLE COLLECTION

Field resistivity tests were performed along two roughly perpendicular survey lines at three locations across the project site. A MiniRes Soil Resistance Meter and Wenner 4-pin arrangement were utilized to obtain electrical resistivity measurements at current and potential electrode intervals ("A" spacings) of 2, 4, 6, 8, 10, 25, 50, 75, and 100 feet. Resistance values were recorded and used to calculate apparent resistivity in Ohm-centimeters (Ohm-cm). The approximate locations of the field resistivity tests are shown on Figure 2.

The field resistivity tests were conducted by a geologist trained and experienced in resistivity surveys. The test results are presented in Appendix D.

# 7. PILE LOAD TESTING

Pile load testing was performed on 24 piles in 12 locations across the site.

## 7.1. Pile Procurement and Installation

Test piles were procured from a local steel mill, pre-cut to the lengths specified, and delivered the project site. The piles were dropped at the test locations and the test piles were installed by Black Canyon Excavating, a minimum of 48 hours prior to testing. Two H-piles were installed at each of the 12 test locations at the site. Each test location had two W6x9 piles with approximately 7-foot and 10-foot embedment. The test locations are presented on Figure 2. The pile driving rig utilized a track-driven hydraulic ram to install the test piles. Driving times ranged from approximately 39 to 630 seconds. Refusal conditions were encountered at the 10-foot piles at PLT-3 and PLT-5. A summary of the pile installation drive times is provided in Appendix E and are also provided on the load test logs in Appendix F.

## 7.2. Pile Load Testing

During pile load testing, lateral and axial reaction was provided by a 12,000-pound, all-terrain forklift and 40,000-pound excavator. Electronic gauges were used to measure deflections and a calibrated electronic load cell was used to measure load. Chains, shackles, quick links, slings, clamps, chain fall, and other miscellaneous hardware were used to rig the piles for testing. The gauges measured deflections with 1/1,000-inch precision. To measure lateral deflections during testing, one gauge was fixed to a beam supported by dunnage and fixed to the pile approximately 8 inches above the ground

surface. During axial testing, a gauge was fixed to a surveyor's tripod to measure axial deflections at the top of the pile.

Lateral loading was performed coincident with the strong axis of the pile and axial loading was directed upward (pull-out) and downward (compression). The piles were loaded axially in 500-pound increments up to approximately 4,000 to 8,000 pounds. The test piles load increments were held for approximately 15 to 300 seconds each.

The piles were loaded laterally in 500-pound increments up to approximately 3,000 pounds. Measurements of deflection were taken at each load increment.

The data collected in the field was reviewed, compiled, and analyzed. The results of the pile load testing performed are presented in Appendix F.

### 7.3. Pile Removal and Disposal

After the completion of load testing, removal of each pile was attempted using a 12,000-pound, all-terrain, reach forklift. None of the piles were removed with the forklift and had to be removed by others using an excavator. After removal, the piles were transported offsite and disposed of.

## 8. GEOLOGIC AND SUBSURFACE CONDITIONS

### 8.1. Regional Geologic Setting

The site is located northeast of the Denver International Airport in rural Adams County. Surficial geology at the project site was eolian deposits. Denver Formation bedrock is mapped underlying the project site at depth.

### 8.2. Subsurface Conditions

Our understanding of the subsurface conditions at the project site is based on our field exploration and laboratory testing, review of published geologic maps, historic aerial photographs, 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.

#### 8.2.1. Eolian Deposits

A plow zone approximately 12 inches thick was encountered in the borings performed on the north half of the site. Below this, and below a surficial root zone in the southern borings, eolian

deposits were encountered to depths of approximately 2 to 26 feet below existing site grades. The eolian deposits were composed of various shades of brown, dry to moist, stiff to hard, lean clay with varying amounts of sand.

Based on laboratory test results, selected samples of the eolian deposits had in-place moisture contents between 5.7 and 21.2 percent and dry densities between 89.4 and 123.8 pounds per cubic foot (pcf). The upper eolian deposits were relatively dry with respect to their optimum moisture content.

### 8.2.1. Denver Formation Bedrock

Bedrock mapped as the Denver Formation was encountered below the eolian deposits and extended to the borings' termination depths of up to approximately 40 feet below existing site grades. The Denver Formation was composed of various shades of brown and yellow, dry to moist, soft to hard, claystone with varying amounts of sand and weakly to strongly cemented sandstone with varying amounts of clay. Due to the variability of bedrock depth across the site, the depth to bedrock is noted on Figure 2.

Based on laboratory test results, selected samples of the bedrock had in-place moisture contents between 4.3 and 31.5 percent and dry densities between 86.3 and 114.8 pcf.

## 8.3. Groundwater

An attempt to measure groundwater was performed during drilling operations. Groundwater was only encountered in Boring B-12 at a depth of approximately 33 feet bgs. An attempt to obtain delayed groundwater readings was also performed 24 hours after drilling. At that time, groundwater was only encountered in Boring B-14 at a depth of approximately 35 feet bgs. Groundwater levels will fluctuate due to seasonal variations in the amount of rainfall, runoff, groundwater withdrawal from adjacent sites, and other factors. In addition, perched water can develop in the higher permeability overburden deposits following periods of heavy or prolonged precipitation.

In general, the timeframe the borings were performed are within the dry season of Adams County. Liquid equivalent precipitation values of less than ½ inch occur in Adams County between October and December. The wettest months are typically April through July. As a result, we anticipate fluctuations from the dry period groundwater measurements of up to 3 feet could be anticipated seasonally. The depth of groundwater encountered will be highly dependent on the time of year construction occurs.

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 encountered during construction of the development. However, groundwater may be encountered if deep utilities are planned and during installation of deep foundations for the substation.

# 9. GEOLOGIC HAZARDS

The following sections describe potential geologic hazards at the site including faulting and seismicity, expansive soils, and compressible/collapsible soils.

## 9.1. Faulting and Seismicity

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 Rocky Mountain Arsenal Fault lies 15 miles southwest 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.

The Golden Fault lies over 37 miles southwest 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.

Design of the proposed improvements should be performed in accordance with the requirements of the governing jurisdictions and applicable building codes. Table 1 presents the seismic design parameters for the site in accordance with the American Society of Civil Engineers (ASCE) 7-16 guidelines and adjusted maximum considered earthquake spectral response acceleration parameters evaluated using a web-based ground motion calculator (ASCE, 2025).

| Table 1 – ASCE 7-16 Seismic Design Criteria | |
|---|---|
| **Site Coefficients and Spectral Response Acceleration Parameters** | **Values** |
| Class | D |
| Coefficient, $F_a$ | 1.3 |
| Coefficient, $F_v$ | 1.5 |
| Mapped Spectral Response Acceleration at 0.2-second Period, $S_s$ | 0.162 g |
| Mapped Spectral Response Acceleration at 1.0-second Period, $S_1$ | 0.051 g |
| Spectral Response Acceleration at 0.2-second Period Adjusted for Site Class, $S_{MS}$ | 0.21 g |
| Spectral Response Acceleration at 1.0-second Period Adjusted for Site Class, $S_{M1}$ | 0.076 g |
| Design Spectral Response Acceleration at 0.2-second Period, $S_{DS}$ | 0.14 g |
| Design Spectral Response Acceleration at 1.0-second Period, $S_{D1}$ | 0.051 g |

## 9.2. Expansive Soils

One of the more significant geologic hazards in Colorado 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. To assess the swell potential of the subsurface soils and bedrock, we collected relatively undisturbed samples for one-dimensional swell/consolidation tests, conducted at surcharge pressures that closely resemble representative field conditions, following the guidelines outlined in ASTM D4546. The laboratory tests are provided in Appendix B and further discussed below.

Selected samples were tested for swell percent against a surcharge pressure of approximately 200 pounds per square-foot (psf) in order to evaluate pavement risk. Based on the results of our laboratory testing, the selected samples tested exhibited swell potentials ranging from approximately 0.4 to 7.8 percent under a surcharge load of approximately 200 psf. 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 2.

| Table 2 – 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 and foundation performance, selected samples of the overburden and bedrock deposits were tested for swell/consolidation at representative field or post-construction surcharge pressures of approximately 500 to 1,500 psf. Selected samples tested exhibited swell potential ranging from nil to approximately 8 percent under surcharge loads of approximately 500 to 1,500 psf. Based on our experience and the results of our laboratory testing, the soils and bedrock expected to be encountered during project development would have a slab performance risk category of “LOW” to “VERY HIGH” based on the criteria presented in Table 3.

| Table 3 – 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).

Recommendations are provided in this report for remediation of subgrade soils below structures due to expansive soils.

## 9.3. Collapsible / Compressible Soils

Soil collapse (or hydrocollapse) is a phenomenon where soils undergo a significant decrease in volume due to rearrangement of soils particles to a more compact arrangement upon an increase in moisture content, with or without an increase in external loads. These soils are generally found in arid to semi-arid regions and have low in-situ unit weights and moisture contents. Buildings,

structures, and other improvements may be subject to excessive settlement-related distress when collapsible soils are present.

The overburden deposits generally consist of lean clay with varying amounts of sand underlain by relatively shallow Denver Formation bedrock. The clay soils were generally observed to be relatively dry with respect to their optimum moisture content.

Based on the results of our subsurface exploration, laboratory testing, and the information obtained from our background review, the eolian deposits are anticipated to pose a low risk of collapse. Compression potential of the overburden deposits is also considered low due to the relatively shallow bedrock.

## 10. CONCLUSIONS

Based on our geotechnical evaluation, it is our opinion that construction of the proposed project and associated infrastructure at the subject site is feasible from a geotechnical standpoint, provided the following recommendations are incorporated into the design and construction of the project.

- A plow zone approximately 12 inches thick was encountered in the borings performed on the north half of the site. Below this, and below a surficial root zone in the southern borings, eolian deposits were encountered to depths of approximately 2 to 26 feet below existing site grades. The eolian deposits were composed of various shades of brown, dry to moist, stiff to hard, lean clay with varying amounts of sand.

- Bedrock mapped as the Denver Formation was encountered below the eolian deposits and extended to the borings' termination depths of up to approximately 40 feet below existing site grades. The Denver Formation was composed of various shades of brown and yellow, dry to moist, soft to hard, claystone with varying amounts of sand and weakly to strongly cemented sandstone with varying amounts of clay.

- Variable bedrock depths were encountered across the site. In general, it appears the deeper bedrock is within the center of the site. However, the variability should be reviewed by foundation installers. Depending on the depth of piles installed, refusal could occur where shallow, competent bedrock depths are encountered. Weathered bedrock was also encountered along the northwestern portion of the site resulting in failure of some piles during the pile load testing program.

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

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

- Site soils generated from on-site excavation activities consisting of eolian deposits that are free of deleterious materials, and do not contain particles larger than 3 inches in diameter, can generally be used as engineered fill during site and remedial grading. If excavated Denver Formation bedrock is encountered, significant processing (disking) should be anticipated to break the material down to 3 inches or less.

- Topsoil or organic rich soil is not suitable for support of structures and improvements, and is not appropriate for use as structural fill. Where encountered, topsoil and organically rich soil will need to be removed from proposed structure and improvement areas. Removal of topsoil will not be needed in areas where driven piles will be used for support of structures.

- The on-site overburden deposits should generally be excavated with medium- to heavy-duty earthmoving or excavation equipment in good operating condition. Difficult excavation and increase wear on equipment should be anticipated for excavations that extend into the Denver Formation bedrock.

- An attempt to measure groundwater was performed during drilling operations. Groundwater was only encountered in Boring B-12 at a depth of approximately 33 feet bgs. An attempt to obtain delayed groundwater readings was also performed 24 hours after drilling. At that time, groundwater was only encountered in Boring B-14 at a depth of approximately 35 feet bgs. In general, groundwater is not anticipated to be encountered during construction of proposed improvements.

- The BESS structures could be supported on conventional spread footings, driven piles, or helical piles. Other small site structures like the perimeter walls and other site walls may be supported on shallow spread-footing or mat foundations.

# 11. RECOMMENDATIONS

It is our opinion that construction of the BESS project and associated infrastructure at the subject site is feasible from a geotechnical standpoint, provided the following recommendations are incorporated into the design and construction of the project. If the site improvements differ from the plans provided, it is important that Ninyo & Moore be notified and given an opportunity to reevaluate our recommendations prior to bidding the project for construction.

## 11.1. Earthwork

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

### 11.1.1. 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 overburden deposits should generally be excavated with medium- to heavy-duty earthmoving or excavation equipment in good operating condition.

Excavations within the hard claystone and strongly cemented sandstone of the Denver Formation bedrock may require the use of heavy-duty excavation equipment. The excavations within the Denver Formation will be difficult and slow, and could result in increased wear and tear on the equipment used. Denver Formation bedrock contains hard claystone and strongly cemented sandstone bedrock, which could result in the use of specialized equipment (i.e., single-shank rippers and rock breaking equipment).

The bedrock will be hard and brittle, and may break off in large sections. 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 subgrade material should be avoided when excavating the bottom 6 to 12 inches of excavations as such equipment may disturb the excavation bases.

### 11.1.2. Temporary Excavations

Temporary excavations will be needed for this project to construct foundations and utilities. Based on the subsurface information obtained from our exploratory excavations and our experience with similar projects, we anticipate that the soil conditions and stability of the excavation sidewalls may 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 overburden deposits and bedrock should generally be considered a Type B and Type A soils, respectively, when applying OSHA regulations. For these soil conditions, OSHA recommends temporary slope inclinations of 1H (Horizontal):1V (Vertical) and ¾H:1V or flatter, respectively, for excavations 20 feet or less in depth. Steeper cut slopes may be utilized for excavations that are less than 4 feet deep depending on the strength, moisture content, and homogeneity of the soils as observed in the field.

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

### 11.1.3. Site and Remedial Grading

Prior to grading, the ground surface in proposed improvement areas should be cleared of any surface obstructions, debris, topsoil, organics (including vegetation) and other deleterious material. Materials generated from the clearing operations should be removed from the site and disposed of at a legal dumpsite. Obstructions that extend below finish grade, if present, should be removed and the resulting holes filled with compacted soil or cement slurry, or in accordance with the recommendations of the geotechnical engineer. Topsoil present on-site should not be incorporated into engineered fill.

Based on the results of our subsurface exploration and laboratory testing, remedial grading should be anticipated below structures supported on the site soils. The remedial work should generally consist of: a) uniformly overexcavating the site to the below outlined depths and locations extending below the bottom of the finished grades; b) scarifying, moisture conditioning, and compacting the exposed subgrade soils to a depth of about 12 inches (scarifying of the exposed subgrade may not be needed in areas where the excavations bottom in firm formational materials); and c) replacing, moisture conditioning, and compacting the excavated materials as engineered fill. The geotechnical consultant should observe the remedial excavations, and the elevations of the excavation bottoms should be surveyed by the project civil engineer.

If conventional spread footings or mat foundations are utilized, remedial grading depths of 4 or more feet below the bottom of the foundations should be anticipated. The remedial grading should extend horizontally 5 or more feet beyond the structure footprint. Where driven piles are utilized, remedial grading below the structures is not required.

Site pavements and roadways should be supported on 24 or more inches of engineered fill (moisture-conditioned and recompacted site soils).

It should be noted that clay soils are present on the site. If allowed to dry out following remedial grading, these soils have the potential for expansion when wetted. As a result, care should be taken to minimize the time these materials are left exposed following remedial grading operations. The time it takes for these materials to dry out will be dependent on the time of year construction occurs.

The exposed subgrade materials should be firm and unyielding prior to fill placement. The extent of and depths of removal should be evaluated by our representative during the excavation work

based on observation of the soils exposed. Additional recommendations specific to the site conditions encountered may be provided at the time of construction. Subgrade materials that are disturbed during grading should be moisture conditioned and re-compacted according to the recommendations provided in this report.

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.

### 11.1.4. Re-Use of Site Soils

Soils generated from on-site excavation activities in the overburden deposits that are free of deleterious materials and do not contain particles larger than 3 inches in diameter can generally be used as engineered fill as evaluated by the geotechnical consultant. If encountered, excavated bedrock is not recommended for re-use as engineered fill. If the client or contractor elects to utilize excavated bedrock in the engineered fill, it is anticipated that significant effort will be required to process the bedrock to the above specifications.

### 11.1.5. Fill Placement and Compaction

Fine-grained, cohesive soils (CL) used as engineered fill should be moisture-conditioned to moisture contents between optimum and 3 percent over optimum moisture content. Granular soils (SC 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 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.

### 11.1.6. Imported Soil

Imported soil for use as engineered fill should have less than 50 percent passing the No. 200 sieve, a very low swell potential (approximately 1 percent or less when wetted against a surcharge pressure of 200 psf), and a low plasticity index (less than 20). Imported soil should not contain organic matter, clay lumps, bedrock (shale, 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 project's geotechnical consultant at the borrow source for its suitability prior to importation to the project site.

### 11.1.7. Controlled Low Strength Material

Use of Controlled Low Strength Material (CLSM) should be considered in lieu of compacted fill for areas with low tolerances for surface settlements, for excavations that extend below the groundwater table and in areas with difficult access for compaction equipment. CLSM consists of a fluid, workable mixture of aggregate, Portland cement, and water. CLSM should be placed in lifts of 5 feet or less with a 24-hour or more curing period between each lift.

The use of CLSM has several advantages:

- A narrower excavation can be used where shoring is present, thereby minimizing the quantity of soil to be excavated and possibly reducing disturbance to the near-by traffic;
- Compaction requirements do not apply;
- There is less risk of damage to improvements, since little compaction is needed to place CLSM;
- CLSM can be batched to flow into irregularities in excavation bottoms and walls; and
- The number of workers needed inside the trench excavation is reduced.

The CLSM mix design should be submitted for review prior to placement. The 28-day strength of the material should be no less than 50 pounds per square inch (psi) and no more than 150 psi. CLSM should be observed and tested by the geotechnical consultant.

### 11.1.8. 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 CLSM 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.

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., TenCate 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.

## 11.2. Structure Foundations

The following subsections provide recommendations for conventional spread footings, mat foundations, driven pile foundations, and helical anchors planned for support of the proposed structures.

### 11.2.1. Spread Footings

Structure foundations consisting of spread footings should extend 36 inches or more below the lowest adjacent finished grade (for frost protection). Footings should bear on engineered fill, as recommended in Section 11.1.3, extending to suitable native deposits or formational material. Continuous wall footings should have a width of 18 inches or more and column footings should have a width of 24 inches or more. Footings should be reinforced in accordance with the recommendations of the Structural Engineer.

Footings may be designed using an allowable bearing pressure of 4,000 pounds per square foot (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).

The bottom surface of foundation excavations should be compacted with hand-held dynamic compaction equipment (i.e., jumping jack, flat-plate vibrator) prior to placement of forms and reinforcing steel. 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 compacted. It is recommended that Ninyo & Moore be retained to observe, test, and evaluate the soil foundation bearing materials.

Based on our evaluation of spread footing bearing capacity, we anticipate that foundation settlement will be on the order of 1-inch.

### 11.2.2. Mat Foundations

We anticipate that mat foundations may be used to support electrical equipment at the project site. Mat foundations should extend 18 inches or more below the lowest adjacent finished grade and bear on engineered fill as recommended in Section 11.1.3. Mat foundations may be designed using an allowable bearing capacity of 4,000 psf. The allowable bearing capacity may be increased by one-third when considering loads of short duration, such as wind or seismic forces. Mat foundations may be designed using a modulus of subgrade reaction, k, of 30 pounds per square inch (psi) per inch of deflection.

Foundations may be designed using an ultimate coefficient of friction of 0.35. The total settlements under static loading conditions corresponding to this allowable bearing pressure are estimated to be up to approximately 1-inch based on our understanding of the structures.

As previously mentioned, frost depth is approximately 36 inches below the existing grade at the subject site. Mat foundations that are founded above frost depth will be subject to soil-related movements resulting from frost heave/settlement.

### 11.2.3. Driven Pile Foundations

It is our understanding that driven pile foundations are being considered for support of the proposed solar panels. The lateral design parameters provided in Table 4 can be used for lateral analysis of piles.

**Table 4 – Recommended Lateral Load Parameters**

| Material Type | $\gamma$ (pcf) | $\phi$ (deg) | $c_u$ (psf) | $k_h$ (pci) | $\varepsilon_{50}$ |
|---|---|---|---|---|---|
| Overburden Deposits | 120 | -- | 2,000 | 500 | 0.007 |
| Denver Formation Bedrock | 125 | -- | 4,000 | 1,500 | 0.005 |

Clay soils were encountered in the borings performed. These materials generally had a low to very high swell potential and pressure. To mitigate frost heave and swell pressure of these soils, we recommend the upper 3 feet of the driven piles be designed using an uplift potential of 700 psf over the area of the piles. If grading is performed such that Denver Formation bedrock is exposed within the frost zone, we recommend the driven piles be designed using an uplift potential of 1,600 psf over the area of the piles

Refusal occurred during pile driving for the 10-foot piles at PLT-3 and PLT-5. In addition, difficult driving time (longer than typical drive times) occurred at numerous locations. These conditions could be correlated to the stiffer clay soils and relatively shallow Denver Formation bedrock.

In addition to refusal occurring, two pile locations (PLT-7 and PLT-9) failed during the pile load testing of the 7-foot embedment (both locations) and 10-foot embedment (PLT-9). At these locations, weathered claystone bedrock was encountered at relatively shallow depths. Based on the loading and settlement readings, it appears punching failing occurred at these locations.

Maximum capacity of the driven piles installed was achieved at most locations as a part of our pile load testing program without appreciable settlement. However, as stated previously, failure also occurred at 2 locations. The variability of bedrock depth across the site also affected the pile load testing results. As a result, the computer program Allpile created by CivilTech Software was utilized to estimate vertical load versus depth and vertical load versus anticipated settlement with multiple parameters based on the pile load testing program.

Three generalized soil profiles were created based on our subsurface exploration and laboratory testing. The first profile assumes clay overburden for the depth of the driven pile. The second profile assumes a relatively shallow clay overburden followed by weathered bedrock. This profile was created in an attempt to mimic the conditions encountered at the northwest corner of the site where failure occurred during the pile load testing. The third profile assume a relatively shallow clay overburden followed by competent bedrock. Steel W6X9 H-piles were considered for our evaluation. The outputs of ultimate capacity versus depth and load versus settlement for the three profiles are included in Appendix G of this report.

### 11.2.4. Helical Pile Foundations

As an alternative to driven piles, the structures may be supported on helical anchors. Helical anchors (piers) are steel shafts with helices that resemble large screws. They are screwed into the ground using specialized equipment. Torque developed during installation has been correlated to foundation capacity. Helical anchors should have a length of 10 or more feet. Due to the relatively shallow bedrock, pre-drilling of helical anchors may be necessary.

Helical anchors should be spaced so that the center to center spacing of the helical piers is three or more times the diameter of the largest helix diameter. Group effects and a reduction in axial capacity should be considered for piles spaced less than three helix diameters on center.

Helical anchor design should be based on the results of a load test performed in general accordance with ASTM D1143-07 (Standards Method of Testing Piles Under Static Axial Compressive Load) and, if under tension, ASTM D 3689-07 (Standard Method of Testing Piles Under Static Axial Tensile Load) using the “Quick Test Method”, and evaluated using the modified Davisson offset failure criteria (ICC Evaluation Service, 2007). Load testing of the piles should be performed incrementally on two times the design load with deflections measured at each additional load increment. The pile head deflections measured at the design load should not exceed 0.5 inches. Prior to the load test the contractor shall submit calibration records of the jacks and dial indicators that will be used during the load test and installation. The test pier,

if successfully tested and assuming it was installed in an actual pier location, may be accepted as a design pier and left in place.

Based on helical anchor design software, HeliCap and design data provided by FHWA, we anticipate helical anchor capacities ranging from 5 to 25 kips per anchor.

The helical anchor contractor should monitor and record the torque applied during the installation of each helical pier. Ninyo & Moore personnel should be present during pre-production pier testing to observe and document testing conditions and results. Based on the findings of the load tests, design axial capacities may be reevaluated for planned production piers.

## 11.3. Substation Deep Foundations

We anticipate transmission structures in the substation will be supported on deep foundations. The commonly used deep foundation system is the straight-shaft drilled-pier foundation. Due to the presence of groundwater and sands that will be prone to sloughing, placement of casing through the alluvial deposits, and/or utilizing a slurry method, will be needed to advance drilled pier foundations into the Denver Formation bedrock.

The design considerations presented below should be considered during drill pier foundation system design. The construction details and other considerations presented in this report should also be considered when preparing project documents. If the measures outlined in this report are implemented effectively, settlements of about ½-inch are anticipated for drilled pier foundation systems. This estimate is based on the subsurface conditions encountered in the borings, anticipated loading conditions, and our experience with similar soils and bedrock.

Deep foundations should be designed in accordance with structural considerations and the following recommendations. In addition, requirements of the appropriate governing jurisdictions and applicable building codes should be considered in design of the structures. As part of the foundation analyses, we used the following representative subsurface base off the soil borings performed in the vicinity of the substation.

### 11.3.1. Drilled Pier Design Considerations

A pier diameter of 18 or more inches or 5 percent of the expected total pier length, whichever is greater, is recommended to facilitate cleaning and observation of the pier hole. The Structural Engineer should design the actual length to diameter ratio.

Based on the subsurface conditions encountered, we recommend utilizing the following design parameters for design of drilled piers.

**Table 5– Drilled Pier Design Parameters**

| Depth Below Ground Surface (ft) | Allowable Skin Friction(psf) | Allowable End Bearing (psf) |
|---|---|---|
| 0 – 3 | -- | -- |
| 3 – 10 | 1,500 | -- |
| 10 – 15 | 2,500 | 25,000 |
| 15 – 40 | 5,000 | 50,000 |

**Note:** Assumes tip of pile extends at least 1 diameter into the bearing stratum for end bearing design.

Two-thirds of the allowable skin friction values provided above can be utilized to resist uplift. The allowable end bearing pressure and allowable skin friction values provided may be increased by one-third when considering loads of short duration such as wind and seismic.

Bedrock penetration in pier holes should be roughened artificially to assist the development of peripheral shear between the pier and bedrock. Artificially roughening of pier holes should consist of installing 3-inch high and 2-inch-deep shear rings placed on 18 inches on center within the bedrock penetration zone of each pier.

We understand lateral load analysis of shafts will be performed by others. The lateral load parameters provided in Section 11.2.3 may be used for lateral analysis of drilled piers for resistance to lateral loads. The parameters were developed based on the field and laboratory data obtained for the subject site and our experience with similar sites and conditions. The Denver Formation bedrock should be designed as Stiff Clay W/O Free Water in the L-Pile program.

### 11.3.2. Drilled Pier Construction Considerations

Our evaluation of the excavation characteristics of the on-site materials is based on the results of our exploratory borings, site observations, and experience with similar materials. Relatively clean sand and resistant bedrock was encountered in our borings. Difficult drilling conditions may be encountered during pier hole drilling. Pier penetration should be adjusted in the field until adequate bearing material is encountered.

The pier-drilling contractor should mobilize equipment of sufficient size and operating capability to achieve the recommended penetration into the bedrock. The excavation technique chosen by the contractor should not adversely affect the quality or strength of the shaft side or end

bearing materials. If refusal is encountered in these materials either during the test program or during actual installation, the Geotechnical Engineer should be retained to evaluate the conditions to establish that true refusal has been met with adequate drilling equipment.

When encountered, groundwater was measured at depths ranging between approximately 33 and 35 feet. The groundwater conditions will fluctuate and perched groundwater may be encountered between the overburden deposits and formational materials. The contractor should be prepared to advance the piers in the presence of groundwater.

The sandy overburden soils are vulnerable to sloughing during the drilling process and casing will be needed to advance the pier holes. A slightly oversized casing can be used to facilitate excavation and to reduce the chance from snagging or lifting the casing during cleanout operations.

In addition to the overburden soils, Denver Formation bedrock below the water table may yield significant volumes of water when penetrated by the pier excavations. Seating of the casing in the upper layers of the bedrock may not create positive cutoff of water infiltration. In the event that casing is seated into the bedrock, the bedrock penetration should be measured from the bottom of the casing.

The concrete may be placed by the free-fall method into piers that exhibit “dry” conditions (i.e. less than 3 inches of water). This method consists of using a vertical section of concrete chute to divert the concrete flow out of the truck in a vertical stream of concrete with a relatively small diameter. The stream should be diverted to avoid hitting the sides of the drilled pier or the reinforcing cage, which could cause concrete segregation. In no case, should concrete be placed in more than 3 inches of water, unless placed using a tremie-method.

Where water or slurry is present in the drilled pier hole, including outside of a casing that will be withdrawn from the hole, the concrete placed for the pier should have sufficient slump and be placed with sufficient head maintained above groundwater levels so that the concrete is not displaced in the body of the pier by water, soil, slurry, etc., leading to effective voids in the pier. Concrete utilized in the piers should be a fluid mix with sufficient slump so that it will fill the void between reinforcing steel and the pier hole wall. We recommend the concrete have a slump in the range of 6 inches +/– 1-inch.

The contractor should take care to reduce enlargement of the excavation at the tops of piers, which could result in mushrooming of the pier top. Pier holes should be cleaned prior to placement of concrete. Care should be taken to check that the soils at the pier bottom have not

been disturbed. The movement associated with mobilizing the end-bearing component should not be beyond tolerable structural limits. The successful advancement of drilled excavations for the construction of drilled piers will depend largely on the suitability of the drilling equipment and skill of the operator. The drilled foundation contractor should try to reduce the time during which the excavation remains open. The contractor should schedule the sequence of operations so that each excavation can be finished, reinforcing steel placed, and the concrete poured in a rapid and timely manner. The contractor should not place drilled piers adjacent to each other until the first one is set. The installation of piers should be scheduled to allow the concrete in adjacent piers to set for 24 or more hours before drilling the next pier. Drilled piers spaced closer than about four pier diameters (clear spacing) should be placed on alternate days and drilled pier excavations should not be left open overnight.

The drilled pier excavations should be evaluated to check that adequate bearing material has been reached and that the bearing surface has been suitably cleaned. This evaluation can typically be done at the surface. Installation should be observed by the Geotechnical Engineer or qualified representative to check that, among other things: 1) subsurface conditions are as anticipated from the borings, 2) the drilled piers are constructed to the specified size and penetration, 3) drilled piers are within allowable tolerances for plumbness, and 4) reinforcements are placed per project specifications. These items are fundamental to the installation and behavior of the drilled piers in accordance with our recommendations. Furthermore, we recommend the following for the installation of drilled piers.

- The clear spacing between rebar or behind the rebar cage should be more than three times the maximum size of the coarse aggregate used in the concrete.
- Centralizers on the rebar cage should be installed to keep the cage positioned per project specifications.
- Cross bracing of a reinforcing cage may be used when fabricating, transporting, and lifting. However, experience has shown that cross bracing can contribute to the development of voids in a concrete pier. Therefore, we recommend removing the cross bracing prior to lowering the reinforcing cage into the open excavation.
- If casing is used, a sufficient head of concrete that fills the casing should be used before pulling the casing.
- If more than one truck load of concrete will be needed to construct the caisson, consideration should be given to the utilization of hydration stabilizers to delay concrete setting and allow for the successful removal of the casing.
- Concrete tremied into a pier excavation with slurry (if utilized) should maintain a hydrostatic pressure in excess of either the surrounding water table or slurry in the excavation.

- The slurry (if utilized) should have a marsh funnel viscosity of more than 45 to 60 seconds. The slurry should have a specific gravity between 1.02 (8.5 lb./gal.) and 1.15 (9.6 lb./gal.) at the time of concrete placement. In addition, the sand content in the slurry should be less than 15 percent.

- We recommend performing sonic integrity testing on an appropriate percentage (i.e., 10 percent or more) of the drilled piers installed at the site to assess the effectiveness of the pier construction methods. Additional information on sonic integrity testing (i.e. sonic-echo or cross-hole sonic) can be provided upon request.

We should be given an opportunity to review the proposed specifications and the contractor's installation procedures prior to construction.

## 11.4. Earthen and Gravel Roads

We understand that the roadways around the project will either be light traffic earthen or gravel roads. The road sections recommended within this section were developed in general accordance with the Low-Volume Road Design guidelines and procedures of the American Association of State Highway and Transportation Officials (AASHTO) (AASHTO, 1993).

### 11.4.1. Low-Volume Road Design

We understand the facility is anticipated to have light-duty maintenance activities consisting of 3, 8,000-pound gross vehicle weight vehicles per day. Based on this information, an equivalent 18-kip single axle load value of less than 1,000 was calculated for the earthen or gravel roads for the project for 20-year design lives. If design traffic loadings differ significantly from this assumed value, we should be notified to re-evaluate the recommendations below.

The subgrade soils encountered during the subsurface exploration generally consisted of lean clay with varying amounts of sand, which classify as A-6 to A-7-6 soils in accordance with the AASHTO soil classification system. It is assumed soils imported to the site would classify as A-4 soils or better.

Earthen and Gravel roads are subject to seasonal moisture fluctuations, which affects the stability and strength of the subgrade soils. As a result, seasonal resilient moduli were utilized to evaluate aggregate base thickness required for the maintenance roads.

Resilient modulus values were assumed for the summer and fall seasons, when subgrade soil moisture conditions range from dry to moist, and spring and winter seasons when subgrade soil is saturated, due to spring thaw, or frozen.

The design of aggregate-surfaced roads was based on the following input parameters:

| | |
|---|---|
| Serviceability Loss: | 3.0 |
| Allowable Rutting (inches): | 2.0 |
| Aggregate Base Elastic Modulus (psi): | 30,000 |
| Estimated Aggregate Loss (GL) (inches): | 2.0 |
| Resilient Modulus – Summer and Fall (Roadbed Dry to Moist): | 6,000 psi |
| Resilient Modulus – Spring-Thaw (Roadbed Saturated): | 2,000 psi |
| Resilient Modulus – Winter (Roadbed Frozen): | 20,000 psi |

Based on these inputs and the results of our analysis, performed in general accordance with the AASHTO Low-Volume Road design procedures, we recommend the site roadways be constructed with 5 or more inches of CDOT Class VI aggregate base course (ABC). Placement and compaction of these materials is described in Section 11.1.5. A layer of geotextile fabric may be placed on the prepared subgrade, prior to the placement of the CDOT Class VI ABC to help prevent the migration of fines.

It is our opinion the recommended design would be sufficient to withstand the light traffic loads, including loads imparted by emergency vehicles, and should be relatively weather resistant. This design thickness accounts for rutting of approximately 2 inches with an estimated aggregate loss of 2 inches over the performance period.

### 11.4.2. Road Subgrade Preparation

For the aggregate-surfaced road section recommended above, we recommend the underlying subgrade soils be prepared as described in Section 11.1.3 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.

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 placement of the aggregate surface.

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 placement of the aggregate surface may need to be re-worked prior to proof rolling.

### 11.4.3. Earthen and Gravel Road Maintenance

The collection and diversion of surface drainage away from roadway areas is vital to satisfactory performance of the maintenance roads. The surface drainage systems should be carefully designed to facilitate removal of the water from subgrade soils. Allowing surface waters to pond will cause soft subgrade soil conditions and will require subgrade stabilization. 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, replacing subgrade soils with ABC, and/or 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/maintenance work.

Earthen and gravel roadways will require recurring maintenance, including grading or subgrade stabilization, as needed to remediate potholes, washboarding, and other defects. The cost associated with the maintenance of these earthen and gravel roads should be included in a roadway maintenance program.

## 11.5. Moisture Infiltration Reduction and Surface Drainage

Infiltration of water into subsurface soils can lead to soil movement and associated distress, as well as chemically and physically related deterioration of concrete and metal 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 proposed structures. Positive drainage may be established by providing a surface gradient of 2 percent or more away from structures for a distance of 10 feet measured perpendicular from structure perimeters, where possible.
- Adequate surface drainage should be provided to channel surface water away from on-site structures and to a suitable outlet. 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.

## 11.6. Corrosion Considerations

The corrosion potential of on-site soils to concrete and buried metal was evaluated in the laboratory using selected samples obtained from our exploratory borings. Results of these tests are presented

in Appendix C. Recommendations regarding concrete to be utilized in construction of proposed improvements and for buried metal pipes are provided in the following sections.

### 11.6.1. Concrete

The test for water-soluble sulfate content of the soils was performed using ASTM D4327. The laboratory test result indicated 0.01 to 0.4 percent sulfates in soil by mass for the selected bulk samples. Based on Table 601-2 of the CDOT 2022 Standard Specifications for Road and Bridge Construction, the on-site soils represent a Class 2 severity of sulfate exposure to concrete on a scale that ranges between Class 0 and Class 3. We recommend the cementitious materials should meet one of the below-outlined requirements.

- ASTM C150 Type V with a minimum of a 20 percent substitution of Class F fly ash or slag cement by weight.
- ASTM C150 Type II or III with a minimum of a 20 percent substitution of Class F fly ash or slag cement by weight. The Type II or III cement shall have no more than 0.040 percent expansion at 14 days when tested according ASTM C452.
- ASTM C150 Type II, III, or V plus High-Reactivity Pozzolan where the blend has less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C1012
- A blend of Portland cement meeting ASTM C150 Type II or III with a minimum of 20 percent Class F fly ash or slag cement by weight, where the blend has less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C1012.
- ASTM C595 Type IP(HS), IL(HS) or IT(HS). Class F fly ash, slag cement, or High-Reactivity Pozzolan may be substituted for Type IL cement.
- ASTM C595 Type IL(MS) or IT(MS) plus Class F fly ash, slag cement, or High-Reactivity Pozzolan where the blend has less than 0.05 percent expansion at 6 months or 0.10 percent expansion at 12 months when tested according to ASTM C1012.

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.

### 11.6.2. 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 at 549 to 1,474 ohm-cm. The results of the laboratory testing indicate the on-site materials could be severely corrosive to ferrous metals based on the criteria presented in Table 6. 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.

**Table 6 – 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 |

### 11.6.3. Driven Steel Piles

Corrosion testing was also performed to determine the need for sacrificial metal loss on driven steel piles. For a site to be considered corrosive to driven piles, the following requirements should be met:

- The pH value of the soil is less than 6.0
- The resistivity is less than 3,000 Ohm-cm
- Chloride ion content is greater than 100 parts per million (ppm)
- Sulfate ion content is greater than 200 ppm

Based on our laboratory results, low resistivity and higher sulfates were measured in the samples. As a result, and assuming a 75-year design life of the driven piles, we recommend a sacrificial steel thickness of 0.125 inches be included in the driven pile design.

## 11.7. 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 the 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 11.6.1.

- 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.
- Avoiding the use of dark colored concrete that may experience additional freeze-thaw cycles and specialty concrete finishes other than standard broom finish.

## 11.8. 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 2.5 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. Detailed recommendations in this regard can be provided upon request.

## 11.9. 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.

## 11.10. 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 concrete, 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 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.

### 11.11. Plan Review

The recommendations presented in this report are based on conceptual plans for the proposed project 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.

### 11.12. 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.

## 12. 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.

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.

# 13. REFERENCES

American Association of State Highway and Transportation Officials (AASHTO), 1993, AASHTO Guide for Design of Pavement Structures.

American Association of State Highway and Transportation Officials (AASHTO), 2011, Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 31st Edition, and Provisional Standards.

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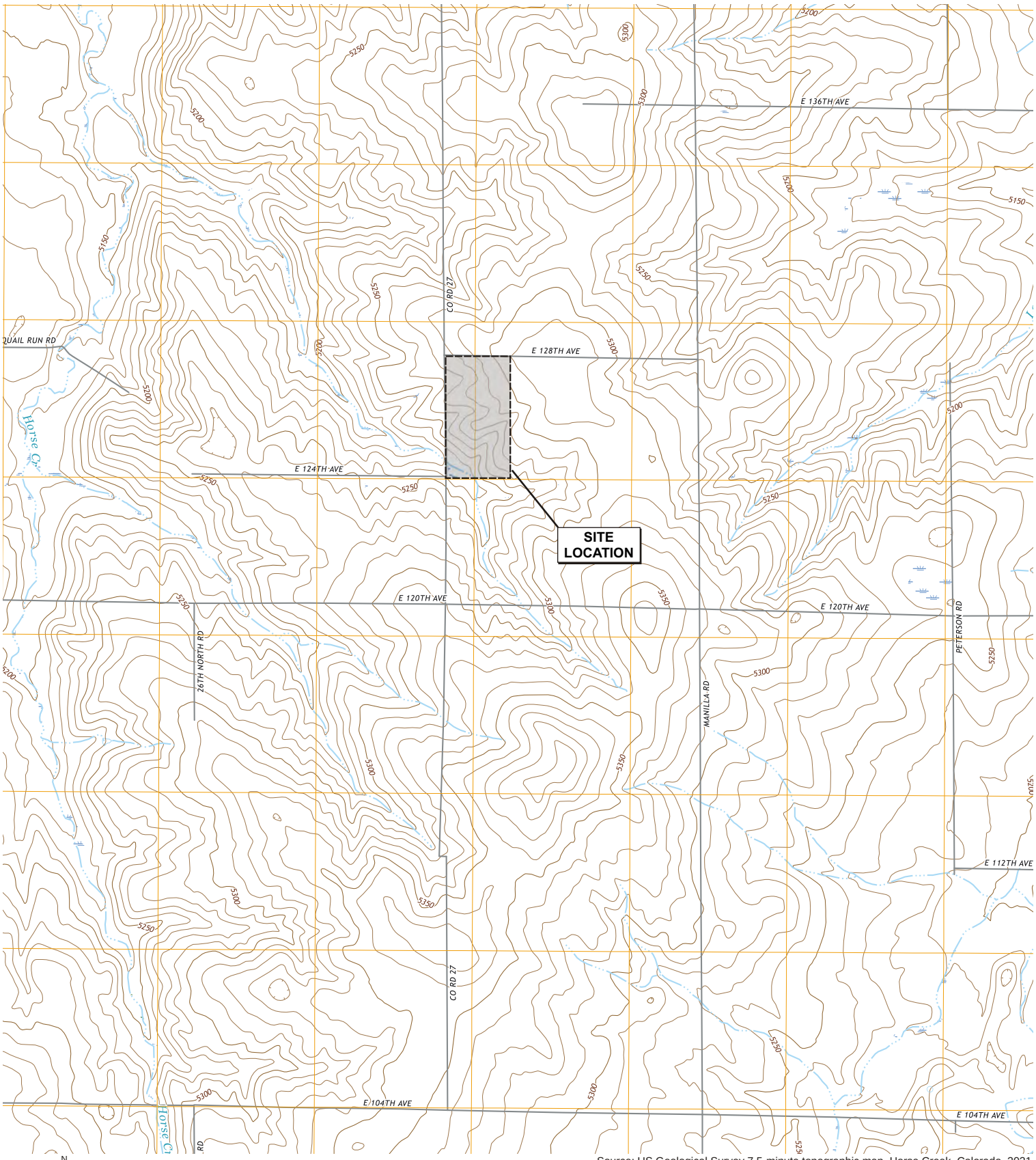
# FIGURES




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

N

FEET

0 2000

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

**FIGURE 1**

# SITE LOCATION

PRAIRIE PASS BESS
ADAMS COUNTY, COLORADO

503390001 | 2/26

Ninyo & Moore
A SOCOTEC COMPANY

bsm file no: 3390vmap0226


Source: NAVTEQ, 02/04/25.

NOTE: DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

bsm file no: 3390blm0226b

**FIGURE 2**

## EXPLORATION LOCATIONS

PRAIRIE PASS BESS
ADAMS COUNTY, COLORADO

Ninyo & Moore
A SOCOTEC COMPANY

503390001 | 2/26

# APPENDIX A

Boring Logs

| Boring Location/Elevation and Bedrock Information | | | | | |
|---|---|---|---|---|---|
| Boring Location | Latitude (Decimal Degrees) | Longitude (Decimal Degrees) | Orthometric Elevation (feet) | Depth to Top of Bedrock (Feet) | Top of Bedrock Elevation (feet) |
| B-1 | 39.92301832 | -104.54378484 | 5279.4 | 16 | 5263.4 |
| B-2 | 39.92272803 | -104.84323421 | 5273.6 | 21 | 5252.6 |
| B-3 | 39.92313779 | -104.54261095 | 5277.0 | 16 | 5261.0 |
| B-4 | 39.92242152 | -104.54476421 | 5258.2 | 4 | 5254.2 |
| B-5 | 39.92258537 | -104.54402514 | 5269.8 | 9 | 5260.8 |
| B-6 | 39.92285015 | -104.54185030 | 5271.5 | 3 | 5268.5 |
| B-7 | 39.92213013 | -104.54518493 | 5249.2 | 9 | 5240.2 |
| B-8 | 39.92212935 | -104.54335359 | 5260.9 | 17 | 5243.9 |
| B-9 | 39.92239583 | -104.54225578 | 5265.7 | 3 | 5262.7 |
| B-10 | 39.92183784 | -104.54201673 | 5274.8 | 12 | 5262.8 |
| B-11 | 39.92128403 | -104.54477633 | 5239.9 | 26 | 5213.9 |
| B-12 | 39.92125037 | -104.54283327 | 5259.1 | 4 | 5255.1 |
| B-13 | 39.92288796 | -104.54481347 | 5267.0 | 11 | 5256.0 |
| B-14 | 39.92336466 | -104.54502757 | 5265.8 | 2 | 5263.8 |
| B-15 | 39.92694198 | -104.54528251 | 5275.9 | 9 | 5266.9 |
| B-16 | 39.92689885 | -104.54352085 | 5286.4 | 12 | 5274.4 |
| B-17 | 39.92685341 | -104.54147699 | 5303.6 | 9 | 5294.6 |
| B-18 | 39.92599232 | -104.54517688 | 5264.6 | 4 | 5260.6 |
| B-19 | 39.92592713 | -104.54346778 | 5279.0 | 4 | 5275.0 |
| B-20 | 39.92592692 | -104.54162593 | 5297.5 | 9 | 5288.5 |
| B-21 | 39.92503762 | -104.54509346 | 5275.1 | 12 | 5263.1 |
| B-22 | 39.92507207 | -104.54332800 | 5284.2 | 16 | 5268.2 |
| B-23 | 39.92499543 | -104.54168819 | 5294.1 | 9 | 5285.1 |
| B-24 | 39.92397111 | -104.54505356 | 5257.9 | 8 | 5249.9 |
| B-25 | 39.92398952 | -104.54332975 | 5272.5 | 4 | 5268.5 |
| B-26 | 39.92393127 | -104.54164962 | 5290.7 | 14 | 5276.7 |
| B-27 | 39.92631298 | -104.54424479 | 5274.0 | 8 | 5266.5 |
| B-28 | 39.92557294 | -104.54425516 | 5277.9 | 9 | 5268.9 |
| B-29 | 39.92449831 | -104.54246892 | 5283.2 | 9 | 5274.2 |
| B-30 | 39.92447939 | -104.54528706 | 5271.9 | 13 | 5258.9 |
| B-31 | 39.92453193 | -104.54418884 | 5273.8 | 8 | 5265.8 |

Note: Coordinates and elevations collected with Trimble DA2-BT survey unit with GNSS output of NAD83 (2011) and GEOID 18. Vertical precision of +/-1.5 inches and horizontal precision of +/- 1-inch using the above GNSS output and geoid model at this site.

# APPENDIX A

## BORING LOGS

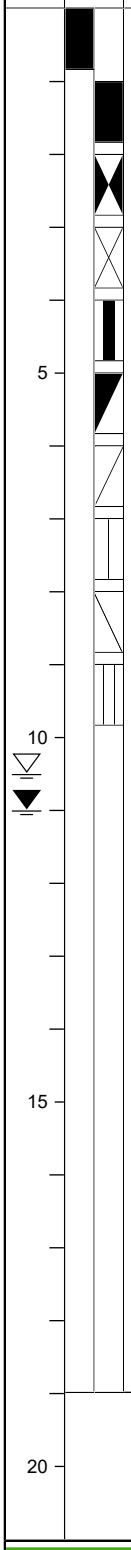
**Field Procedure for the Collection of Disturbed Samples**
Disturbed soil samples were obtained in the field using the following method.

**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 method.

**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 D 3550. 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 an SPT.

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

No recovery with Shelby tube sampler.

Continuous Push Sample.

Groundwater encountered during drilling.

Groundwater measured after drilling.

**MAJOR MATERIAL TYPE (SOIL)**: 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.

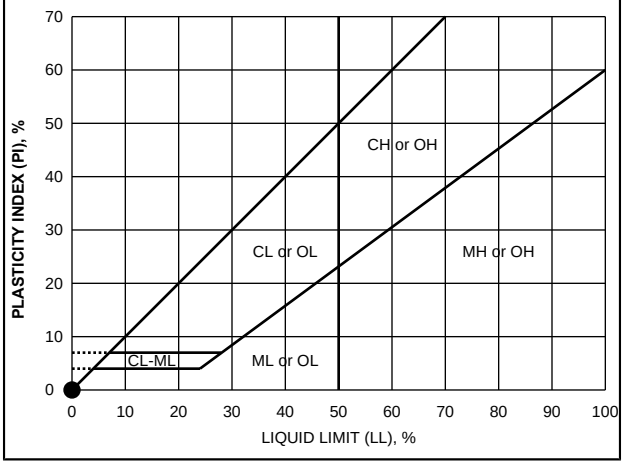
## SOIL CLASSIFICATION CHART PER ASTM D 2488

| 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 retained on 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 CLAY | |
| | 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) | SPLIT BARREL (blows/foot) | SPT (blows/foot) | 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) | SPLIT BARREL (blows/foot) | SPT (blows/foot) | 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 |

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | DATE DRILLED 12/31/2025 BORING NO. B-1 |
| | | | | | | | | GROUND ELEVATION ~5279.4' SHEET 1 OF 1 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | CL | **EOLIAN DEPOSITS**: Light brown, moist, very stiff, lean CLAY; trace sand. |
| | | | 21 | 8.4 | 96.9 | | | |
| 5 | | | 43 | 10.8 | 101.8 | | | Hard; with calcium mineralizations. |
| 10 | | | 31 | 14.6 | 114.0 | | | Brown; very stiff. |
| 15 | | | 50 | 9.0 | 123.8 | | | Hard. |
| | | | | | | | | **DENVER FORMATION**: Light brown, moist, strongly cemented, SANDSTONE. |
| 20 | | | 50/2" | | | | | |
| | | | 50/2" | | | | | |
| 25 | | | | | | | | Total Depth: 24.2 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 12/31/25. |
| | | | | | | | | Notes:<br>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. |
| 30 | | | | | | | | Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18. |
| 35 | | | | | | | | |

**FIGURE A-1**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 12/31/2025 BORING NO. B-2 |
| | | | | | | | | GROUND ELEVATION ~5273.6' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, sandy lean CLAY with calcium mineralizations. |
| | | | 37 | | | | | |
| 5 | | | 50/10" | 10.1 | 102.0 | | | Hard. |
| 10 | | | 50/7" | 10.2 | 110.5 | | | |
| 15 | | | 50/8" | 13.1 | 119.7 | | | |
| 20 | | | 38 | 14.1 | 120.0 | | | Very stiff. |
| | | | | | | | | **DENVER FORMATION**: Gray, moist, hard, CLAYSTONE. |
| 25 | | | 50/6" | | | | | |
| 30 | | | 50/6" | | | | | |
| 35 | | | 50/5" | | | | | |
| | | | 50/5" | | | | | |

**FIGURE A-2**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 12/31/2025 BORING NO. B-2

GROUND ELEVATION ~5273.6' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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Total Depth: 39.4 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 12/31/25.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | CL | **EOLIAN DEPOSITS**: Brown, moist, hard, sandy lean CLAY with calcium mineralizations. |
| | | | 49 | 10.0 | 110.3 | | | |
| 5 | | | 50/7" | 10.1 | 117.8 | | | |
| 10 | | | 50/10" | | | | | |
| 15 | | | 50/9" | | | | | **DENVER FORMATION**: Reddish yellow, moist, moderately hard, sandy CLAYSTONE. |
| 20 | | | 50/9" | 20.3 | 107.1 | | | |
| 25 | | | 50/5" | 19.5 | 108.6 | | | Reddish yellow to gray; hard. |
| 30 | | | 50/5" | | | | | Total Depth: 29.4 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 12/31/25. |
| 35 | | | | | | | | |

DATE DRILLED 12/31/2025 BORING NO. B-3

GROUND ELEVATION ~5277.0' SHEET 1 OF 1

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|
| 0 | | | 47 | 8.2 | 108.9 | | CL |
| 5 | | | 50 | 14.6 | 111.4 | | |
| 10 | | | 50/6" | 16.7 | 114.8 | | |
| 15 | | | 50/6" | 31.5 | 92.6 | | |
| 20 | | | 50/4" | | | | |
| 25 | | | 50/3" | | | | |
| 30 | | | 50/2" | | | | |
| 35 | | | 50/2" | | | | |

DATE DRILLED 12/31/2025 BORING NO. B-4

GROUND ELEVATION ~5258.2' SHEET 1 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**EOLIAN DEPOSITS**: Brown, moist, hard, sandy lean CLAY with calcium mineralizations.

**DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE.

Hard; sandy.

Total Depth: 34.2 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 12/31/25.

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.

**FIGURE A-5**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 12/31/2025 BORING NO. B-4

GROUND ELEVATION ~5258.2' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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Notes (Cont.):
Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | DATE DRILLED 12/31/2025 BORING NO. B-5 |
| | | | | | | | | GROUND ELEVATION ~5269.8' SHEET 1 OF 1 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, sandy lean CLAY with calcium mineralizations. |
| | | | 32 | 9.6 | 98.7 | | | |
| 5 | | | 32 | 8.8 | 106.3 | | | |
| 10 | | | 14 | | | | | **DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE. |
| 15 | | | 50/6" | | | | | Reddish yellow; hard; sandy. |
| 20 | | | 50/6" | | | | | |
| 25 | | | 50/5" | | | | | |
| 30 | | | 50/5" | | | | | |
| 35 | | | | | | | | |

Total Depth: 29.4 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 12/31/25.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-7**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | CL | **EOLIAN DEPOSITS**: Brown and gray, moist, very stiff, sandy lean CLAY. |
| | | | 28 | 10.4 | 106.5 | | | |
| | | | 50/7" | 16.9 | 110.5 | | | **DENVER FORMATION**: Gray and reddish yellow, moist, moderately hard, sandy CLAYSTONE. |
| 5 | | | | | | | | |
| | | | 50/7" | | | | | |
| 10 | | | | | | | | |
| | | | 50/6" | | | | | Hard. |
| 15 | | | | | | | | |
| | | | 50/5" | | | | | |
| 20 | | | | | | | | |
| | | | 50/5" | | | | | |
| 25 | | | | | | | | |
| | | | 50/3" | | | | | |
| 30 | | | | | | | | |
| | | | 50/3" | | | | | |
| 35 | | | | | | | | Total Depth: 34.3 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 12/31/25.<br><br>Notes:<br>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. |

DATE DRILLED 01/02/2026 BORING NO. B-6

GROUND ELEVATION ~5271.5' SHEET 1 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**FIGURE A-8**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 01/02/2026 BORING NO. B-6

GROUND ELEVATION ~5271.5' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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Notes (Cont.):
Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|
| 0 | | | 32 | 8.3 | 109.7 | | CL |
| 5 | | | 23 | 7.9 | 106.6 | | |
| 10 | | | 25 | 4.3 | 105.6 | | |
| 15 | | | 50/6" | 17.8 | 109.6 | | |
| 20 | | | 50/5" | | | | |
| 25 | | | 50/5" | | | | |
| 30 | | | 50/4" | | | | |
| 35 | | | | | | | |

DATE DRILLED 12/31/2025 BORING NO. B-7

GROUND ELEVATION ~5249.2' SHEET 1 OF 1

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**EOLIAN DEPOSITS**: Light brown, moist, very stiff, sandy lean CLAY.

**DENVER FORMATION**: Reddish yellow to yellow, moist, weakly cemented, clayey SANDSTONE.

Gray, moist, hard, CLAYSTONE.

Total Depth: 29.4 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 12/31/25.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-10**

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|
| 0 | | | 42 | 11.2 | 115.9 | | CL |
| | | | 50/6" | 13.1 | 118.0 | | |
| 5 | | | | | | | |
| | | | 44 | | | | |
| 10 | | | | | | | |
| | | | 37 | 21.2 | 106.4 | | |
| 15 | | | | | | | |
| | | | 50/4" | | | | |
| 20 | | | | | | | |
| | | | 50/4" | | | | |
| 25 | | | | | | | |
| | | | 50/4" | | | | |
| 30 | | | | | | | |
| | | | 50/3" | | | | |
| 35 | | | | | | | |
| | | | 50/2" | | | | |

DATE DRILLED 01/02/2026 BORING NO. B-8

GROUND ELEVATION ~5260.9' SHEET 1 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**EOLIAN DEPOSITS**: Brown, moist, hard, sandy lean CLAY with calcium mineralizations.

Very stiff.

**DENVER FORMATION**: Reddish yellow and yellowish brown, moist, hard, sandy CLAYSTONE.

**FIGURE A-11**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 01/02/2026 BORING NO. B-8

GROUND ELEVATION ~5260.9' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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55

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65

70

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Total Depth: 39.2 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/02/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|
| 0 | | | 35 | 10.9 | 106.4 | | CL |
| | | | 50/6" | 9.6 | 104.6 | | |
| 5 | | | | | | | |
| | | | 50/6" | 15.6 | 110.6 | | |
| 10 | | | | | | | |
| | | | 50/5" | | | | |
| 15 | | | | | | | |
| | | | 50/5" | | | | |
| 20 | | | | | | | |
| | | | 50/4" | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

DATE DRILLED 01/02/2026 BORING NO. B-9

GROUND ELEVATION ~5265.7' SHEET 1 OF 1

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**EOLIAN DEPOSITS**: Light brown, moist, very stiff, lean CLAY with sand.

**DENVER FORMATION**: Reddish yellow and gray, moist, hard, sandy CLAYSTONE.

Total Depth: 24.3 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/02/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-13**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|
| 0 | | | 41 | 9.2 | 97.4 | | CL |
| | | | 42 | 5.3 | 114.0 | | |
| 5 | | | | | | | |
| | | | 50/8" | 5.7 | 114.8 | | |
| 10 | | | | | | | |
| | | | 50/6" | 18.3 | 107.7 | | |
| 15 | | | | | | | |
| | | | 50/6" | | | | |
| 20 | | | | | | | |
| | | | 50/5" | | | | |
| 25 | | | | | | | |
| | | | 50/5" | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

DATE DRILLED 01/02/2026 BORING NO. B-10

GROUND ELEVATION ~5274.8' SHEET 1 OF 1

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**EOLIAN DEPOSITS**: Brown, moist, hard, sandy lean CLAY with Calcium Mineralizations.

**DENVER FORMATION**: Yellowish brown, moist, strongly cemented, clayey SANDSTONE.

Total Depth: 29.4 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/02/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-14**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/02/2026 BORING NO. B-11 |
| | | | | | | | | GROUND ELEVATION ~5239.9' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | |
| | | | | | | | CL | **EOLIAN DEPOSITS**: Light brown, moist, very stiff, sandy lean CLAY; trace calcium mineralizations. |
| | | | 32 | 8.3 | 99.2 | | | |
| 5 | | | 26 | 7.4 | 107.9 | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 35 | 9.2 | 114.8 | | | |
| 10 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 23 | 12.0 | 118.4 | | | |
| 15 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 20 | | | | | Stiff. |
| 20 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 40 | | | | SC | Brown, moist, medium dense, clayey SAND. |
| 25 | | | | | | | | |
| | | | | | | | | **DENVER FORMATION**: Reddish yellow and gray, moist, hard, sandy CLAYSTONE. |
| | | | | | | | | |
| | | | 50/6" | | | | | |
| 30 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 50/5" | | | | | |
| 35 | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 50/4" | | | | | |

**FIGURE A-15**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 01/02/2026 BORING NO. B-11

GROUND ELEVATION ~5239.9' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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Total Depth: 39.3 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/02/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/02/2026 BORING NO. B-12 |
| | | | | | | | | GROUND ELEVATION ~5259.1' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | |
| | | | | | | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, sandy lean CLAY. |
| | | | 31 | 6.6 | 106.3 | | | |
| | | | 47 | 18.3 | 105.6 | | | **DENVER FORMATION**: Gray, moist, moderately soft, sandy CLAYSTONE. |
| 5 | | | | | | | | |
| | | | 50/11" | 10.4 | 106.3 | | | Gray and reddish yellow, moist, weakly cemented, clayey SANDSTONE. |
| 10 | | | | | | | | |
| | | | 50/2" | | | | | Light brown; strongly cemented. |
| 15 | | | | | | | | |
| | | | 50/5" | 8.3 | 100.6 | | | |
| 20 | | | | | | | | |
| | | | 50/4" | | | | | Reddish gray, moist, hard, sandy CLAYSTONE. |
| 25 | | | | | | | | |
| | | | 50/4" | | | | | Reddish yellow. |
| 30 | | | | | | | | |
| ▽ | | | | | | | | @33': Groundwater encountered during drilling. |
| | | | 50/5" | | | | | Gray and reddish yellow. |
| 35 | | | | | | | | |
| | | | 50/6" | | | | | |

**FIGURE A-17**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 01/02/2026 BORING NO. B-12

GROUND ELEVATION ~5259.1' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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55

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65

70

75

Total Depth: 39.5 feet.
Groundwater was encountered during drilling at approximately 33 feet.
Backfilled with on-site soil after drilling on 01/02/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 50 | 10.2 | 111.4 | | CL | **EOLIAN DEPOSITS**: Light brown, moist, hard, sandy lean CLAY with calcium mineralizations. |
| 5 | | | 35 | 7.6 | 117.4 | | | Brown; very stiff. |
| 10 | | | 42 | 13.8 | 119.1 | | | Hard; without calcium mineralizations. |
| 15 | | | 50/6" | | | | | **DENVER FORMATION**: Reddish yellow and gray, moist, hard, sandy CLAYSTONE. |
| 20 | | | 50/5" | | | | | |
| 25 | | | 50/6" | | | | | |
| 30 | | | 50/4" | | | | | |
| 35 | | | | | | | | |

DATE DRILLED 12/31/2025 BORING NO. B-13

GROUND ELEVATION ~5267.0' SHEET 1 OF 1

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

Total Depth: 29.3 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 12/31/25.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 12/31/2025 BORING NO. B-14 |
| | | | | | | | | GROUND ELEVATION ~5265.8' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, sandy lean CLAY. |
| | | | 36 | 18.9 | 86.3 | | | **DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE. |
| | | | 50/11" | 19.8 | 107.2 | | | Reddish yellow and gray. |
| 5 | | | | | | | | |
| | | | 50/3" | 19.4 | 106.2 | | | Yellow; very hard; sandy. |
| 10 | | | | | | | | |
| | | | 50/4" | | | | | Reddish yellow and gray; hard. |
| 15 | | | | | | | | |
| | | | 50/5" | | | | | Gray. |
| 20 | | | | | | | | |
| | | | 50/5" | | | | | Yellow and gray. |
| 25 | | | | | | | | |
| | | | 50/3" | | | | | Gray; very hard. |
| 30 | | | | | | | | |
| | | | 50/7" | | | | | Moderately hard. |
| ▼35 | | | | | | | | @35.1': Groundwater measured on 1/2/2026. |
| | | | 50/6" | | | | | |

**FIGURE A-20**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 12/31/2025 BORING NO. B-14

GROUND ELEVATION ~5265.8' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

45

50

55

60

65

70

75

Total Depth: 39.5 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 12/31/25.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/02/2026 BORING NO. B-15 |
| | | | | | | | | GROUND ELEVATION ~5275.9' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 29 | 10.0 | 103.8 | | CL | **EOLIAN DEPOSITS**: Light brown, moist, very stiff, sandy lean CLAY. |
| 5 | | | 36 | 11.8 | 117.2 | | | Hard. |
| 10 | | | 33 | 17.9 | 104.8 | | | **DENVER FORMATION**: Light brown and gray, moist, soft, CLAYSTONE. |
| 15 | | | 50/5" | 13.3 | 113.2 | | | Reddish yellow and gray; hard; sandy. |
| 20 | | | 50/6" | | | | | Gray. |
| 25 | | | 50/6" | | | | | |
| 30 | | | 50/4" | | | | | |
| 35 | | | 50/6" | | | | | |
| | | | 50/6" | | | | | |

**FIGURE A-22**

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 01/02/2026 BORING NO. B-15

GROUND ELEVATION ~5275.9' SHEET 2 OF 2

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

45

50

55

60

65

70

75

Total Depth: 39.5 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/02/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/02/2026 BORING NO. B-16 |
| | | | | | | | | GROUND ELEVATION ~5286.4' SHEET 1 OF 1 |
| | | | | | | | | RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 14 | 12.8 | 100.9 | | CL | **EOLIAN DEPOSITS**: Light brown, moist, stiff, sandy lean CLAY; trace calcium mineralizations. |
| 5 | | | 27 | 18.7 | 109.8 | | | Very stiff. |
| 10 | | | 12 | 13.9 | 107.5 | | | |
| 15 | | | 37 | 23.0 | 104.4 | | | **DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE. |
| 20 | | | 50/6" | | | | | Hard. |
| | | | 50/5" | | | | | |
| 25 | | | | | | | | Total Depth: 24.4 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/02/26. |
| 30 | | | | | | | | Notes:<br>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. |
| 35 | | | | | | | | Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18. |

**FIGURE A-24**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/05/2026 BORING NO. B-17 |
| | | | | | | | | GROUND ELEVATION ~5303.6' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 32 | 20.8 | 95.4 | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, sandy lean CLAY; trace calcium mineralizations. |
| 5 | | | 48 | 10.6 | 100.4 | | | Light brown; with calcium mineralizations. |
| 10 | | | 50/11" | 24.1 | 102.5 | | | **DENVER FORMATION**: Gray and yellow, moist, moderately soft, CLAYSTONE. |
| 15 | | | 50/10" | 23.1 | | | | Moderately hard. |
| 20 | | | 50/5" | | | | | Hard; sandy. |
| | | | | | | | | Yellow, moist, strongly cemented, clayey SANDSTONE. |
| 25 | | | 50/3" | 8.1 | 110.4 | | | |
| 30 | | | 50/4" | | | | | |
| 35 | | | 50/4" | | | | | Light brown. |
| | | | 50/10" | | | | | Gray and reddish yellow, moist, moderately hard, CLAYSTONE. |

**FIGURE A-25**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DATE DRILLED | 01/05/2026 | | BORING NO. | B-17 | | | |
| GROUND ELEVATION | ~5303.6' | | SHEET | 2 | OF | 2 | |
| RIG TYPE | CME-55 | TOOLING | 4" Solid Stem Auger | DRILLING FIRM | Dakota | | |
| DRIVE WEIGHT | 140 lbs | TYPE | Spooling Cathead | | DROP | 30" | |
| SAMPLED BY | TWC | LOGGED BY | TWC | REVIEWED BY | BFG | | |

45
50
55
60
65
70
75

Total Depth: 39.8 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/05/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 19 | 13.7 | 102.4 | | CL | **EOLIAN DEPOSITS**: Brown, moist, stiff, sandy lean CLAY. |
| 5 | | | 39 | 17.2 | 112.8 | | | **DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE. |
| 10 | | | 43 | 25.9 | 100.6 | | | Gray and yellowish brown. |
| 15 | | | 50/5" | | | | | Gray and yellow; hard. |
| 20 | | | 50/4" | | | | | |
| 25 | | | 50/4" | | | | | |
| | | | 50/5" | | | | | |
| 30 | | | | | | | | Total Depth: 29.4 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/05/26. |
| 35 | | | | | | | | Notes:<br>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.<br><br>Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18. |

DATE DRILLED 01/05/2026 BORING NO. B-18

GROUND ELEVATION ~5264.6' SHEET 1 OF 1

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**FIGURE A-27**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| | |
|---|---|
| DATE DRILLED | 01/05/2026 |
| BORING NO. | B-19 |
| GROUND ELEVATION | ~5279.0' |
| SHEET | 1 OF 1 |
| RIG TYPE | CME-55 |
| TOOLING | 4" Solid Stem Auger |
| DRILLING FIRM | Dakota |
| DRIVE WEIGHT | 140 lbs |
| TYPE | Spooling Cathead |
| DROP | 30" |
| SAMPLED BY | TWC |
| LOGGED BY | TWC |
| REVIEWED BY | BFG |

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 16 | 23.8 | 101.8 | | CL | **EOLIAN DEPOSITS**: Brownish gray, moist, stiff, lean CLAY; trace sand. |
| 5 | | | 50/10" | 11.0 | 103.0 | | | **DENVER FORMATION**: Reddish yellow, moist, weakly cemented, clayey SANDSTONE. |
| 10 | | | 37 | 26.0 | 99.8 | | | Gray and yellowish brown, moist, moderately hard, CLAYSTONE. |
| 15 | | | 50/6" | | | | | Yellow to reddish yellow, moist, strongly cemented, clayey SANDSTONE. |
| 20 | | | 50/4" | | | | | |
| 25 | | | 50/4" | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |

Total Depth: 24.3 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/05/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 50 | 13.0 | 104.9 | | CL | **EOLIAN DEPOSITS**: Brown, moist, hard, sandy lean CLAY; trace calcium mineralizations. |
| 5 | | | 34 | 15.1 | 113.0 | | | |
| 10 | | | 40 | 20.6 | 108.0 | | | **DENVER FORMATION**: Gray and reddish yellow, moist, moderately soft, CLAYSTONE. |
| 15 | | | 50/9" | | | | | Gray; moderately hard. |
| 20 | | | 50/7" | | | | | Gray and reddish yellow. |
| 25 | | | 50/6" | | | | | |
| 30 | | | 50/6" | | | | | Total Depth: 29.5 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/05/26. |
| 35 | | | | | | | | |

DATE DRILLED 01/05/2026 BORING NO. B-20

GROUND ELEVATION ~5297.5' SHEET 1 OF 1

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-29**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/06/2026 BORING NO. B-21 |
| | | | | | | | | GROUND ELEVATION ~5275.1' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 16 | 12.2 | 95.2 | | CL | **EOLIAN DEPOSITS**: Light brown, moist, stiff, lean CLAY; trace sand. |
| 5 | | | 23 | 15.4 | 110.4 | | | Brown; very stiff; with calcium mineralizations. |
| 10 | | | 18 | 14.9 | 109.3 | | | Stiff. |
| | | | 50/6" | 13.1 | 112.5 | | | **DENVER FORMATION**: Yellow and gray, moist, hard, sandy CLAYSTONE. |
| 15 | | | | | | | | |
| 20 | | | 50/5" | | | | | |
| 25 | | | 50/6" | | | | | |
| | | | 50/3" | | | | | Reddish yellow, moist, strongly cemented, clayey SANDSTONE. |
| 30 | | | | | | | | |
| 35 | | | 50/4" | | | | | |
| | | | 50/3" | | | | | |

**FIGURE A-30**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DATE DRILLED | 01/06/2026 | | BORING NO. | B-21 | | | |
| GROUND ELEVATION | ~5275.1' | | SHEET | 2 | OF | 2 | |
| RIG TYPE | CME-55 | TOOLING | 4" Solid Stem Auger | DRILLING FIRM | Dakota | | |
| DRIVE WEIGHT | 140 lbs | TYPE | Spooling Cathead | | DROP | 30" | |
| SAMPLED BY | TWC | LOGGED BY | TWC | REVIEWED BY | BFG | | |

45
50
55
60
65
70
75

Total Depth: 39.3 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/06/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 40 | 11.0 | 100.8 | | CL | **EOLIAN DEPOSITS**: Light brown, moist, hard, sandy lean CLAY. |
| 5 | | | 28 | 11.5 | 96.9 | | | Brown; very stiff. |
| 10 | | | 32 | 14.2 | 118.0 | | | Yellow and brown. |
| 15 | | | 39 | 11.9 | 111.8 | | | Hard. |
| | | | | | | | | **DENVER FORMATION**: Gray, moist, hard, CLAYSTONE. |
| 20 | | | 50/6" | | | | | |
| 25 | | | 50/6" | | | | | |
| | | | 50/5" | | | | | |
| 30 | | | | | | | | Total Depth: 29.4 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/05/26. |
| 35 | | | | | | | | Notes:<br>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.<br><br>Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18. |

DATE DRILLED 01/05/2026 BORING NO. B-22

GROUND ELEVATION ~5285.2' SHEET 1 OF 1

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**FIGURE A-32**

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**. |
| | | | 13 | 16.5 | 108.6 | | CL | **EOLIAN DEPOSITS**: Brown, moist, stiff, lean CLAY; trace sand. |
| 5 | | | 24 | 14.3 | 109.2 | | | |
| 10 | | | 46 | 25.4 | 100.3 | | | **DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE. |
| 15 | | | 50/7" | 22.1 | 105.7 | | | Gray and yellow; moderately hard. |
| 20 | | | 50/6" | | | | | Hard. |
| 25 | | | 50/5" | | | | | |
| 30 | | | 50/5" | | | | | Total Depth: 29.4 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/05/26. |
| 35 | | | | | | | | |

DATE DRILLED 01/05/2026 BORING NO. B-23

GROUND ELEVATION ~5294.1' SHEET 1 OF 1

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-33**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/06/2026 BORING NO. B-24 |
| | | | | | | | | GROUND ELEVATION ~5257.9' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 26 | 10.1 | 116.8 | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, sandy lean CLAY; trace calcium mineralizations. |
| 5 | | | 39 | 13.7 | 112.0 | | | Hard. |
| | | | 45 | 20.5 | 108.3 | | | **DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE. |
| 10 | | | | | | | | |
| | | | 50/6" | 17.6 | 105.8 | | | Light brown and yellow; hard; sandy. |
| 15 | | | | | | | | |
| | | | 50/7" | | | | | |
| 20 | | | | | | | | |
| | | | 50/5" | | | | | |
| 25 | | | | | | | | |
| | | | 50/5" | | | | | |
| 30 | | | | | | | | |
| | | | 50/6" | | | | | |
| 35 | | | | | | | | Total Depth: 34.5 feet. |
| | | | | | | | | Groundwater was not encountered during drilling. |
| | | | | | | | | Backfilled with on-site soil after drilling on 01/06/26. |

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.

**FIGURE A-34**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DATE DRILLED | 01/06/2026 | | BORING NO. | B-24 | | | |
| GROUND ELEVATION | ~5257.9' | | SHEET | 2 | OF | 2 | |
| RIG TYPE | CME-55 | TOOLING | 4" Solid Stem Auger | DRILLING FIRM | Dakota | | |
| DRIVE WEIGHT | 140 lbs | TYPE | Spooling Cathead | | DROP | 30" | |
| SAMPLED BY | TWC | LOGGED BY | TWC | REVIEWED BY | BFG | | |

Notes:
Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

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50
55
60
65
70
75

**FIGURE A-35**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DATE DRILLED | 01/05/2026 | BORING NO. | B-25 | | |
|---|---|---|---|---|---|
| GROUND ELEVATION | ~5272.5' | SHEET | 1 | OF | 2 |
| RIG TYPE | CME-55 | TOOLING | 4" Solid Stem Auger | DRILLING FIRM | Dakota |
| DRIVE WEIGHT | 140 lbs | TYPE | Spooling Cathead | DROP | 30" |
| SAMPLED BY | TWC | LOGGED BY | TWC | REVIEWED BY | BFG |

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick.. |
| | | | 24 | 12.6 | 102.0 | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, sandy lean CLAY. |
| 5 | | | 29 | 18.9 | 110.2 | | | **DENVER FORMATION**: Gray and reddish yellow, moist, soft, sandy CLAYSTONE. |
| 10 | | | 46 | 31.5 | 91.9 | | | Moderately soft. |
| 15 | | | 50/9" | | | | | Moderately hard. |
| 20 | | | 50/8" | | | | | Yellow. |
| 25 | | | 50/4" | 9.5 | 90.9 | | | Reddish yellow, moist, strongly cemented, clayey SANDSTONE. |
| 30 | | | 50/5" | 5.9 | 94.9 | | | Light brown. |
| 35 | | | 50/5" | | | | | Gray, moist, hard, sandy CLAYSTONE. |
| | | | 50/6" | | | | | |

**FIGURE A-36**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 01/05/2026 BORING NO. B-25

GROUND ELEVATION ~5272.5' SHEET 2 OF 2

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

45

50

55

60

65

70

75

Total Depth: 39.5 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/05/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| | | |
|---|---|---|
| DATE DRILLED | 01/05/2026 | BORING NO. B-26 |
| GROUND ELEVATION | ~5290.7' | SHEET 1 OF 1 |
| RIG TYPE | CME-55 | TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| DRIVE WEIGHT | 140 lbs | TYPE Spooling Cathead DROP 30" |
| SAMPLED BY | TWC | LOGGED BY TWC REVIEWED BY BFG |

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 12 | 10.9 | 89.4 | | CL | **EOLIAN DEPOSITS**: Light brown, moist, stiff, lean CLAY with sand. |
| 5 | | | 27 | 13.5 | 106.1 | | | Brown; very stiff; trace calcium mineralizations. |
| 10 | | | 50/11" | 14.5 | 119.8 | | | Hard. |
| 15 | | | 41 | 17.8 | 110.2 | | | **DENVER FORMATION**: Gray and yellow, moist, moderately soft, CLAYSTONE with calcium mineralizations. |
| 20 | | | 50/5" | | | | | Hard. |
| 25 | | | 50/4" | | | | | Reddish yellow, moist, strongly cemented, SANDSTONE. |
| | | | 50/3" | | | | | |
| 30 | | | | | | | | Total Depth: 29.3 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/05/26. |
| 35 | | | | | | | | Notes:<br>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.<br><br>Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18. |

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 21 | 10.3 | 99.6 | | CL | **EOLIAN DEPOSITS**: Light brown, moist, very stiff, sandy lean CLAY. |
| 5 | | | 24 | 12.5 | 108.3 | | | With Calcium mineralizations. |
| | | | 50/7" | 19.0 | 110.6 | | | **DENVER FORMATION**: Yellow, moderately hard, sandy CLAYSTONE. |
| 10 | | | | | | | | |
| 15 | | | 50/7" | | | | | |
| | | | 50/6" | | | | | Hard. |
| 20 | | | | | | | | |
| | | | 50/5" | | | | | |
| 25 | | | | | | | | Total Depth: 24.4 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/02/26. |
| 30 | | | | | | | | Notes:<br>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.<br><br>Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18. |
| 35 | | | | | | | | |

DATE DRILLED 01/02/2026 BORING NO. B-27

GROUND ELEVATION ~5274.0' SHEET 1 OF 1

RIG TYPE Diedrich D-120 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**FIGURE A-39**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **PLOW ZONE:**, Approximately 12" thick. |
| | | | 13 | 12.2 | 94.4 | | CL | **EOLIAN DEPOSITS**: Brown, moist, stiff, lean CLAY with sand. |
| 5 | | | 25 | 19.5 | 107.3 | | | Very stiff. |
| 10 | | | 28 | 10.6 | 103.0 | | | **DENVER FORMATION**: Gray and yellowish brown, moist, soft, CLAYSTONE. |
| 15 | | | 50/7" | | | | | Yellow, moist, hard, moderately cemented, clayey SANDSTONE. |
| 20 | | | 50/6" | | | | | |
| 25 | | | 50/6" | | | | | Gray and brown, moist, moderately hard, sandy CLAYSTONE. |
| 30 | | | 50/6" | | | | | Total Depth: 29.6 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/06/26. |
| 35 | | | | | | | | |

DATE DRILLED 01/06/2026 BORING NO. B-28

GROUND ELEVATION ~5277.9' SHEET 1 OF 1

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-40**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | |
| | | | 25 | 13.2 | 110.3 | | CL |
| 5 | | | 30 | 11.7 | 108.5 | | |
| 10 | | | 42 | 23.3 | 104.6 | | |
| 15 | | | 45 | | | | |
| 20 | | | 50/6" | | | | |
| | | | 50/5" | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

DATE DRILLED 01/05/2026 BORING NO. B-29

GROUND ELEVATION ~5283.2' SHEET 1 OF 1

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**PLOW ZONE:**, Approximately 12" thick.

**EOLIAN DEPOSITS**: Brown, moist, very stiff, lean CLAY; trace sand.

Light brown.

**DENVER FORMATION**: Gray and reddish yellow, moist, moderately soft, CLAYSTONE.

Yellow to reddish yellow; hard; sandy.

Total Depth: 24.4 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/05/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

**FIGURE A-41**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | | |
| | | | 15 | 12.8 | 102.8 | | CL |
| | | | 26 | 12.1 | 113.0 | | |
| 5 | | | | | | | |
| | | | 50/11" | 20.4 | 103.5 | | |
| 10 | | | | | | | |
| | | | 40 | 21.7 | 106.9 | | |
| 15 | | | | | | | |
| | | | 50/7" | | | | |
| 20 | | | | | | | |
| | | | 50/6" | | | | |
| 25 | | | | | | | |
| | | | 50/4" | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

DATE DRILLED 01/06/2026 BORING NO. B-30

GROUND ELEVATION ~5271.9' SHEET 1 OF 1

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

**ROOT ZONE:**, Approximately 12" thick.

**EOLIAN DEPOSITS**: Light brown, moist, stiff, sandy lean CLAY.

Brown; with calcium mineralizations.

Hard.

**DENVER FORMATION**: Gray, moist, moderately soft, CLAYSTONE.

Yellowish brown; moderately hard.

Hard.

Total Depth: 29.3 feet.
Groundwater was not encountered during drilling.
Backfilled with on-site soil after drilling on 01/06/26.

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.

Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | DATE DRILLED 01/06/2026 BORING NO. B-31 |
| | | | | | | | | GROUND ELEVATION ~5273.8' SHEET 1 OF 2 |
| | | | | | | | | RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota |
| | | | | | | | | DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30" |
| | | | | | | | | SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG |
| | | | | | | | | **ROOT ZONE:**, Approximately 12" thick. |
| | | | 28 | 14.1 | 114.7 | | CL | **EOLIAN DEPOSITS**: Brown, moist, very stiff, lean CLAY with sand and calcium mineralizations. |
| 5 | | | 36 | 13.7 | 120.3 | | | |
| | | | 50/11" | 20.7 | 107.0 | | | **DENVER FORMATION**: Yellowish brown, moist, moderately soft, sandy CLAYSTONE. |
| 10 | | | | | | | | |
| | | | 37 | | | | | Gray; with iron staining. |
| 15 | | | | | | | | |
| | | | 50/7" | | | | | Yellow and gray; moderately hard. |
| 20 | | | | | | | | |
| | | | 50/6" | | | | | Hard. |
| 25 | | | | | | | | |
| | | | 50/5" | | | | | |
| 30 | | | | | | | | |
| | | | 50/5" | | | | | |
| 35 | | | | | | | | Total Depth: 34.4 feet.<br>Groundwater was not encountered during drilling.<br>Backfilled with on-site soil after drilling on 01/06/26. |

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.

**FIGURE A-43**

Ninyo & Moore

**PRAIRIE PASS BESS**
**ADAMS COUNTY, COLORADO**
**503390001 | 02/26**

| DEPTH (feet) | BULK | DRIVEN | BLOWS/FOOT | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | SYMBOL | USCS |
|---|---|---|---|---|---|---|---|

DATE DRILLED 01/06/2026 BORING NO. B-31

GROUND ELEVATION ~5273.8' SHEET 2 OF 2

RIG TYPE CME-55 TOOLING 4" Solid Stem Auger DRILLING FIRM Dakota

DRIVE WEIGHT 140 lbs TYPE Spooling Cathead DROP 30"

SAMPLED BY TWC LOGGED BY TWC REVIEWED BY BFG

45

50

55

60

65

70

75

Notes:
Ground elevations were measured using a Trimble Model DA2-BT survey unit with global navigation satellite system (GNSS) output of NAD83 (2011) and referencing geoid model GEOID18.

# 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 D 2488-00. 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 borings were evaluated in general accordance with ASTM D2937-04. The test results are presented on the logs of the exploratory borings in Appendix A.

**Atterberg Limits**
Tests were performed on selected representative fine-grained 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 Unified Soil Classification System. The test results and classifications are shown on Figures B-1 through B-3.

**No. 200 Sieve Analysis**
An evaluation of the percentage of particles finer than the No. 200 sieve in selected soil samples was performed in general accordance with ASTM D1140. The results of the tests are presented on Figures B-4 through B-7.

**Swell/Consolidation Tests**
The consolidation and/or swell potential of selected materials were evaluated in general accordance with ASTM D4546. Specimens were loaded with a specified surcharge before inundation with water. Readings of volumetric consolidation/swell were recorded until completion of primary consolidation/swell. After the completion of primary swell, surcharge loads were increased incrementally to evaluate swell pressure. The results of the consolidation/swell tests are presented on Figures B-8 through B-37.

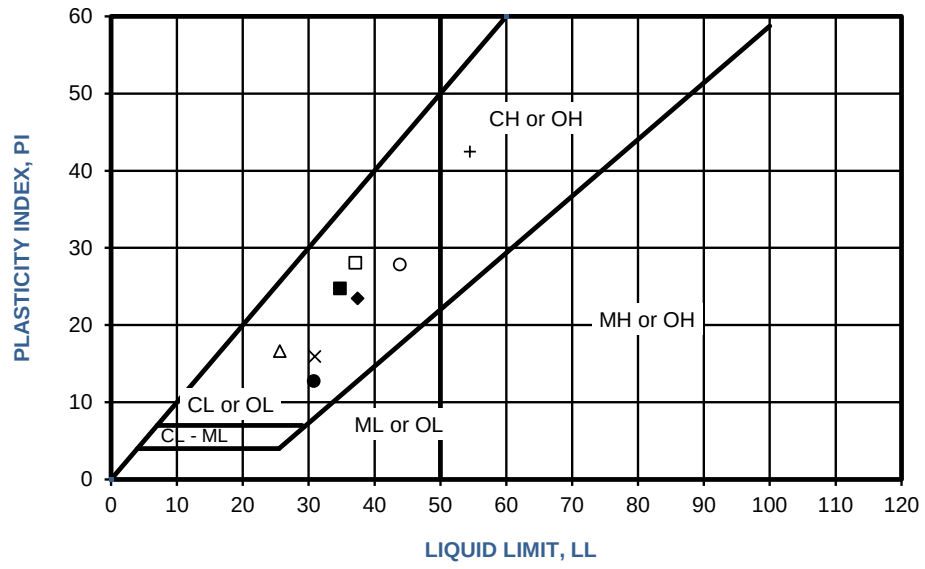
**Proctor Density Tests**
The maximum dry density and optimum moisture content of selected representative soil samples were evaluated using the Standard Proctor method in general accordance with ASTM D 698. The results of these tests are summarized on Figures B-38, B-40, B-42, B-45, B-47, B-50, B-52, and B-54.

**Thermal Resistivity**
Thermal resistivity testing was performed in general accordance with IEEE Standard 442-2017. Three (3) thermal resistivity tests were performed at 90% compaction and at three (3) different moisture contents. In addition, one (1) thermal resistivity test was performed at both 95% and 98% compaction. The results are presented on Figures B-39, B-41, B-44, B-46, B-49, B-51, B-53, and B-55.

**California Bearing Ratio (CBR)**
CBR tests were performed on selected representative soil samples in general accordance with ASTM D 1883. Specimens were molded under a specified compactive energy to approximately 100 percent of maximum laboratory density at optimum moisture content. The specimens were soaked for at least 96 hours, or until stabilization, and then tested to evaluate the penetration resistance of a piston moving at a rate of 0.05 inch per minute. The CBR values shown on Figures B-43 and B-48 is a ratio of penetration resistance at 0.1 inch of penetration to the standard penetration resistance value.

| SYMBOL | LOCATION | DEPTH (ft) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve) | EQUIVALENT USCS |
|---|---|---|---|---|---|---|---|
| ● | B-1 | 1.0-2.0 | 31 | 18 | 13 | CL | CL |
| ■ | B-2 | 9.0-9.6 | 35 | 10 | 25 | CL | CL |
| ◆ | B-3 | 19.0-19.8 | 37 | 14 | 23 | CL | CL |
| ○ | B-4 | 4.0-5.0 | 44 | 16 | 28 | CL | CL |
| □ | B-5 | 4.0-5.0 | 37 | 9 | 28 | CL | CL |
| Δ | B-10 | 9.0-9.7 | 26 | 9 | 17 | CL | CL |
| X | B-11 | 4.0-5.0 | 31 | 15 | 16 | CL | CL |
| + | B-14 | 4.0-4.9 | 54 | 12 | 42 | CH | CH |

NP - INDICATES NON-PLASTIC




PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

FIGURE B-1

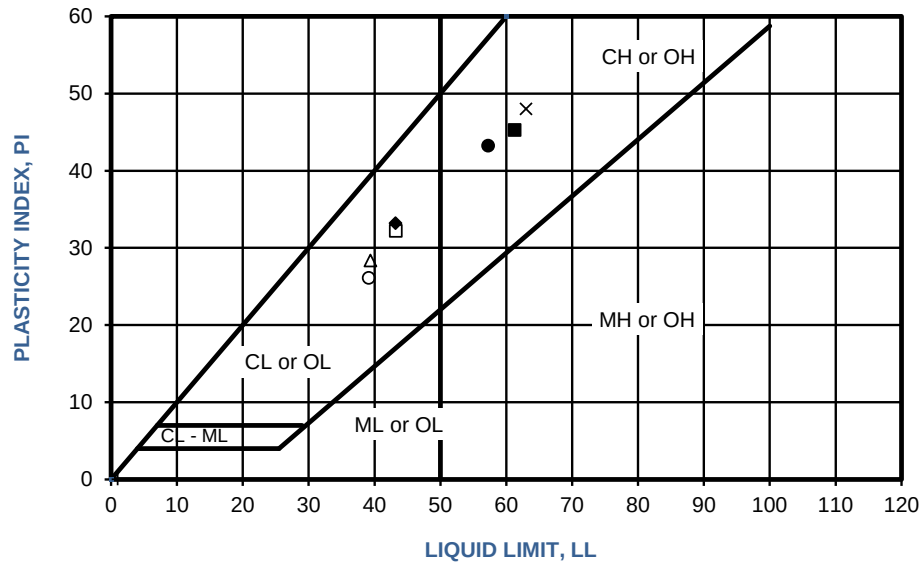
Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

ATTERBERG LIMITS TEST RESULTS

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO

| SYMBOL | LOCATION | DEPTH (ft) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve) | EQUIVALENT USCS |
|---|---|---|---|---|---|---|---|
| ● | B-16 | 14.0-15.0 | 57 | 14 | 43 | CH | CH |
| ■ | B-17 | 9.0-9.9 | 61 | 16 | 45 | CH | CH |
| ◆ | B-19 | 1.0-2.0 | 43 | 10 | 33 | CL | CL |
| ○ | B-21 | 1.0-2.0 | 39 | 13 | 26 | CL | CL |
| □ | B-26 | 4.0-5.0 | 43 | 11 | 32 | CL | CL |
| △ | B-29 | 4.0-5.0 | 39 | 11 | 28 | CL | CL |
| ✕ | B-29 | 9.0-10.0 | 63 | 15 | 48 | CH | CH |

NP - INDICATES NON-PLASTIC




PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

FIGURE B-2

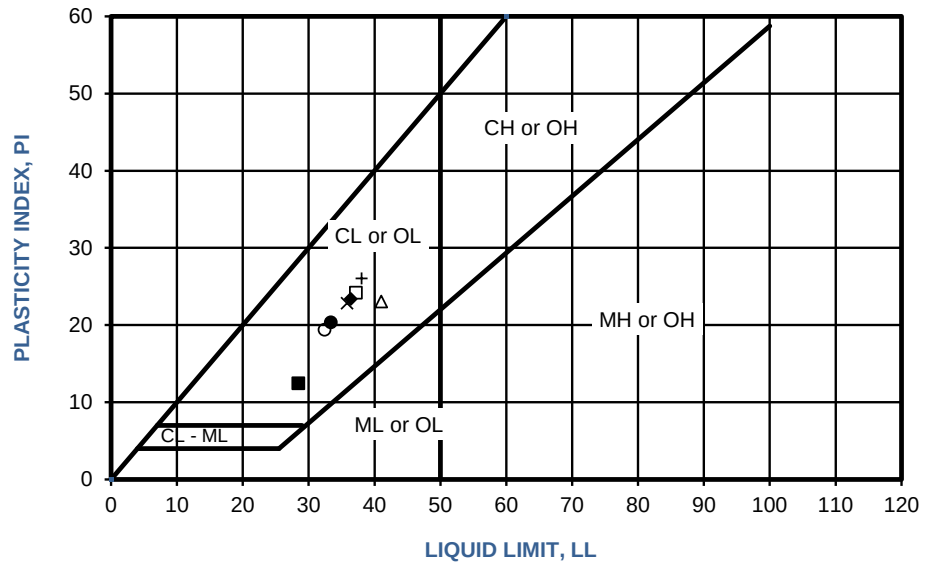
Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

ATTERBERG LIMITS TEST RESULTS

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO

| SYMBOL | LOCATION | DEPTH (ft) | LIQUID LIMIT | PLASTIC LIMIT | PLASTICITY INDEX | USCS CLASSIFICATION (Fraction Finer Than No. 40 Sieve) | EQUIVALENT USCS |
|---|---|---|---|---|---|---|---|
| ● | R-1 | 0.0-2.0 | 33 | 13 | 20 | CL | CL |
| ■ | R-2 | 0.0-2.0 | 28 | 16 | 12 | CL | CL |
| ◆ | R-3 | 0.0-2.0 | 36 | 13 | 23 | CL | CL |
| ○ | R-4 | 0.0-2.0 | 32 | 13 | 19 | CL | CL |
| □ | R-5 | 0.0-2.0 | 37 | 13 | 24 | CL | CL |
| △ | R-6 | 0.0-2.0 | 41 | 18 | 23 | CL | CL |
| X | R-7 | 0.0-2.0 | 36 | 13 | 23 | CL | CL |
| + | R-8 | 0.0-2.0 | 38 | 12 | 26 | CL | CL |

NP - INDICATES NON-PLASTIC




PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

FIGURE B-3

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

ATTERBERG LIMITS TEST RESULTS

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO

| SAMPLE LOCATION | SAMPLE DEPTH (ft) | DESCRIPTION | PERCENT PASSING NO. 4 | PERCENT PASSING NO. 200 | EQUIVALENT USCS |
|---|---|---|---|---|---|
| B-1 | 1.0-2.0 | Light Brown Lean CLAY; Trace Sand | 100 | 97 | CL |
| B-2 | 9.0-9.6 | Brown Sandy Lean CLAY | 100 | 59 | CL |
| B-3 | 19.0-19.8 | Reddish Yellow Sandy CLAYSTONE; DENVER FORMATION | 100 | 68 | CL |
| B-4 | 4.0-5.0 | Gray CLAYSTONE; DENVER FROMATION | 100 | 87 | CL |
| B-5 | 4.0-5.0 | Brown Sandy Lean CLAY | 100 | 66 | CL |
| B-7 | 9.0-10.0 | Reddish Yellow to Yellow Clayey SANDSTONE; DENVER FORMATION | 100 | 13 | SC |
| B-7 | 14.0-14.5 | Gray CLAYSTONE; DENVER FORMATION | 100 | 81 | CL |
| B-9 | 4.0-4.5 | Reddish Yellow to Gray Sandy CLAYSTONE; DENVER FORMATION | 100 | 70 | CL |
| B-10 | 9.0-9.7 | Brown Sandy Lean CLAY | 100 | 56 | CL |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1140

| SAMPLE LOCATION | SAMPLE DEPTH (ft) | DESCRIPTION | PERCENT PASSING NO. 4 | PERCENT PASSING NO. 200 | EQUIVALENT USCS |
|---|---|---|---|---|---|
| B-11 | 4.0-5.0 | Light Brown Sandy Lean CLAY | 100 | 69 | CL |
| B-12 | 4.0-5.0 | Gray Sandy CLAYSTONE; DENVER FORMATION | 100 | 69 | CL |
| B-12 | 9.0-9.9 | Gray to Reddish Yellow Clayey SANDSTONE; DENVER FORMATION | 100 | 20 | SC |
| B-14 | 4.0-4.9 | Reddish Yellow to Gray CLAYSTONE; DENVER FORMATION | 100 | 93 | CH |
| B-16 | 14.0-15.0 | Gray CLAYSTONE; DENVER FORMATION | 100 | 90 | CH |
| B-17 | 9.0-9.9 | Gray to Yellow CLAYSTONE; DENVER FORMATION | 100 | 96 | CH |
| B-19 | 1.0-2.0 | Brownish Gray Lean CLAY; Trace Sand | 100 | 87 | CL |
| B-19 | 4.0-4.8 | Reddish Yellow Clayey SANDSTONE; DENVER FORMATION | 100 | 23 | SC |
| B-21 | 1.0-2.0 | Light Brown Lean CLAY; Trace Sand | 100 | 94 | CL |

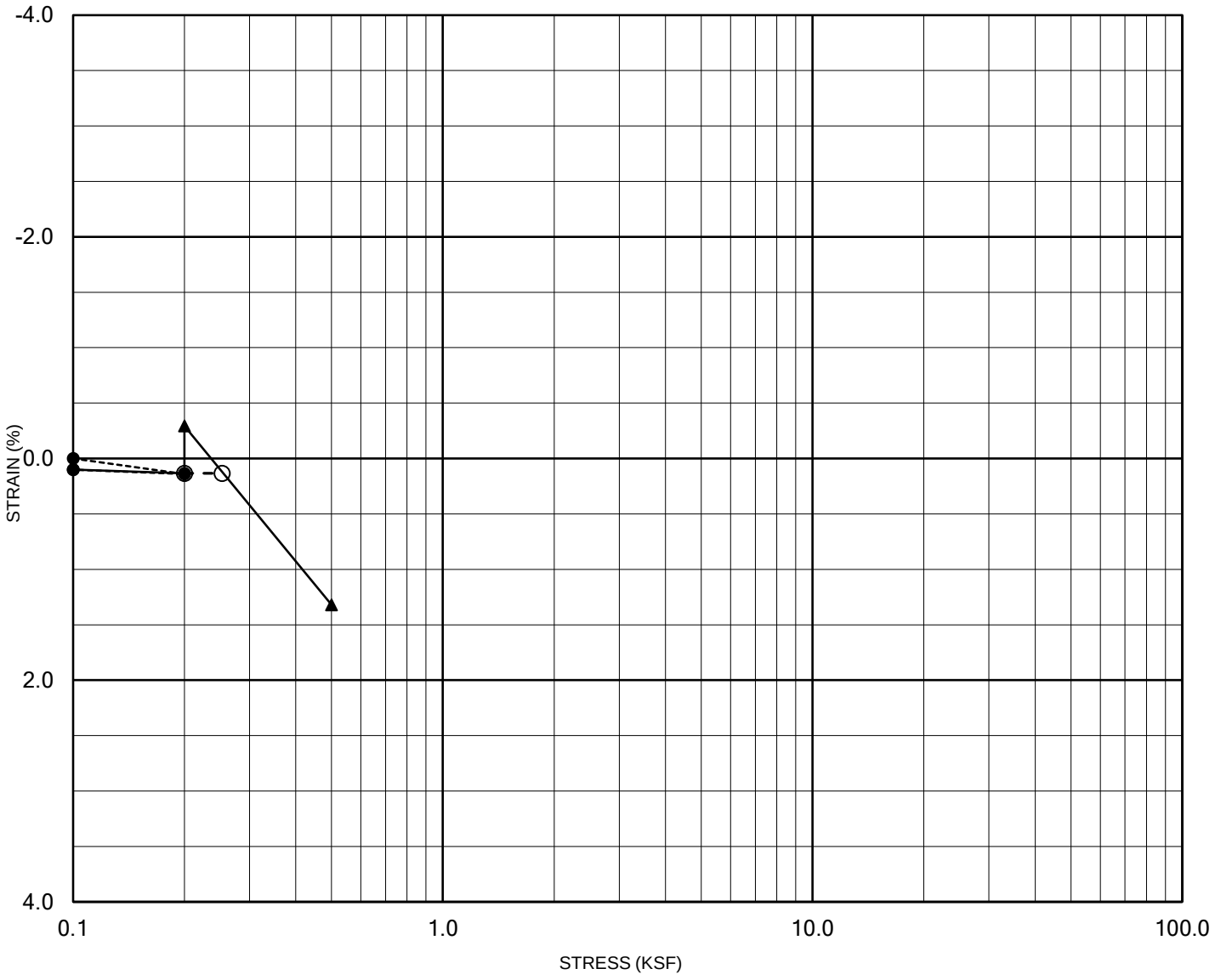
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1140

| SAMPLE LOCATION | SAMPLE DEPTH (ft) | DESCRIPTION | PERCENT PASSING NO. 4 | PERCENT PASSING NO. 200 | EQUIVALENT USCS |
|---|---|---|---|---|---|
| B-25 | 19.0-19.7 | Yellow Sandy CLAYSTONE; DENVER FORMATION | 100 | 69 | CL |
| B-25 | 24.0-24.3 | Reddish Yellow Clayey SANDSTONE; DENVER FORMATION | 100 | 33 | SC |
| B-26 | 4.0-5.0 | Brown Lean CLAY with Sand | 100 | 81 | CL |
| B-29 | 4.0-5.0 | Light Brown Lean CLAY; Trace Sand | 100 | 86 | CL |
| B-29 | 9.0-10.0 | Gray to Reddish Yellow CLAYSTONE; DENVER FORMATION | 100 | 97 | CH |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1140

| SAMPLE LOCATION | SAMPLE DEPTH (ft) | DESCRIPTION | PERCENT PASSING NO. 4 | PERCENT PASSING NO. 200 | EQUIVALENT USCS |
|---|---|---|---|---|---|
| R-1 | 0.0-2.0 | Light Brown Sandy Lean CLAY | 100 | 70 | CL |
| R-2 | 0.0-2.0 | Light Brown Lean CLAY with Sand | 100 | 76 | CL |
| R-3 | 0.0-2.0 | Light Brown Lean CLAY with Sand | 100 | 77 | CL |
| R-4 | 0.0-2.0 | Light Brown Sandy Lean CLAY; Trace Gravel | 97 | 59 | CL |
| R-5 | 0.0-2.0 | Light Brown Lean CLAY; Trace Sand | 100 | 86 | CL |
| R-6 | 0.0-2.0 | Light Brown Lean CLAY; Trace Sand | 100 | 93 | CL |
| R-7 | 0.0-2.0 | Light Brown Lean CLAY with Sand | 100 | 84 | CL |
| R-8 | 0.0-2.0 | Light Brown Lean CLAY with Sand | 100 | 85 | CL |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1140




Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 29.1 |
| Swell Percentage (%): | 0.4 |
| Swell Pressure (psf): | 53 |

Sample Location: B-1
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-8**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



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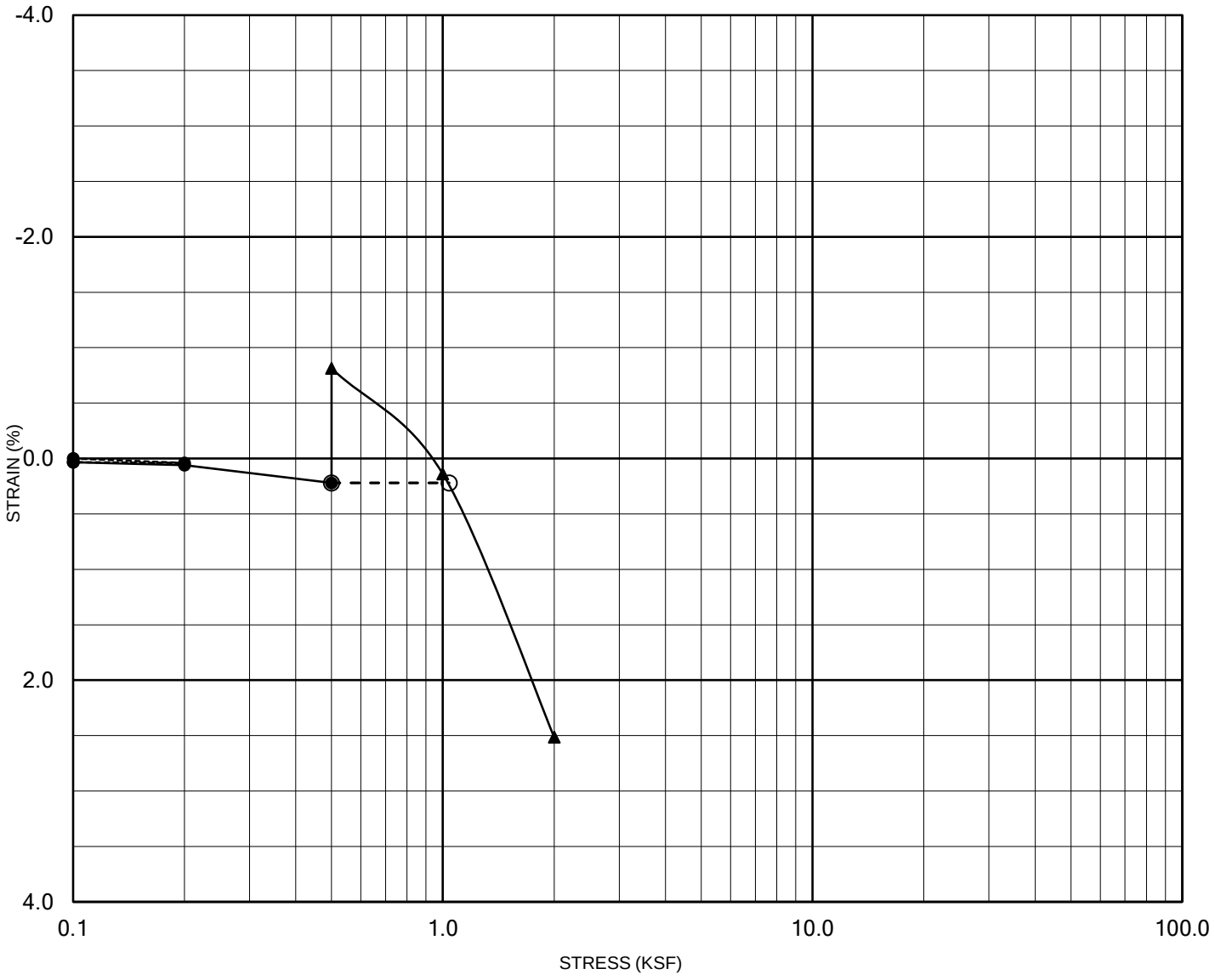


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 19.3 |
| Swell Percentage (%): | 1.0 |
| Swell Pressure (psf): | 540 |

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

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-9**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



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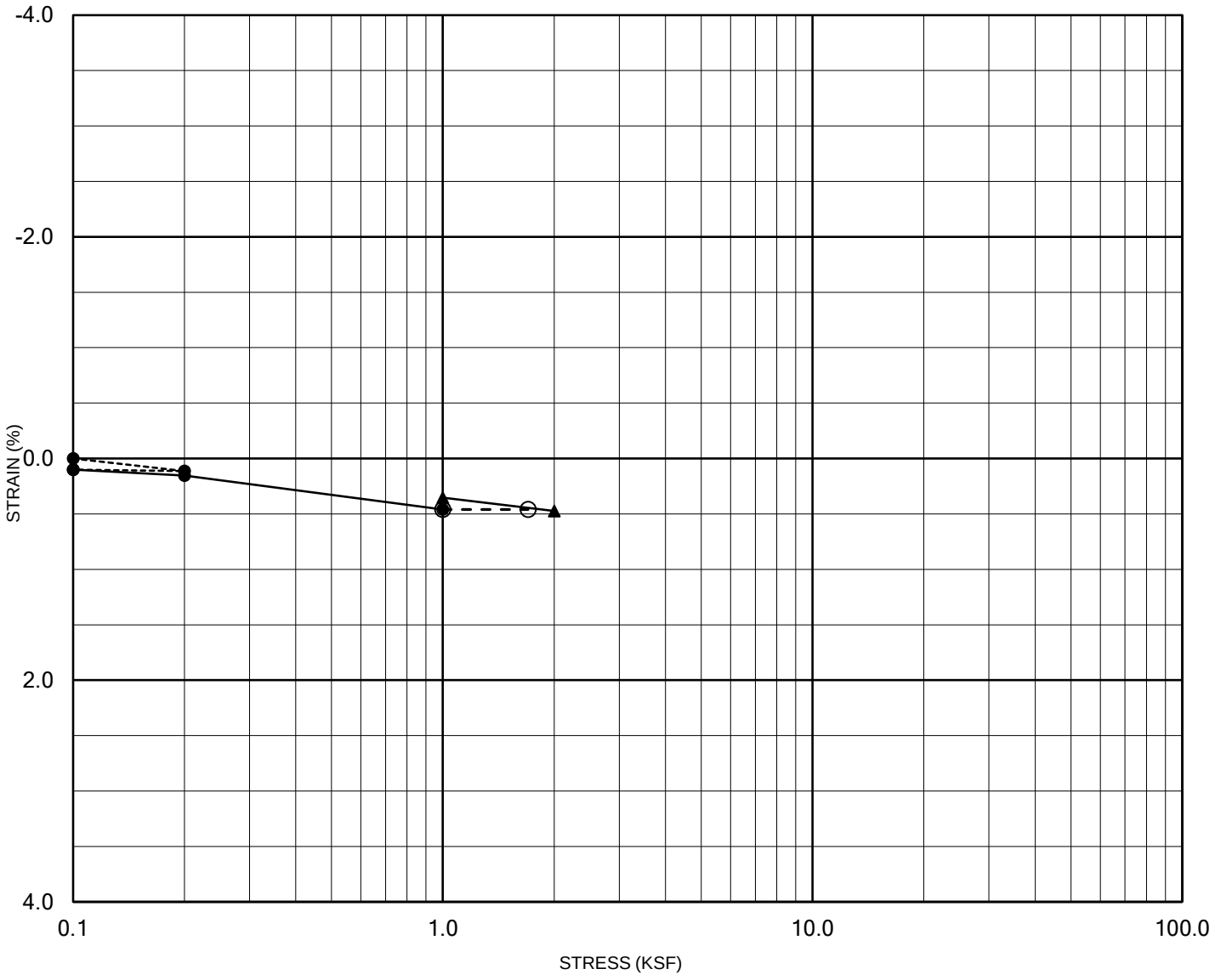


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 6.9 |
| Swell Percentage (%): | 0.1 |
| Swell Pressure (psf): | 700 |

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

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-10**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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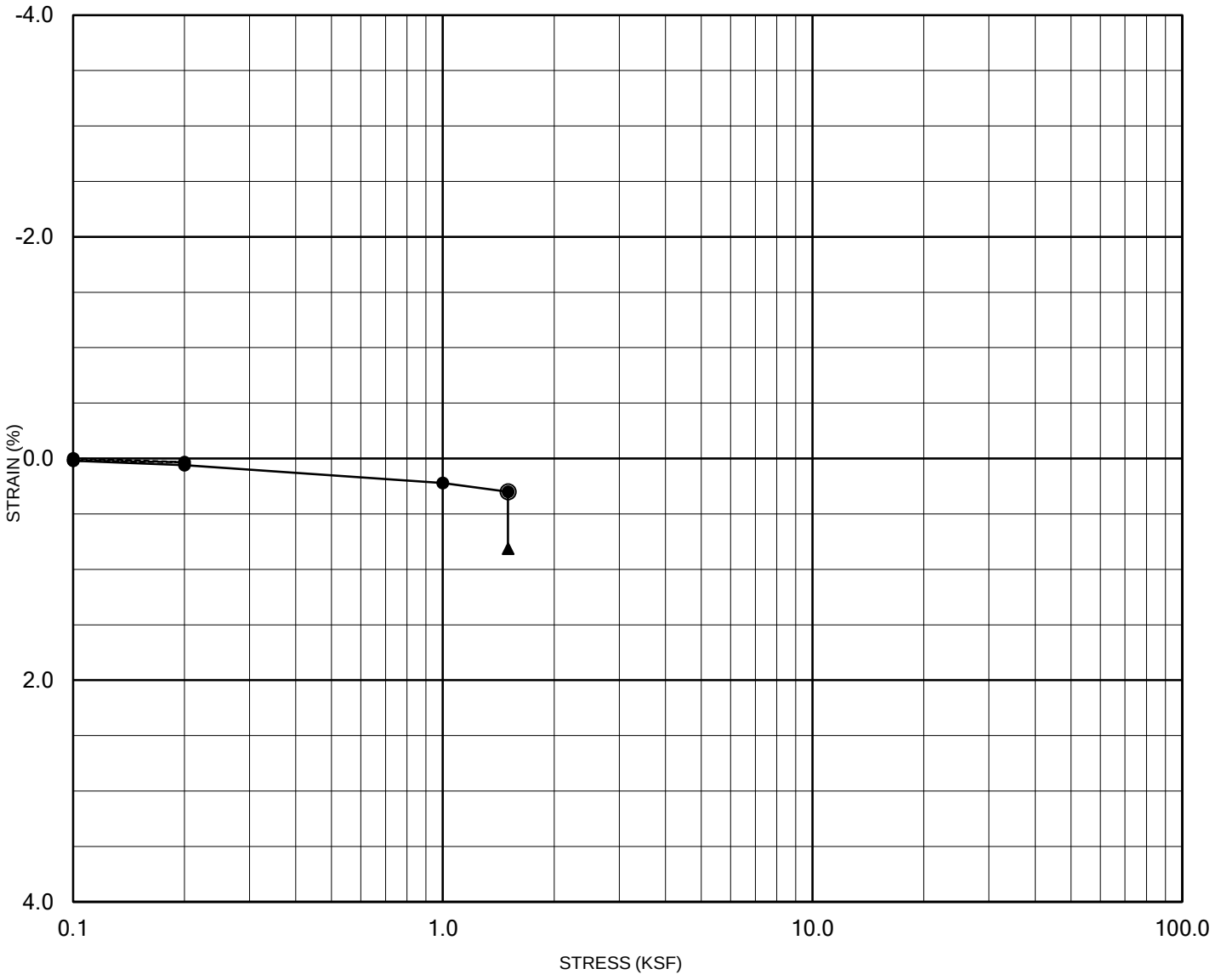


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 10.6 |
| Swell Percentage (%): | -0.5 |
| Swell Pressure (psf): | -- |

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

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-11**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

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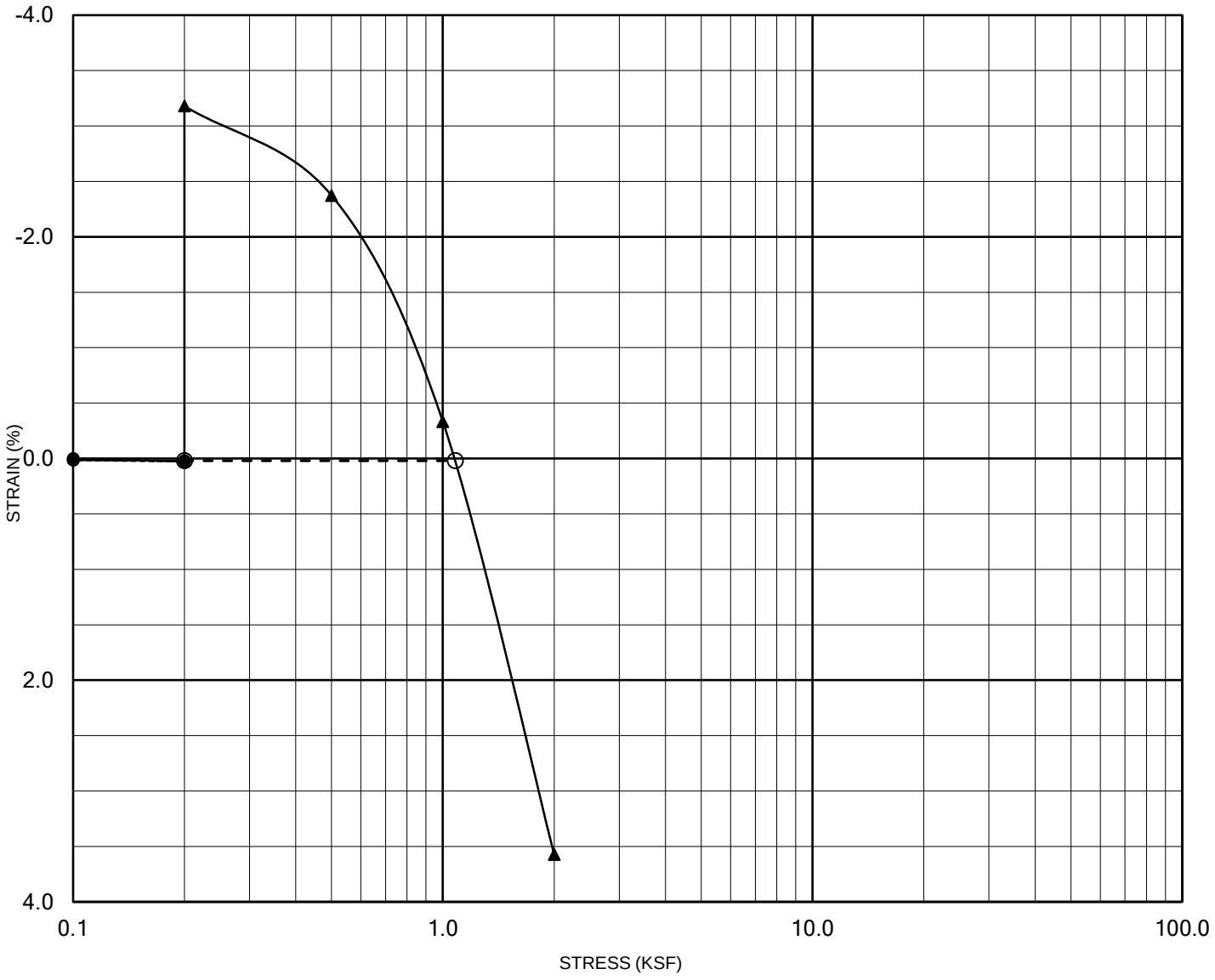


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 15.1 |
| Swell Percentage (%): | 3.2 |
| Swell Pressure (psf): | 880 |

Sample Location: B-10
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-12**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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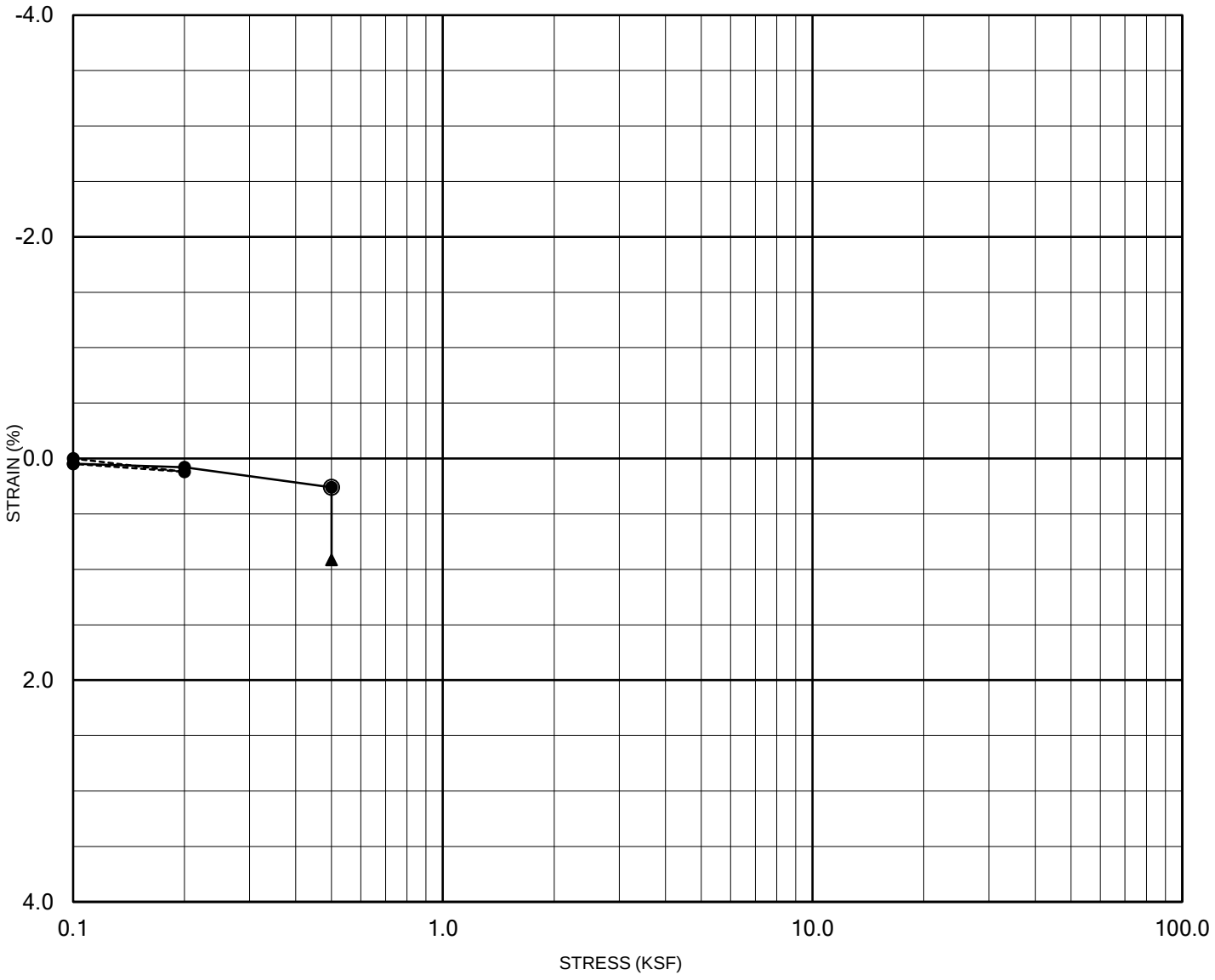


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 14.4 |
| Swell Percentage (%): | -0.7 |
| Swell Pressure (psf): | -- |

Sample Location: B-10
Depth: 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-13**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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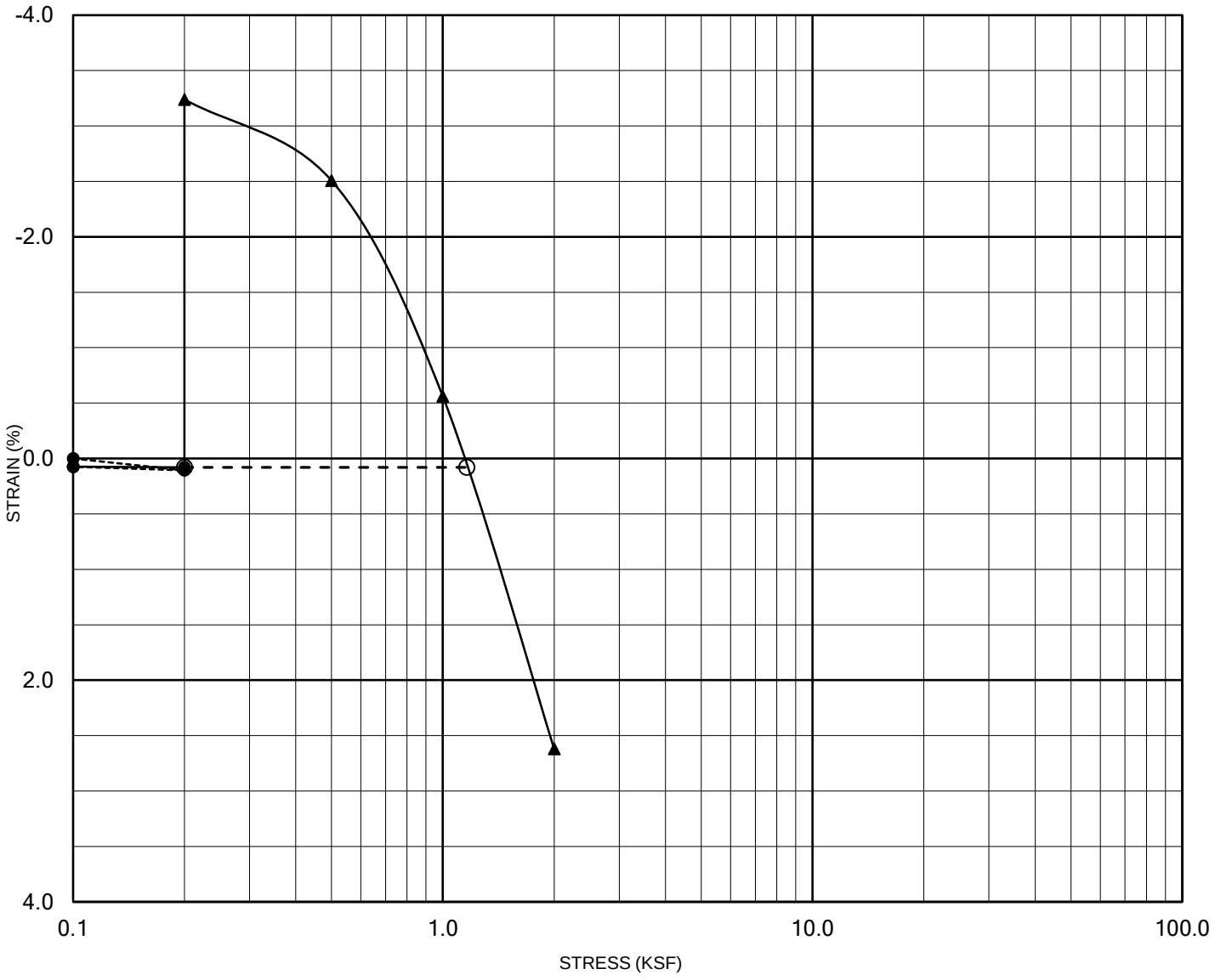


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 15.7 |
| Swell Percentage (%): | 3.3 |
| Swell Pressure (psf): | 960 |

Sample Location: B-11
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-14**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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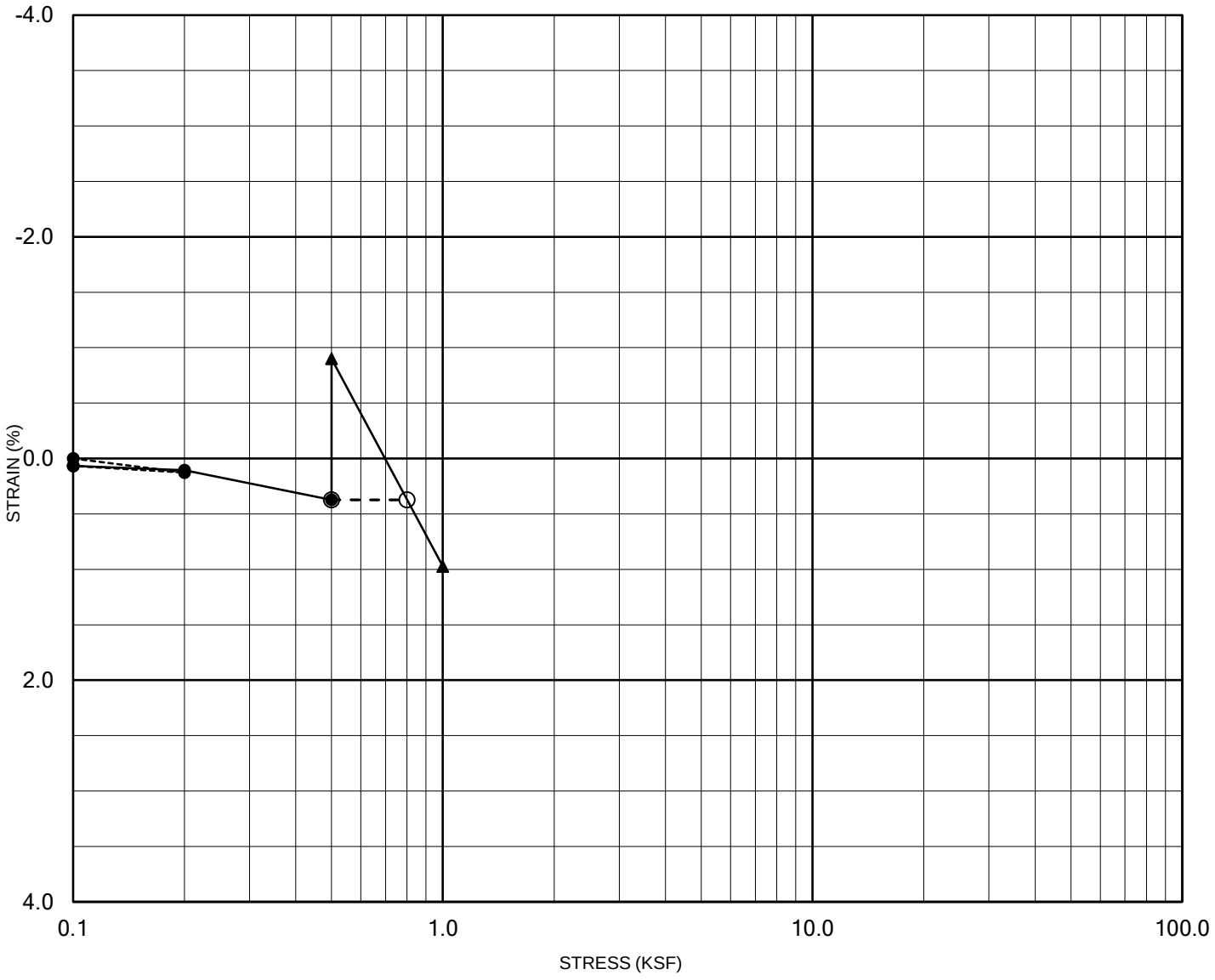


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 21.7 |
| Swell Percentage (%): | 1.3 |
| Swell Pressure (psf): | 300 |

Sample Location: B-11
Depth: 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-15**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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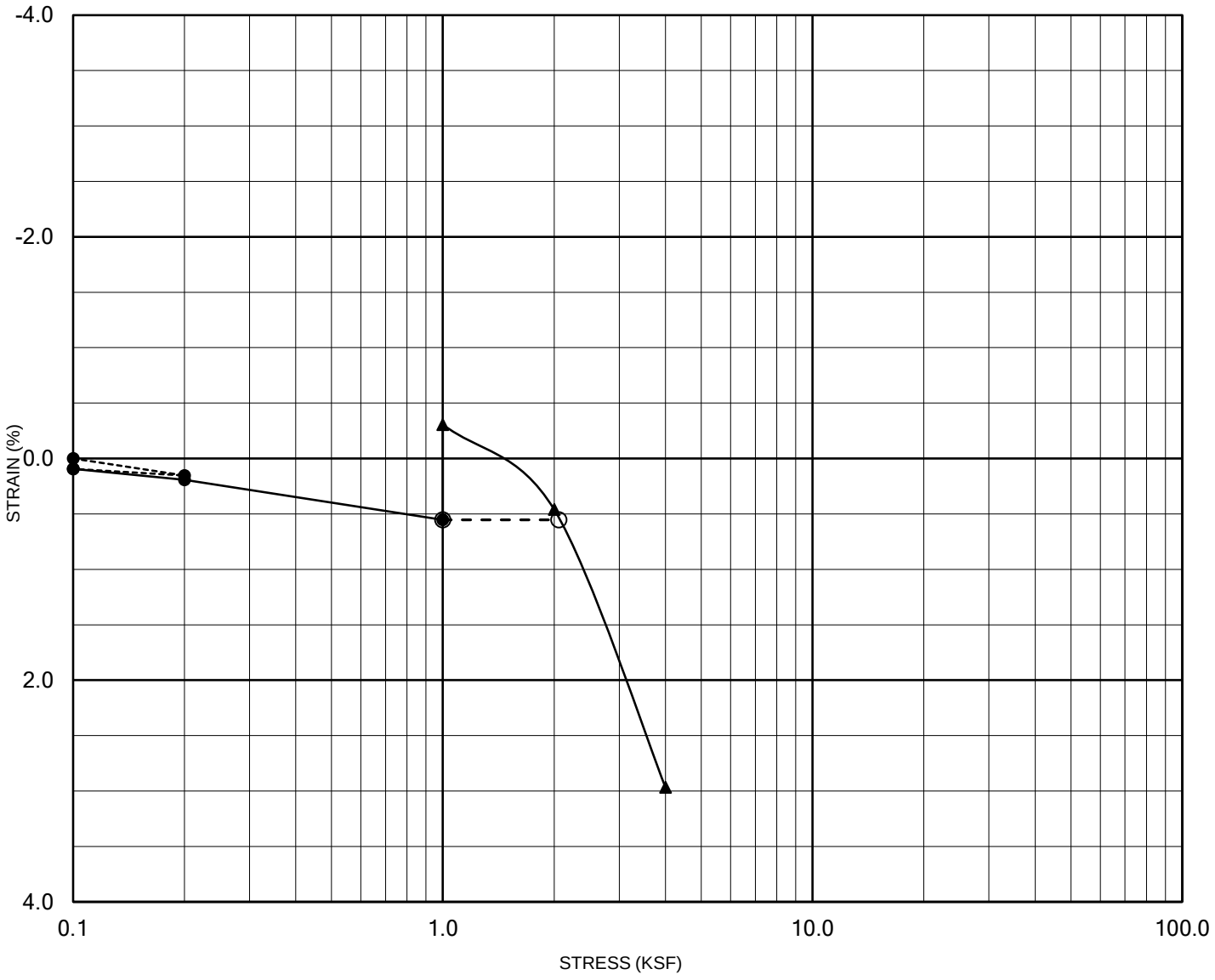


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 10.6 |
| Swell Percentage (%): | 0.9 |
| Swell Pressure (psf): | 1,060 |

Sample Location: B-11
Depth: 9.0-10.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-16**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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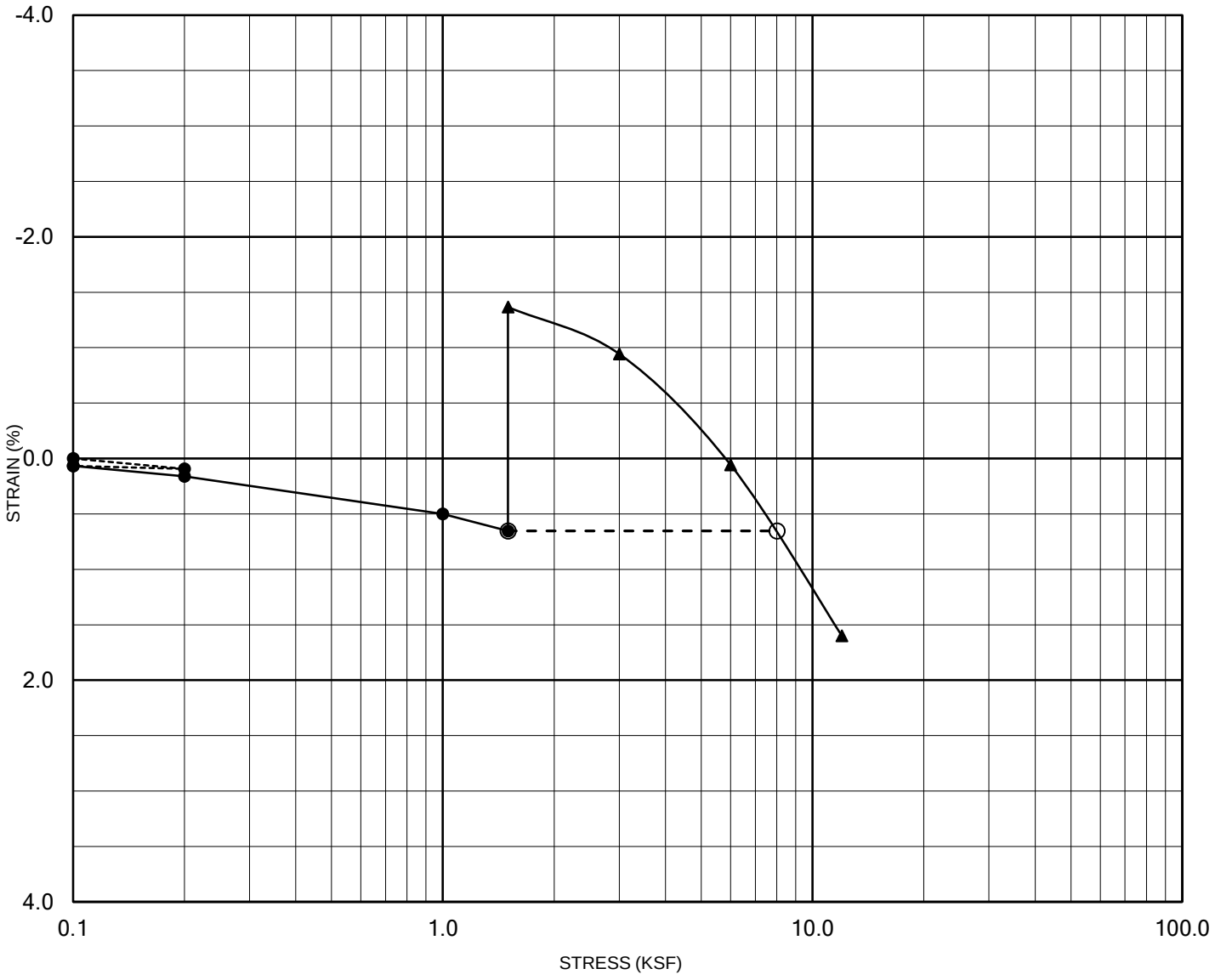


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 5.7 |
| Swell Percentage (%): | 2.0 |
| Swell Pressure (psf): | 6,520 |

Sample Location: B-11
Depth: 14.0-15.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-17**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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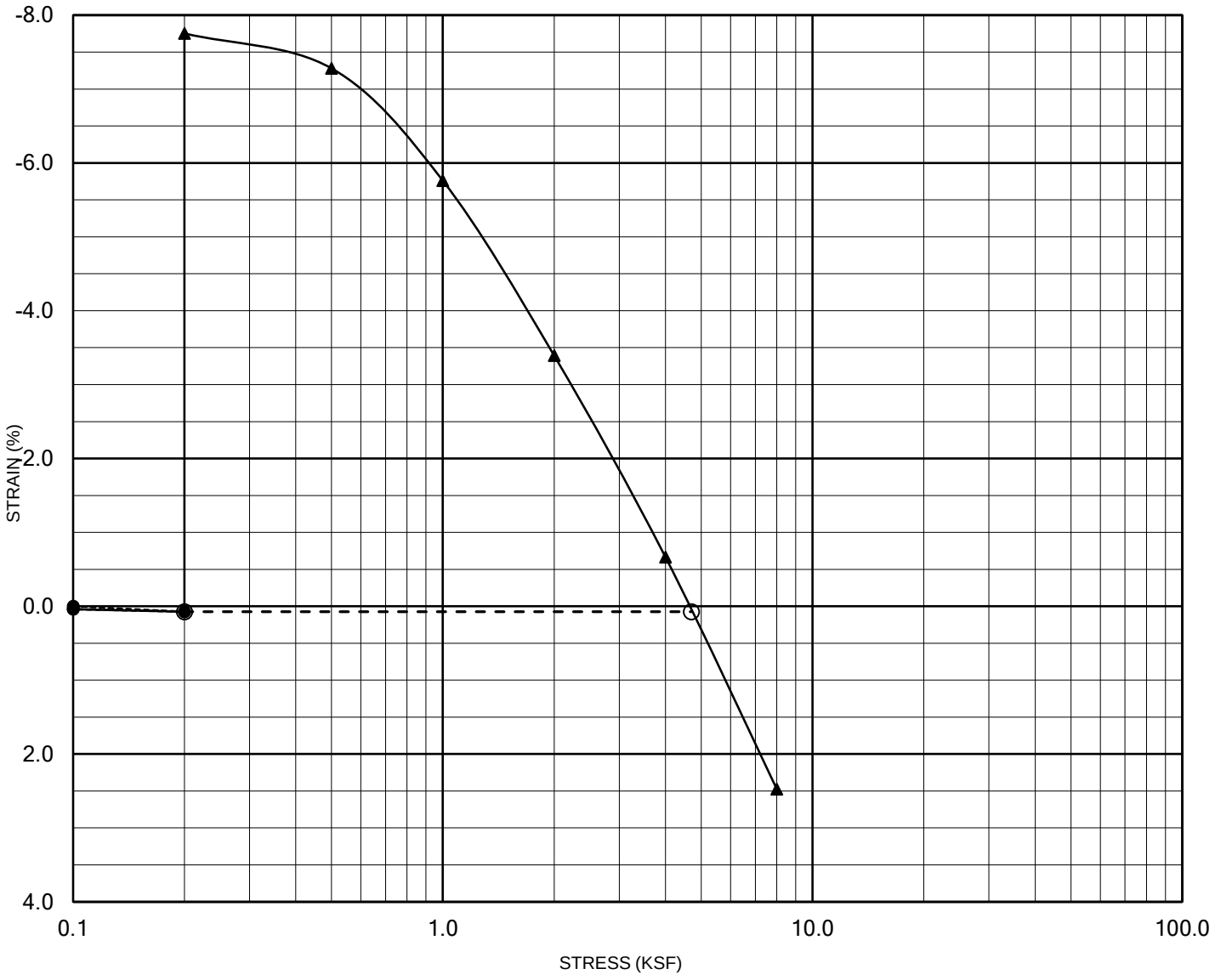


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 10.9 |
| Swell Percentage (%): | 7.8 |
| Swell Pressure (psf): | 4,500 |

Sample Location: B-15
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-18**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 4.9 |
| Swell Percentage (%): | 5.8 |
| Swell Pressure (psf): | 17,500 |

Sample Location: B-15
Depth: 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-19**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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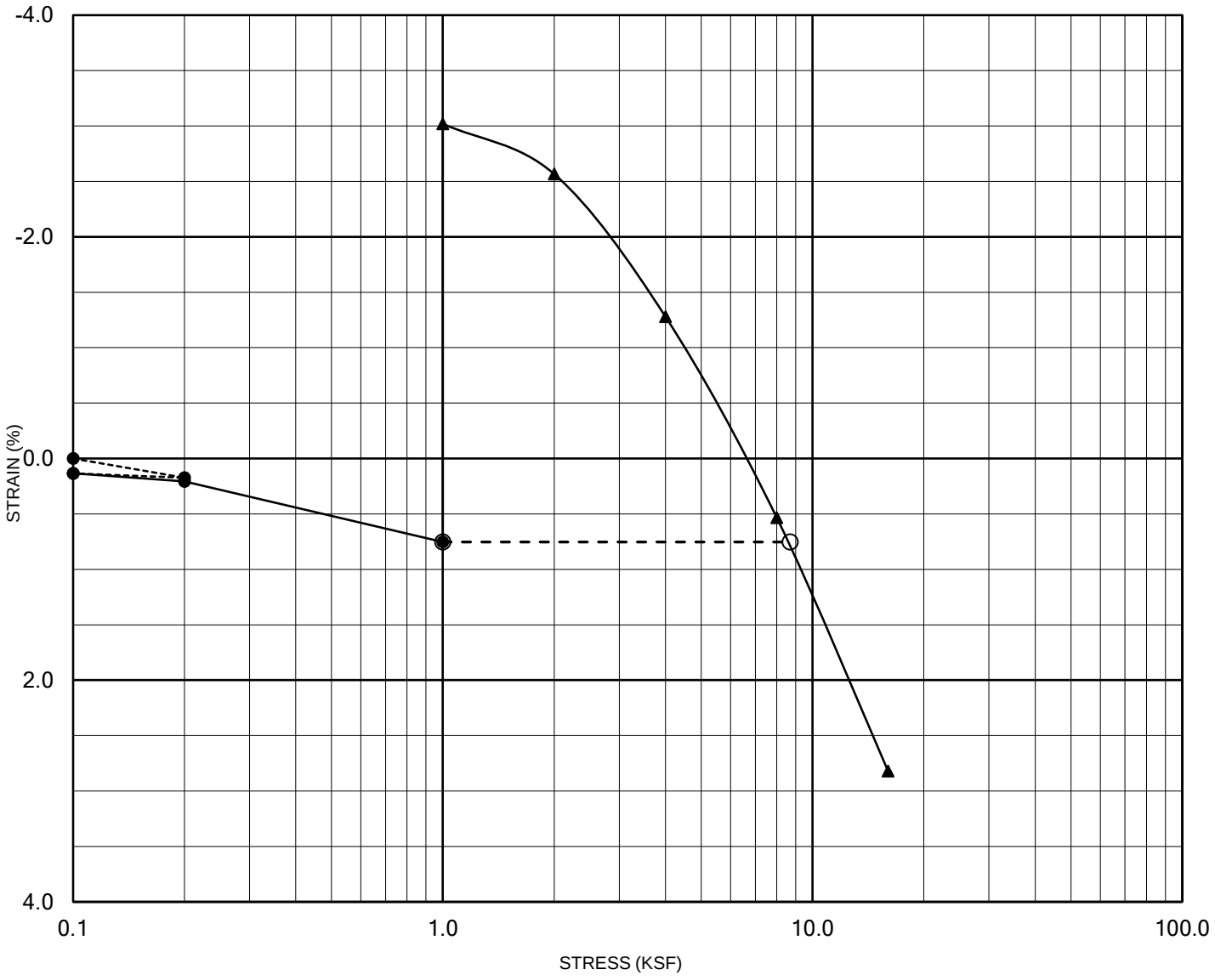


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 5.1 |
| Swell Percentage (%): | 3.8 |
| Swell Pressure (psf): | 7,700 |

Sample Location: B-15
Depth: 9.0-10.0
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-20**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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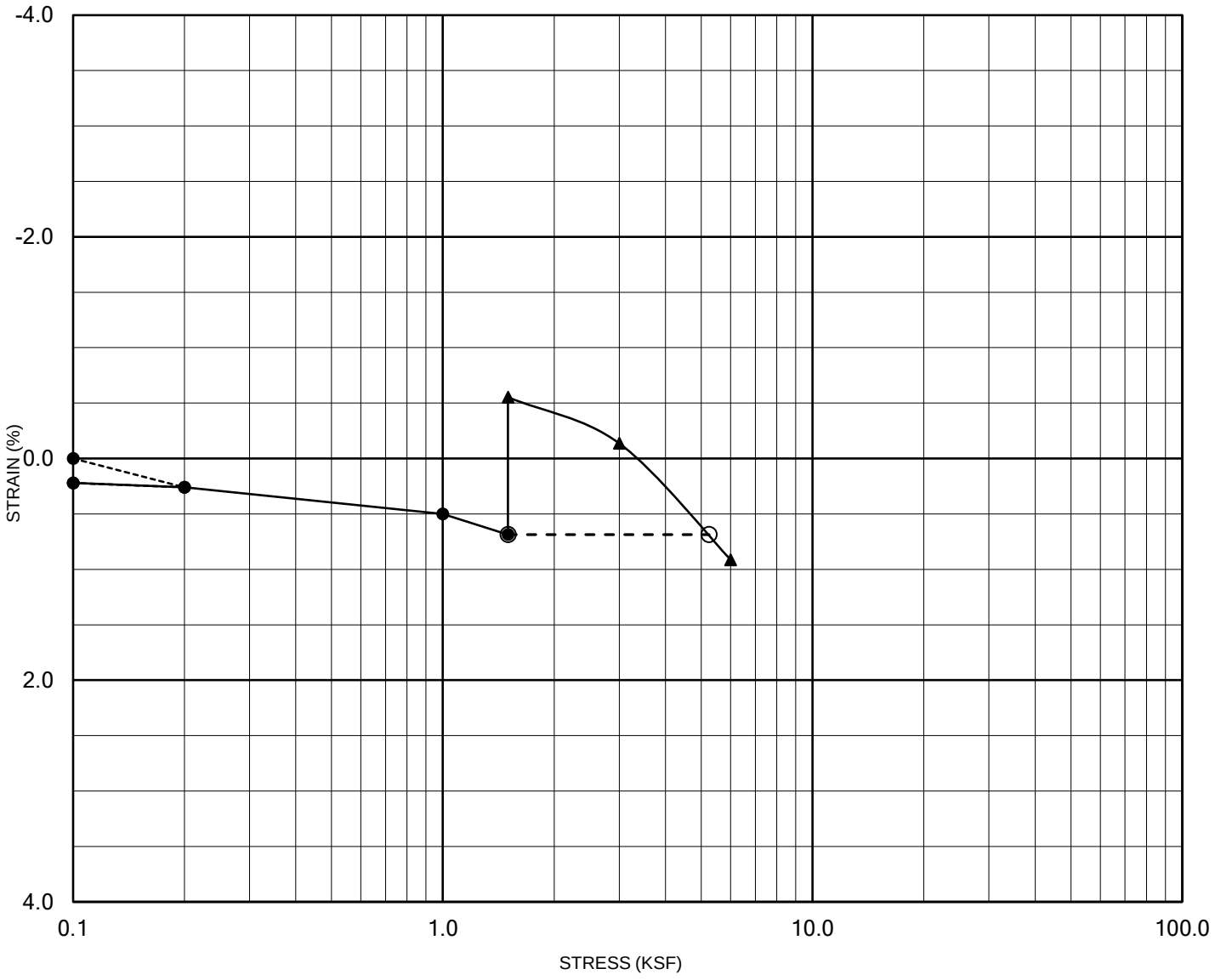


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 6.6 |
| Swell Percentage (%): | 1.2 |
| Swell Pressure (psf): | 3,750 |

Sample Location: B-15
Depth: 14.0-14.4
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-21**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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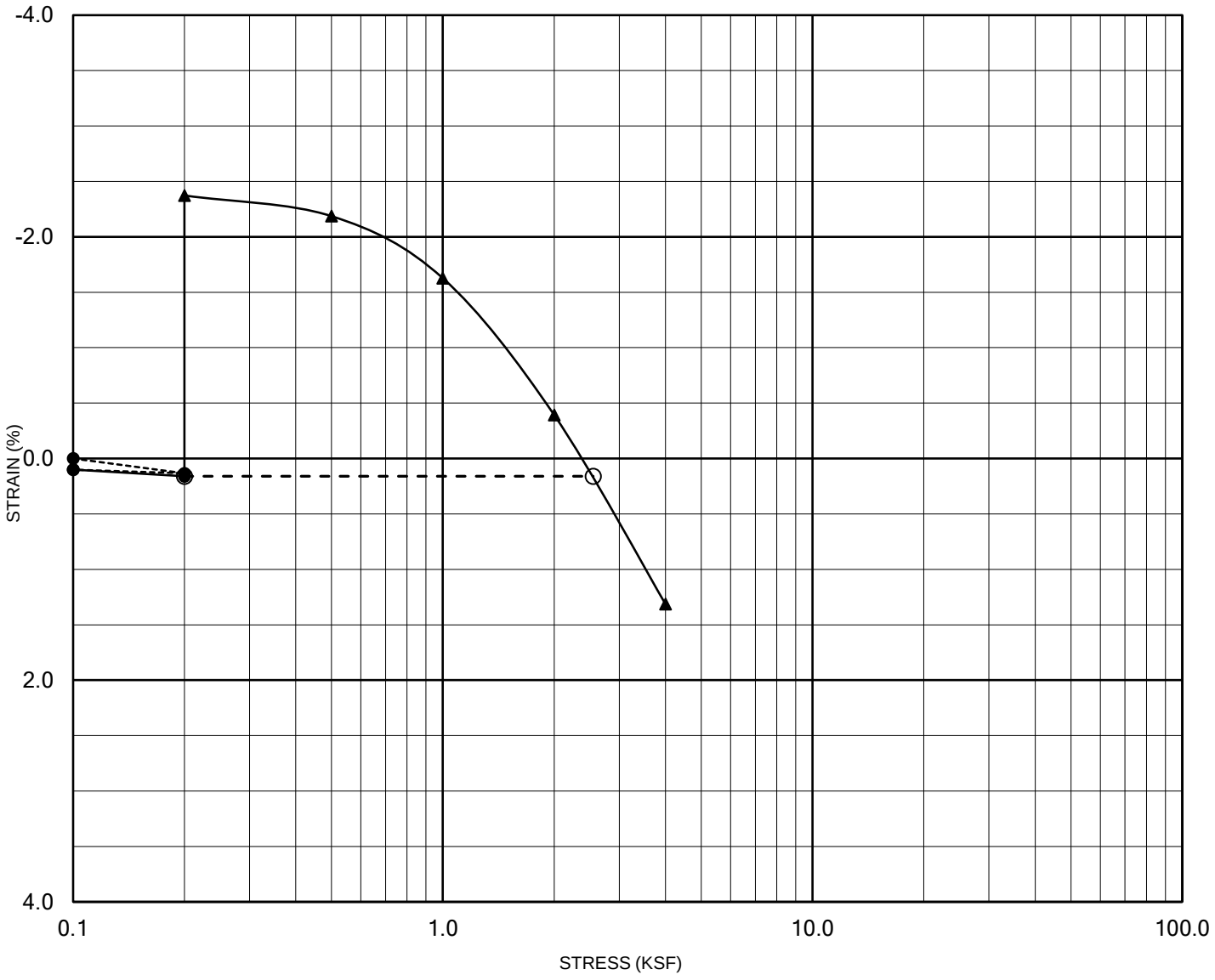


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 10.0 |
| Swell Percentage (%): | 2.5 |
| Swell Pressure (psf): | 2,350 |

Sample Location: B-17
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-22**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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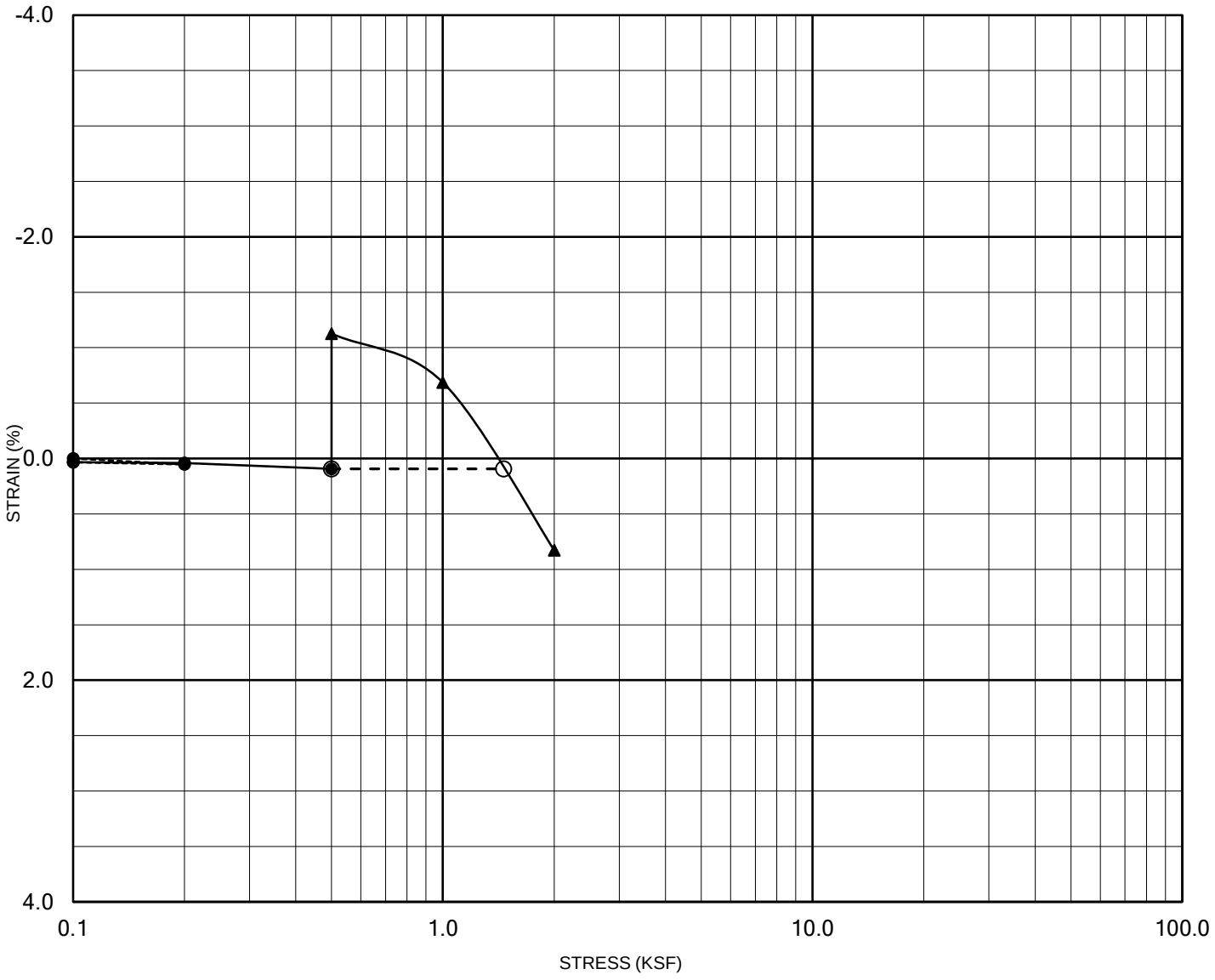


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 18.5 |
| Swell Percentage (%): | 1.2 |
| Swell Pressure (psf): | 960 |

Sample Location: B-17
Depth: 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-23**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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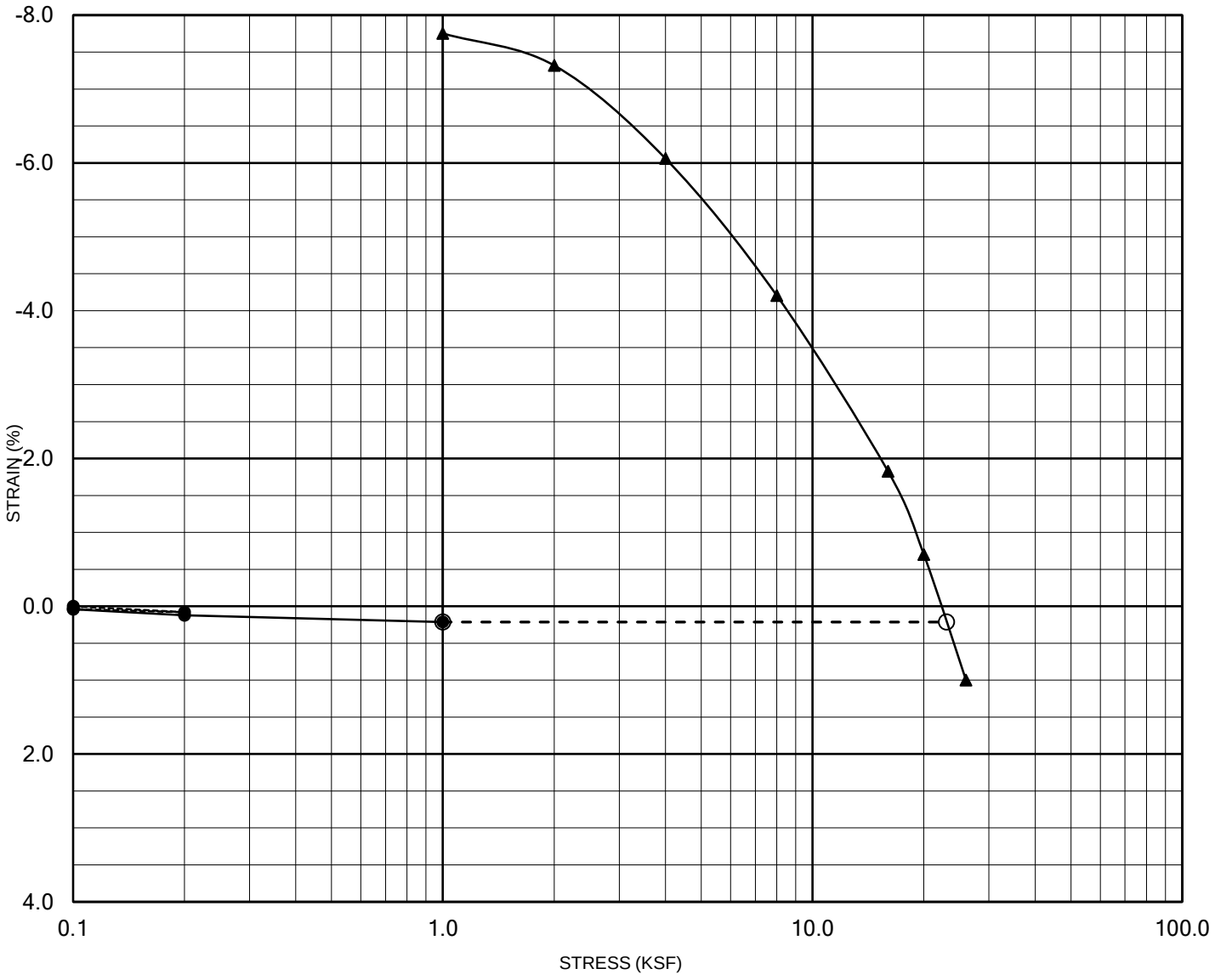


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 3.3 |
| Swell Percentage (%): | 8.0 |
| Swell Pressure (psf): | 22,000 |

Sample Location: B-17
Depth: 9.0-9.9
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-24**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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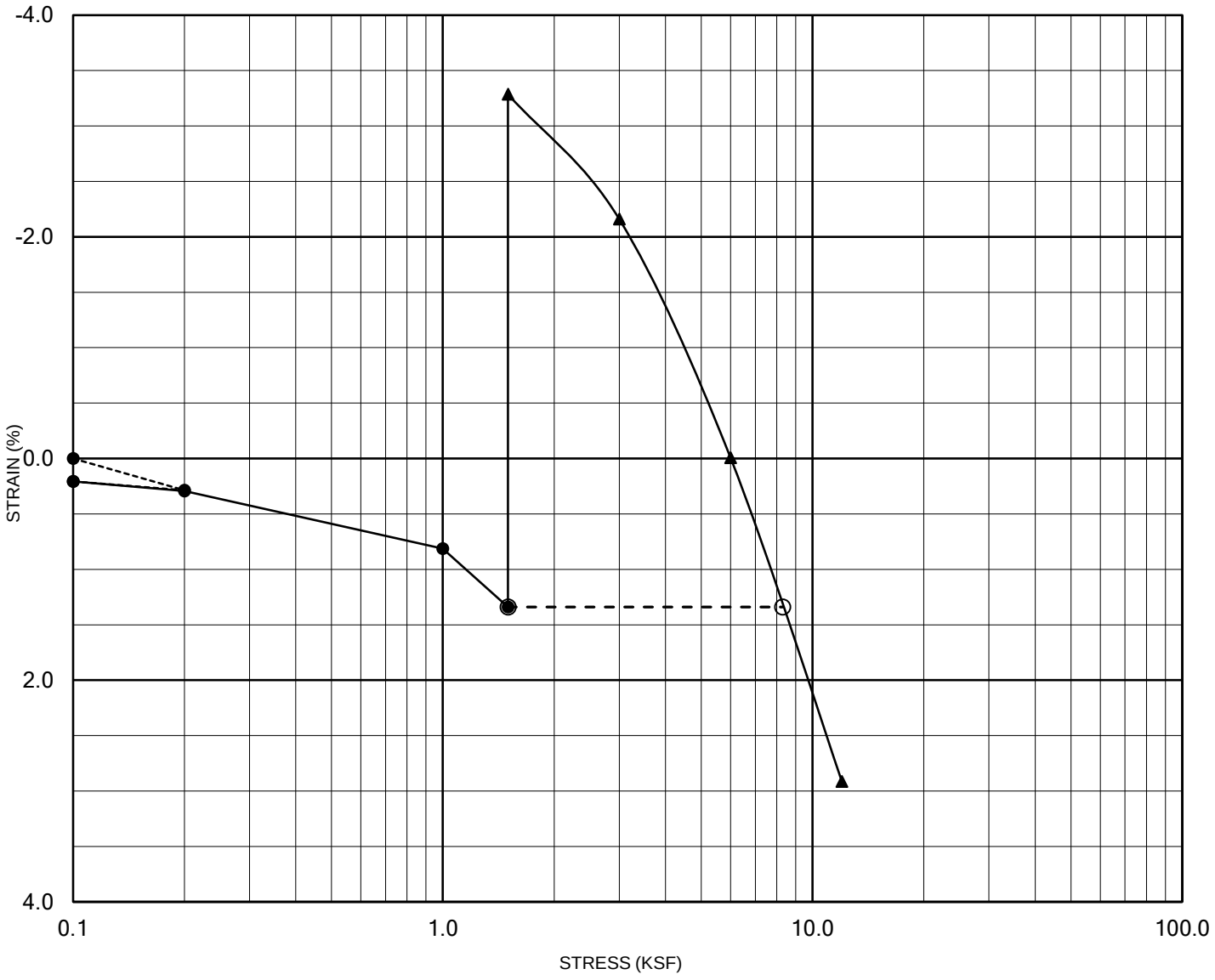


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 8.0 |
| Swell Percentage (%): | 4.6 |
| Swell Pressure (psf): | 6,800 |

Sample Location: B-17
Depth: 14.0-14.8
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-25**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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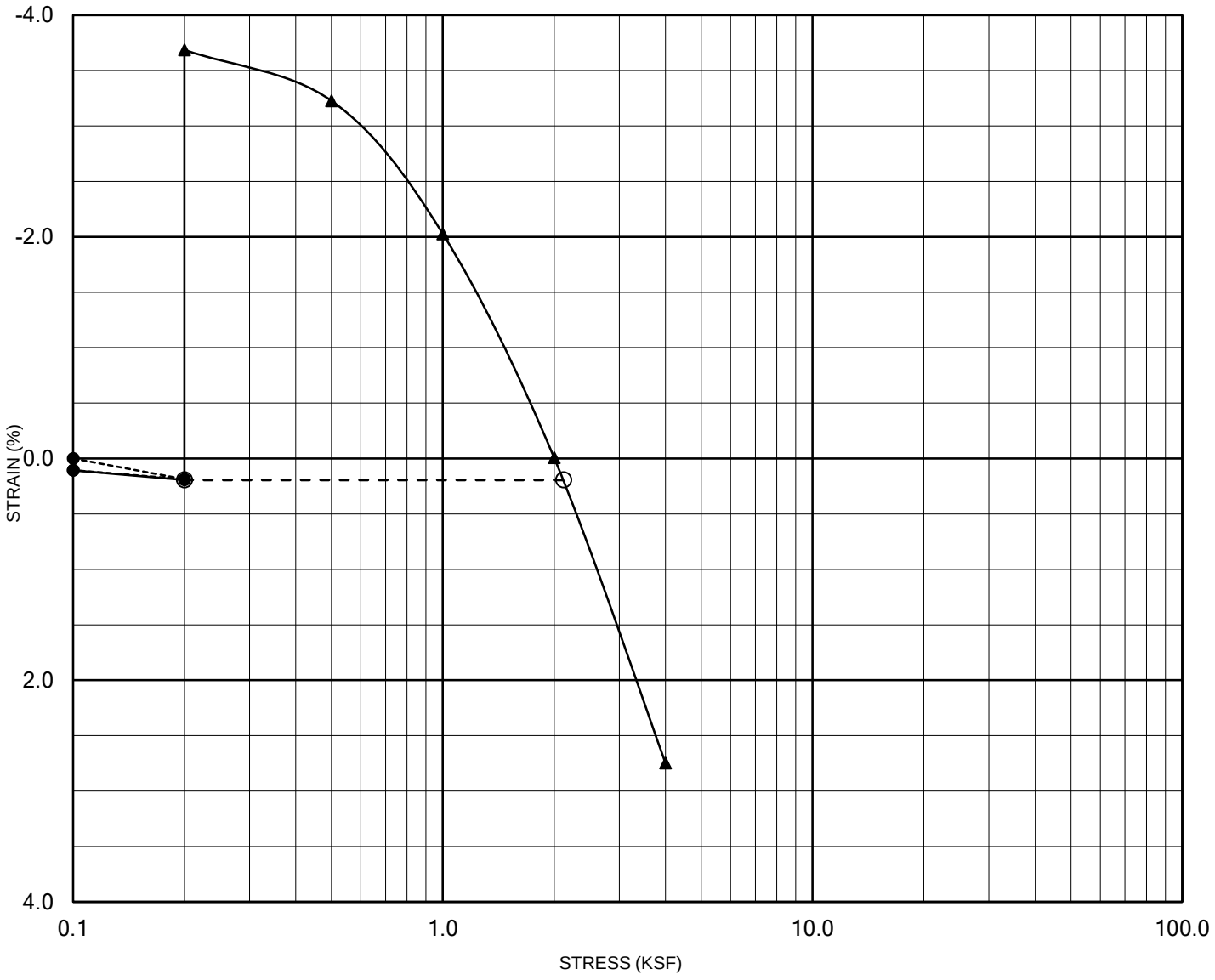


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 13.9 |
| Swell Percentage (%): | 3.9 |
| Swell Pressure (psf): | 1,920 |

Sample Location: B-22
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-26**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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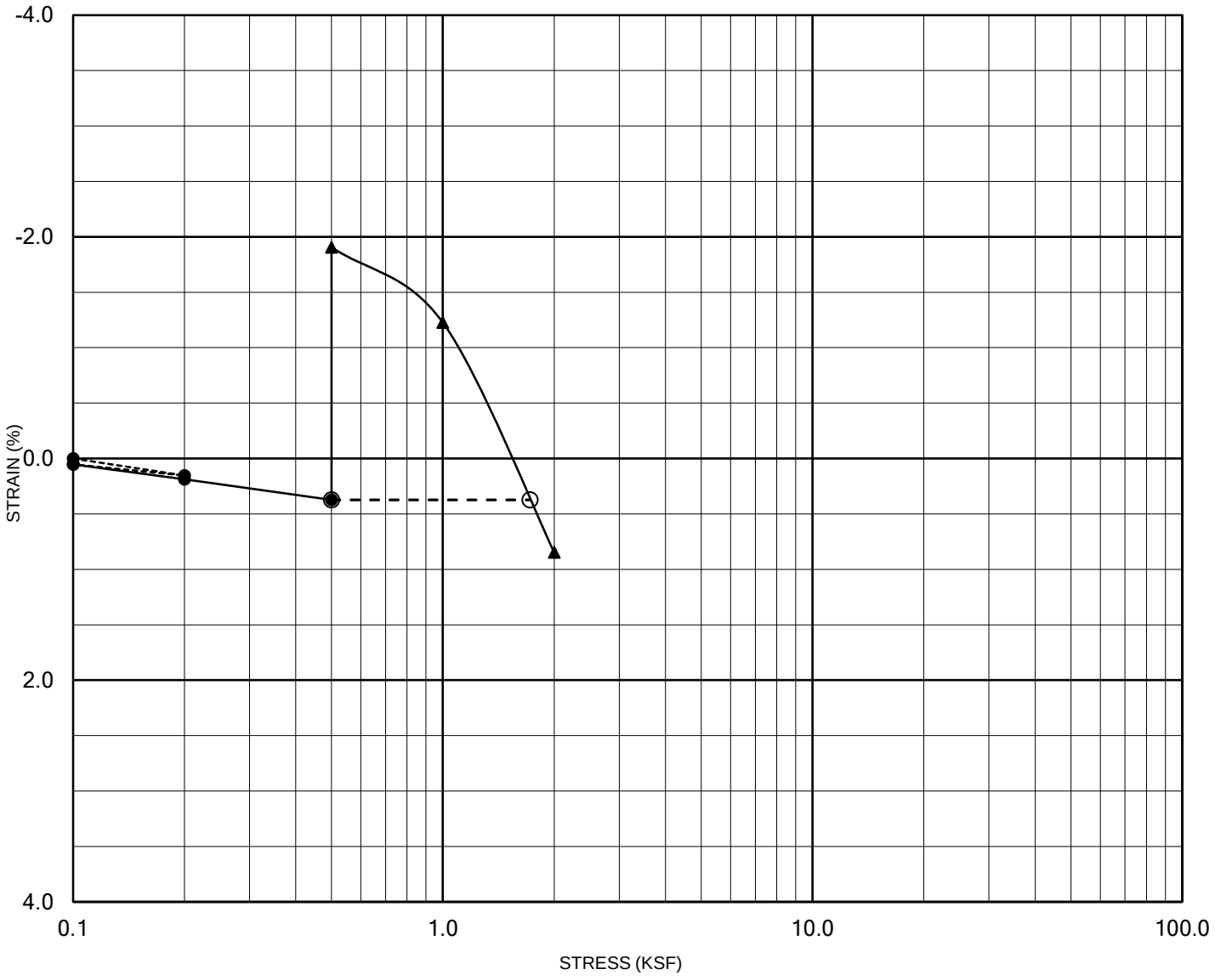


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 16.8 |
| Swell Percentage (%): | 2.3 |
| Swell Pressure (psf): | 1,220 |

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

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-27**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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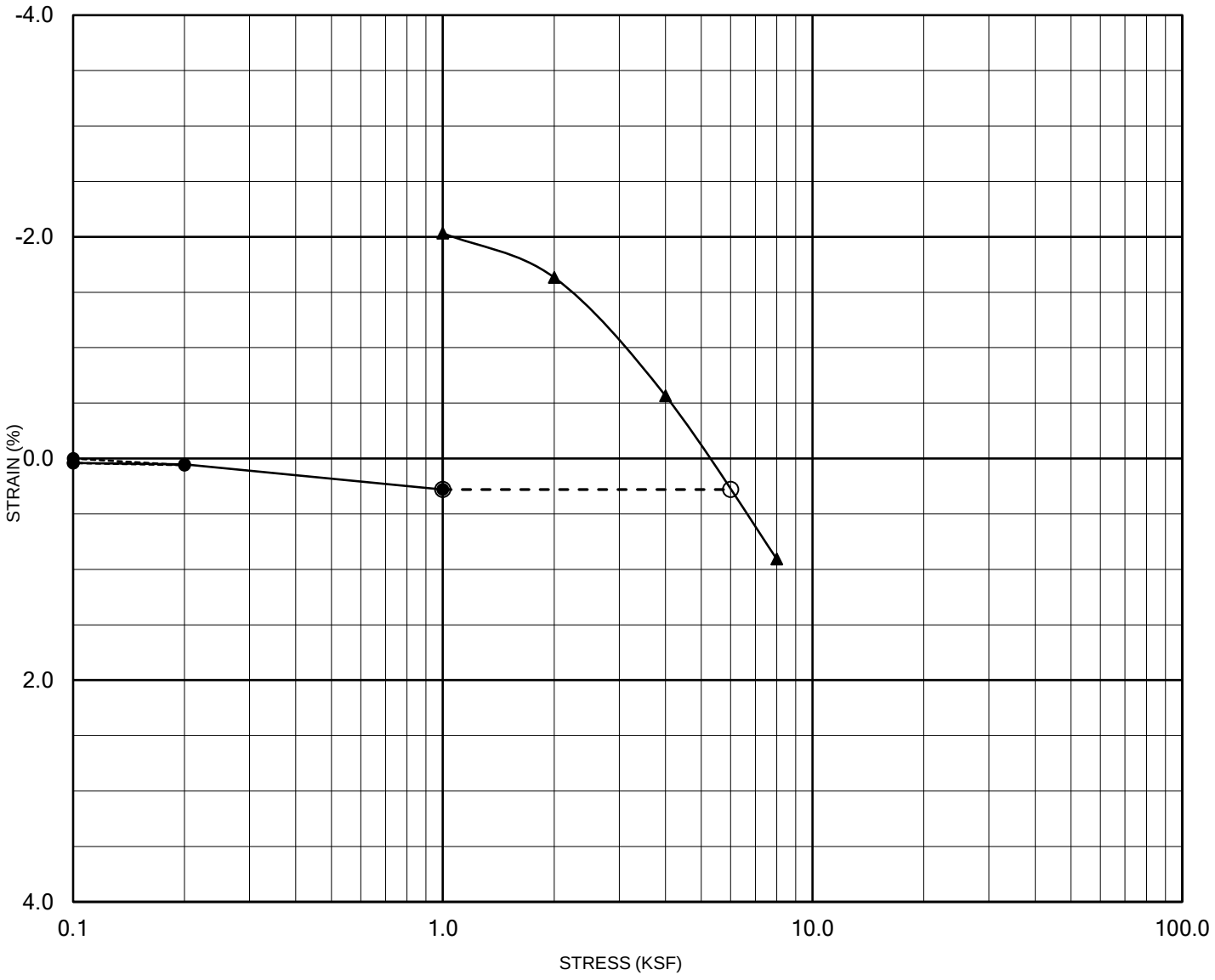


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 4.5 |
| Swell Percentage (%): | 2.3 |
| Swell Pressure (psf): | 5,000 |

Sample Location: B-22
Depth: 9.0-10.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-28**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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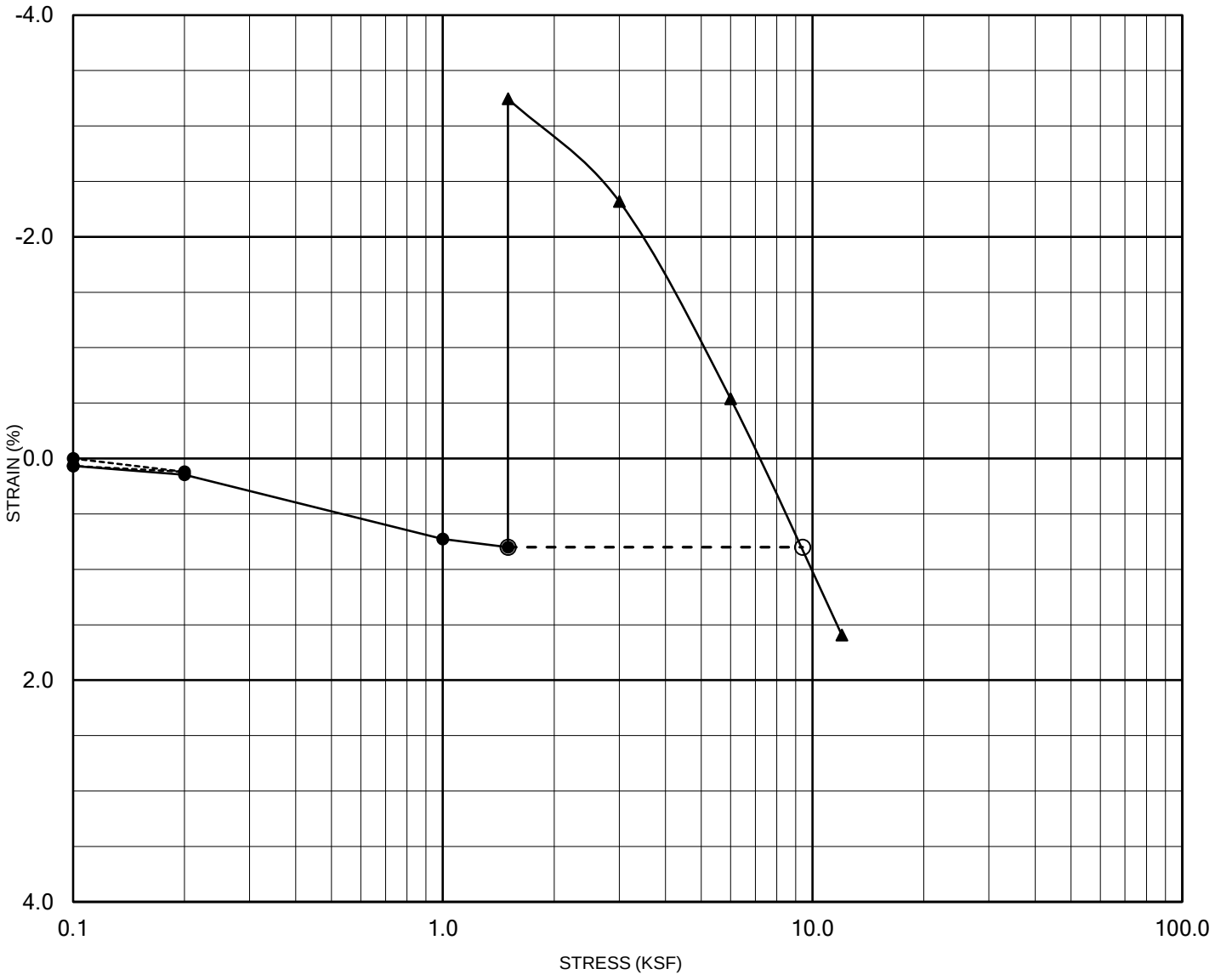


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 6.6 |
| Swell Percentage (%): | 4.0 |
| Swell Pressure (psf): | 7,900 |

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

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-29**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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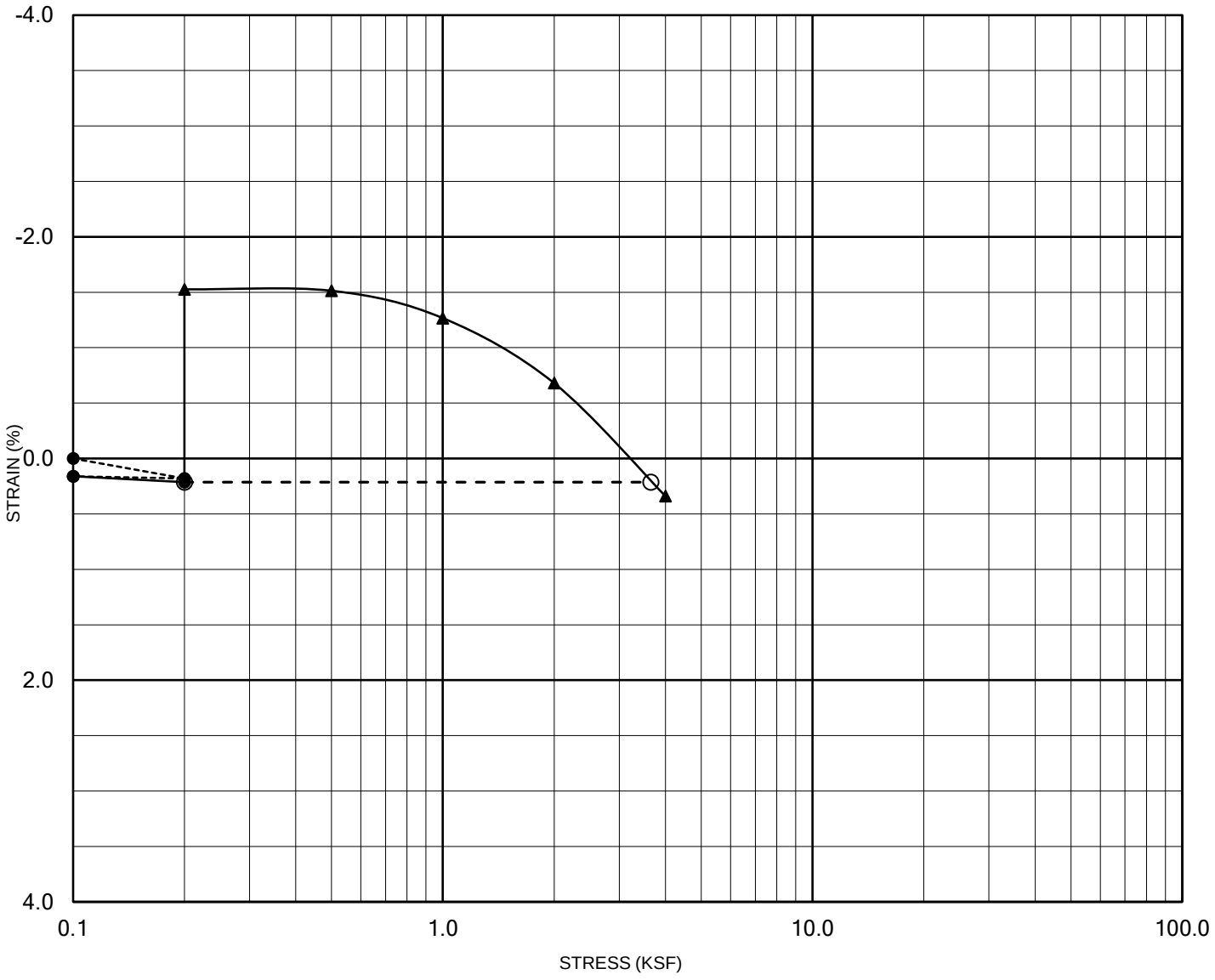


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 4.7 |
| Swell Percentage (%): | 1.7 |
| Swell Pressure (psf): | 3,450 |

Sample Location: B-23
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-30**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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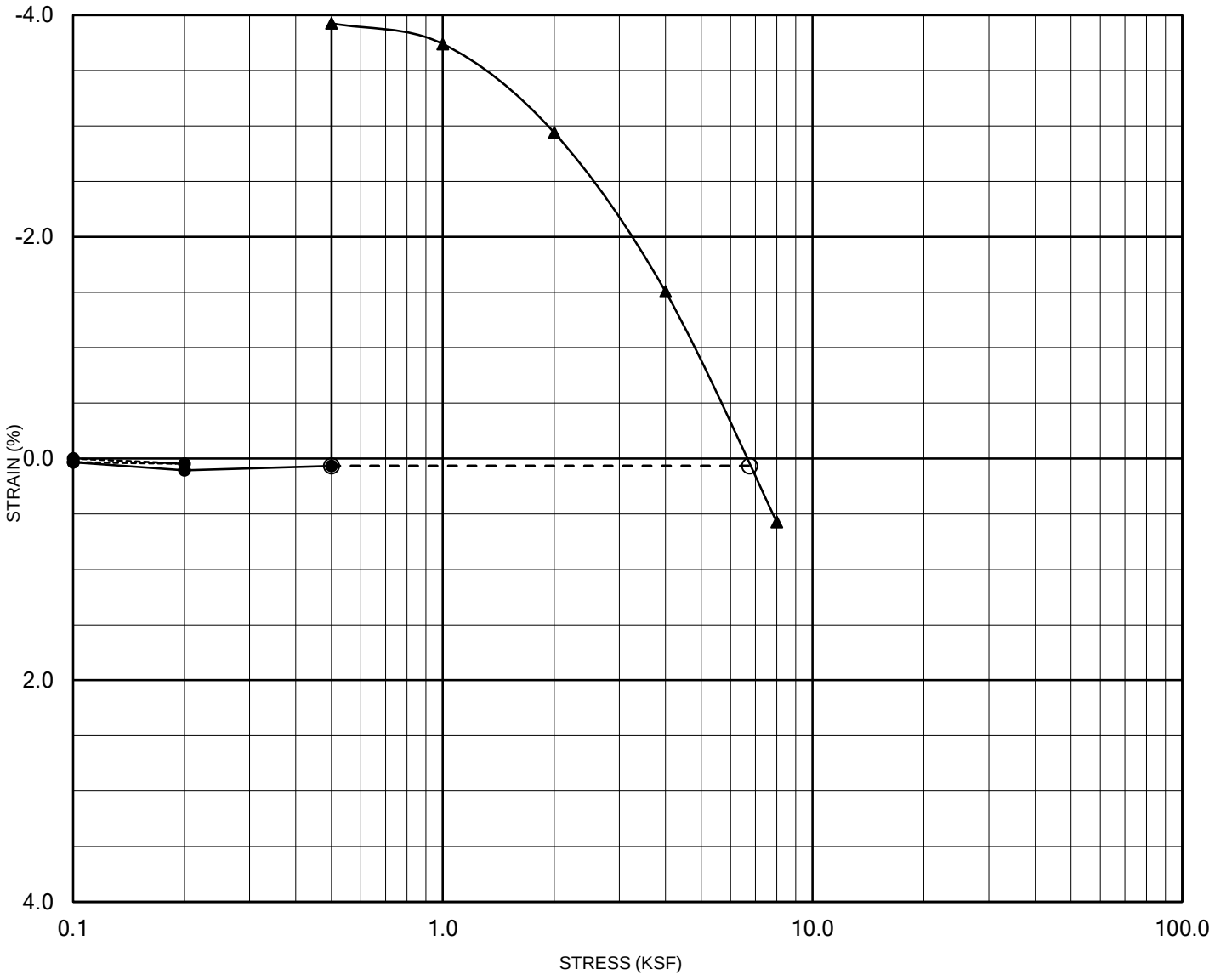


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 7.4 |
| Swell Percentage (%): | 4.0 |
| Swell Pressure (psf): | 6,250 |

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

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-31**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

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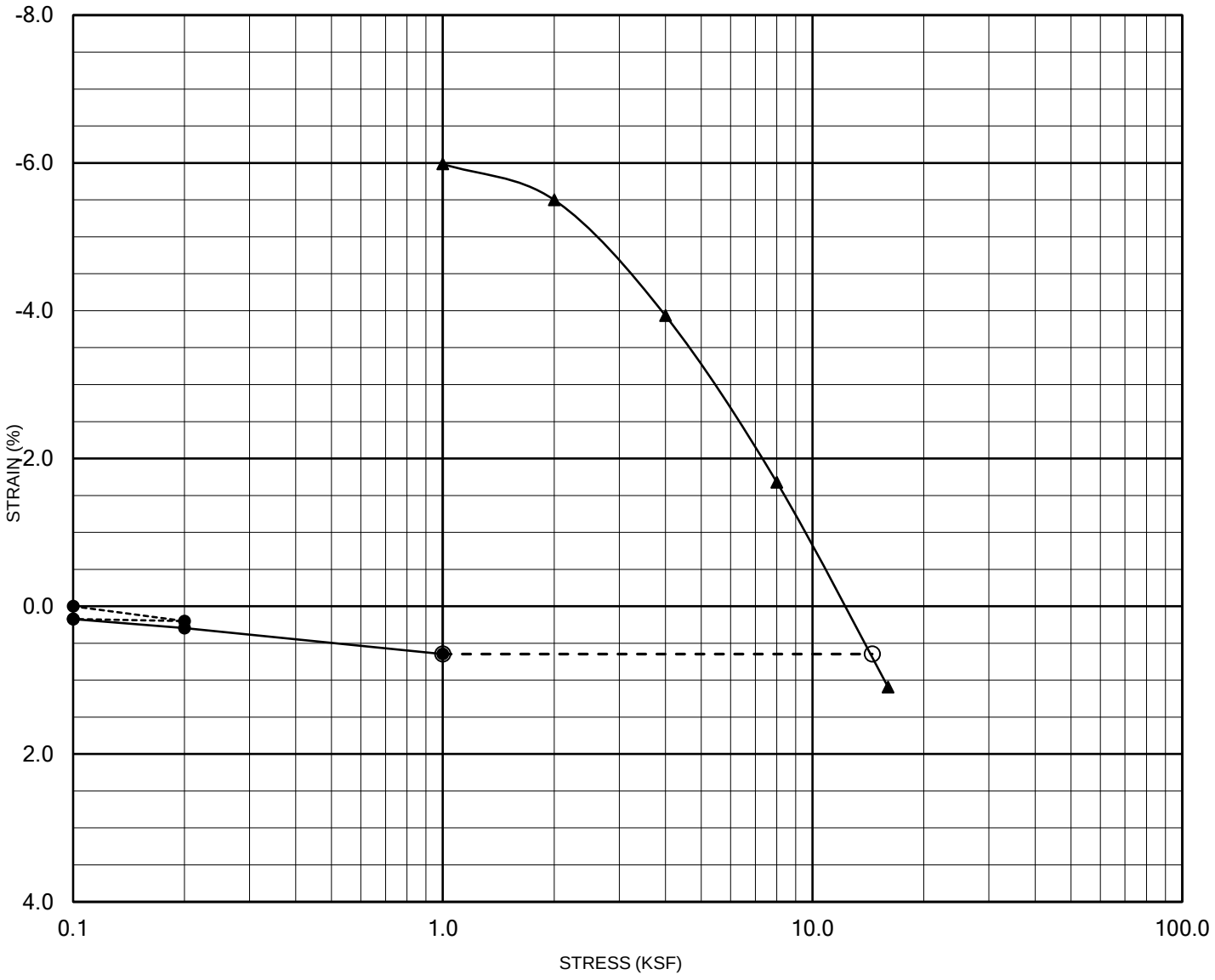


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 1.7 |
| Swell Percentage (%): | 6.6 |
| Swell Pressure (psf): | 13,500 |

Sample Location: B-23
Depth: 9.0-10.0
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-32**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



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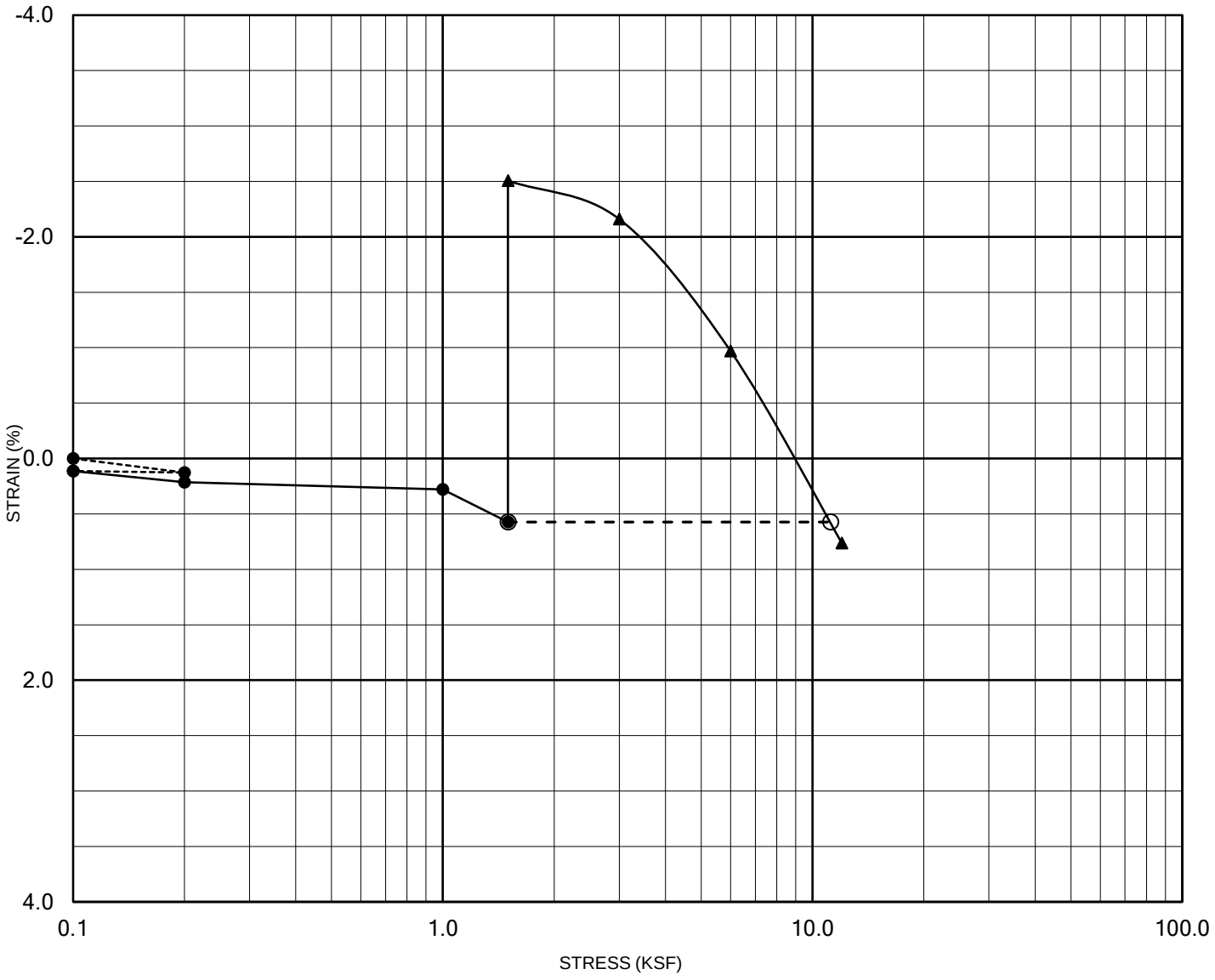


Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 1.8 |
| Swell Percentage (%): | 3.1 |
| Swell Pressure (psf): | 9,700 |

Sample Location: B-23
Depth: 14.0-14.6
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-33**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



Ninyo & Moore
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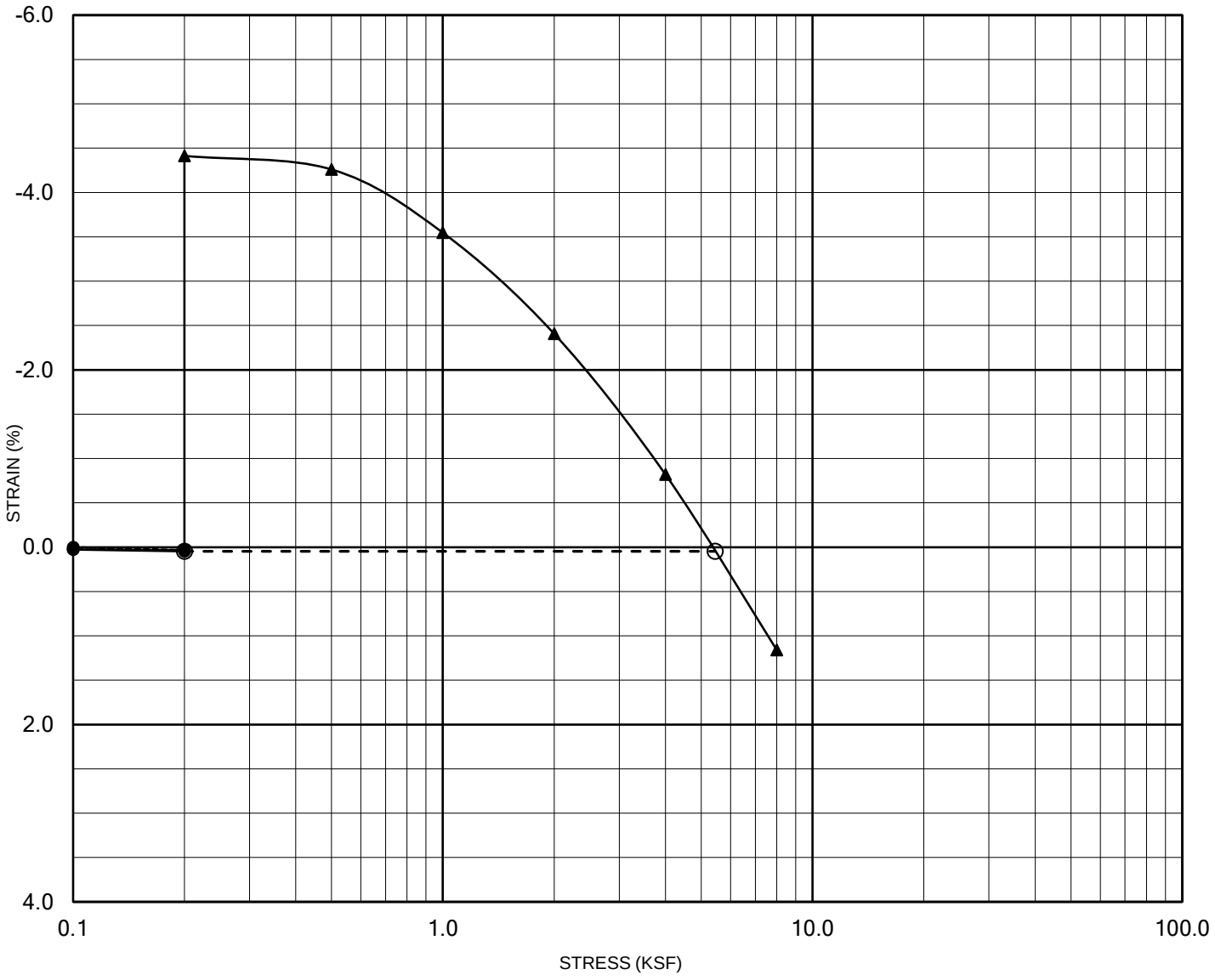



Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 7.3 |
| Swell Percentage (%): | 4.5 |
| Swell Pressure (psf): | 5,250 |

Sample Location: B-24
Depth: 1.0-2.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

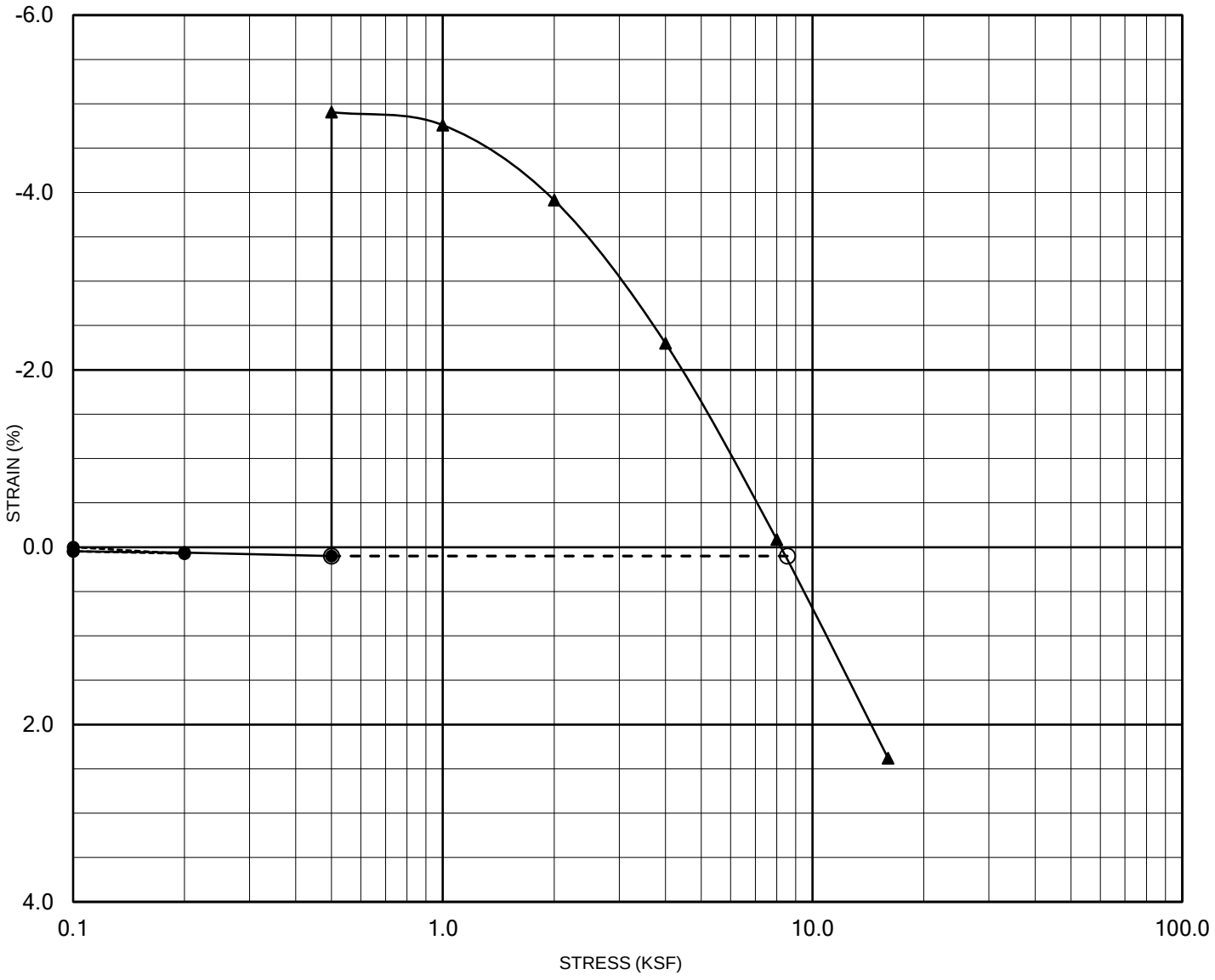
**FIGURE B-34**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 5.4 |
| Swell Percentage (%): | 5.0 |
| Swell Pressure (psf): | 8,050 |

Sample Location: B-24
Depth: 4.0-5.0
Soil Type: CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-35**

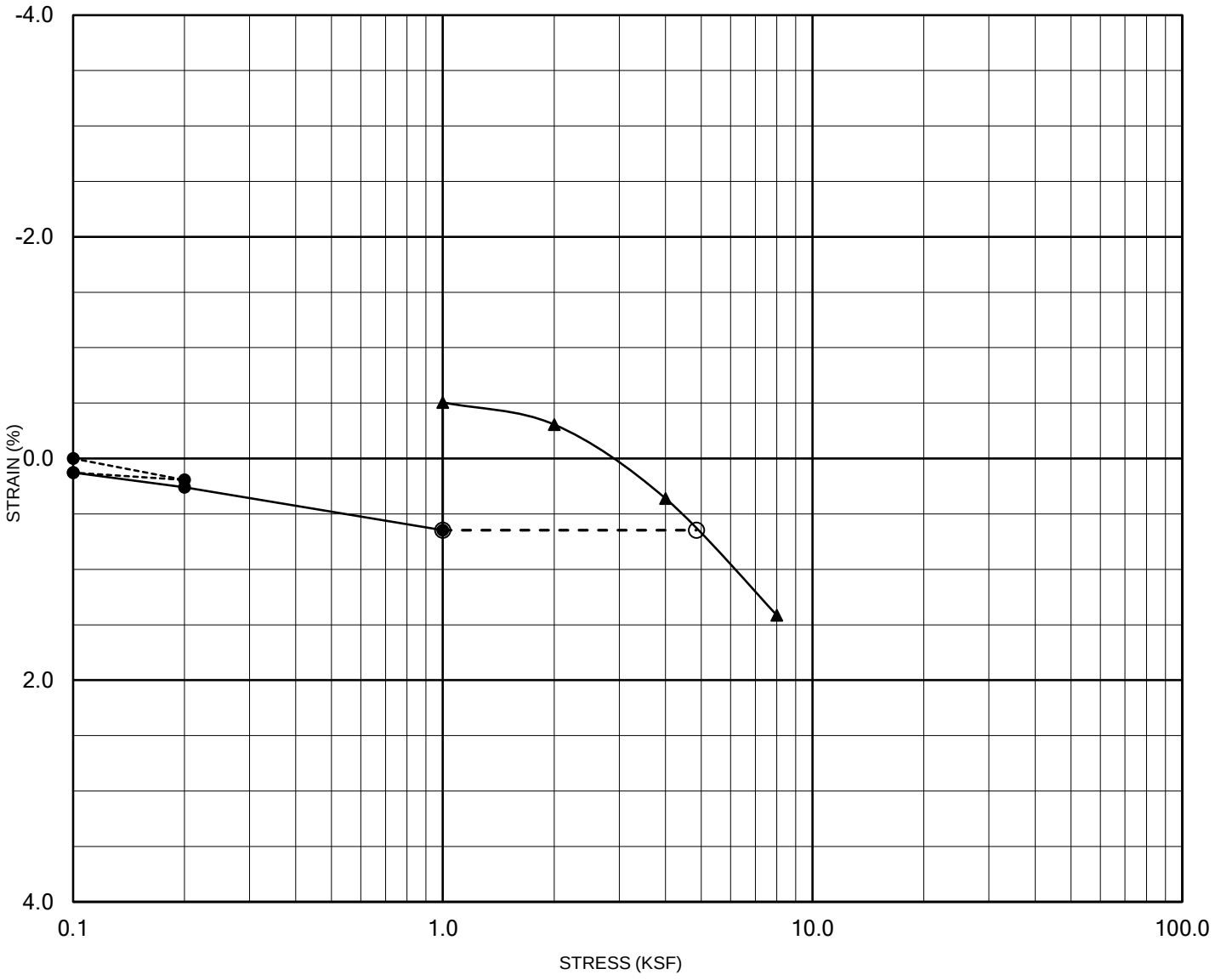
**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 1.7 |
| Swell Percentage (%): | 1.2 |
| Swell Pressure (psf): | 3,850 |

Sample Location: B-24
Depth: 9.0-10.0
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

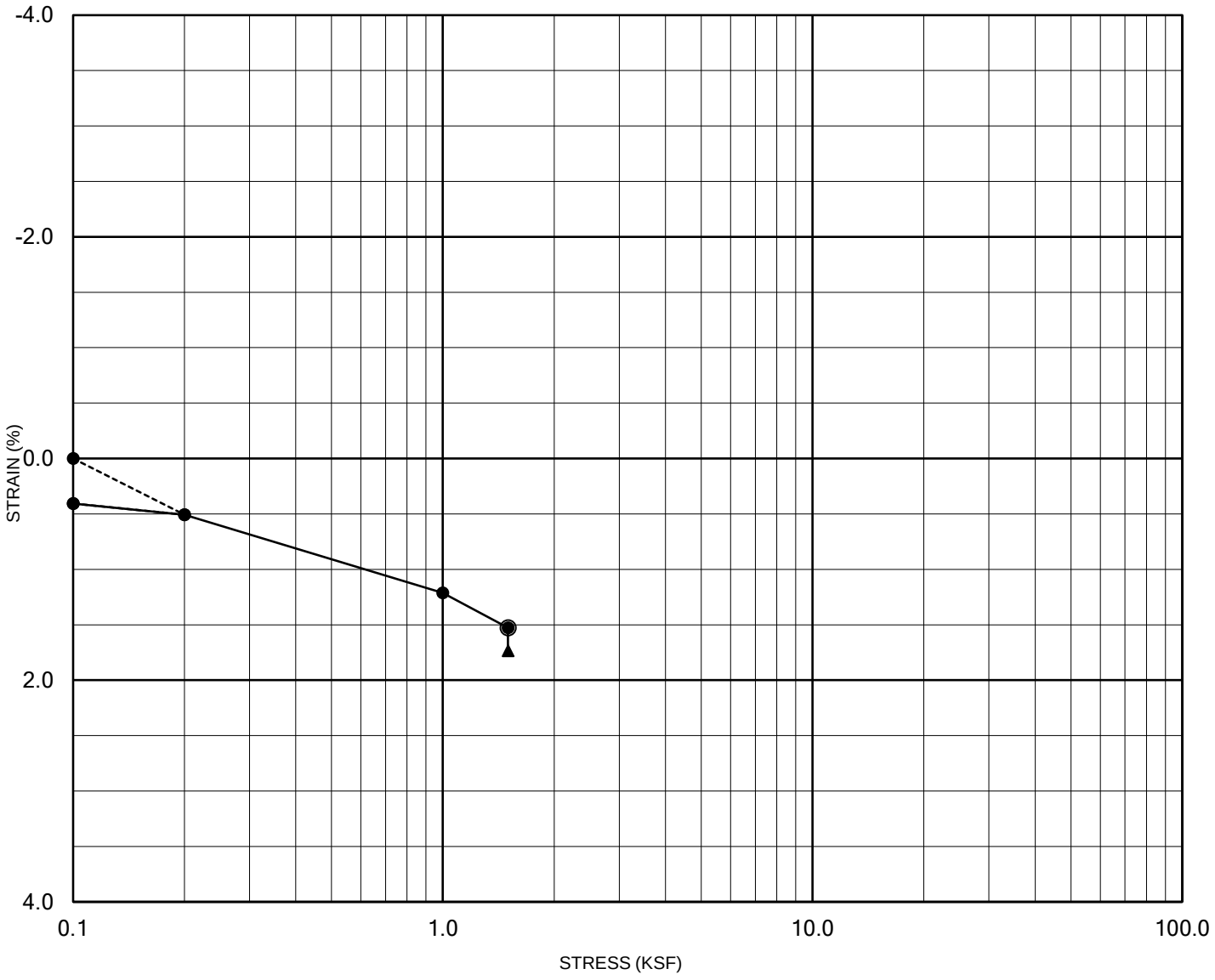
**FIGURE B-36**

**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




Seating Cycle
Load Prior to Inundation
Load After Inundation
Swell Pressure

| | |
|---|---|
| Moisture Increase (%): | 13.9 |
| Swell Percentage (%): | -0.2 |
| Swell Pressure (psf): | -- |

Sample Location: B-24
Depth: 14.0-14.5
Soil Type: CLAYSTONE; DENVER FORMATION

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4546

**FIGURE B-37**

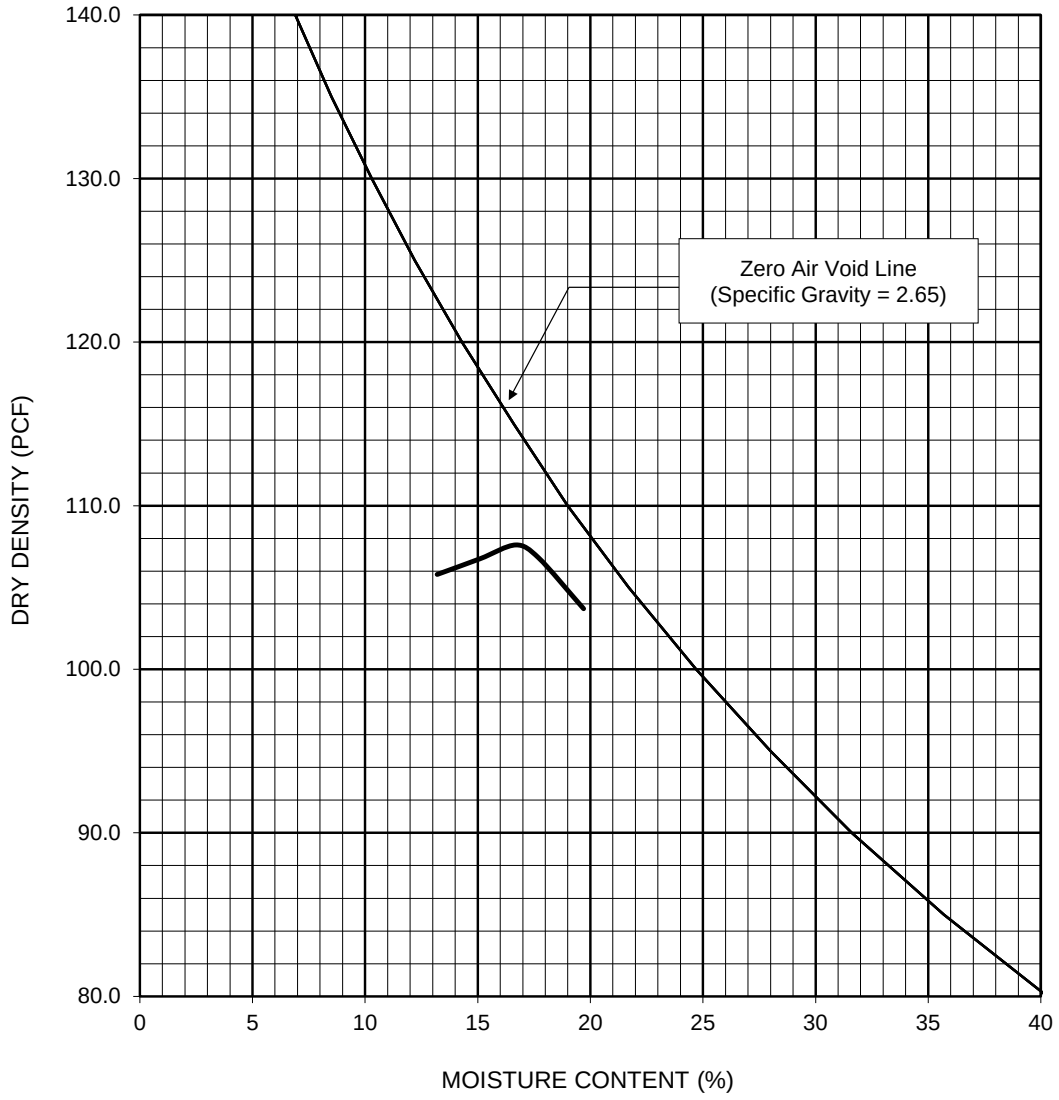
**CONSOLIDATION TEST RESULTS**

PRAIRIE PASS B.E.S.S.

ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-1 | 0.0-2.0 | Light Brown Sandy Lean CLAY | 107.6 | 16.7 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

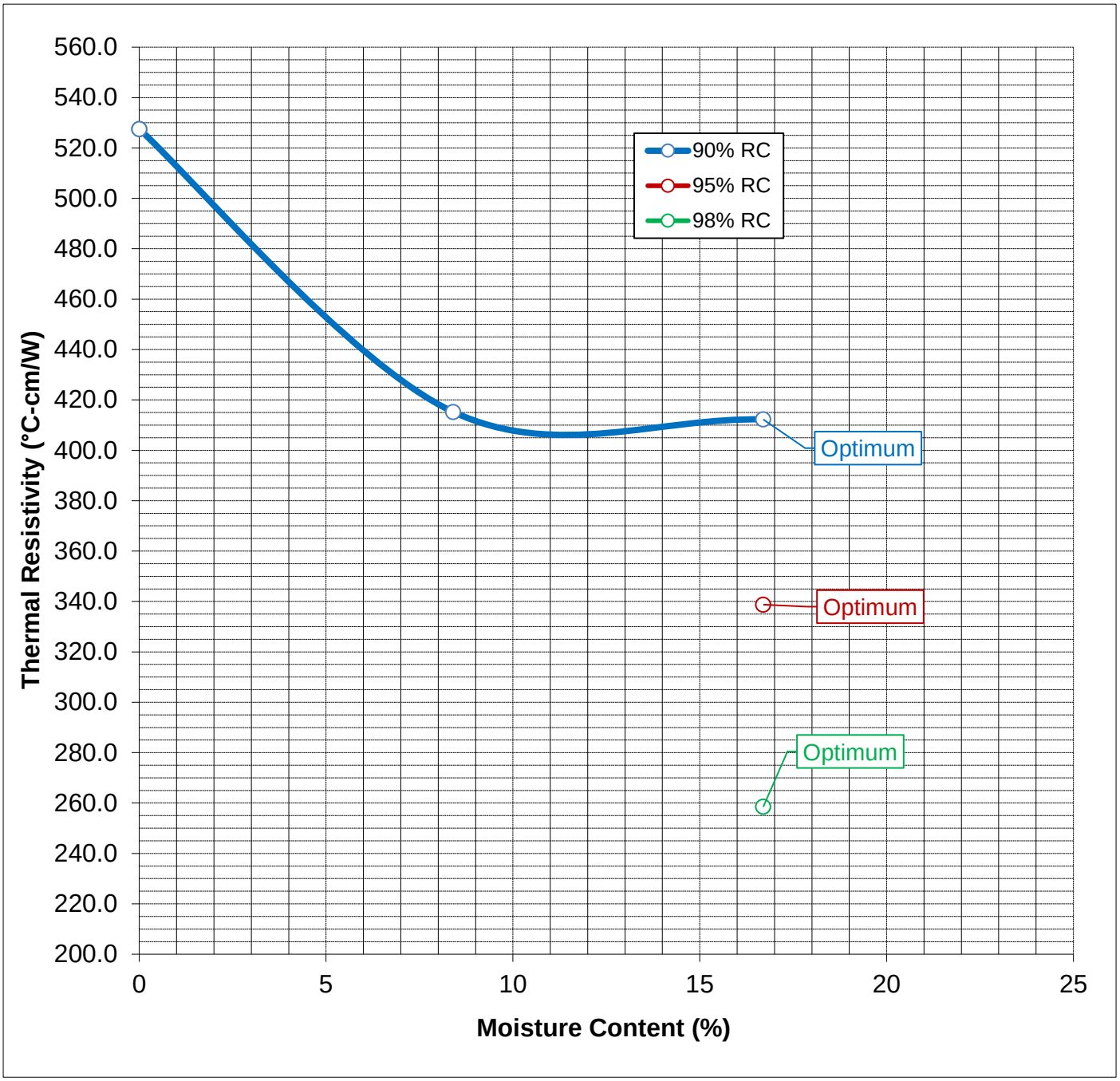
**FIGURE B-38**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-1 | 107.6 | 16.7 | 412 | 528 | 90% | 94.7 |
| | | | 339 | n/a | 95% | 99.9 |
| | | | 259 | n/a | 98% | 103.1 |

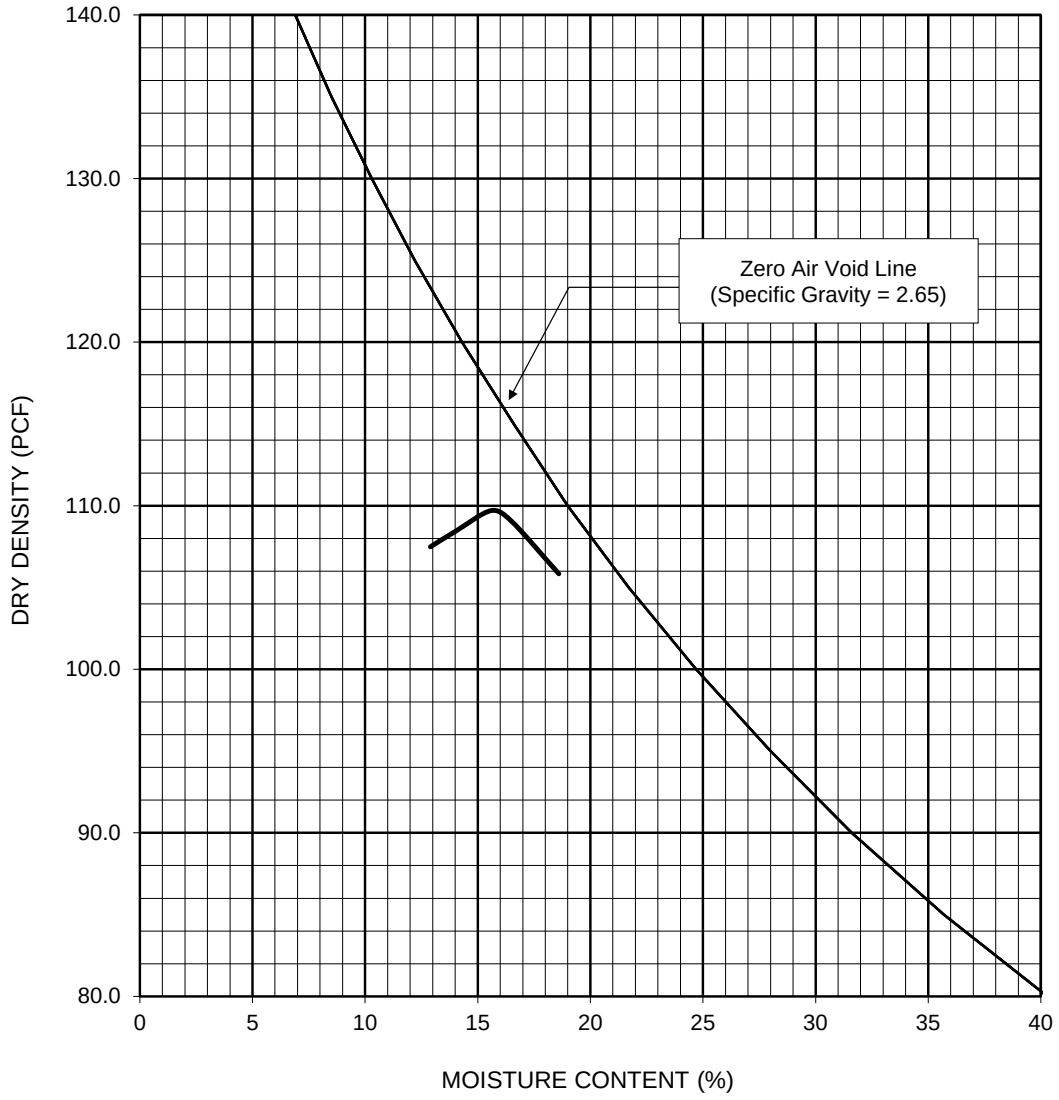
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-39**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-2 | 0.0-2.0 | Light Brown Lean CLAY with Sand | 109.7 | 15.6 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

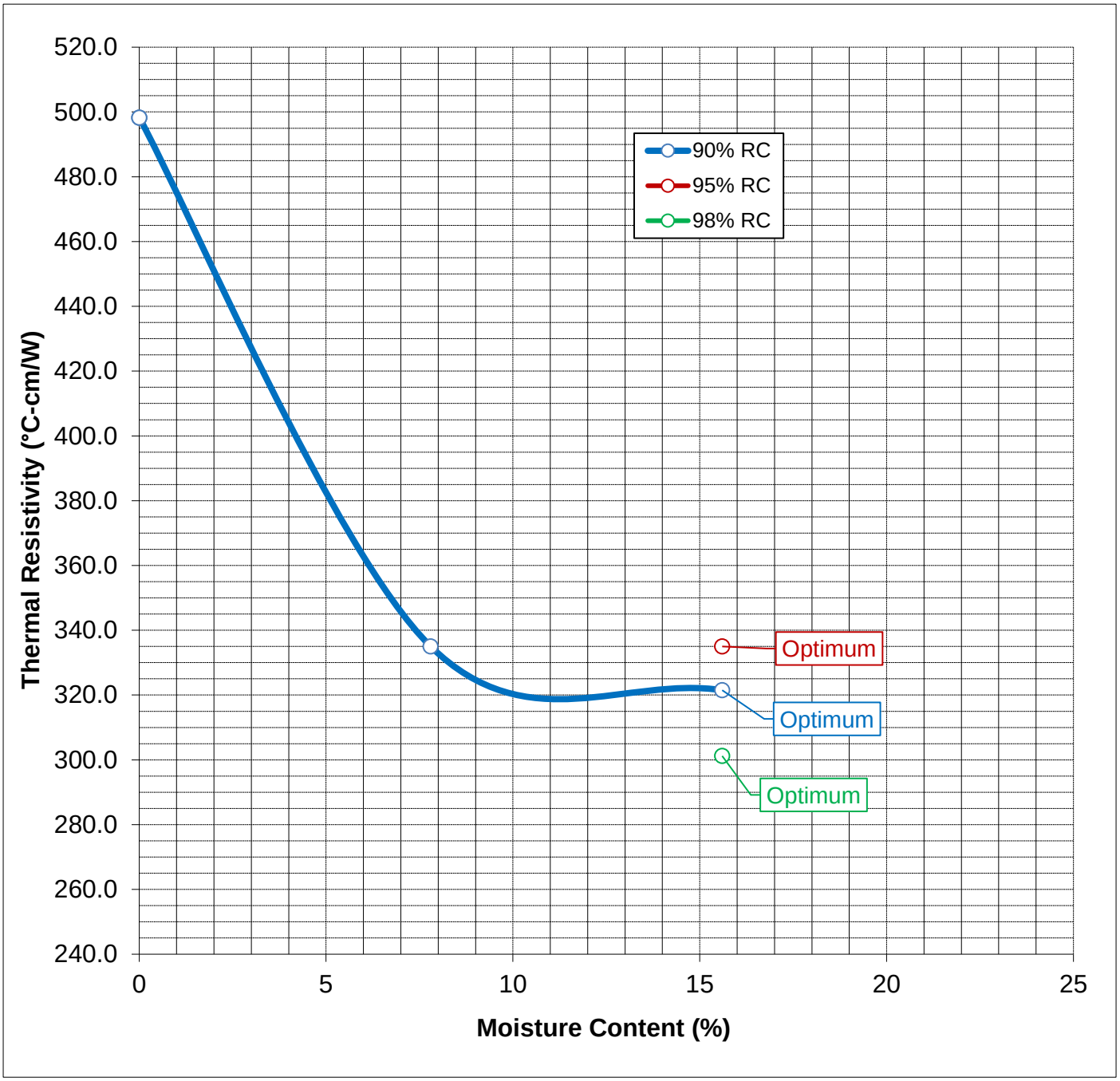
**FIGURE B-40**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-2 | 109.7 | 15.6 | 322 | 498 | 90% | 94.7 |
| | | | 335 | n/a | 95% | 99.9 |
| | | | 301 | n/a | 98% | 103.1 |

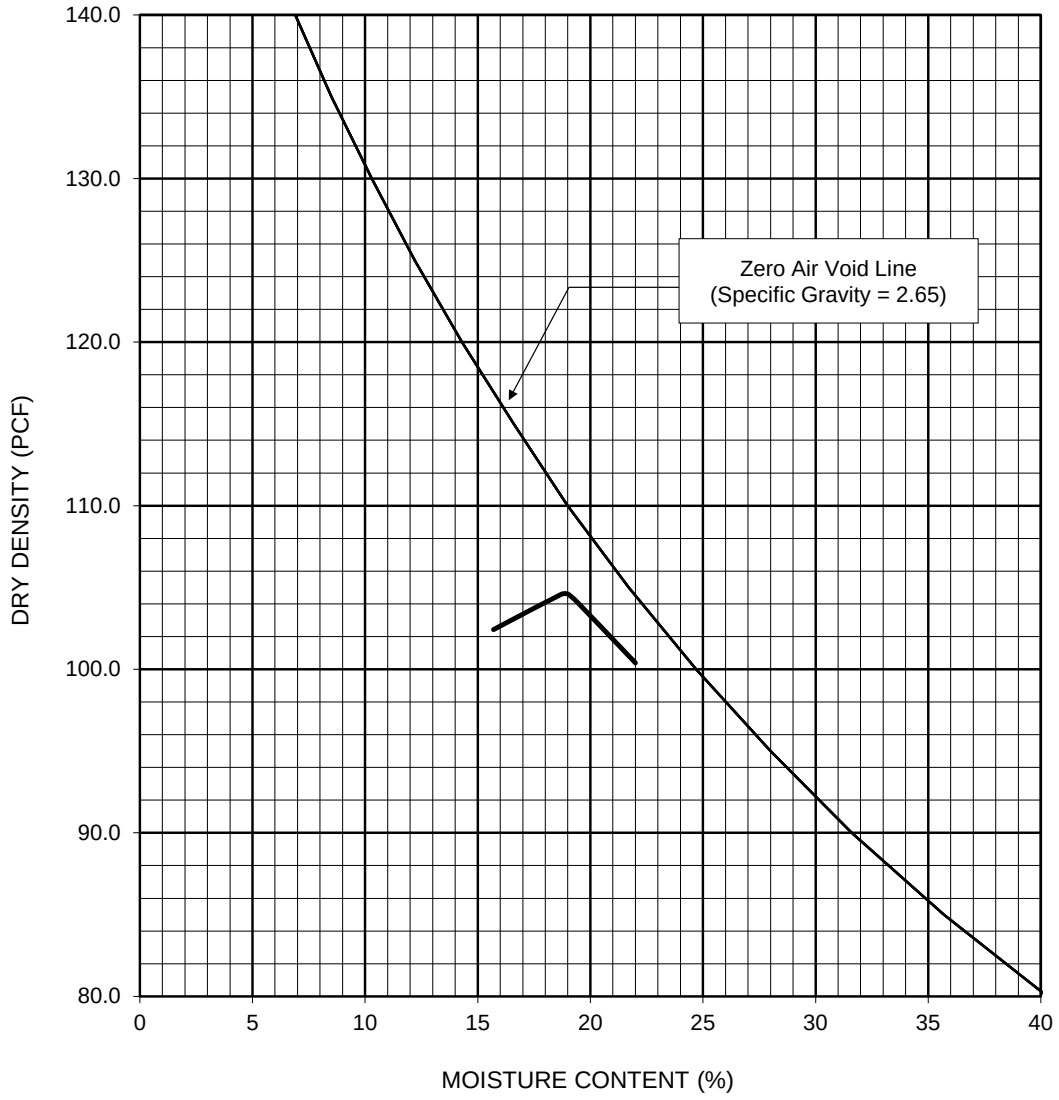
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-41**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-3 | 0.0 - 2.0 | Light Brown Lean CLAY with Sand | 104.6 | 19.0 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

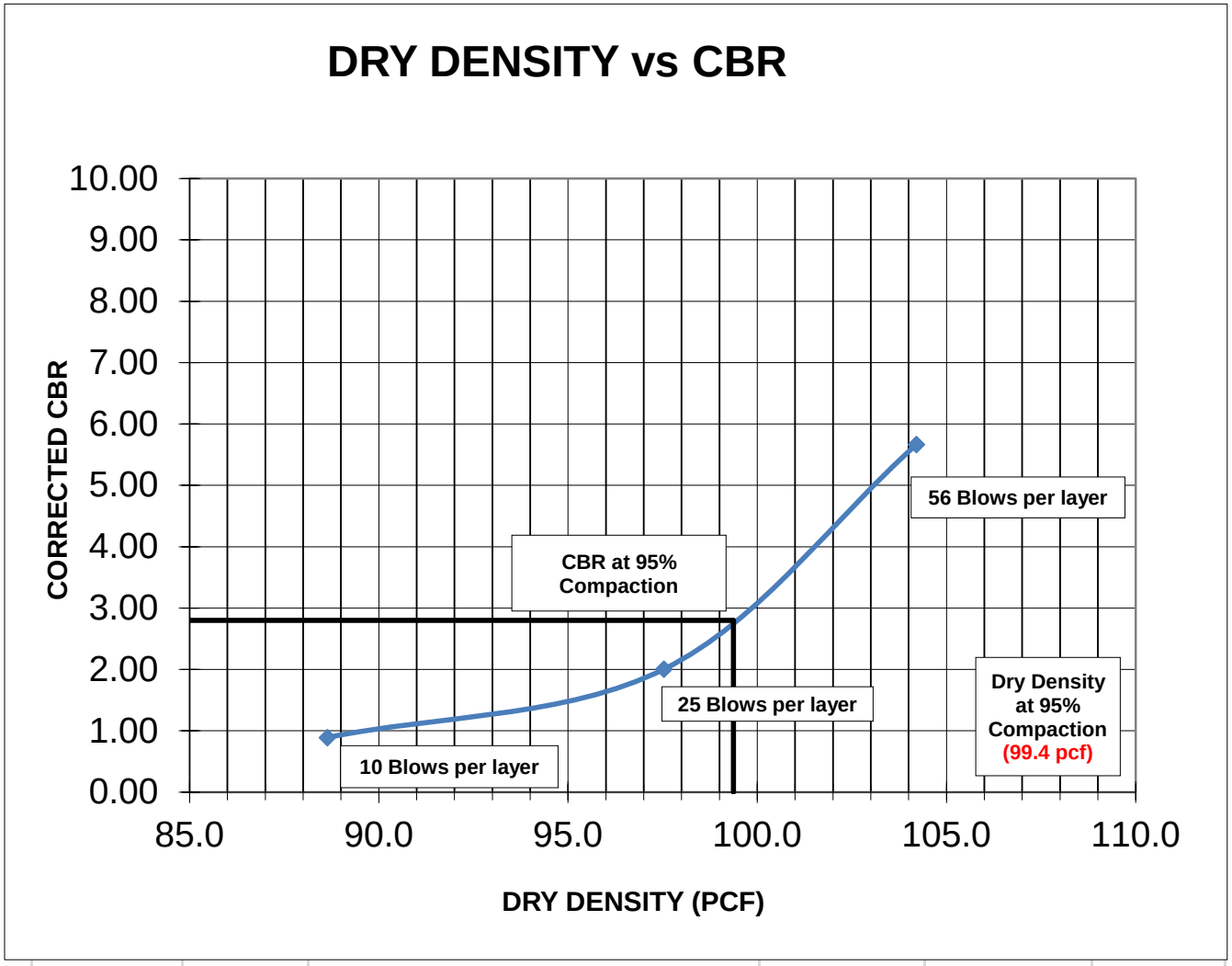
**FIGURE B-42**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Description | Symbol | Sample Location | Depth (ft.) | Soil Type | Design CBR |
|---|---|---|---|---|---|
| Light Brown Lean CLAY with Sand | | R-3 | 0.0-2.0 | CL | 2.8 |

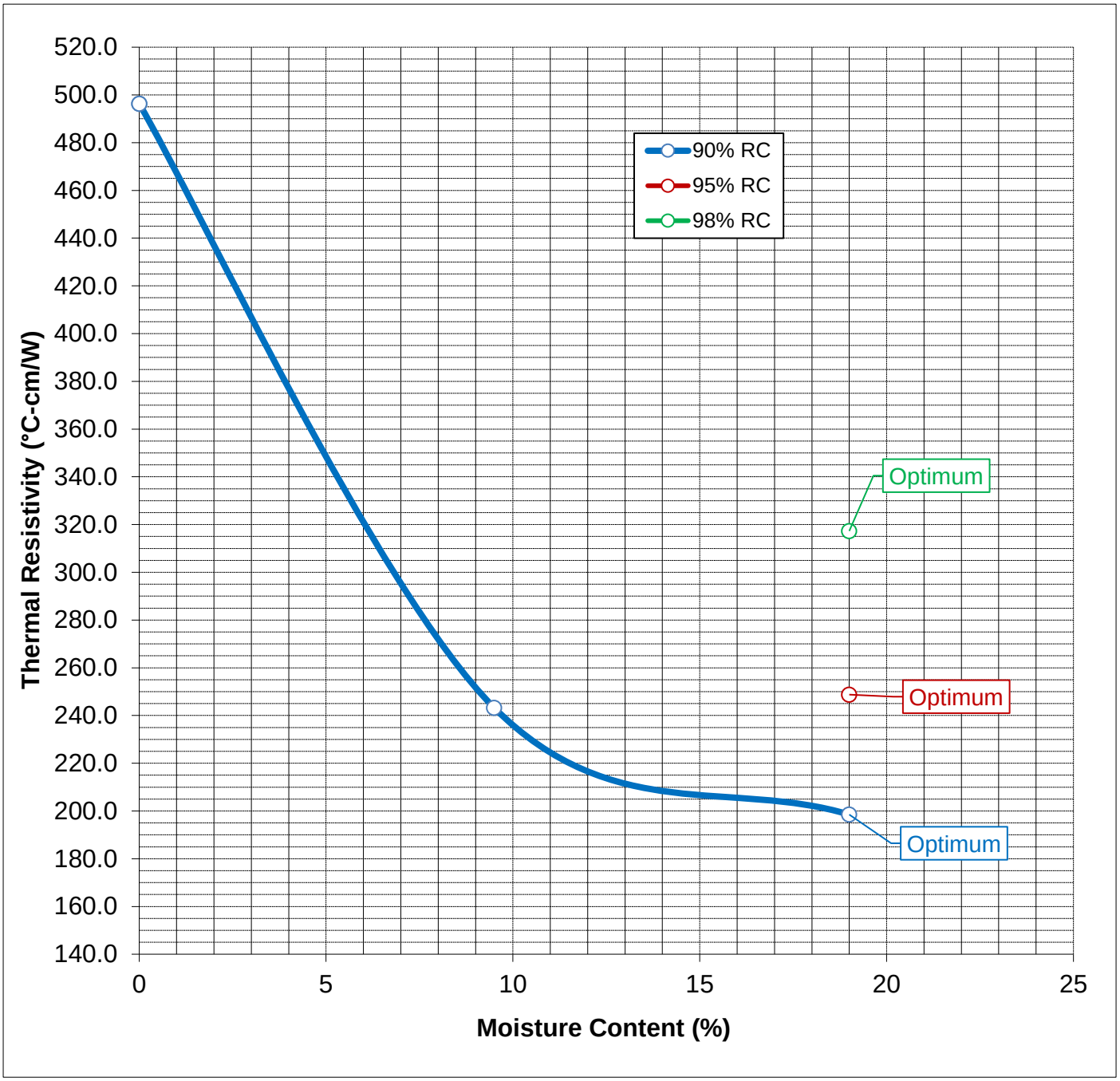
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1883

**FIGURE B-43**

**CBR TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 | 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-3 | 104.6 | 19.0 | 199 | 496 | 90% | 94.7 |
| | | | 249 | n/a | 95% | 99.9 |
| | | | 317 | n/a | 98% | 103.1 |

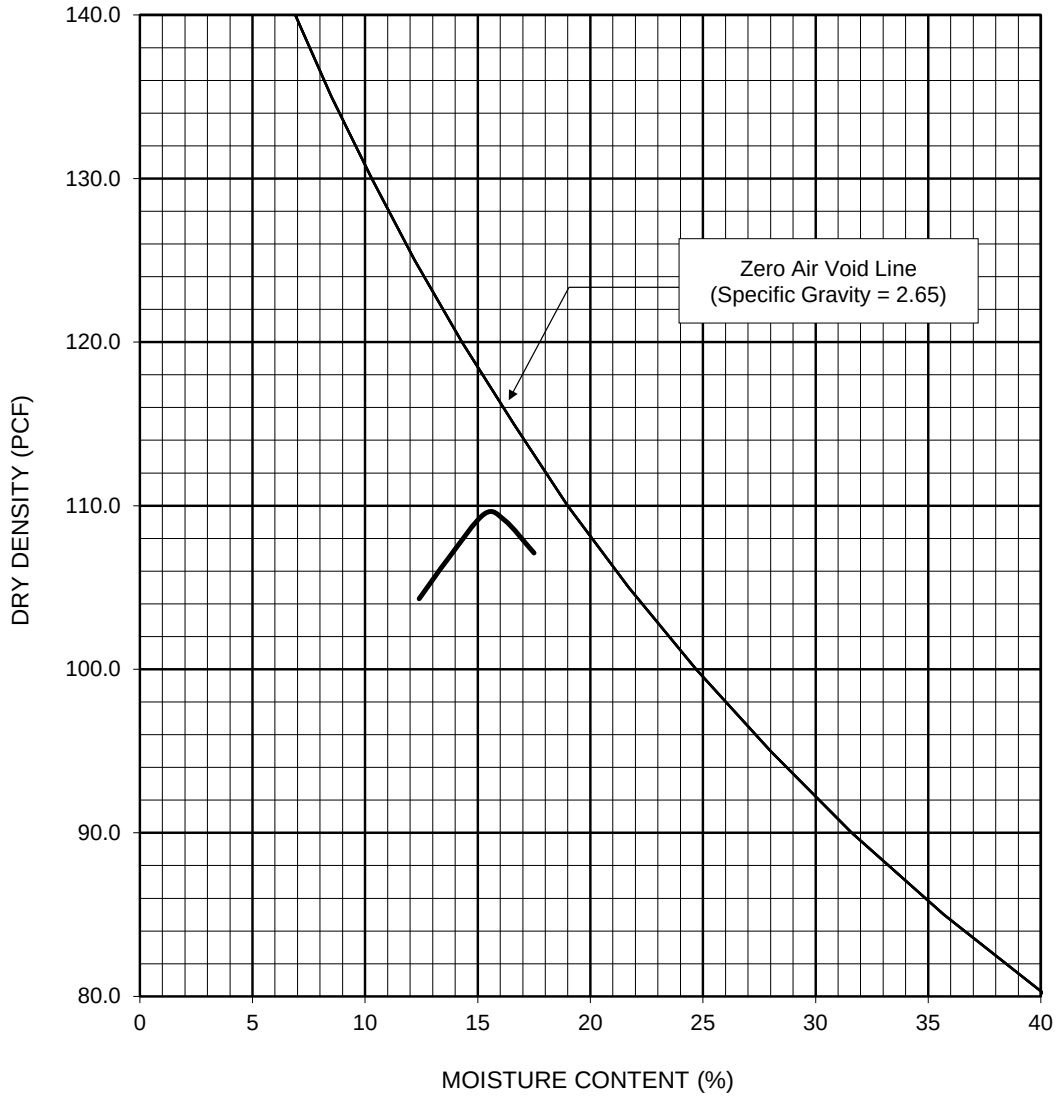
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-44**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-4 | 0.0-2.0 | Light Brown Sandy Lean CLAY; Trace Gravel | 109.5 | 15.3 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

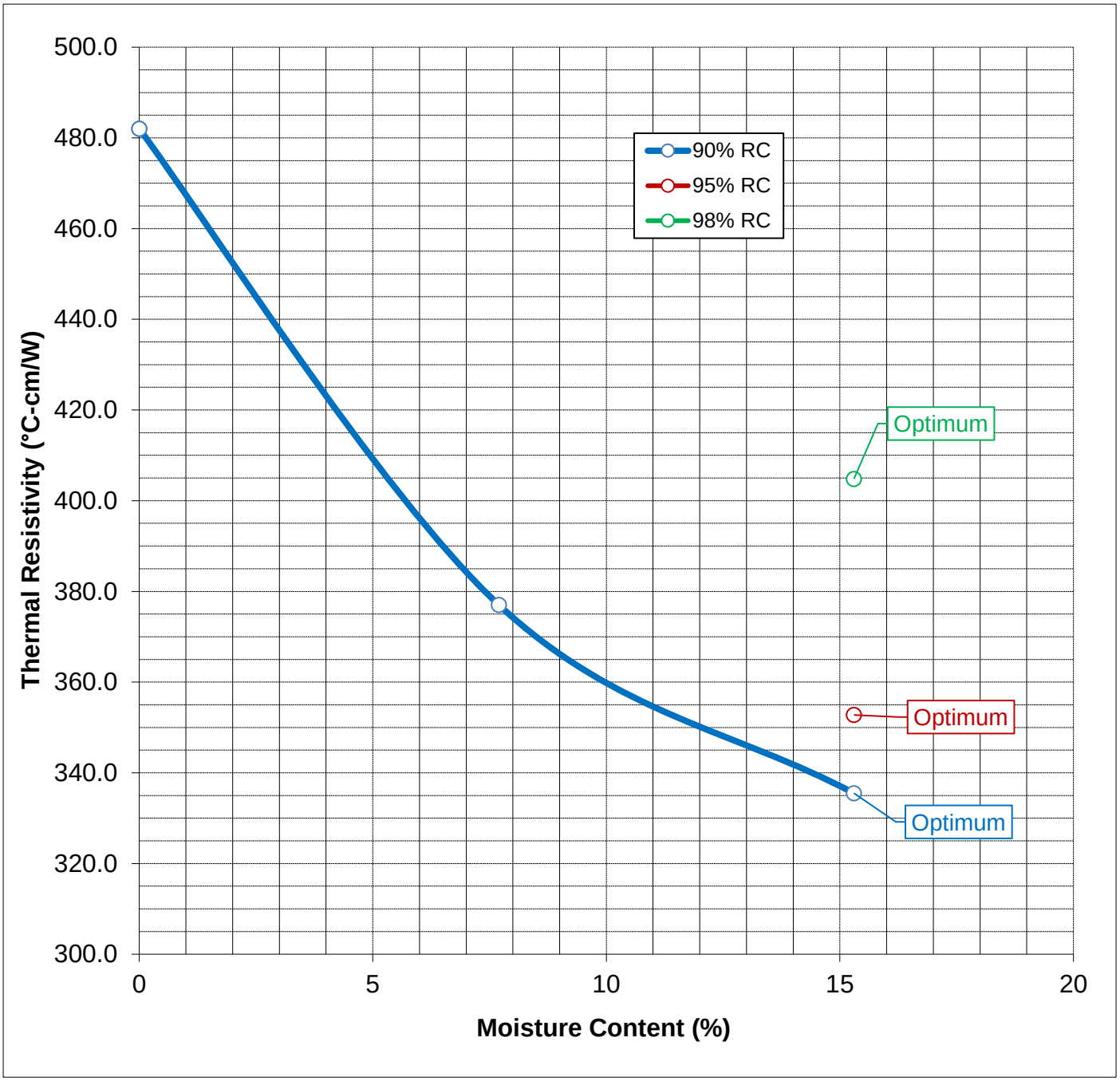
**FIGURE B-45**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-4 | 109.5 | 15.3 | 336 | 482 | 90% | 94.7 |
| | | | 353 | n/a | 95% | 99.9 |
| | | | 405 | n/a | 98% | 103.1 |

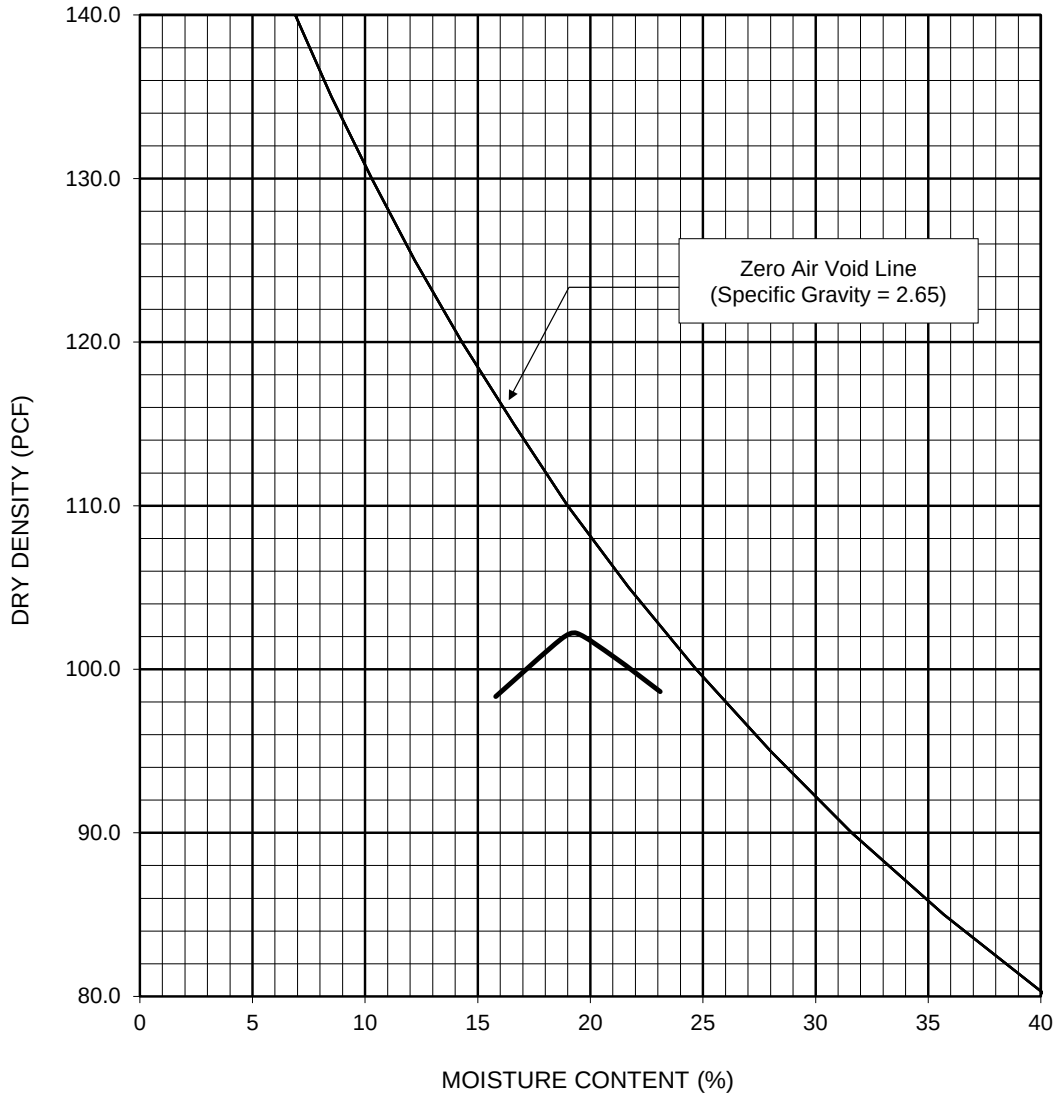
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-46**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-5 | 0.0 - 2.0 | Light Brown Lean CLAY; Trace Sand | 102.2 | 19.4 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

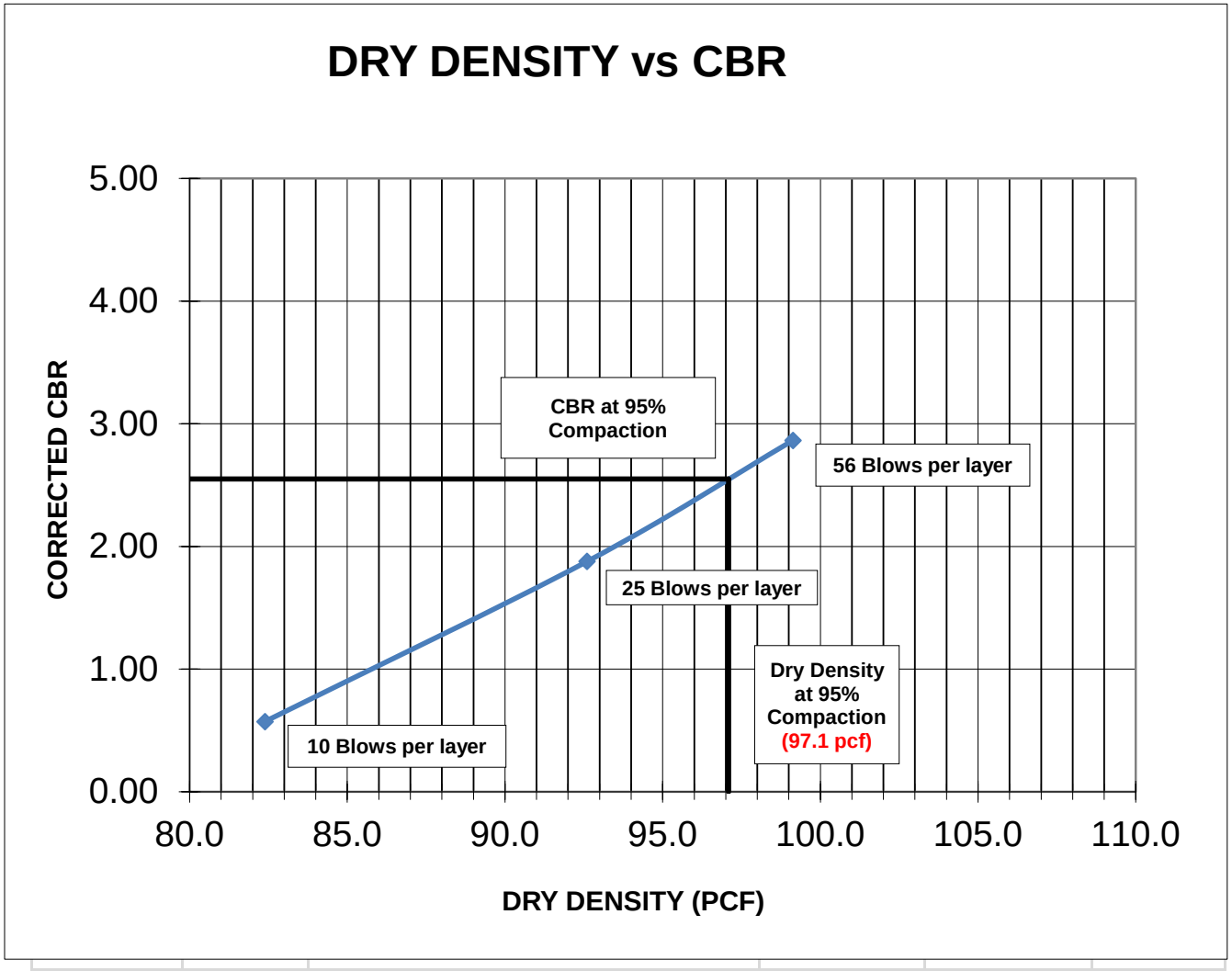
**FIGURE B-47**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Description | Symbol | Sample Location | Depth (ft.) | Soil Type | Design CBR |
|---|---|---|---|---|---|
| Light Brown Lean CLAY; Trace Sand | | R-5 | 0.0-2.0 | CL | 2.6 |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 1883

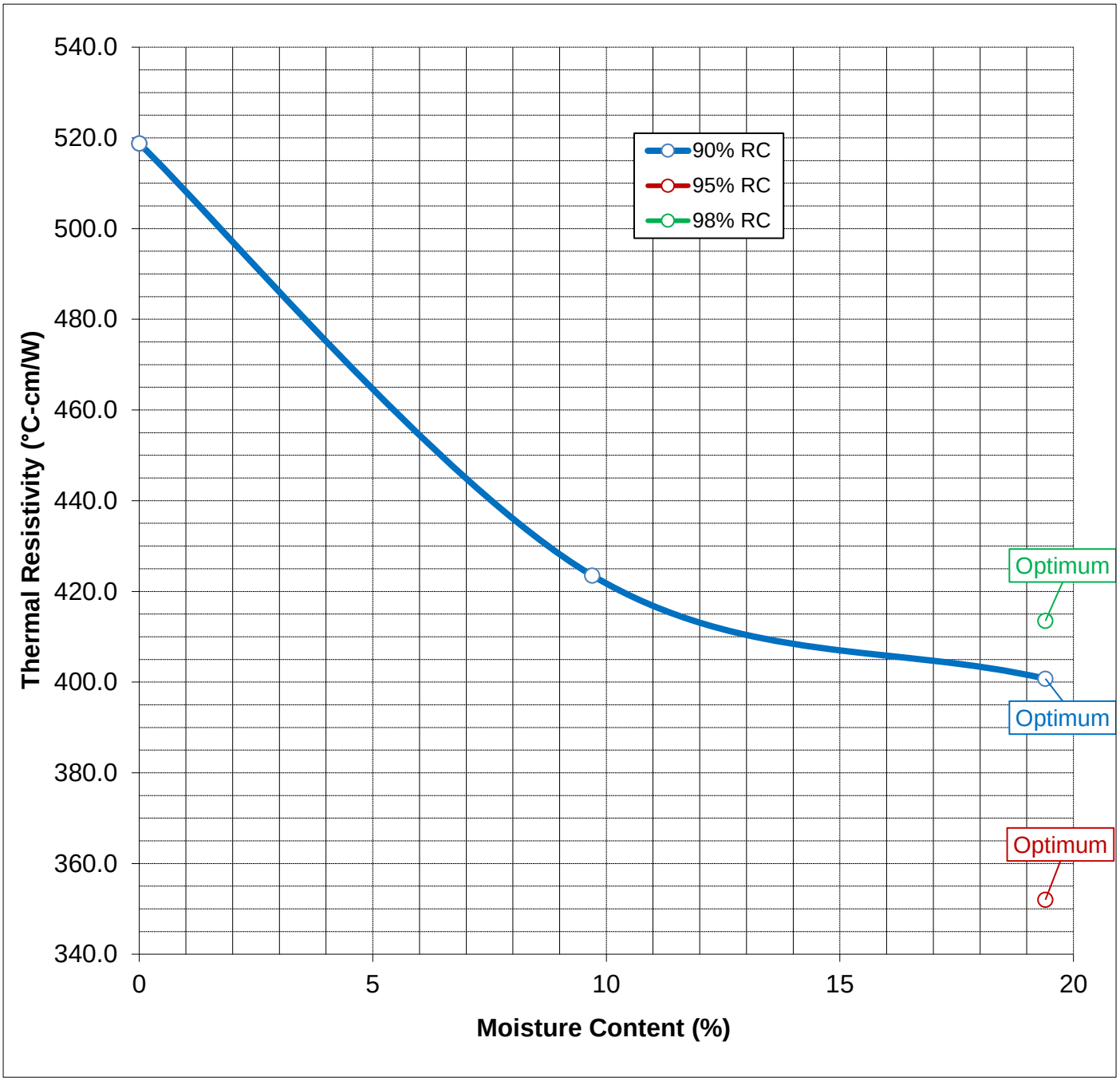
**FIGURE B-48**

**CBR TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-5 | 102.2 | 19.4 | 401 | 519 | 90% | 94.7 |
| | | | 352 | n/a | 95% | 99.9 |
| | | | 414 | n/a | 98% | 103.1 |

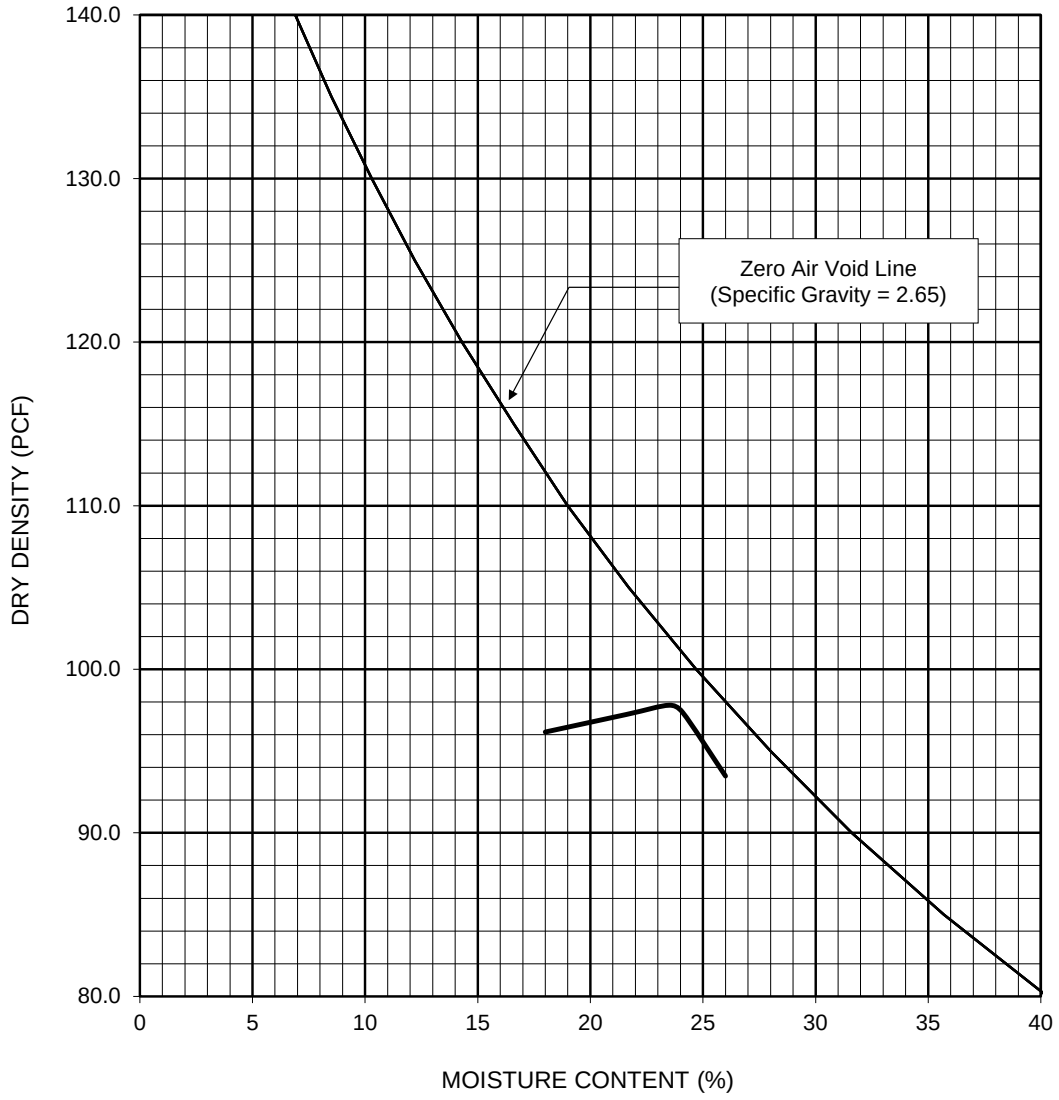
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-49**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-6 | 0.0-2.0 | Light Brown Lean CLAY; Trace Sand | 97.8 | 23.5 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

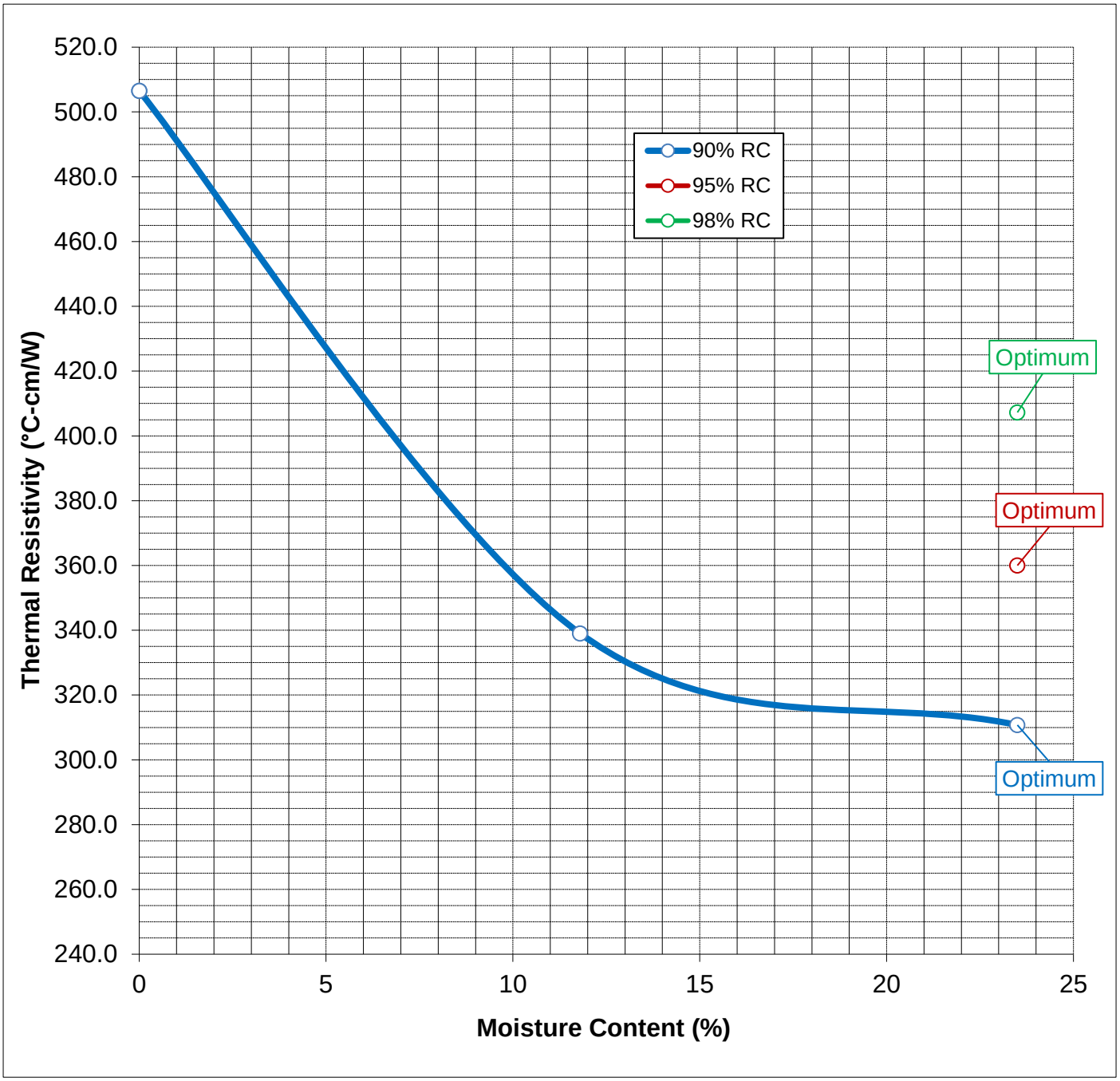
**FIGURE B-50**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-6 | 97.8 | 23.5 | 311 | 507 | 90% | 94.7 |
| | | | 360 | n/a | 95% | 99.9 |
| | | | 407 | n/a | 98% | 103.1 |

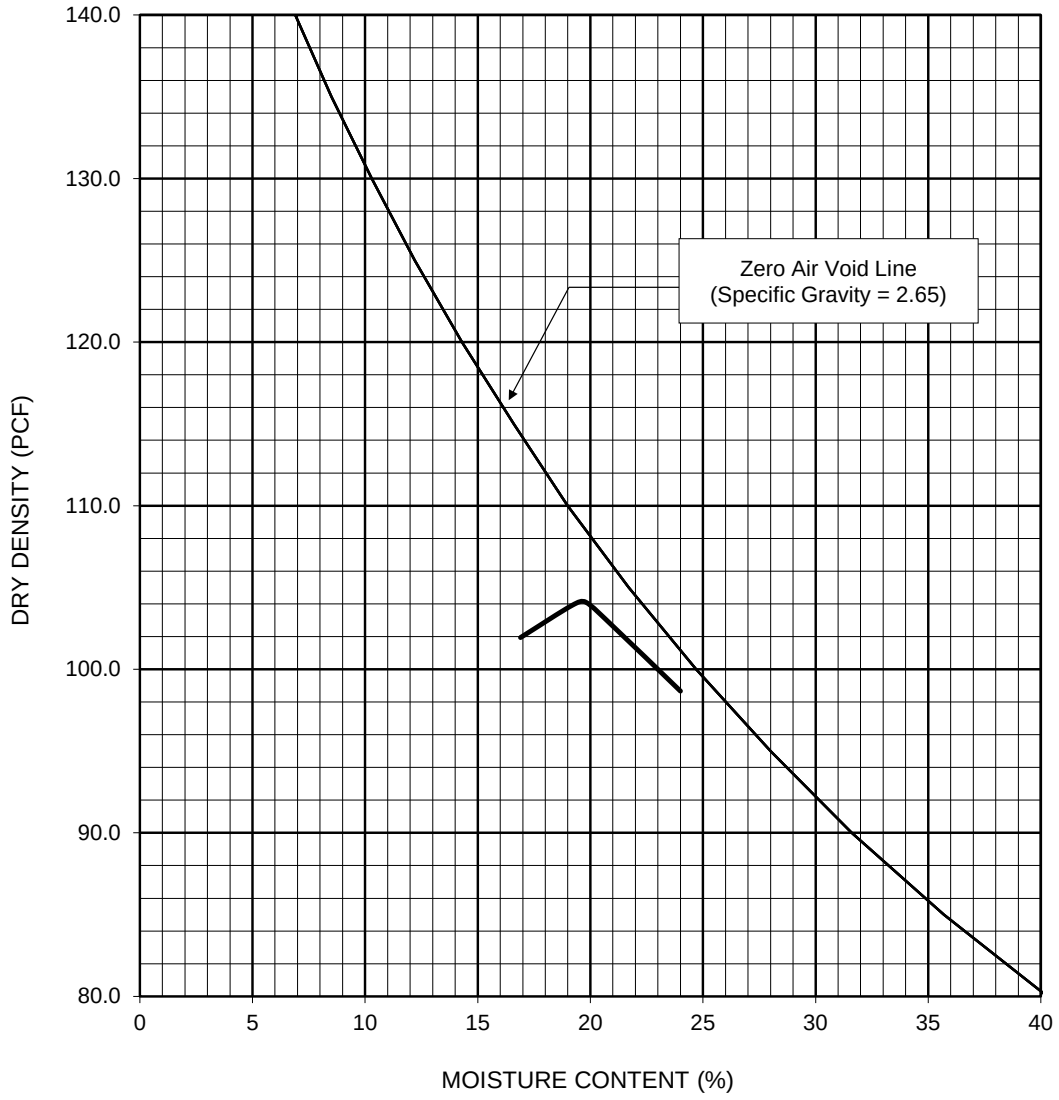
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-51**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-7 | 0.0-2.0 | Light Brown Lean CLAY with Sand | 104.1 | 19.8 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

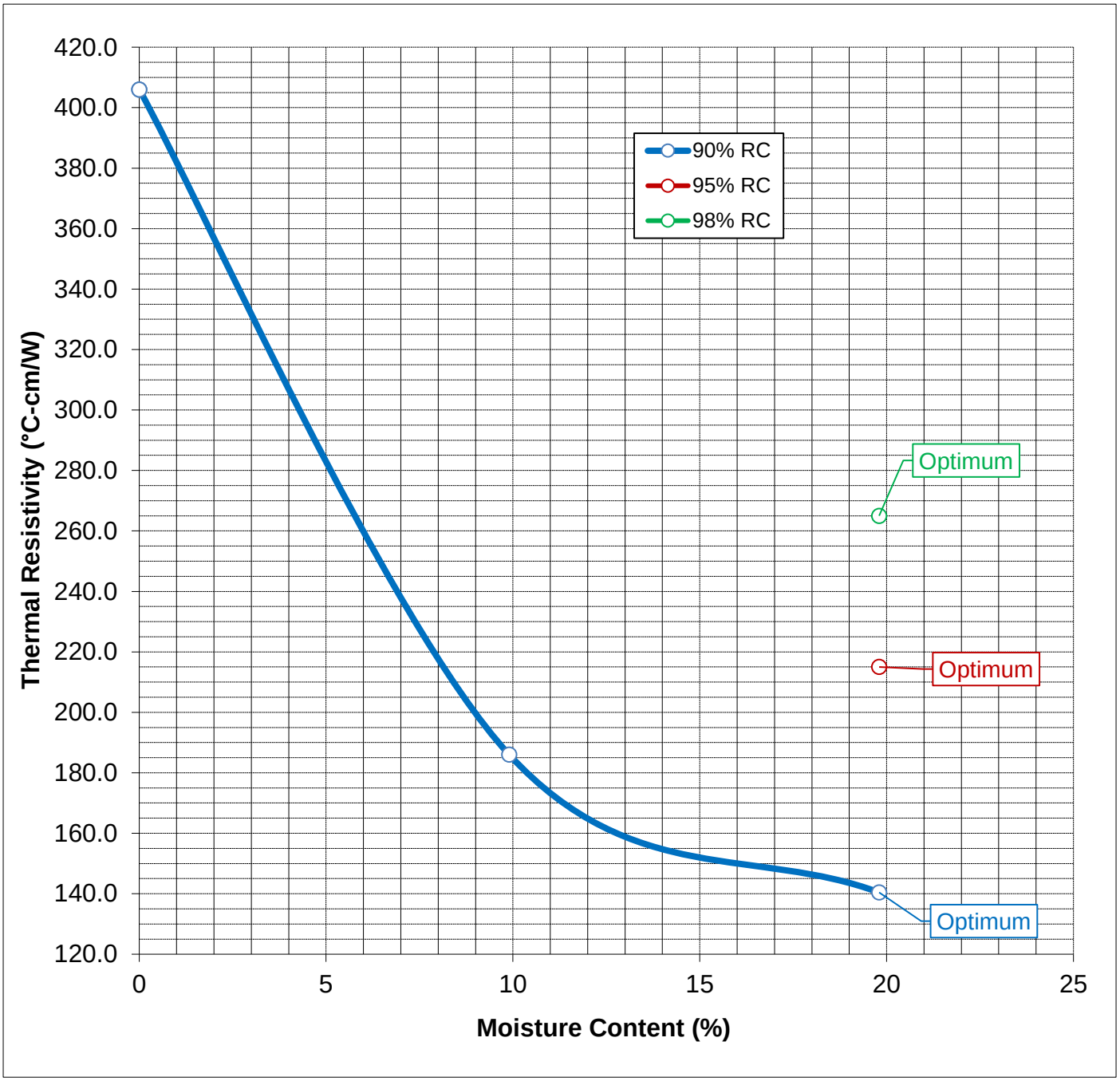
**FIGURE B-52**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-7 | 104.1 | 19.8 | 140 | 406 | 90% | 94.7 |
| | | | 215 | n/a | 95% | 99.9 |
| | | | 265 | n/a | 98% | 103.1 |

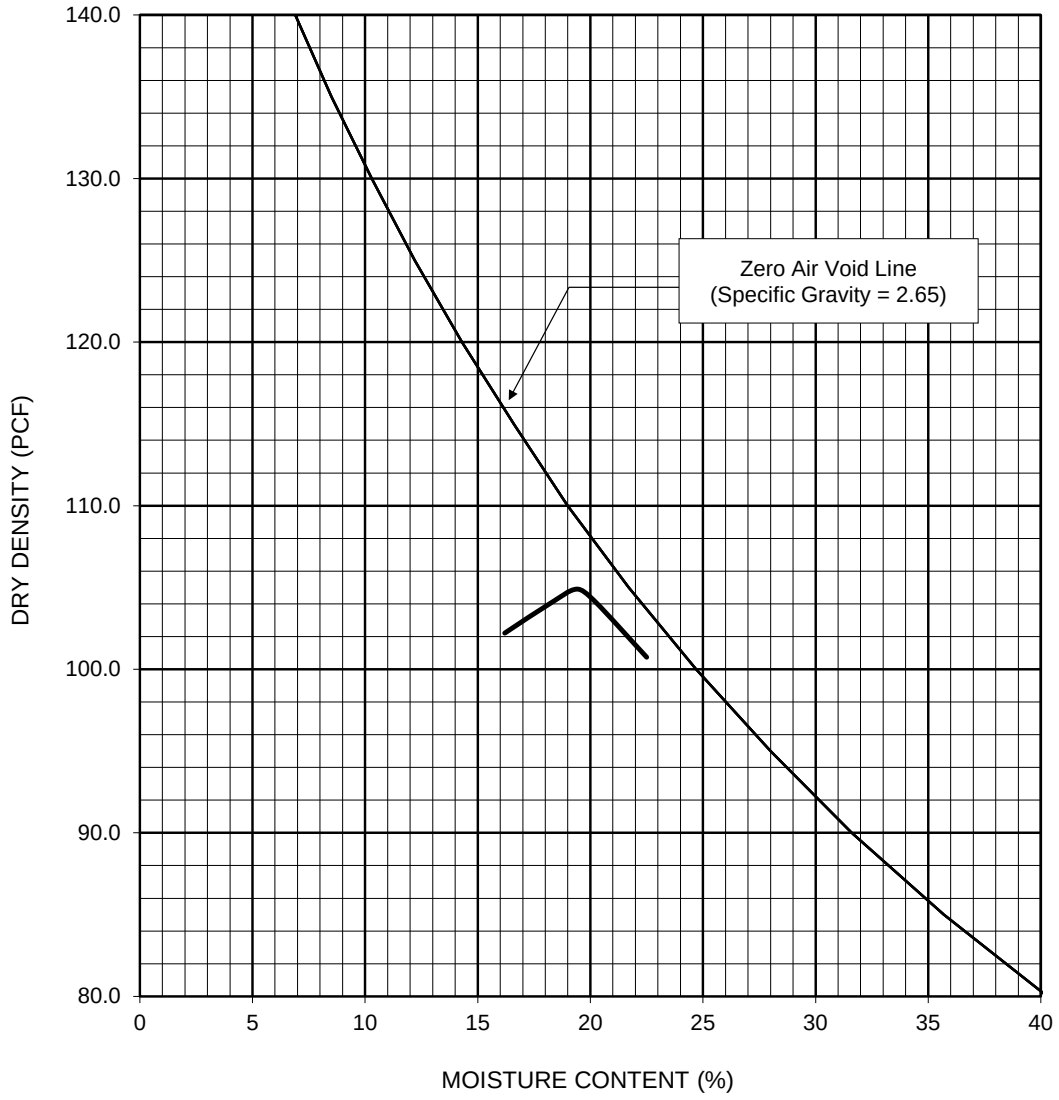
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-53**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Sample Location | Depth (ft) | Soil Description | Maximum Dry Density (pcf) | Optimum Moisture Content (percent) |
|---|---|---|---|---|
| R-8 | 0.0-2.0 | Light Brown Lean CLAY with Sand | 104.9 | 19.4 |
| Dry Density and Moisture Content Values Corrected for Oversize (ASTM D 4718) | | | N/A | N/A |

PERFORMED IN GENERAL ACCORDANCE WITH ☐ ASTM D 1557 ☑ ASTM D 698 METHOD ☑ A ☐ B ☐ C

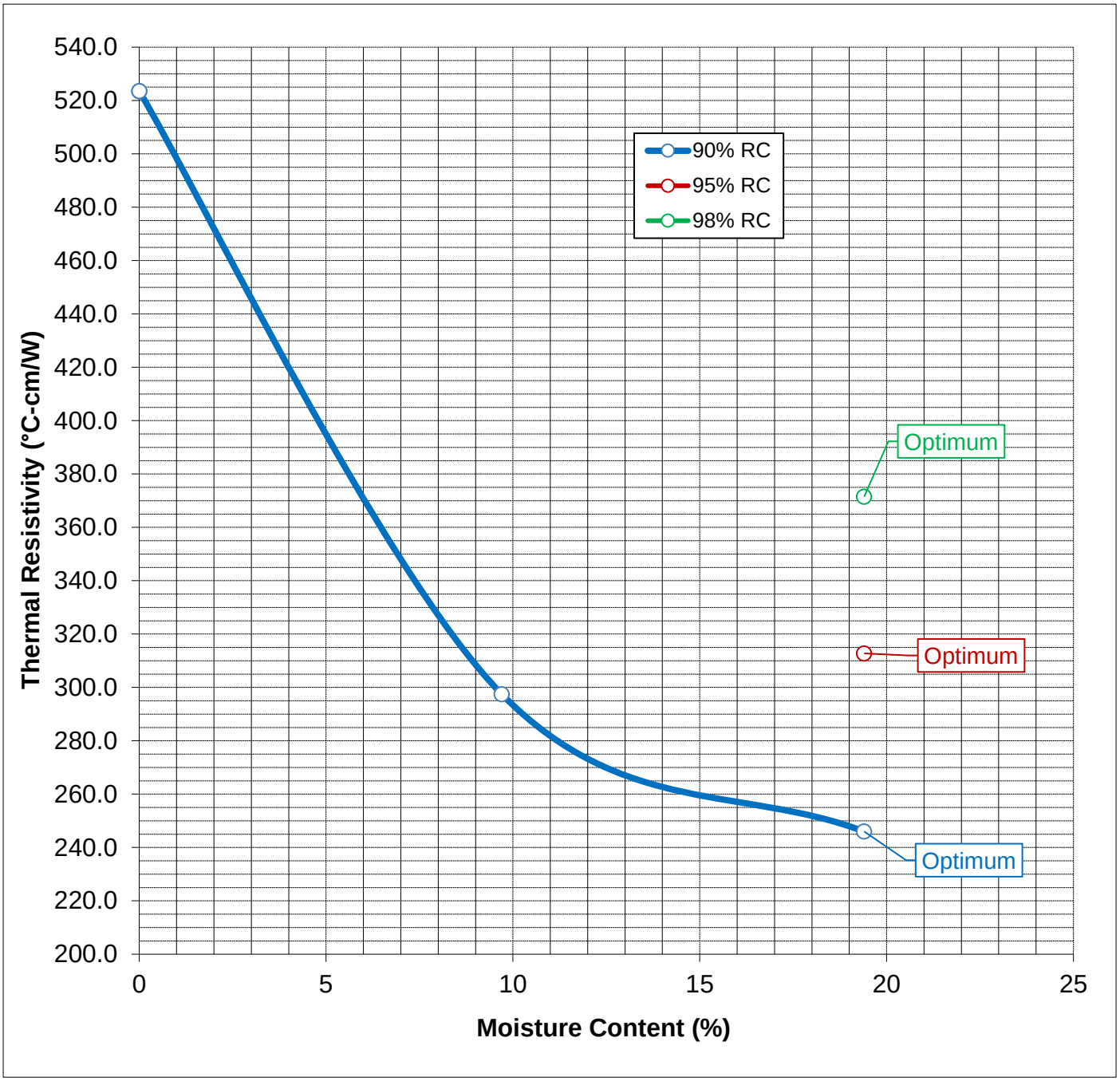
**FIGURE B-54**

**PROCTOR DENSITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO



Ninyo & Moore
Geotechnical & Environmental Sciences Consultants




| Lab Number | Maximum Density (pcf) | Optimum Moisture Content (%) | Thermal Resistivity (ºC-cm/W) | | Relative Compaction (%) | Dry Density (pcf) |
|---|---|---|---|---|---|---|
| | | | Wet | Dry | | |
| R-8 | 104.9 | 19.4 | 246 | 524 | 90% | 94.7 |
| | | | 313 | n/a | 95% | 99.9 |
| | | | 372 | n/a | 98% | 103.1 |

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 5334

**FIGURE B-55**

**THERMAL RESISTIVITY TEST RESULTS**

PRAIRIE PASS B.E.S.S.
ADAMS COUNTY, COLORADO
503390001 - 2/26

Ninyo & Moore
Geotechnical & Environmental Sciences Consultants

# APPENDIX C

## Chemical Test Results

# Soil Analysis Lab Results

Client: Ninyo & Moore
Job Name: Prairie Pass
Client Job Number: 503390001
Project X Job Number: S260113C
January 16, 2026

| | Method | ASTM D4327 | | ASTM D4327 | | ASTM G187 | | ASTM G51 | ASTM G200 | SM 4500-D | ASTM D4327 | ASTM D6919 | ASTM D6919 | ASTM D6919 | ASTM D6919 | ASTM D6919 | ASTM D6919 | ASTM D4327 | ASTM D4327 | ASTM D5907 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bore# / Description** | **Depth** | **Sulfates** $SO_4^{2-}$ | | **Chlorides** $Cl^-$ | | **Resistivity** As Rec'd \| Minimum | | **pH** | **Redox** | **Sulfide** $S^{2-}$ | **Nitrate** $NO_3^-$ | **Ammonium** $NH_4^+$ | **Lithium** $Li^+$ | **Sodium** $Na^+$ | **Potassium** $K^+$ | **Magnesium** $Mg^{2+}$ | **Calcium** $Ca^{2+}$ | **Fluoride** $F_2^{2-}$ | **Phosphate** $PO_4^{3-}$ | **Total Soluble Salts (TSS)** |
| | (ft) | (mg/kg) | (wt%) | (mg/kg) | (wt%) | (Ω-cm) | (Ω-cm) | | (mV) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | (mg/kg) | PPM |
| B-1 | 0-5 | 109.5 | 0.0109 | 7.2 | 0.0007 | 16,750 | 1,474 | 6.7 | 164 | 0.03 | 1.3 | 2.9 | ND | 138.8 | 4.1 | 33.4 | 165.0 | 14.3 | 6.6 | 171.4 |
| B-10 | 0-5 | 1,274.8 | 0.1275 | 17.6 | 0.0018 | 13,400 | 737 | 6.6 | 172 | 0.12 | 2.4 | 9.0 | ND | 422.2 | 13.3 | 73.4 | 197.9 | 19.4 | 0.4 | 696.4 |
| B-11 | 0-5 | 236.9 | 0.0237 | 7.9 | 0.0008 | 8,040 | 1,407 | 6.6 | 166 | 0.06 | 3.2 | 1.0 | ND | 54.9 | 18.9 | 50.0 | 158.2 | 10.6 | 7.0 | 192.8 |
| B-15 | 0-5 | 382.1 | 0.0382 | 19.2 | 0.0019 | 6,700 | 871 | 6.4 | 163 | 2.01 | 12.9 | 1.4 | ND | 89.2 | 19.3 | 53.7 | 170.5 | 6.7 | 0.3 | 507.1 |
| B-23 | 0-5 | 138.3 | 0.0138 | 6.1 | 0.0006 | 7,370 | 1,273 | 7.4 | 147 | ND | 0.9 | 1.0 | ND | 141.1 | 6.1 | 23.6 | 163.1 | 17.6 | 4.1 | 239.3 |
| B-30 | 0-5 | 4,177.7 | 0.4178 | 33.7 | 0.0034 | 67,000 | 549 | 6.6 | 192 | 0.12 | 11.3 | 2.6 | ND | 611.9 | 13.1 | 233.6 | 711.3 | 7.3 | 0.3 | 2,439.3 |

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract
PPM = mg/kg (soil) = mg/L (Liquid)

For AWWA 105C: 0-3mg/kg sulfide = Negative; 3-6mg/kg = trace; >6mg/kg = Positive

**Note**: Sometimes a bad sulfate hit is a contaminated spot. Typical fertilizers are Potassium chloride, ammonium sulfate or ammonium sulfate nitrate (ASN). So this is another reason why testing full corrosion series is good because we then have the data to see if those other ingredients are present meaning the soil sample is just fertilizer-contaminated soil. This can happen often when the soil samples collected are simply surface scoops. This is why it's best to dig in a foot, throw away the top and test the deeper stuff. Dairy farms are also notorious for these items.

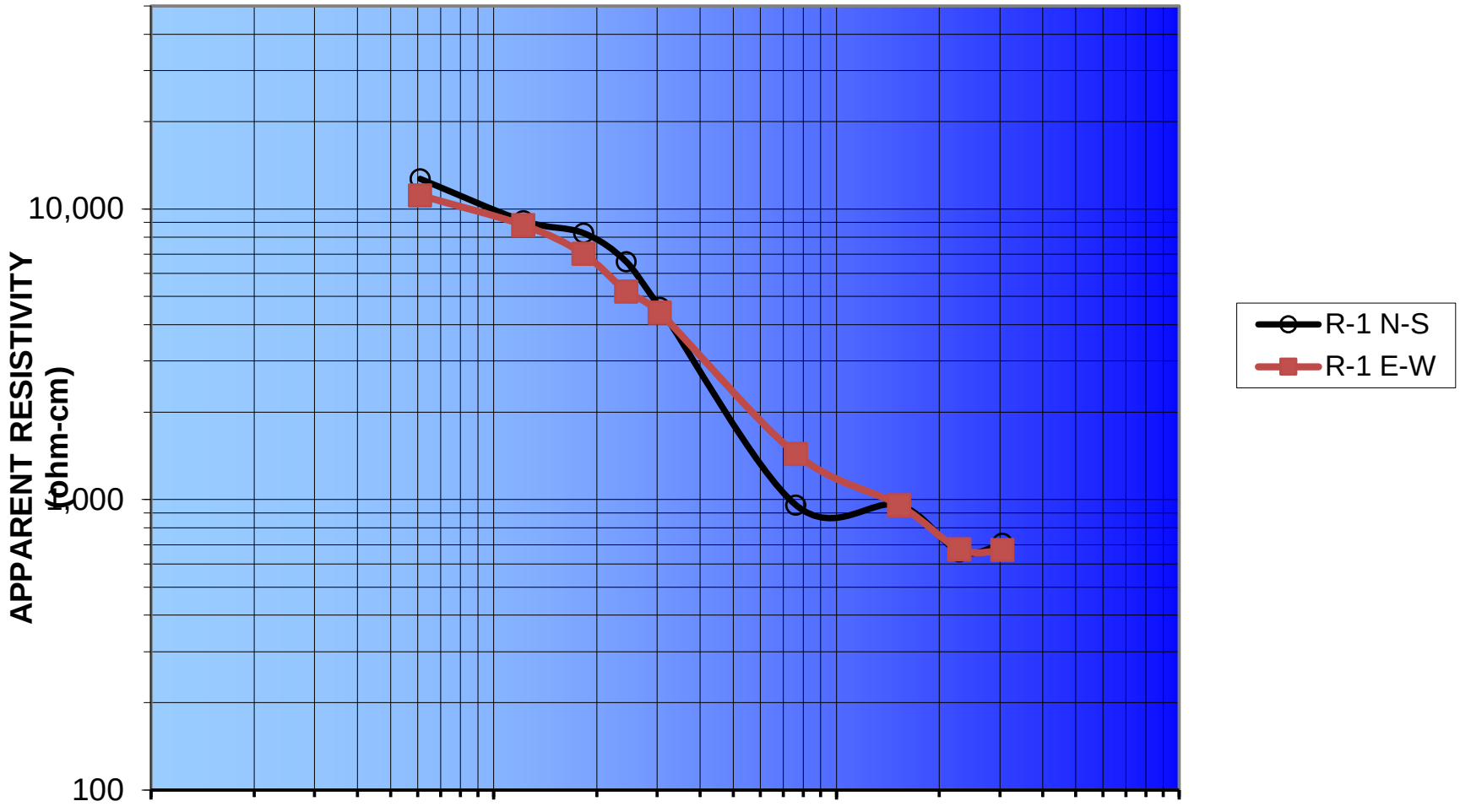
If one sample pops up much more corrosive than all others, we would recommend collecting more samples surrounding the problem sample location to determine if the peak is isolated to it. This allows us to conclude it was a contaminated sample and able to declare it an outlier.

Try out our new online forms: SOIL CORROSIVITY & THERMAL RESISTIVITY LAB REQUEST FORM & IN-SITU WENNER 4 PIN QUOTE REQUEST FORM

# APPENDIX D

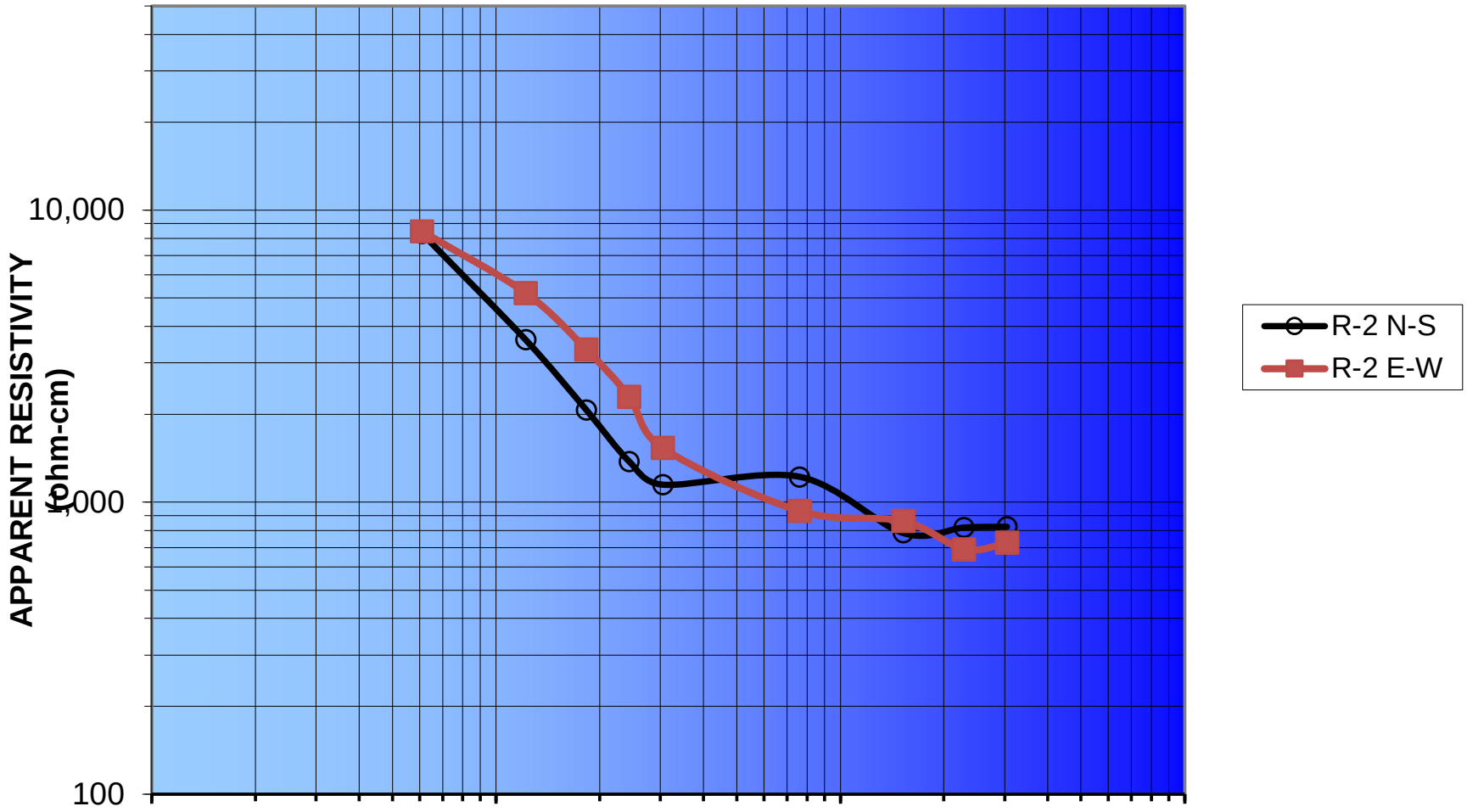
## Field Resistivity Test Results

Project No. 503353001
Apparent Resistivity
ASTM G57



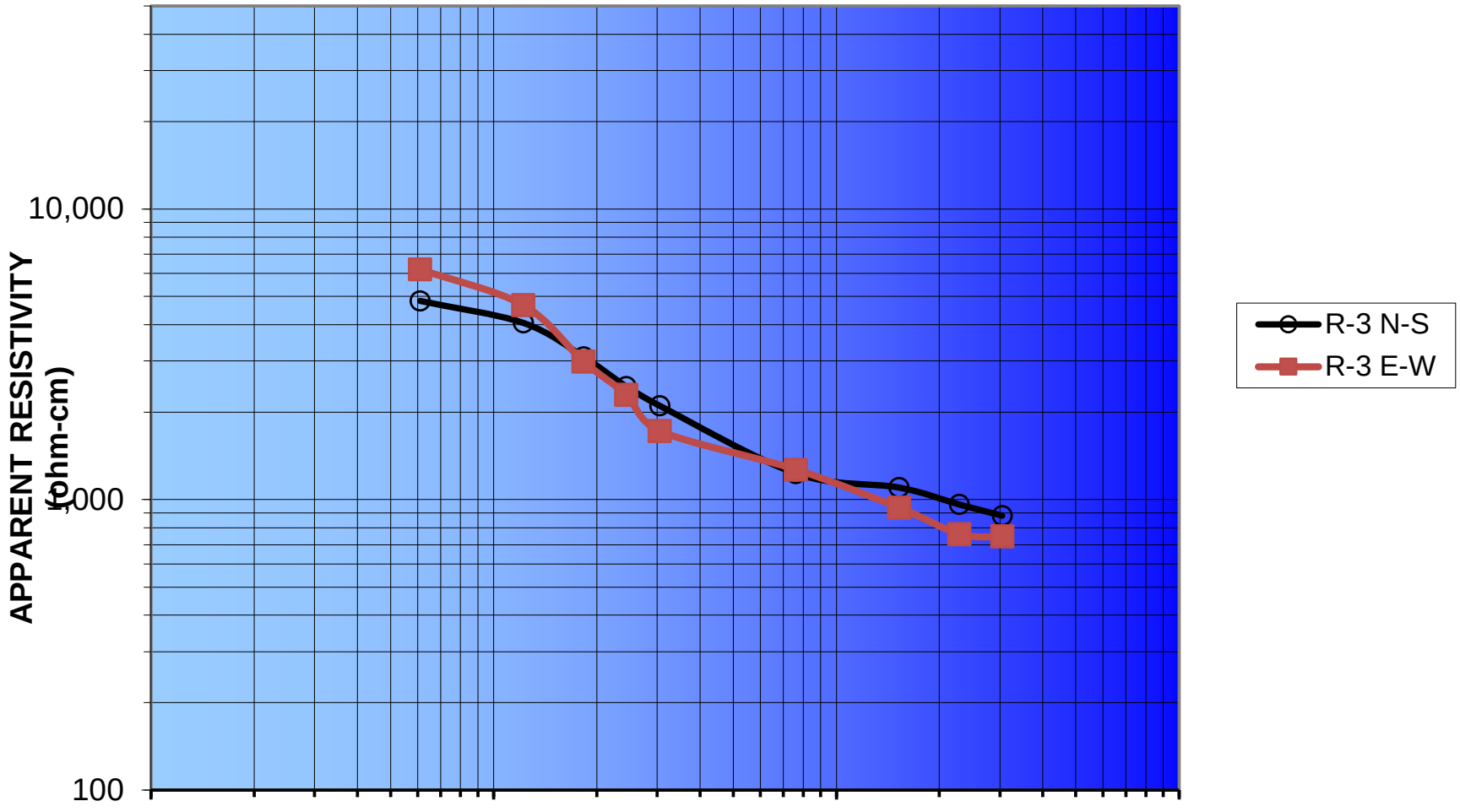

Ninyo & Moore

Project No. 503353001
Apparent Resistivity
ASTM G57



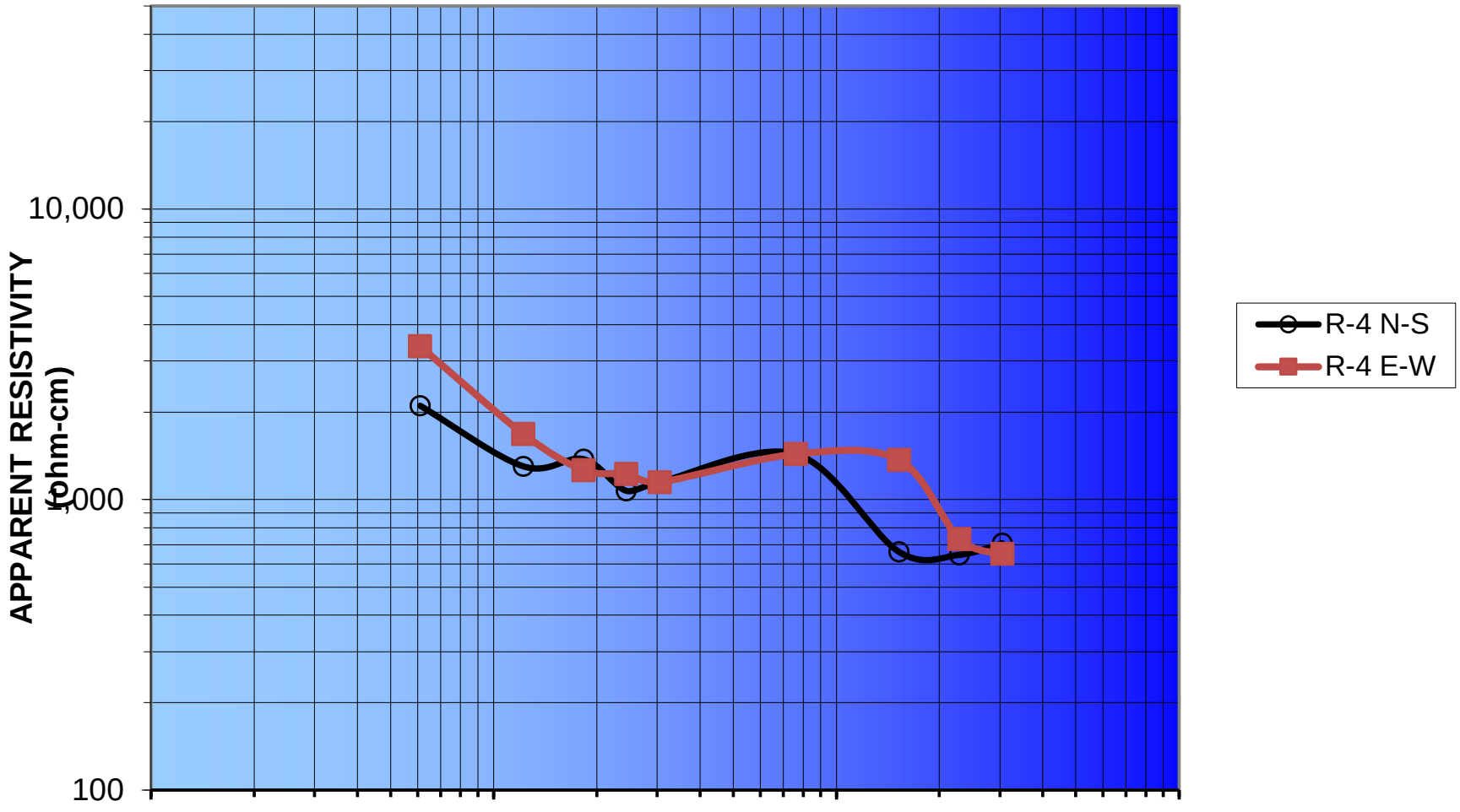

Ninyo & Moore

Project No. 503353001
Apparent Resistivity
ASTM G57



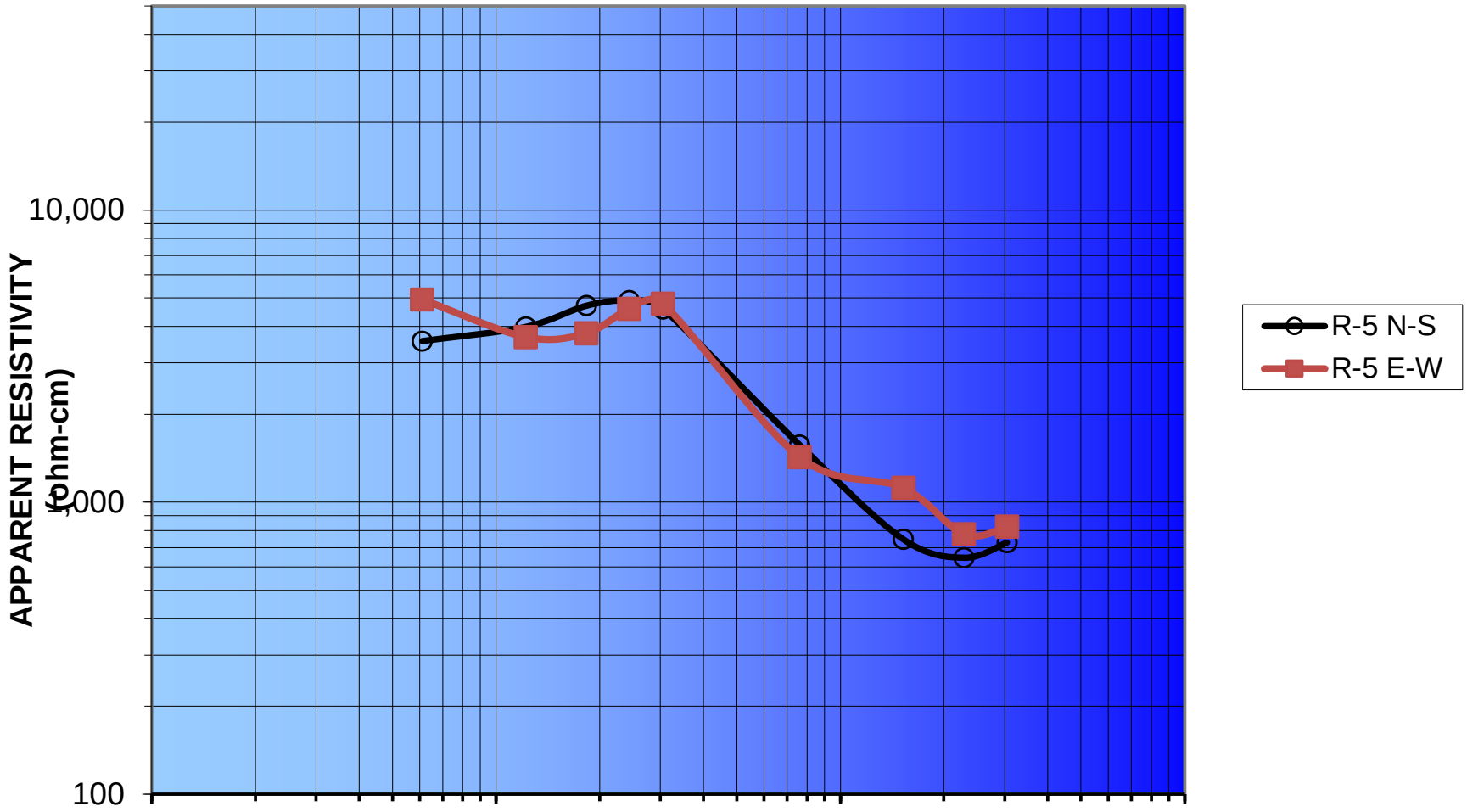

Ninyo & Moore

Project No. 503353001
Apparent Resistivity
ASTM G57



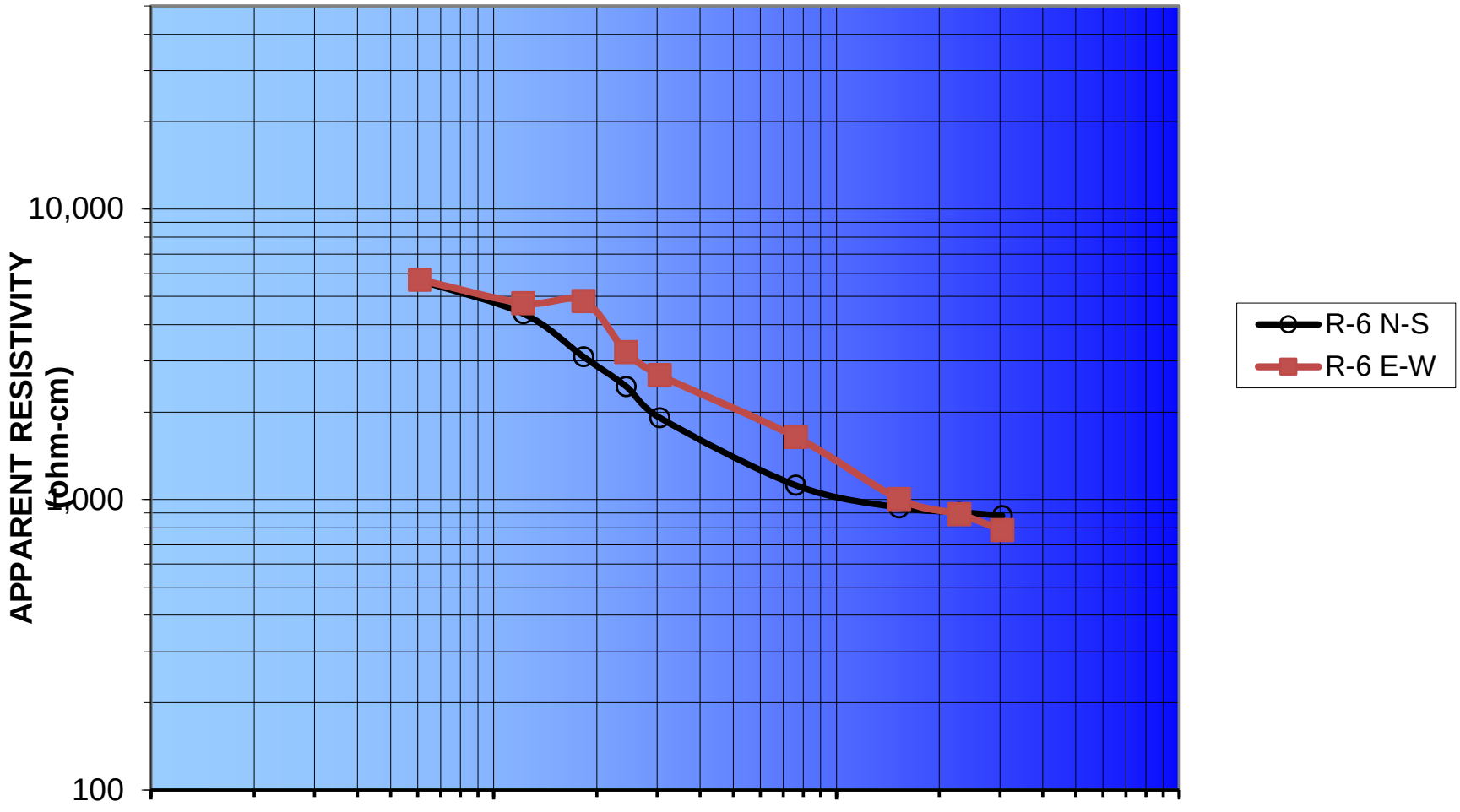

Ninyo & Moore

Project No. 503353001
Apparent Resistivity
ASTM G57



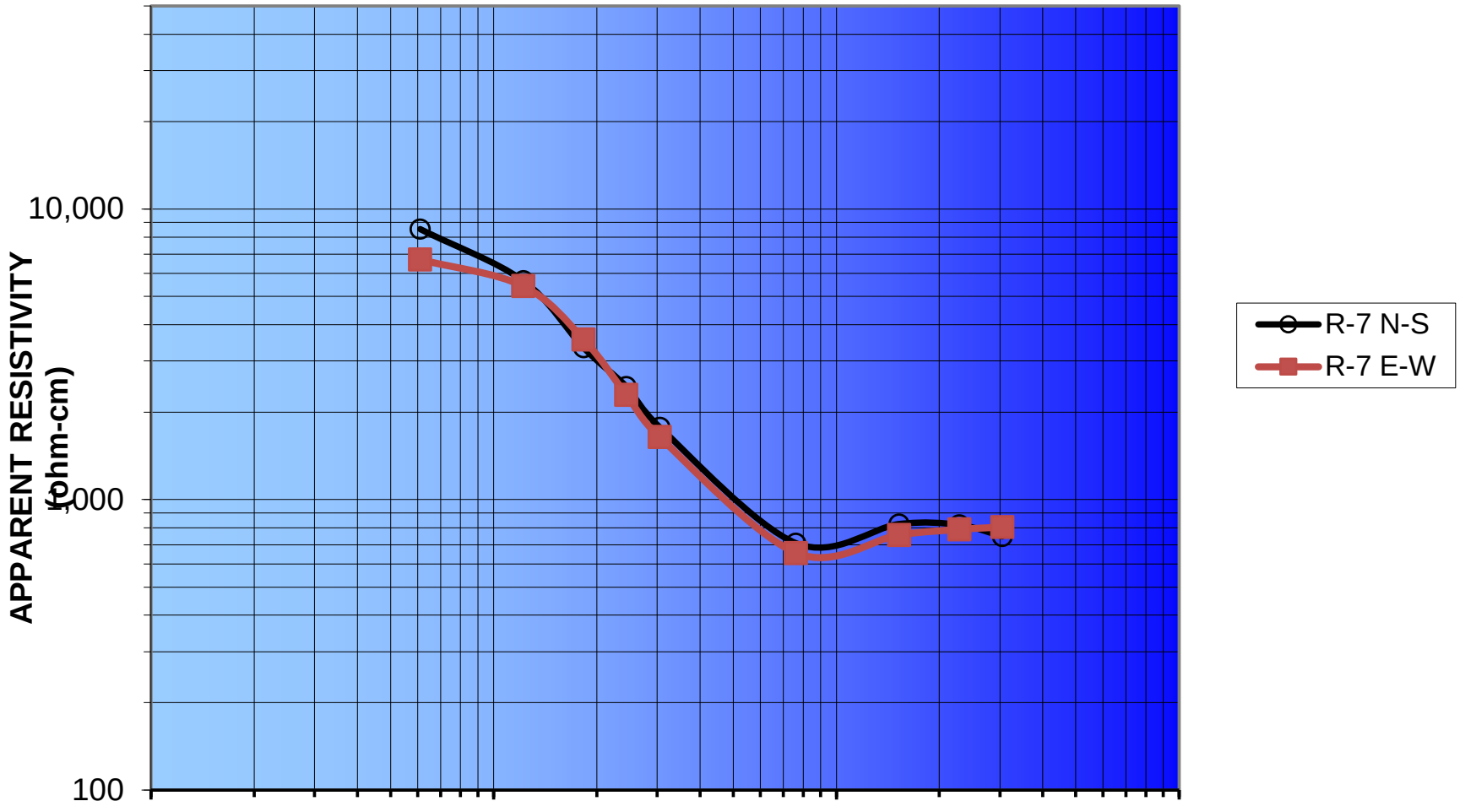

Ninyo & Moore

Project No. 503353001
Apparent Resistivity
ASTM G57



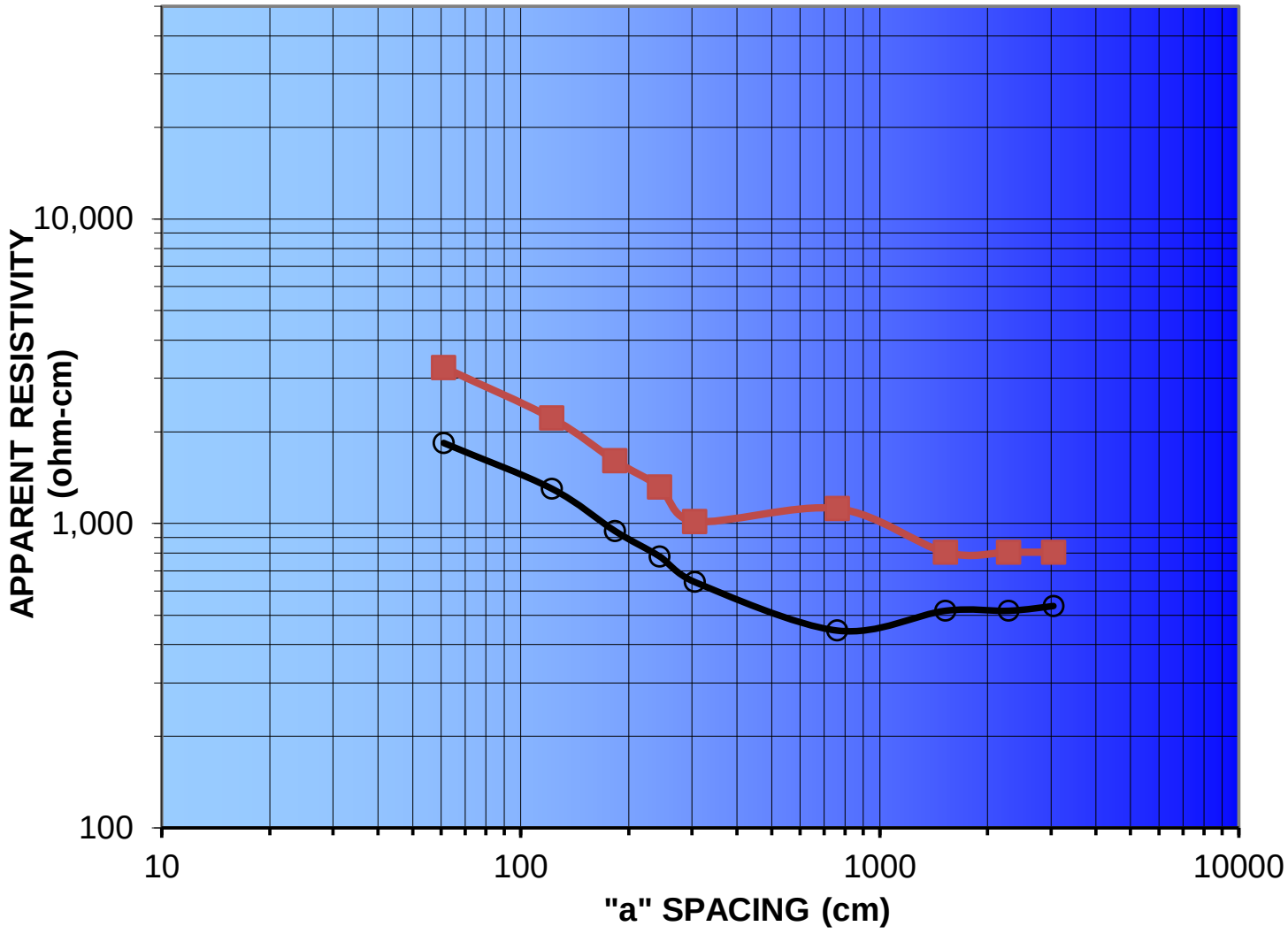

Ninyo & Moore

Project No. 503353001
Apparent Resistivity
ASTM G57




Ninyo & Moore

Project No. 503353001
Apparent Resistivity
ASTM G57

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# APPENDIX E

## Pile Drive Summary Table

| Pile ID | Pile Type | Pile Length (feet) | Target Embedment Depth (inches) | Actual Embedment Depth (inches) | Drive Time (seconds) | Time and Date Pile was Driven (00:00 - DD/MM/YY) | Notes |
|---|---|---|---|---|---|---|---|
| PLT-1 (7) | W6-9 | 9 | 84 | 84 | 70 | 7/1/2026 10:50 | |
| PLT-1 (10) | W6-9 | 12 | 120 | 120 | 175 | 7/1/2026 10:41 | |
| PLT-2 (7) | W6-9 | 9 | 84 | 84 | 61 | 7/1/2026 11:15 | |
| PLT-2 (10) | W6-9 | 12 | 120 | 120 | 280 | 7/1/2026 11:10 | Last 12" very stiff |
| PLT-3 (7) | W6-9 | 9 | 84 | 85 | 310 | 7/1/2026 11:50 | Last 12" very stiff |
| PLT-3 (10) | W6-9 | 12 | 120 | 104 | 378 | 7/1/2026 11:30 | Last 24" very stiff until refusal |
| PLT-4 (7) | W6-9 | 9 | 84 | 81 | 146 | 7/1/2026 13:20 | Last 12" very stiff |
| PLT-4 (10) | W6-9 | 12 | 120 | 118 | 429 | 7/1/2026 13:12 | Last 24" very stiff |
| PLT-5 (7) | W6-9 | 9 | 84 | 84 | 195 | 7/1/2026 12:28 | Last 18" very stiff |
| PLT-5 (10) | W6-9 | 12 | 120 | 75 | 630 | 7/1/2026 12:20 | Last 24" very stiff until refusal |
| PLT-6 (7) | W6-9 | 9 | 84 | 84 | 100 | 7/1/2026 12:52 | stiff from 3' to 5.5' |
| PLT-6 (10) | W6-9 | 12 | 120 | 120 | 288 | 7/1/2026 12:48 | Stiff from 5' to 8' |
| PLT-7 (7) | W6-9 | 9 | 84 | 81 | 39 | 7/1/2026 15:32 | |
| PLT-7 (10) | W6-9 | 12 | 120 | 116 | 91 | 7/1/2026 15:29 | |
| PLT-8 (7) | W6-9 | 9 | 84 | 81 | 65 | 7/1/2026 15:05 | |
| PLT-8 (10) | W6-9 | 12 | 120 | 118 | 165 | 7/1/2026 15:01 | |
| PLT-9 (7) | W6-9 | 9 | 84 | 83 | 42 | 7/1/2026 15:50 | |
| PLT-9 (10) | W6-9 | 12 | 120 | 118 | 49 | 7/1/2026 15:43 | |
| PLT-10 (7) | W6-9 | 9 | 84 | 82 | 65 | 7/1/2026 14:49 | |
| PLT-10 (10) | W6-9 | 12 | 120 | 118 | 125 | 7/1/2026 14:45 | |
| PLT-11 (7) | W6-9 | 9 | 84 | 80 | 90 | 7/1/2026 14:07 | |
| PLT-11 (10) | W6-9 | 12 | 120 | 117 | 220 | 7/1/2026 14:00 | |
| PLT-12 (7) | W6-9 | 9 | 84 | 82 | 125 | 7/1/2026 14:32 | |
| PLT-12 (10) | W6-9 | 12 | 120 | 117 | 325 | 7/1/2026 14:27 | |

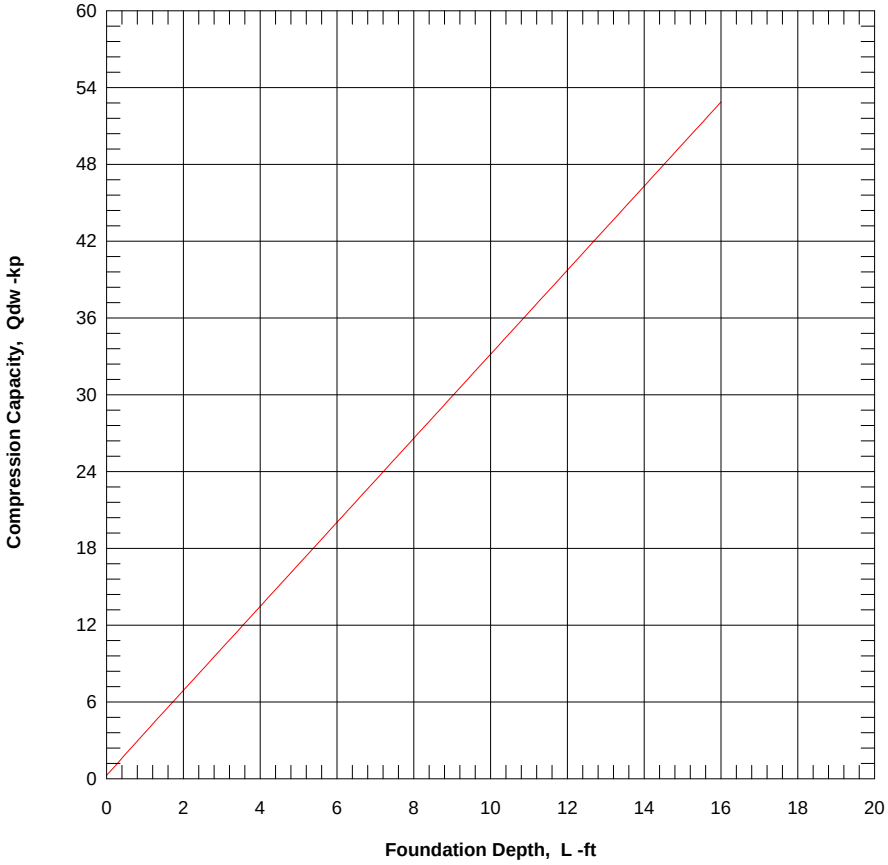
# APPENDIX F

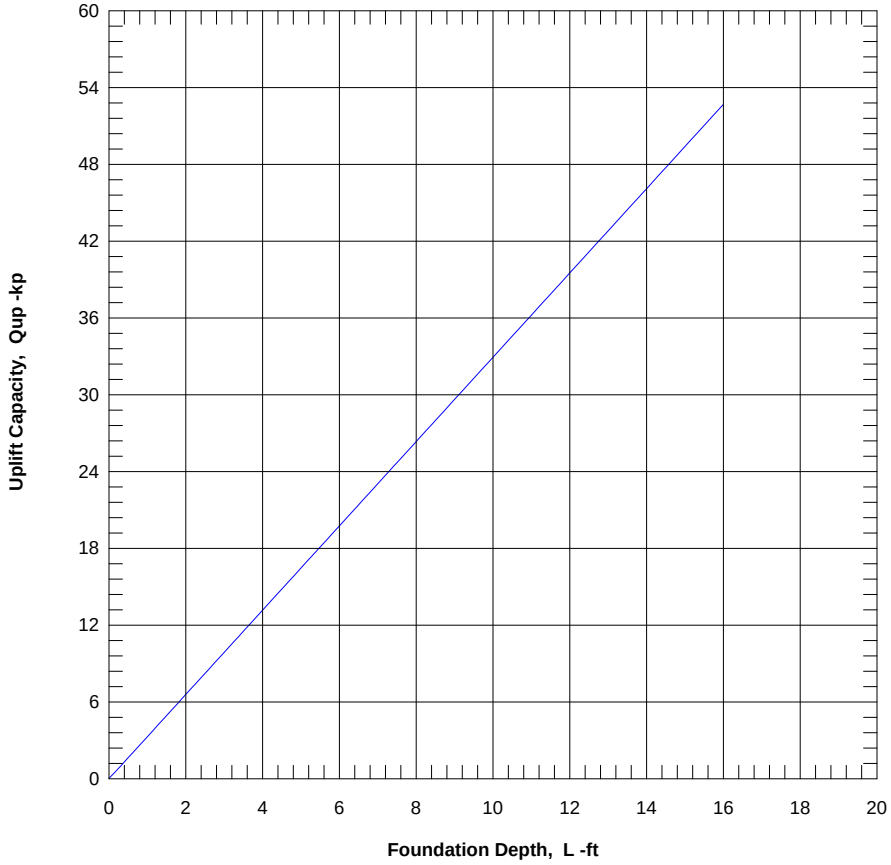
## Drive Pile Axial, Lateral, and Compressive Test Results

# APPENDIX G

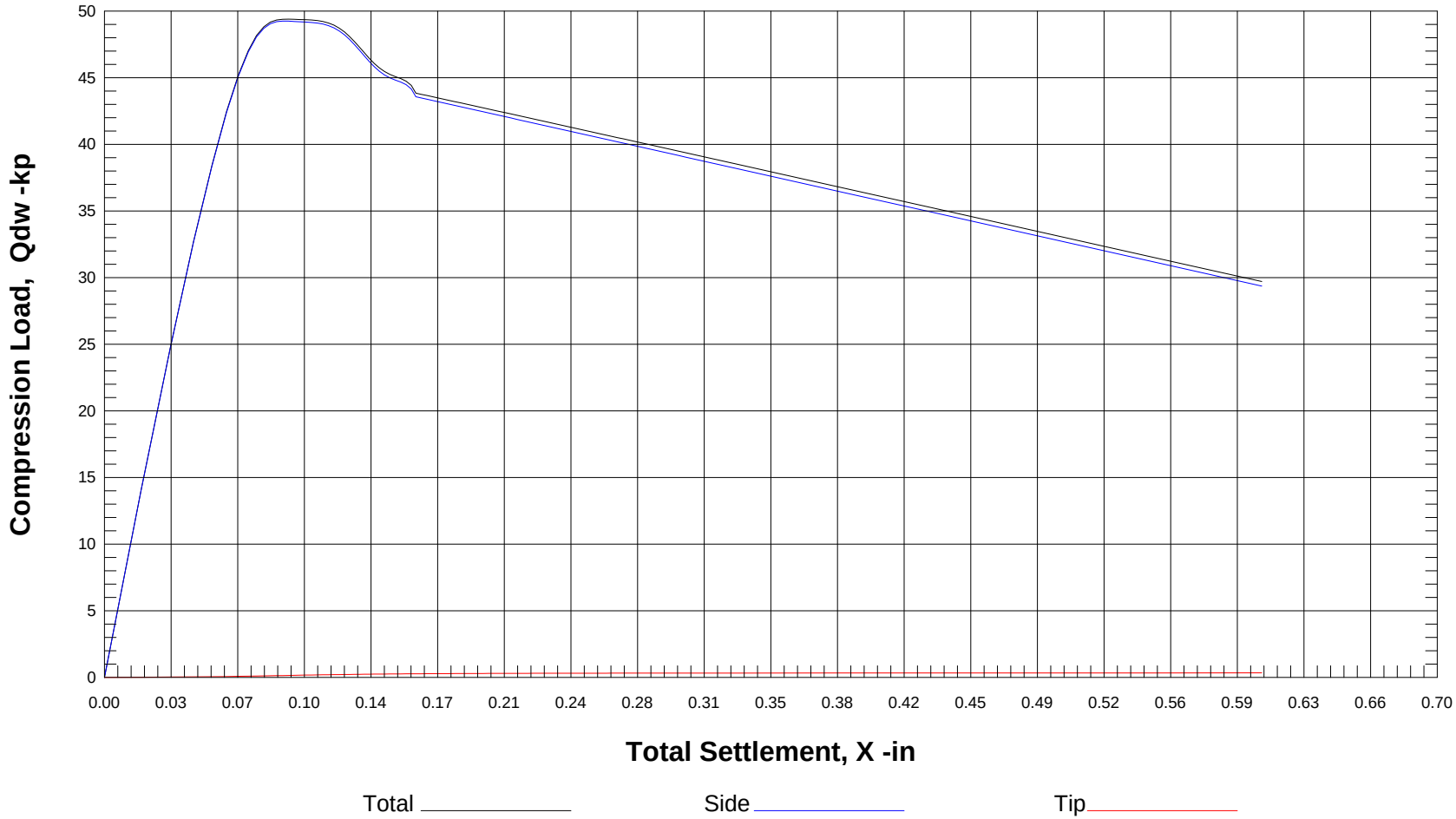
Allpile Results

# ULTIMATE CAPACITY vs FOUNDATION DEPTH

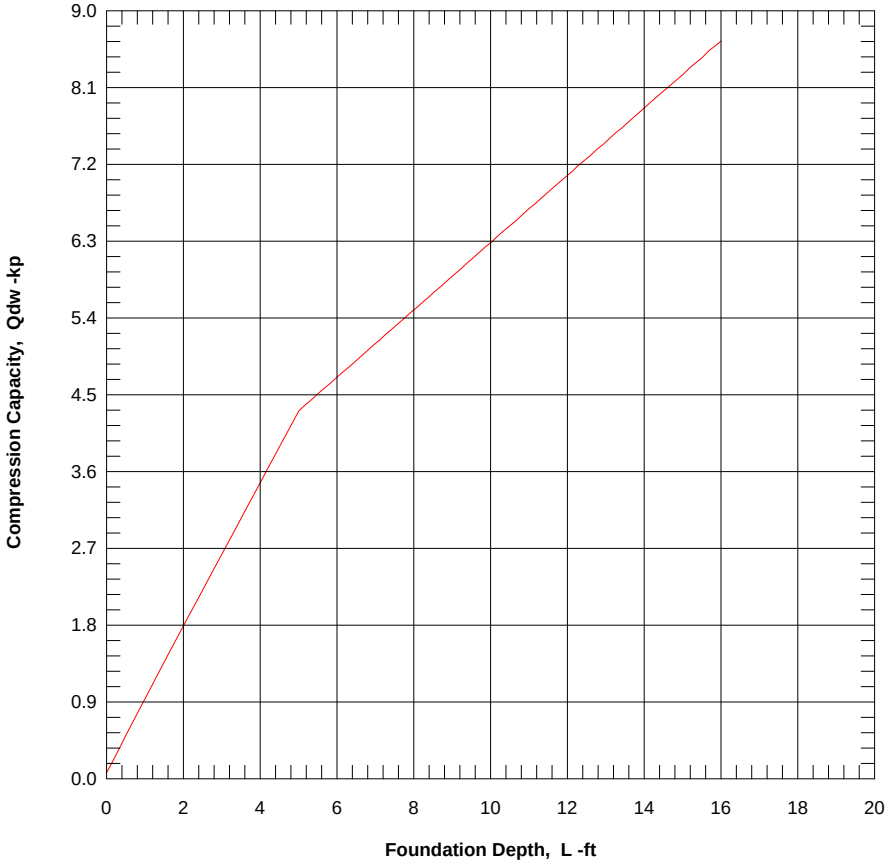


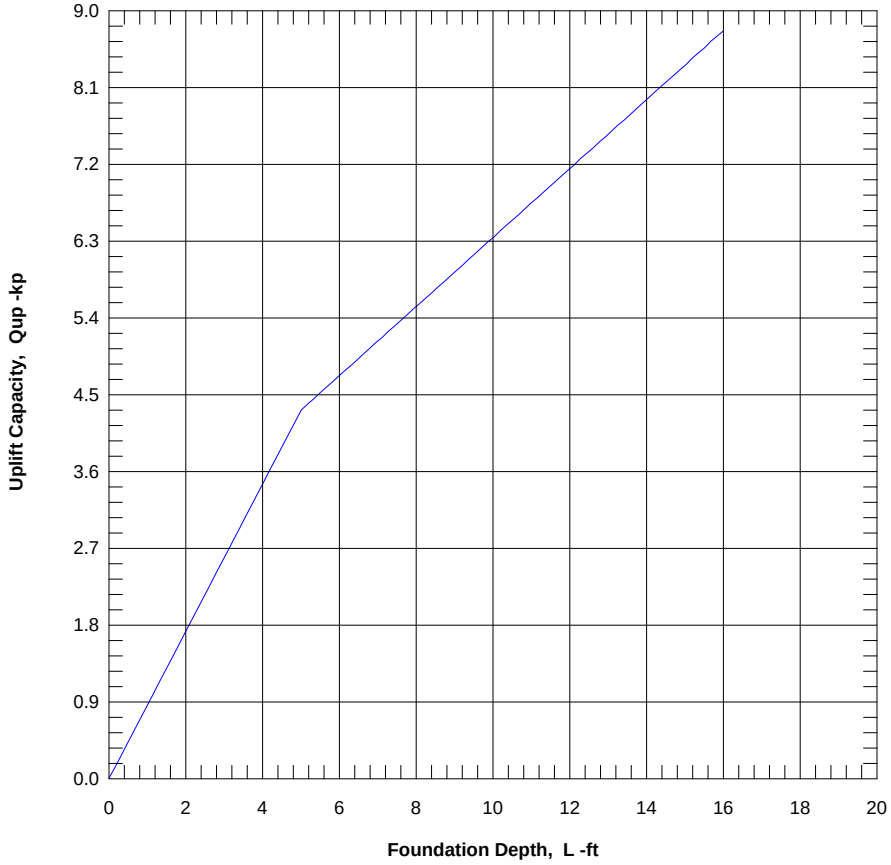



# Vertical Load vs. Total Settlement

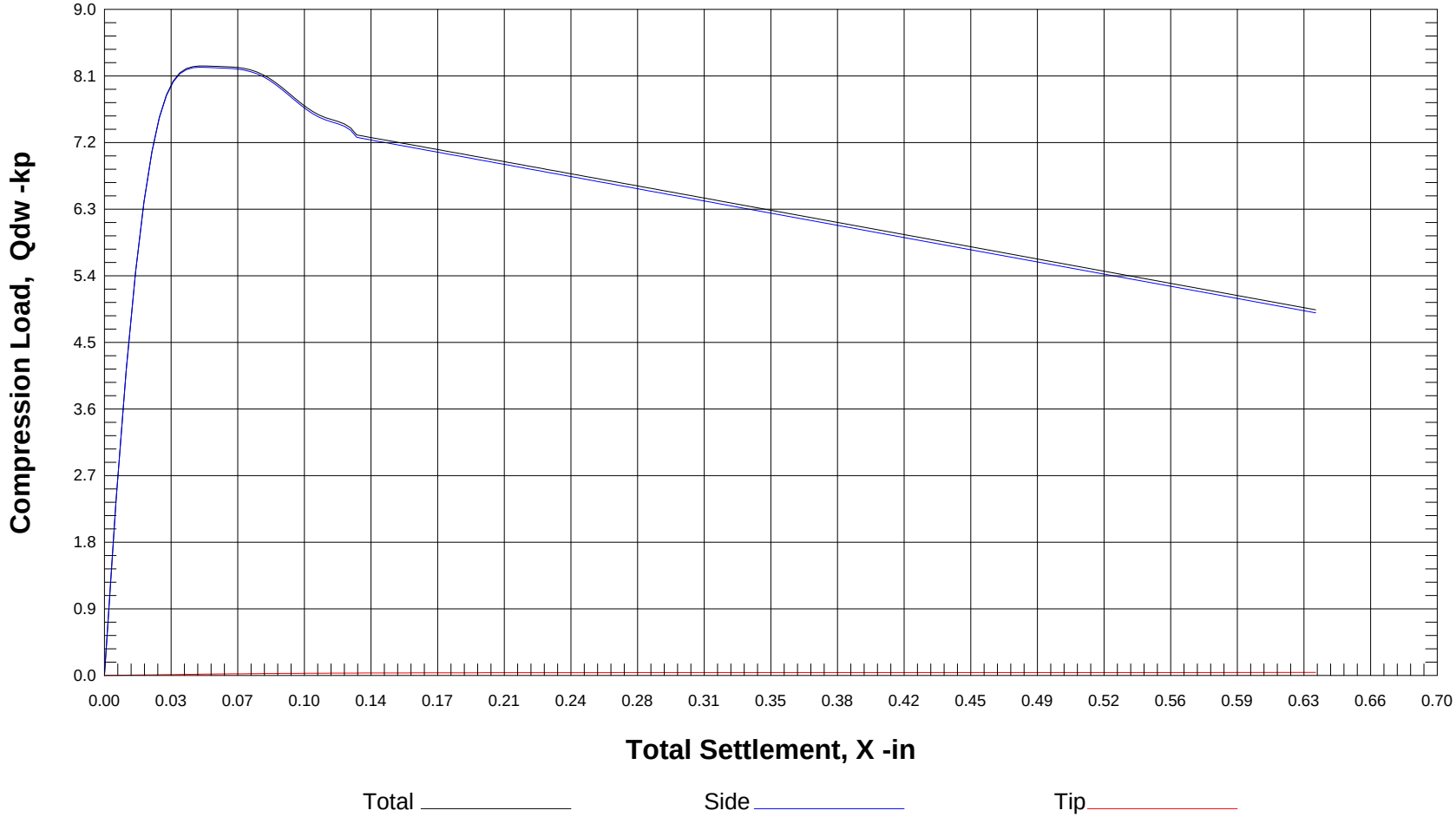


# ULTIMATE CAPACITY vs FOUNDATION DEPTH

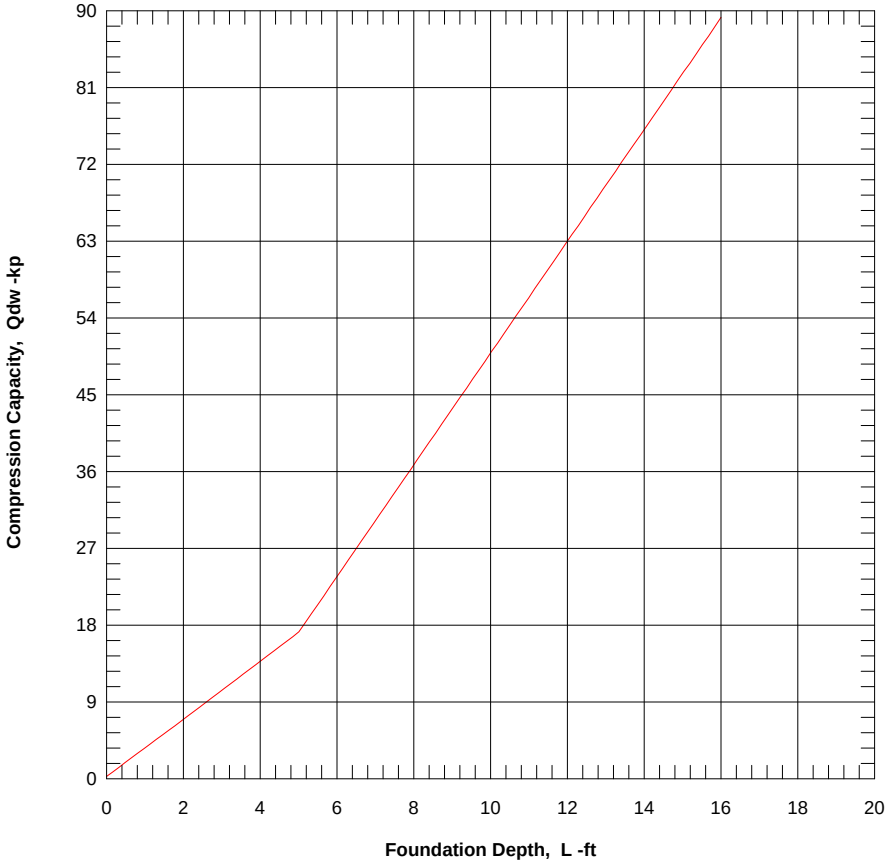


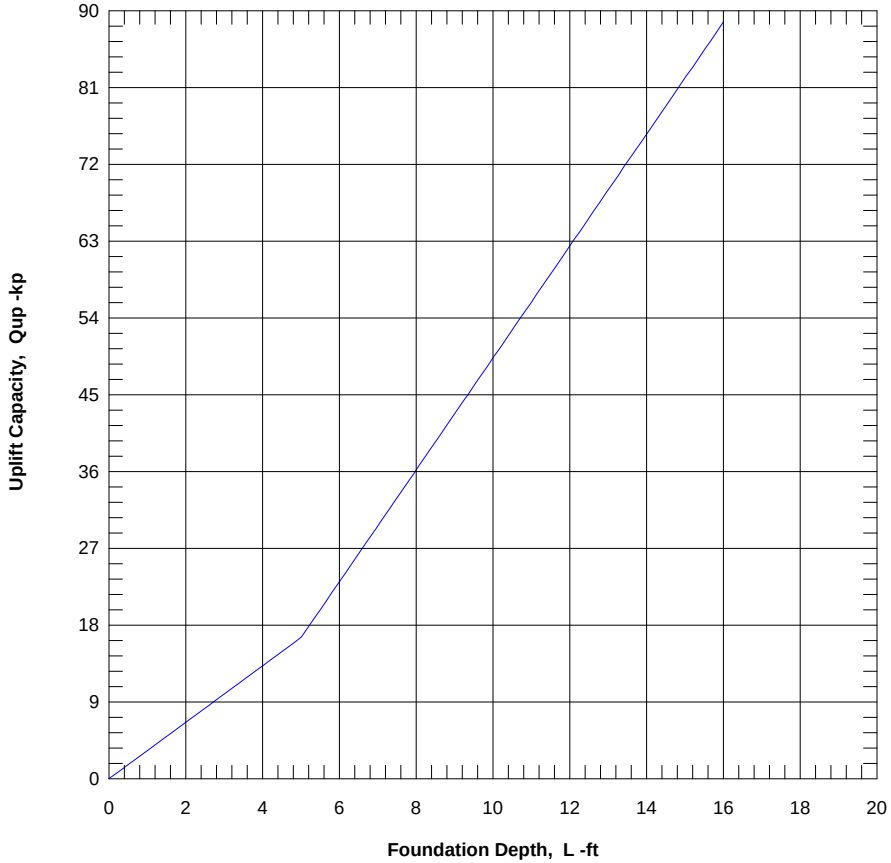



# Vertical Load vs. Total Settlement

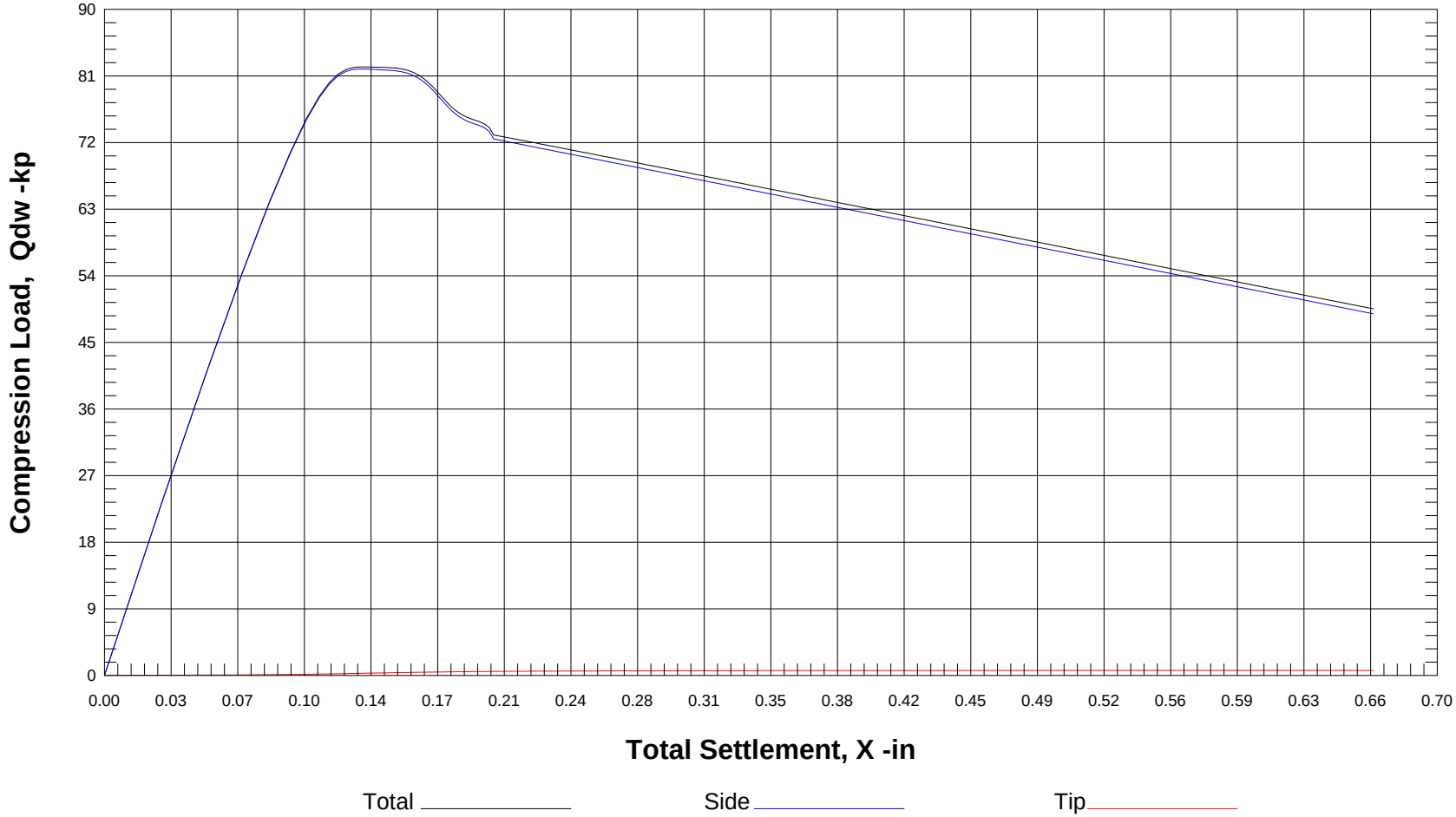


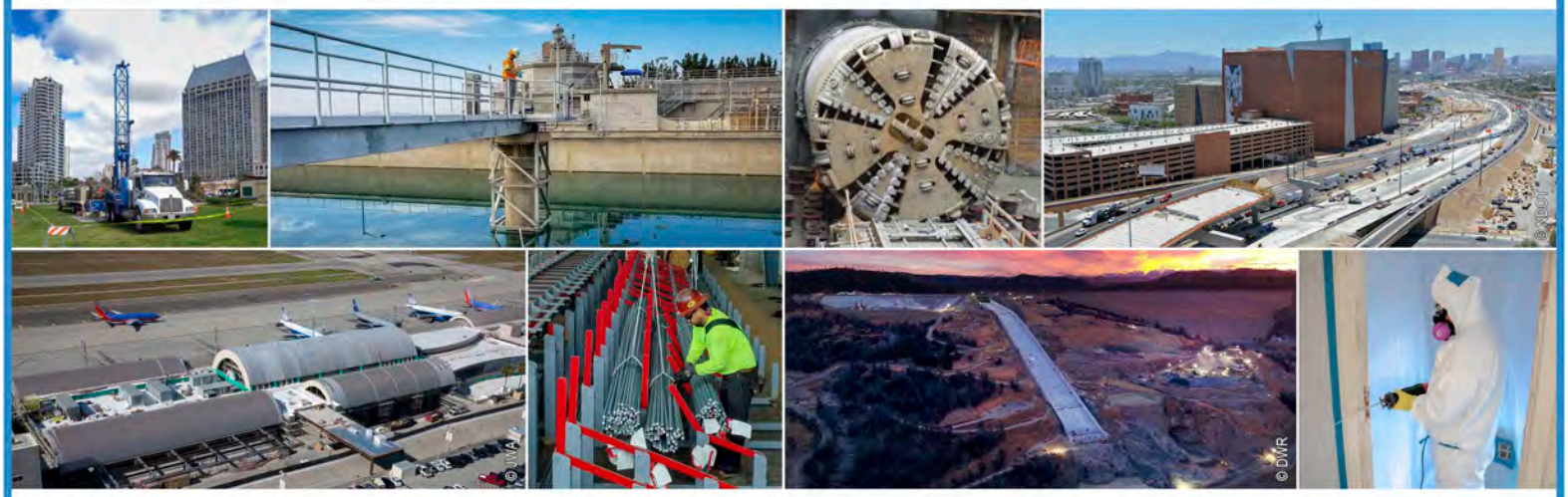
# ULTIMATE CAPACITY vs FOUNDATION DEPTH



# Vertical Load vs. Total Settlement





9707 E. Easter Lane | Centennial, Colorado 80112 | p. 303.629.6000

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Ninyo & Moore

Geotechnical & Environmental Sciences Consultants

Outlook

**RE: Adams County Battery Energy Storage Development: MHFD Requested Input for Horse Creek Watershed OSP**

**From** Andy Stewart <astewart@mhfd.org>
**Date** Mon 3/30/2026 4:05 PM
**To** Lisa Warren <lwarren@logansimpson.com>
**Cc** Skye Stuart <skye@thepachnercompany.com>; Colby Mask <colby.mask@jupiterpower.io>; Jeremy Call <JCall@LOGANSIMPSON.COM>; Lindsay Tearman <ltearman@logansimpson.com>; Marcus Pachner <marcus@thepachnercompany.com>; Gage Fuller <Gage.Fuller@jupiterpower.io>

Some people who received this message don't often get email from astewart@mhfd.org. Learn why this is important

**[EXTERNAL]**

Hi Lisa,

Thank you for providing this information and County contacts for this site. I have been on PTO and am still getting through my backlog of emails.

I reached out to Matt, Greg, and Steve at the county to discuss this site. I want to get on a quick call with them to see how I can best help the County and your team with this comment on your preapplication. I will reach back out after I am able to connect with the County.

Thanks,

**Andy Stewart, P.E., CFM**
Program Manager
**MILE HIGH FLOOD DISTRICT**
**12575 W. Bayaud Ave. | Lakewood, CO 80228**
**Office:** 303-455-6277 | **Direct:** 303-749-5446 | www.mhfd.org
*Protecting People, Property, and our Environment*
MHFD
MILE HIGH FLOOD DISTRICT

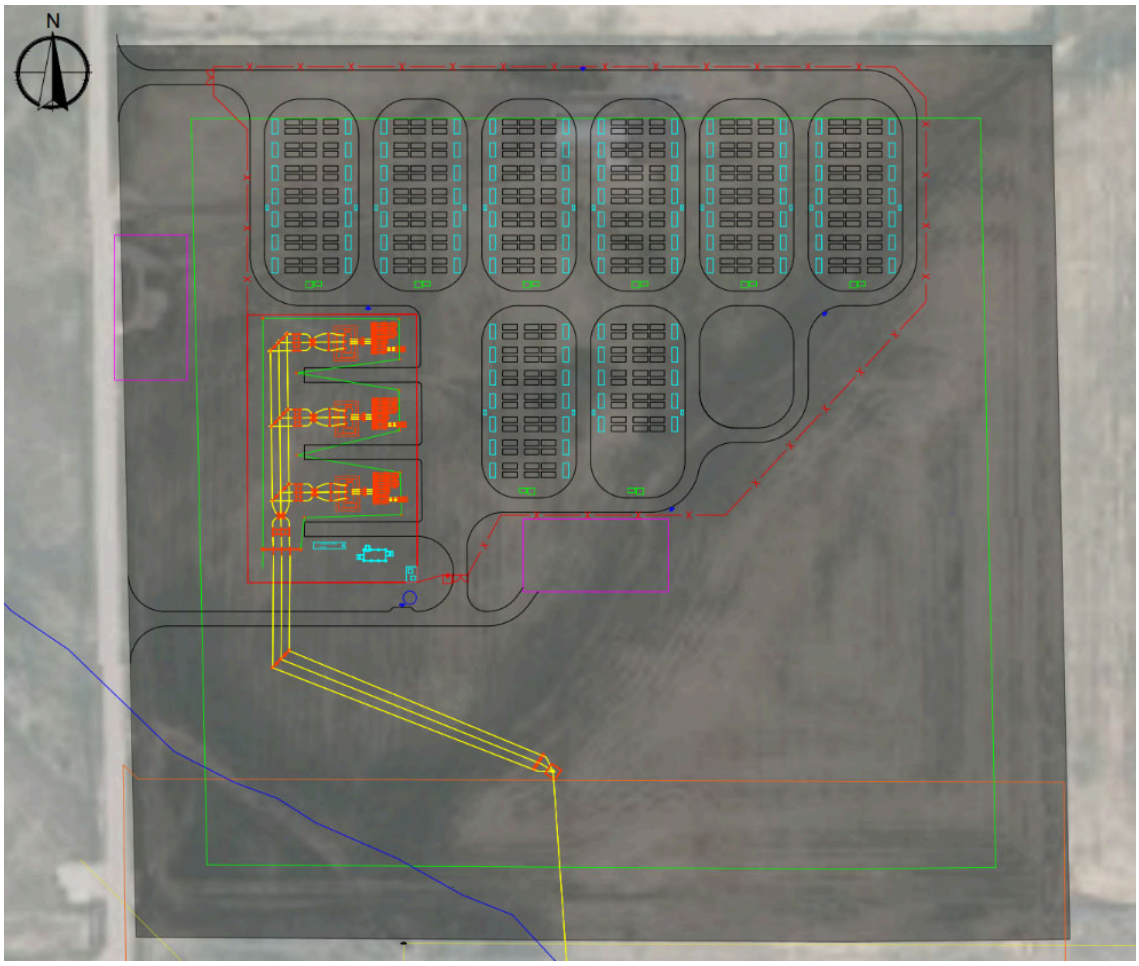
---

**From:** Lisa Warren <lwarren@logansimpson.com>
**Sent:** Wednesday, March 18, 2026 3:23 PM
**To:** Andy Stewart <astewart@mhfd.org>
**Cc:** Skye Stuart <skye@thepachnercompany.com>; Colby Mask <colby.mask@jupiterpower.io>; Jeremy Call <JCall@LOGANSIMPSON.COM>; Lindsay Tearman <ltearman@logansimpson.com>; Marcus Pachner <marcus@thepachnercompany.com>; Gage Fuller <gage.fuller@jupiterpower.io>
**Subject:** RE: Adams County Battery Energy Storage Development: MHFD Requested Input for Horse Creek Watershed OSP

You don't often get email from lwarren@logansimpson.com. Learn why this is important

Hi Andy –

Thank you for the chat yesterday. Below is the current proposed layout for the Prairie Pass Battery Energy Storage System, located at 12500 Cavanaugh Road on Parcel 0156534200004 (Cavanaugh Road runs along the western boundary of the parcel).




Please note the delineated easement from the District's online GIS dataset located in the southwest portion of the Project site.

We understand the Adams County Case Manager for the Project is Greg Barnes, and the Primary Engineer is Matt Emmenm. Below is a snip of the pre-application comment from Adams County regarding consultation with the District on the proposed channel/easement:

> ENG10: The Mile High Flood District has proposed a channel improvement on the Southwest corner of the site. The channel is included in the study titled "Horse Creek Watershed OSP, dated February 2003. Development of this site will need to avoid the area of the planned Channel. In Addition, the applicant will be required to dedicate an easement for this channel to the County.
>
> Development Engineering Review Complete 08/14/2025

As mentioned in our conversation, the Project area is to be leased from the landowner (i.e., not owned by Jupiter), and it does not appear that an easement was ever recorded for the proposed channel.

Please reach out with any questions and advice on next steps.

Cheers!
-Lisa

**Lisa Warren, MLA**
**SENIOR ASSOCIATE RENEWABLES PLANNER**

**Logan Simpson**
213 LInden Street, Suite 300
Fort Collins, CO 80524
C: 303-868-7190

lwarren@logansimpson.com
**www.logansimpson.com**
LOGANSIMPSON

---

**From:** Lisa Warren
**Sent:** Monday, March 16, 2026 4:58 PM
**To:** astewart@mhfd.org
**Cc:** Skye Stuart <skye@thepachnercompany.com>; Colby Mask <colby.mask@jupiterpower.io>; Jeremy Call <JCall@LOGANSIMPSON.COM>; Lindsay Tearman <ltearman@logansimpson.com>; Marcus Pachner <marcus@thepachnercompany.com>; Gage Fuller <gage.fuller@jupiterpower.io>
**Subject:** Adams County Battery Energy Storage Development: MHFD Requested Input for Horse Creek Watershed OSP

Hello Andy –

Jupiter Power has is submitting a development application to Adams County for the Prairie Pass Battery Energy Storage facility (Project) and has been directed by County Staff to consult with the Mile High Flood District (District) regarding the Horse Creek Watershed OSP, dated February 2003. A section of proposed channel intersects the southwest corner of the proposed Project site; however, it does not appear that an easement was ever secured from the landowner for the proposed channel.

Are you the correct person within the District to provide development consultation regarding the proposed channel, and if so, would you be available for a half-hour call in the next couple of weeks to discuss the Project? Jupiter Power would like to learn more about the proposed easement, what to hold as a buffer around the line path obtained from the District's GIS website, and any other restrictions that may apply.

Thank you!
-Lisa

**Lisa Warren, MLA**
**SENIOR ASSOCIATE RENEWABLES PLANNER**

**Logan Simpson**
213 LInden Street, Suite 300
Fort Collins, CO 80524
C: 303-868-7190

lwarren@logansimpson.com
**www.logansimpson.com**
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FIRE & RISK ALLIANCE

# Prairie Pass BESS

## Draft Emergency Response Plan


Prepared for: Jupiter Power LLC

04/14/26

Draft Rev E

# TABLE OF CONTENTS

# TABLE OF FIGURES



# TABLE OF TABLES

# 1 GENERAL INFORMATION

## 1.1 Scope

This document is an emergency response plan (ERP) for the Prairie Pass battery energy storage system (BESS) facility. The ERP provides a facility overview, site design, type of equipment, safety features, suppression and detection information along with response recommendations for potential BESS facility failure scenarios.

## 1.2 Purpose

The purpose of this ERP is to provide information to BESS subject matter experts (SMEs) and fire department personnel about potential hazards at BESS facilities. This guidance outlines the size-up and response tactics necessary to ensure safety and mitigate risks during emergency operations.

## 1.3 Site Owner

**Site Owner**: Jupiter Power

**Headquarters Address**: 1003 Rio Grande St, Austin, TX 78701

**Headquarters Telephone**: 512.375.4052

## 1.4 Project Location

Adams County, Colorado

39°55'17.4"N, 104°32'43.0"W

## 1.5 Emergency Contact

The Jupiter Remote Operations Center (ROC) can be reached 24/7 regarding any emergencies that occur at the Prairie Pass BESS facility.

**Phone Number**: 512.861.1080

**Email Address**: roc@jupiterpower.io

Table 1 Emergency Services Contact Information

| Emergency Services Agency | Address |
|---|---|
| *All Emergencies* | *Call 911* |
| Brighton Fire Rescue District Station 54 | 15229 Great Rock Rd, Brighton, CO 80603 |
| Adam's County Sheriff's Office | 4430 S Adams County Pkwy 1st Floor, Suite W5400, Brighton, CO 80601 |
| Intermountain Health Platte Valley Hospital | 1600 Prairie Center Pkwy, Brighton, CO 80601 |

# 2 SITE OVERVIEW

## 2.1 General Site Overview

The Prairie Pass BESS facility is located at East 124th Avenue and Cavanaugh Road in Adams County, Colorado, surrounded predominantly by farmland and limited residential properties, as shown in Figure 1. The facility is accessible via two entrances off Cavanaugh Road, on the northwest and southwest corners of the yard.

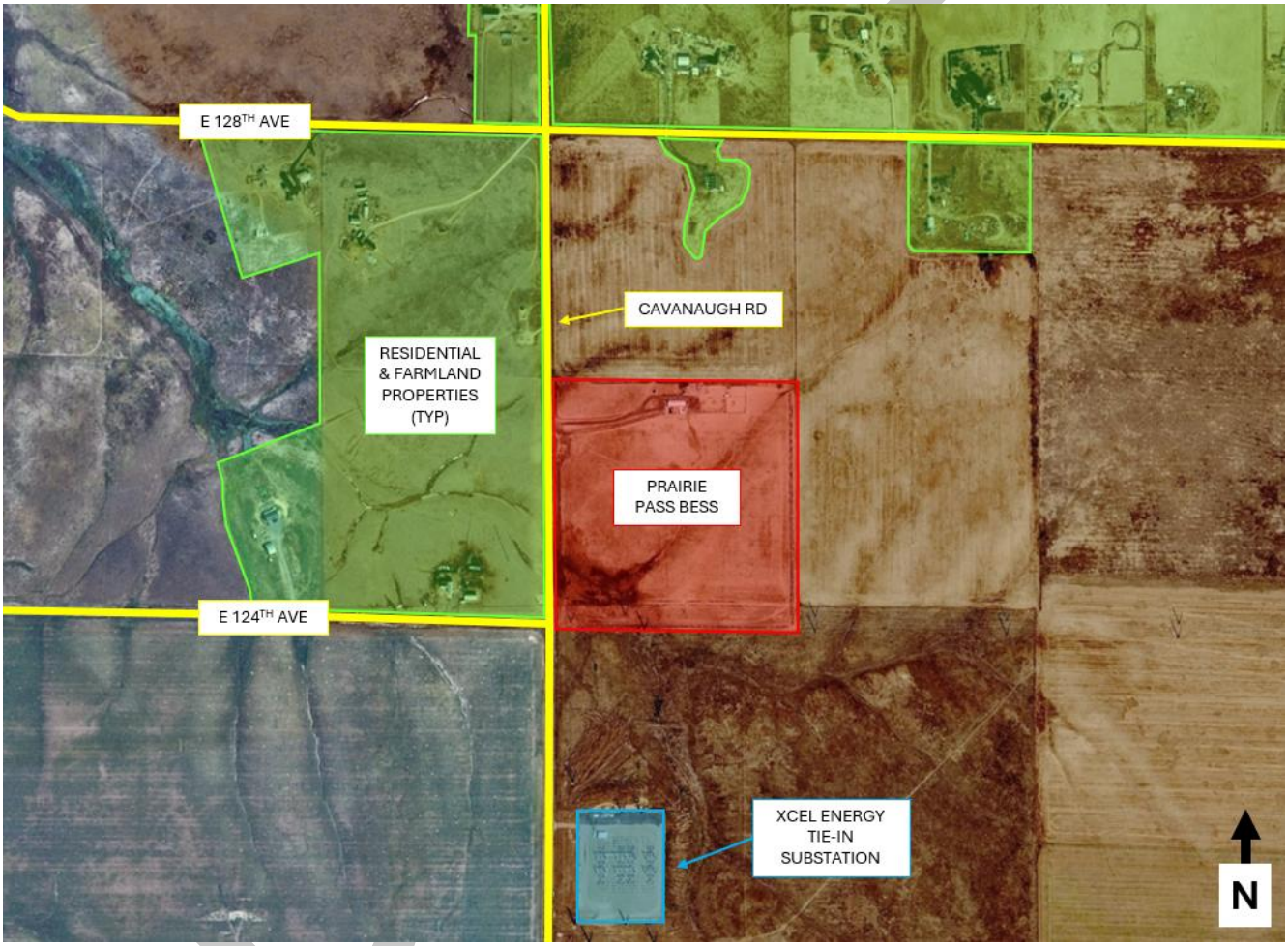


Figure 1 Site Overview

## 2.2 Energy Storage System Site Overview

The Prairie Pass BESS facility will have an estimated energy capacity of 300 MW / 1,200 MWh and tie into the existing Xcel Energy substation to the south. The Prairie Pass BESS will consist of 438 SBB 2.0 BESS enclosures and 146 PCS (at the time of its ultimate build), with auxiliary power and distribution equipment, and a new substation, as shown in Figure 2. The PCS contains inverters, transformers, and disconnects. BESS cabinets produce DC voltage, which is sent to the PCS for conversion to AC voltage. The PCS steps up the AC voltage for distribution to a point of interconnection (POI) with the grid, where it is distributed to end users.

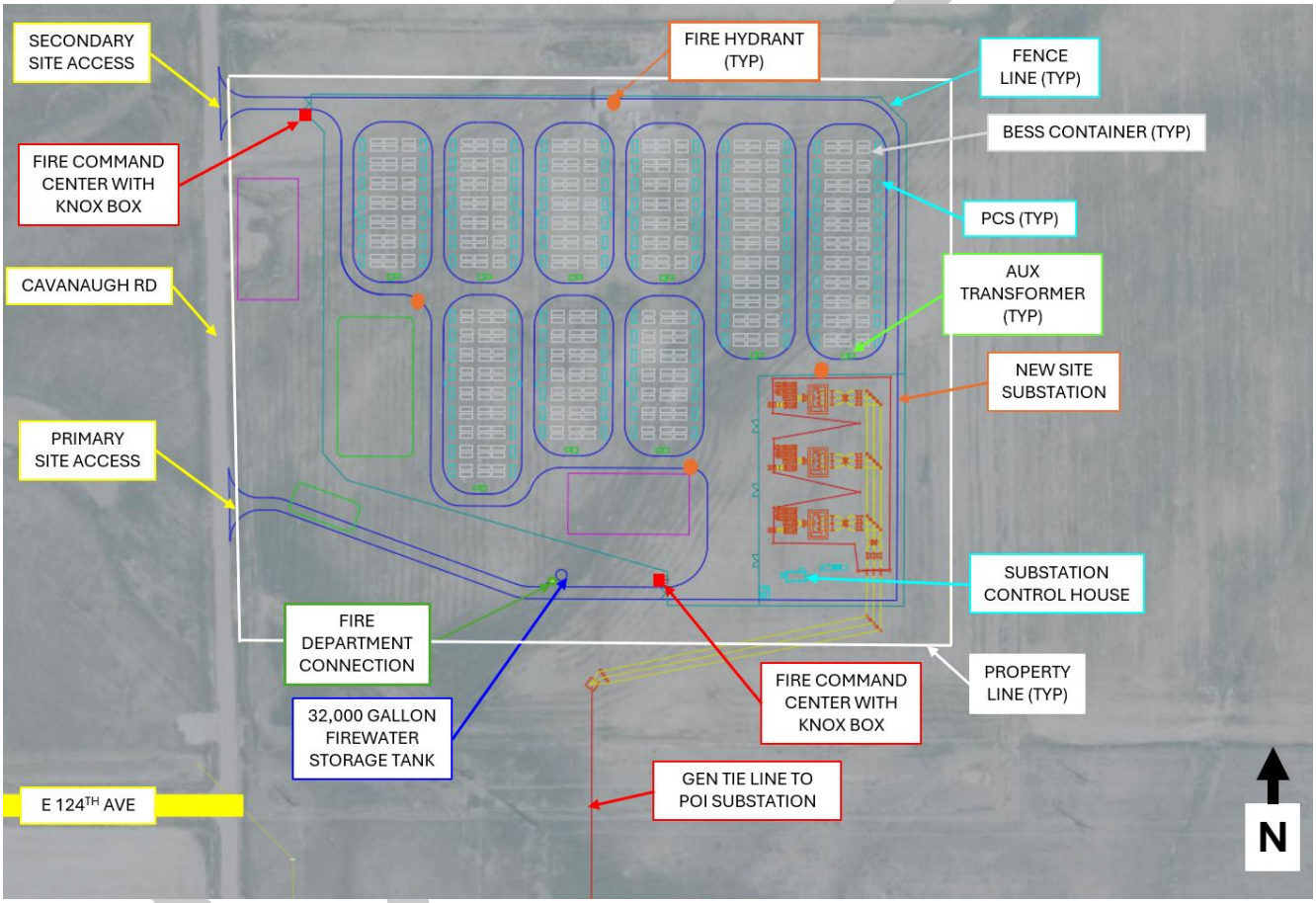


Figure 2 General Equipment Arrangement

# 3 MITIGATION

## 3.1 Battery Cabinet Equipment Overview

The SBB 2.0 is a fully integrated BESS cabinet (IP 55 rated) housing battery modules, power electronics, control systems, a battery/energy management system (BMS/EMS), a thermal management system (TMS), an explosion control ventilation system, a deflagration venting system, and a fire detection and notification system.

The smallest anatomy of the SBB 2.0 BESS is a lithium iron phosphate (LFP) cell. These cells are combined into modules which are combined into racks (12 modules per rack). The SBB 2.0 contains seven racks and additional protection, monitoring and isolation features powered by on-site auxiliary power.

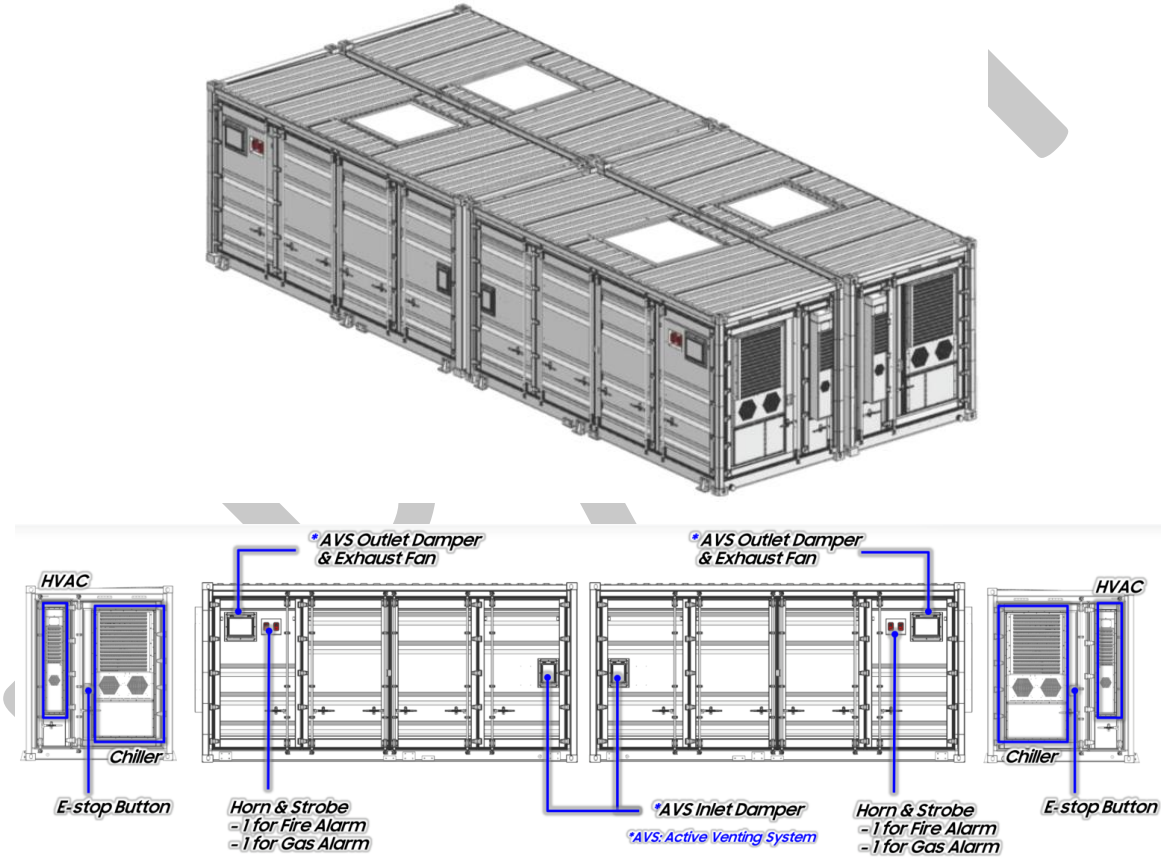


Figure 3. SBB 2.0 Components

## 3.2 Fire Protection Overview

### 3.2.1 Site Access

The site is accessible via two 20 ft wide access gates off Cavanaugh Road, as shown in Figure 1. Facility driving surfaces are provided and shown in Figure 2.

### 3.2.2 Fire Alarm and Detection System

Each SBB 2.0 is equipped with two smoke detectors and two combustible gas detectors that are monitored by an internal fire alarm control panel (FACP). The FACP monitors and controls the detection, notification, and ventilation systems for the BESS cabinets. Alarms received at the FACP will generate audible and visual alarms on the exterior of the trouble cabinet for local notification of all alarms. Two horn/strobes will be installed on the exterior of the cabinet: one horn/strobe (amber) for gas alarm and one horn/strobe (clear) for fire alarm.

The local BESS FACPs will aggregate to a master FACP in the site substation control enclosure. The master FACP will transmit signals to a 24/7 remote supervising station with a redundant communication via Modbus to the ROC.

### 3.2.3 Fire Command Center

The site will have a fire command center (FCC) which will be located at the southwest (primary) entrance to the BESS yard, as shown in Figure 2. The FCC will be outfitted with a remote fire alarm annunciator panel capable of illustrating smoke and gas. The annunciator will also display fault conditions on critical equipment such as the gas detectors, the explosion control system, and the thermal management system.

### 3.2.4 Fire Protection Water Supply

The facility will be equipped with a 32,000-gallon firewater storage tank located at the southwest (primary) entrance to the facility. A dedicated fire department connection will be located adjacent to the storage tank that is intended for the fire department to charge the dry fire hydrant loop on the interior of the facility. The proposed locations of the site fire hydrants are illustrated in Figure 2.

This water shall be used for the intermittent cooling of exposures to prevent propagation should this risk exist, not for offensive firefighting of fires involving battery cabinets.

## 3.3 Explosion Control and Prevention System

The SBB 2.0 BESS is equipped with an explosion control system and a deflagration venting system. If flammable gases are detected, the system activates a powered ventilation system, which includes air intakes, exhausts, and fans, as shown in Figure 3. The goal is to rapidly purge the enclosure with fresh air, keeping the concentration of any explosive gas mixture below 25% of its lower flammability limit (LFL). The entire system is monitored by the cabinet FACP. Each modular enclosure of the SBB 2.0 is equipped with a single deflagration

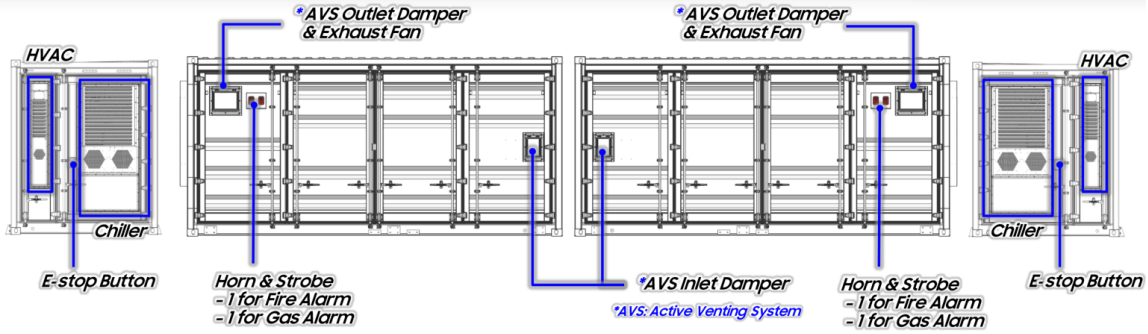


Figure 3. The deflagration venting system is designed to provide a controlled release of an overpressure condition caused by flammable gas ignition through a pressure sensitive panel on the roof of the enclosure. The deflagration panel is a passive system designed to relieve the deflagration overpressure upwards, away from nearby personnel or equipment.

## 3.4 Battery Management System

The BMS monitors, protects, and manages the BESS, ensuring battery health parameters are maintained for efficient and continual operation.

Table 2 BMS Functions

| | |
|---|---|
| Monitoring | The BMS continuously monitors key parameters such as voltage, current, temperature, and state of charge (SOC). |
| Protection | The BMS protects the battery from over-charging, over-discharging, over-current, over-temperature, and short circuits by isolating batteries that exceed predetermined operating parameters. |
| Balancing | The BMS helps to equalize the SOC across all cells. |
| Thermal Management | The BMS regulates the battery temperature by controlling heating or cooling systems, keeping the battery within the predetermined temperature range. |
| Power Control | The BMS regulates the power in and out of the batteries. |
| Communication | The BMS remotely communicates the status of monitored parameters and autonomously performed functions. |

## 3.5 Emergency Stop

An emergency stop (E-Stop) button is located on the side of the SBB 2.0, as shown in Figure 3. The operation of a BESS E-Stop isolates the BESS cabinet. Though isolated, the BESS batteries still maintain their SOC. Never approach a trouble cabinet for manual activation of the E-Stop.

# 4 PREPAREDNESS

## 4.1 Chemical Hazards

### 4.1.1 Cell Vent Gas

During a failure event, battery cells produce toxic gases that have the potential to be harmful to site personnel and first responders. If the failure spreads to other BESS components, it can produce additional toxic gases similar to those released during the combustion of ordinary manufactured products. Although outdoor BESS cabinets are not occupiable, site personnel and first responders can still be exposed to these toxic gases while operating near a BESS during a failure or fire event. In the event of a gas release, these toxic gases are expected to be diluted by the entrainment of outside air. Fire department personnel should wear the appropriate personal protective equipment (PPE), as outlined in Section 4.5.

### 4.1.2 Hydrogen

When the temperature of a cell reaches the venting stage, the primary hazard is the production of hydrogen gas (H2). The gas is odorless, colorless, and requires internal sensors or external meters for detection. H2 is flammable and lighter than air.

Table 3 Hydrogen Characteristics

| | |
|---|---|
| Appearance | Colorless Gas |
| Odor | Odorless |
| LFL | 4% |
| UFL | 76% |
| Auto Ignition | 500°C/932°F |
| 25% LFL | 1% or 10,000 ppm |
| Vapor Density | 0.069 (Air = 1) |

### 4.1.3 Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless gas, and requires internal sensors or external meters for detection. CO is produced during incomplete combustion and/or cell failure.

Table 4 Carbon Monoxide Characteristics

| | |
|---|---|
| Appearance | Colorless Gas |
| Odor | Odorless |
| LFL | 12.5 % |
| UFL | 74.2% |
| Auto Ignition | 607°C (1125°F) |
| 25% LFL | 3.125% or 31,250 ppm |
| Vapor Density | 0.97 (Air = 1) |

### 4.1.4 Transformer Dielectric Fluid

Dielectric fluid is used to insulate and cool site transformers such as PCS transformers and auxiliary power transformers. During a transformer failure, arcing and sustained fire can lead to heat retention in the windings and metal cabinet of the transformer, making this a persistent fire.

### 4.1.5 Refrigerant

Refrigerant is commonly used within the BESS thermal management system. Refrigerants are nonflammable under normal operating conditions. However, refrigerants are pressurized and can become combustible when mixed with air at elevated temperatures and pressures. Refrigerants can also release toxic by-products as a result of heating and decomposition. In high concentrations, refrigerants can also become an asphyxiation hazard.

Table 5 Refrigerant Characteristics

| | |
|---|---|
| Appearance | Colorless Liquid |
| Odor | Faintly Sweet |

## 4.2 Electrical Hazards

Shielded electrical hazards at the BESS facility include battery cabinets, inverters and transformers. Outer covers around the equipment eliminate casual contact and locks prevent access to energized areas.

Unshielded electrical hazards at the facility include exposed bus within a substation or overhead electrical connections to the surrounding grid. OSHA regulations require a minimum standoff distance of 10 feet from equipment and power lines. The minimum clearance should be increased by 4 inches for every 10kV over 50kV.

BESS products contain batteries that are ALWAYS energized and present an electrical hazard even when disconnected from an electrical source. The operation of breakers or E-Stops will serve to isolate trouble equipment. However, the operation of these devices will not remove stranded energy. Class C electrical hazards constantly exist at BESS facilities.

NFPA 1970 structural firefighting ensemble is not rated for arc flash hazards. Maintain a 10-foot standoff distance from any open doors on BESS cabinets.

E-field detectors are commonly used to identify potential AC hazards. These devices do not have the ability to

detect DC voltage from battery cabinets. Do not use E-field detectors within a BESS facility.

## 4.3 Thermal Runaway and Fire Hazards

Thermal runaway occurs when an electrochemical battery cell's temperature increases at an accelerating rate in an uncontrollable fashion sufficient to result in damage to the cell. The thermal runaway progresses when the cell's generation of heat is at a higher rate than the heat it can dissipate.

During thermal runaway, flammable gas and heat is produced. Failure may spread to adjacent cells or modules and the gas may ignite. Due to the high pressure at which these gases vent and the lack of a listed suppression agent, no attempt should be made to suppress this fire.

## 4.4 Explosion Hazard

The failure of a cell will begin with the venting stage; this is the pre-cursor to thermal runaway. Accumulation of flammable gases within a confined space, such as a BESS cabinet, can lead to an explosive atmosphere where the gas concentration falls within its upper and lower flammability limits. An explosion can occur when cell vent gases accumulate and contact a competent ignition source. While safety features are present to decrease the risk of an explosion, always assume that they are non-operational. Maintain an exclusion zone from the trouble equipment for the duration of the incident.

## 4.5 Recommended PPE

The recommended PPE is NFPA 1970 structural firefighting gear and the use of a self-contained breathing apparatus (SCBA) when exposed to respiratory hazards. All chemicals associated with the failure of BESS equipment and ancillary electrical components present dermal and respiratory hazards.

**Note:** The PPE recommendation is for emergency response operations and life safety. PPE recommendations for the post-fire removal of damaged modules will be defined by conditions found at the time of decommissioning. In addition, structural firefighting ensembles are not designed to provide protection from arc flash hazards.

## 4.6 BESS Subject Matter Expert

Typically, a BESS SME is a person or group familiar with the BESS product, the site layout and equipment, installation guides and manuals, the BMS architecture, passive and active protection systems, notification sequencing, and this ERP.

The BESS SME, equipment owner, and site operator play a critical role in guiding fire department personnel responding to a BESS emergency by coordinating the following:

- Ensuring security of the site and limiting access to only authorized personnel
- Ensuring accountability of non-fire department personnel inside the facility.
- Ensuring authorized personnel have PPE that is appropriate to their assigned role/task.
- Reviewing and interpreting BMS data including SOC, state of health (SOH), temperature, and status of equipment.

- Locating and isolating trouble equipment.
- Ensuring an exclusion zone has been established around the trouble equipment.
- Expanding exclusion zone in the event additional battery cabinets sustain alarms or direct fire impingement.
- Evaluating the status of the explosion control and prevention system.
- Identifying need for exposure protection.
- Leading post-incident operations.
- Administering decommissioning plan.

# 5 RESPONSE

## 5.1 Tactics

**DO NOT FORCE ENTRY**

Fire department personnel should not encroach within 100 feet of the facility fence line until the trouble battery cabinet has been identified.

Upon arrival, fire department incident command should contact the ROC at **512.861.1080** to obtain preliminary information including the following:

- Accountability
  - ☐ Were any personnel present at the site?
  - ☐ If personnel are present, what is the status of their accountability?
- Location of Equipment in Alarm
  - ☐ What is the type and location of the trouble equipment in alarm?
- Alarm Type
  - ☐ What type of alarm has generated the initial response and have any other alarms been received that would suggest conditions are deteriorating?
- Equipment Status
  - ☐ Has trouble equipment been isolated autonomously or manually?
- Explosion Control and Prevention Systems
  - ☐ What is the status of the explosion control and prevention system?

### 5.1.1 Life Safety

BESS facilities are normally not staffed and are observed and controlled remotely. However, facility personnel may be on-site periodically for inspection, testing and maintenance of equipment. Accountability shall be confirmed with the ROC.

Obvious line of sight rescues is the priority for responding fire department personnel. Fire department personnel shall not enter the facility for recovery operations. Where recovery operation is required, coordinate with the site operator prior to entering the facility.

Unescorted Rescue Considerations:

- Personnel located >100 feet from the battery cabinet in alarm
  - Outside explosion risk zone
- Personnel located <100 feet from battery cabinet in alarm
  - Inside explosion risk zone
- Personnel located near battery cabinet with door open
  - Possible equipment contact – shock or electrocution risk.

## 5.1.2 Community Air Monitoring

Establish air monitoring 100 feet downwind from the facility fence line to evaluate gas dispersion from failed equipment. Visually observe smoke plume to ensure it is not encroaching on exposure structures. If metering equipment detects increased levels of CO or VOC, consider evacuating affected areas.

## 5.1.3 Exclusion Zone

Once the trouble equipment is identified, establish a 100-foot exclusion zone. Expand the exclusion zone if failure conditions spread to adjacent equipment.


Figure 4 General 100' Exclusion Zone

## 5.1.4 Alarms Monitoring

Monitor input alarms from the FACP and the BMS for the trouble equipment. Receipt of additional alarms can indicate deteriorating conditions within the trouble equipment. A review of the BMS can indicate the possible origin location and further impacted internal equipment.

## 5.1.5 Isolation of Trouble Equipment

Confirm trouble equipment has been autonomously isolated. If recommended by the BESS SME, remotely isolate adjacent equipment.

**Fire Department personnel should never operate equipment or controls within the site. The BESS SME will coordinate all operational requests.**

**Never approach a trouble cabinet for manual activation of the E-Stop.**

## 5.1.6 Condition Monitoring

From outside the exclusion zone, visually and audibly monitor the conditions of the trouble cabinet. This may be done by the BESS SME in person or using remote monitoring from the ROC. Look for the presence of white gas, smoke, fire, and damage to the cabinet. Even if there are no visible or audible indications of failure, hazards to responding fire department personnel may still be present.

### 5.1.7 Exposure Assessment

Assess the adjacent equipment to determine if exposure protection is necessary. Evaluate the following:

- Are there any heat and/or cell temperature alarms in adjacent equipment?
  - Expand exclusion zone if adjacent equipment becomes involved.
- Based on thermal imaging camera readings, is there any increase in temperature on adjacent equipment?
- Is there any direct flame impingement on adjacent equipment?

### 5.1.8 Exposure Protection

Exposure protection should be considered if conditions warrant or if recommended by the BESS SME. While maintaining the exclusion zone, establish a continuous water supply. From outside the exclusion zone, using a rain down method, apply water in a fog pattern to cool the exposure equipment. Do not use a solid or straight stream to ensure fire department personnel safety and limit water intrusion into uninvolved equipment.

## 5.2 Incident Stabilization

### 5.2.1 Under Control

The incident may be considered under control when:

- Fire is contained to the equipment involved with no exposure concerns
- No new alarms have been generated
- The volume of fire or gas has decreased

Once the incident has been placed under control, establish continuous fire-watch for the facility through decommissioning.

# 6 RECOVERY

Recovery focuses on equipment assessments for determining repair, replacement, or restoration as part of the facility owner/operator's recovery plan. Implementation of the recovery plan is the responsibility of the facility owner/operator and should be overseen by the BESS SME. Fire department involvement in the recovery plan is at the discretion of the BESS SME and the facility owner/operator.

Typical facility recovery plans can include:

- Facility fire watch
- Post-incident equipment assessment including:
  - Grid connectivity
  - BMS status
  - Fire alarm status
  - Fire suppression status
  - Explosion control status
- Lock out/Tag out
- Decommissioning
- Installation of new equipment
- Recommissioning

# 7 REVISION SHEET

| Rev. No. | Date | Written By | Reviewed By | Approved By | Notes |
|---|---|---|---|---|---|
| | | | | | |

**This document is draft material. Significant changes are expected once all design and testing information for the SBB 2.0 has been provided.**

FIRE & RISK ALLIANCE

# Preliminary Hazard Mitigation Analysis

Prairie Pass

Battery Energy Storage System

Adams County, Colorado

Samsung SBB 2.0

Prepared for: Jupiter Power

April 14, 2026

Draft RevE

# REVISION SUMMARY

| Date | Revision | Reason for Issue | Developed By | Checked By | Approved by |
|---|---|---|---|---|---|
| | | | | | |

**This document is draft material. Significant changes are expected once all design and testing information for the SBB 2.0 has been provided.**

Fire & Risk Alliance

7620 Standish Place, Rockville, MD 20855

☎ (301) 658-3060 | ✉ info@fireriskalliance.com | 🌐 www.fireriskalliance.com

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# EXECUTIVE SUMMARY

Fire and Risk Alliance, LLC (FRA) performed a Hazard Mitigation Analysis (HMA) for the proposed Prairie Pass Battery Energy Storage System (BESS) facility located in Adams County, Colorado, in accordance with the 2024 International Fire Code (2024 IFC) and the 2023 Edition of NFPA 855, as required by the Brighton Fire Rescue District, the Authority Having Jurisdiction (AHJ). Adams County adopts the 2018 International Fire Code (2018 IFC) with amendments, the 2024 IFC and NFPA 855 apply specifically to the BESS. The IFC 2018 remains the governing fire code for all non-BESS designs and systems.

This HMA evaluates the Samsung Battery Box 2.0 (SBB 2.0) BESS intended for installation at the Prairie Pass BESS facility. It is intended to be used as a tool for the AHJ to assist in their review of the Prairie Pass BESS. The HMA includes a review of SBB 2.0, including its construction, design, and fire safety features.

***Note:*** *The SBB 2.0 is still under development, with listings, UL 9540A testing, and large-scale fire testing (LSFT) yet to be completed. As such, this HMA is preliminary in nature and is intended to highlight the current design features of the SBB 2.0 based on information provided by Samsung and the site-level safety features for the Prairie Pass BESS facility.* A discussion of listings, certifications, UL 9540A fire test data, and LSFT data will be included in future revisions of this analysis. *The HMA will be finalized and fixed with a PE-Stamp upon completion of the SBB 2.0 design and testing series.*

*Per AHJ request, the manufacturer provided UL9540/UL9540A test certifications and test reports will be submitted as part of final approval documentation.*

The Prairie Pass BESS will have an approximate capacity of 300 megawatts (MW) / 1,200 megawatt hours (MWh), utilizing 438 SBB 2.0 BESS at the time of its ultimate build. The SBB 2.0 is a pre-assembled, non-walk-in (NWI) style modular lithium-ion BESS with a capacity of 4,990 kilowatt hours (kWh). The Prairie Pass BESS is being designed to meet the 2024 IFC installation level requirements for an outdoor, NWI-style BESS. In addition, the SBB 2.0 installation at the Prairie Pass BESS is being designed to meet the HMA approval criteria in 2024 IFC §1207.1.6.2 and NFPA 855 §4.4.3, as follows:

1. Fires will be contained within unoccupied ESS rooms or areas for the minimum duration of the fire-resistance-rated separations [...].
2. Fires involving the ESS will allow occupants or the general public to evacuate to a safe location.
3. Deflagration hazards will be addressed by an explosion control or other system.

# 1. INTRODUCTION

FRA performed an HMA in accordance with the requirements of the 2024 IFC and NFPA 855. This HMA is being used to evaluate the SBB 2.0 lithium-ion BESS intended for installation at the Prairie Pass BESS facility located in Adams County, Colorado.

The Prairie Pass BESS will have an approximate capacity of 300 MW / 1,200 MWh, utilizing 360 SBB 2.0 BESS enclosures at the time of its ultimate build. The SBB 2.0 is a pre-assembled, NWI-style modular lithium-ion BESS with a capacity of 4,990 kWh. The HMA is intended to be used as a tool for the AHJ to assist in their review of the Prairie Pass BESS. The HMA includes a review of the SBB 2.0, including its construction, design, and fire safety features.

***Note:*** *A discussion and evaluation of listings, certifications, UL 9540A fire test data, and LSFT data will be included in future revisions of this analysis as these become available from the manufacturer.*

## 1.1 Purpose and Scope

The 2024 IFC and NFPA 855 require an HMA to evaluate the consequences associated with the following failure modes and others deemed necessary by the AHJ. Only single failure modes must be considered in this analysis [2024 IFC §1207.1.6.1 & NFPA 855 §4.4.2.1]:

1. A thermal runaway or mechanical failure condition in a single ESS unit
2. Failure of any battery (energy) management system or fire protection system within the ESS equipment that is not covered by the product listing failure mode effects analysis (FMEA).
3. Failure of any required protection system external to the ESS, including but not limited to ventilation (HVAC), exhaust ventilation, smoke detection, fire detection, gas detection or fire suppression system.

The AHJ is authorized to approve the HMA provided the analysis demonstrates all of the following [2024 IFC §1207.1.6.2 and NFPA 855 §4.4.3]:

1. Fires will be contained within unoccupied ESS rooms or areas for the minimum duration of the fire-resistance-rated separations [...].
2. Fires involving the ESS will allow occupants or the general public to evacuate to a safe location.
3. Deflagration hazards will be addressed by an explosion control or other system.

The framework for this analysis is as follows:

- **Review the SBB 2.0 design and testing data**: FRA reviewed the limited available information related to the construction, design, and fire safety features of the SBB 2.0 (see Section 2.0).
- **Review site specifications:** FRA reviewed the proposed Prairie Pass BESS site layout and installation including the area surrounding the BESS (see Section 4.0).
- **Prescriptive code compliance review:** The proposed site design and plans were reviewed for compliance with 2024 IFC and NFPA 855 requirements (see Section 5.0 and 6.0).
- **Hazard Mitigation Analysis:** The HMA evaluates the BESS failure modes as required by the IFC. The consequence-based analysis considers product-level and site-level barriers to prevent failure or reduce the consequences of a failure scenario. Based on the provided barriers, the consequences of a

failure event are analyzed. The IFC states acceptance criteria for which the AHJ is authorized to approve the HMA provided the consequences of the analysis meet or exceed the criteria (see Section 7.0).

- **Recommendations:** Recommendations are provided throughout the report where gaps exist between the site design and code requirements and where the consequences of failure modes exceed the approval criteria (see Section 8.0).

## 1.2 Referenced Code and Standards

The following codes and standards are applicable in Adams County, Colorado:

- 2018 International Fire Code (2018 IFC), with Adams County Amendments.
- 2018 International Mechanical Code (IMC), with Adams County Amendments.
- NFPA 22 Standard for Water Tanks for Private Fire Protection, 2022 Edition.
- NFPA 24 Standard for Installation of Private Fire Service Mains and Their Appurtenances, 2016 Edition.
- NFPA 25 Standard for the Inspection, Testing and Maintenance of Water-based Fire Protection Systems, 2017 Edition.
  NFPA 70 National Electric Code (NEC), 2017 Edition.
- NFPA 72 National Fire Alarm and Signaling Code, 2016 Edition.

Per Brighton Fire Rescue District AHJ direction, the following codes and standards will apply specifically to the regulation of BESS installations.

- 2024 International Fire Code (2024 IFC).
- NFPA 855, Standard for the Installation of Stationary Energy Storage Systems, 2023 Edition
- NFPA 68, Standard on Explosion Protection by Deflagration Venting, 2023 Edition.
- NFPA 69, Standard on Explosion Prevention Systems, 2019 Edition.
- UL 1973, Standard for Batteries for Use in Stationary, Vehicle Auxiliary Power and Light Electric Rail (LER) Applications, 2018.
- UL 9540, Standard for Safety of Energy Storage Systems and Equipment, 2020.
- UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 2019.

## 1.3 Referenced Materials

The following reference materials were reviewed as part of this analysis:

- Samsung SDI SBB 2.0 Tentative Specification dated July 11, 2025.
- Samsung SBB 2.0 Site Footprint Comparison dated August 20, 2025.
- Samsung SBB 2.0 Electrical Drawings dated July 10, 2025.
- Prairie Pass BESS General Arrangement dated February 17, 2026.

## 1.4 Limitations

At the request of Jupiter Power, FRA performed an HMA in accordance with the requirements of the IFC for the Prairie Pass BESS facility located in Adams County, Colorado. The scope of services performed during this analysis may not adequately address the needs of other users of this report, and any re-use of this report or its conclusions presented herein are at the sole risk of the user. The opinions and comments formulated during this assessment are based on observations and information available at the time of the analysis, which has been provided to FRA by others. No guarantee or warranty as to future performance of any reviewed condition is expressed or implied.

As the Prairie Pass BESS facility and the SBB 2.0 product are still under development, this HMA is preliminary in nature and is intended to highlight the current design features of the SBB 2.0 based on information provided by Samsung and the site level safety features for the Prairie Pass BESS facility. The HMA will be finalized upon completion of the SBB 2.0 design and testing series. It is also assumed that the BESS and its associated equipment, as well as all fire protection systems, will be installed, commissioned, inspected, tested, and maintained as required by the manufacturer(s), the IFC, and/or other applicable codes and standards throughout the lifetime of the BESS. The accuracy and applicability of this report's findings are subject to change based on changes to the site. The authors, engineers, and firms involved in the creation of this report assume no liability for performance, errors, omissions, or failures that may arise during construction or operation, and no warranty of fitness for a particular purpose is implied.

# 2. SBB 2.0 DESCRIPTION

The SBB 2.0 is a fully integrated BESS specifically designed for outdoor ground-mounted applications, as shown in Figure 1. Each enclosure houses battery modules, power electronics, control systems, a battery/energy management system (BMS/EMS), a thermal management system (TMS), an explosion control ventilation system, and a deflagration venting system. Each modular cabinet of the SBB 2.0 measures 20 ft long, 8 ft deep, and 9.5 ft high and weighs approximately 82,000-84,000 lbs. The SBB 2.0 cabinets arrive at the site fully assembled, needing only their power and communication cables to be connected. Below is a brief description of the SBB 2.0, including its components and fire safety features. For a more detailed discussion of the SBB 2.0 components, their location, functionality, and purpose, refer to the referenced Samsung documentation.

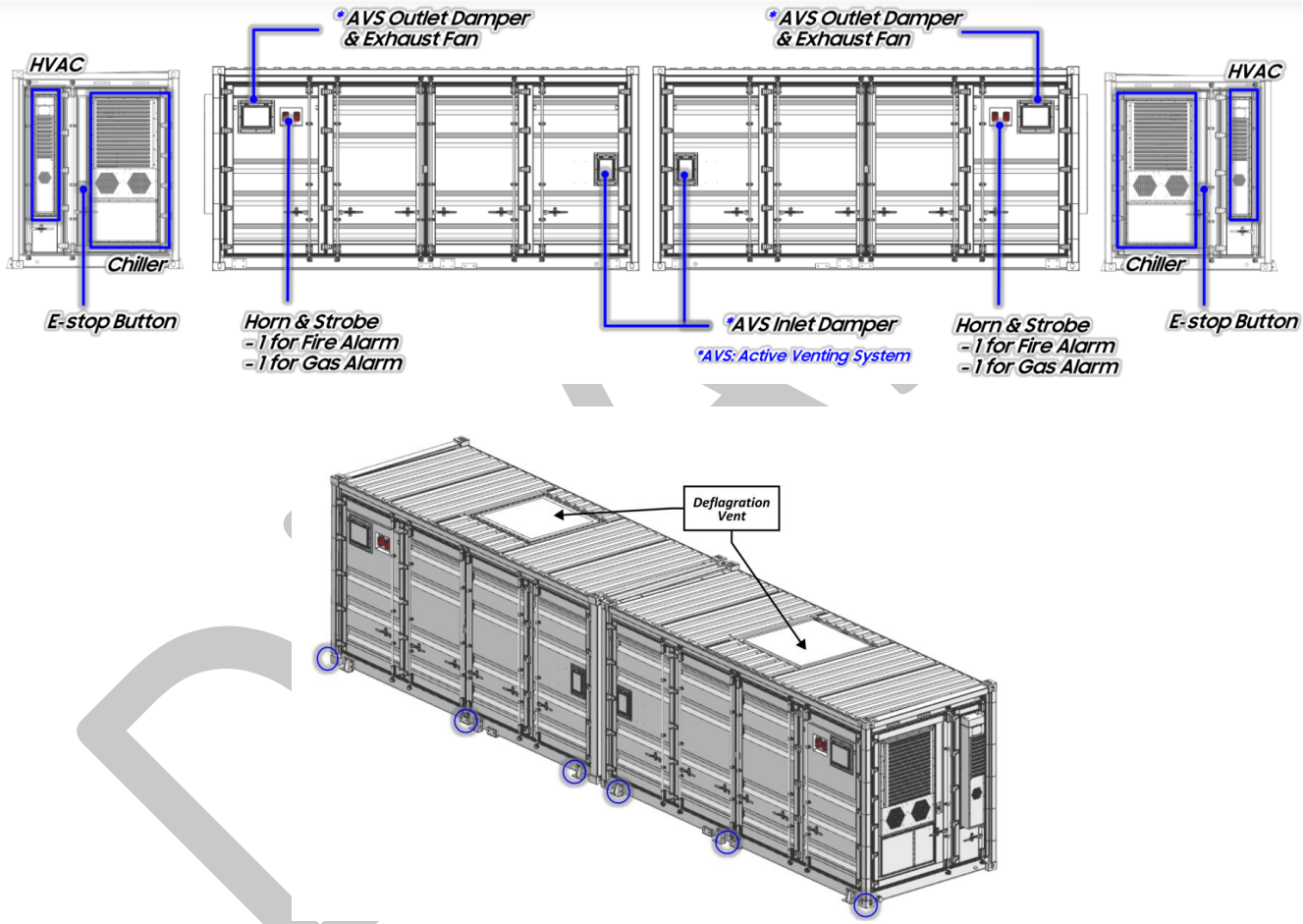



*Figure 1. SBB 2.0 Components*

## 2.1 Cabinet Layout

The SBB 2.0 is intended for outdoor installations, ground-mounted to a foundation or base strong enough to support the weight of the equipment and anchor loads (including concrete pads, grade beams, etc.). The typical SBB 2.0 layout configuration and spacing are illustrated in Figure 2.

Each SBB 2.0 modular cabinet is contained within an IP55 enclosure that prevents particles and water from coming into contact with the battery modules and power electronics. The cabinets cannot be entered, but are provided with equipment access doors. This cabinet-style approach allows for the system to be easily maintained and serviced from outside the cabinets, thus eliminating the need for personnel to enter an enclosure, structure, building, or cabinet to perform those activities. The cabinets are equipped with exterior equipment access doors on one side of the enclosures. Since the BESS cabinets do not permit walk-in access, they are considered a NWI-style BESS; they are not defined as occupied buildings or structures per the IFC. Each SBB 2.0 houses modules containing lithium iron phosphate (LFP) cells, safety systems, communications, controls, the AC load panel, and climate control.

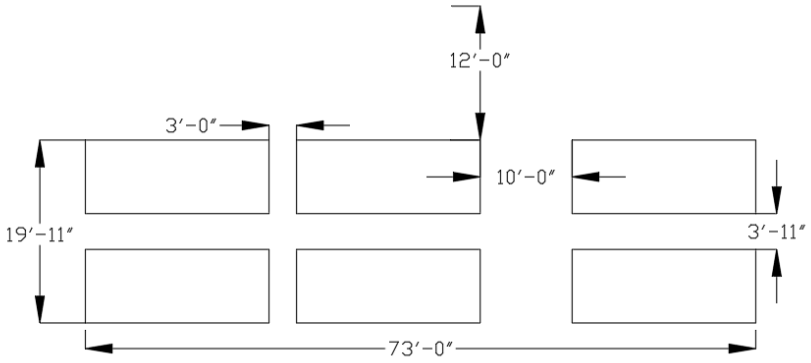



*Figure 2. SBB 2.0 Typical Layout and Spacing*

## 2.2 Cells, Modules, and Racks

The cell is the smallest anatomy of the battery assembly. The SBB 2.0 utilizes an LFP prismatic cell rated 263-amp hour (Ah) with a nominal voltage of 3.2 volts (V). The cell is approximately 5.4 inches in height, 8.1 inches in length, 2.1 inches in depth, and weighs 10.9 in pounds.

The battery module is the second smallest level of the BESS anatomy. The SBB 2.0 module has a 34S2P cell configuration (total 68 LFP cells), a nominal capacity of 263 Ah, a nominal voltage of 217 V, and a nominal energy capacity of 57.2 kWh. Each module has overall dimensions of 0.6 feet in height, 2.3 feet in length, 6.9 feet in depth, and weighs 930 pounds. Battery modules are installed in racks (twelve modules per rack), with a total of seven racks per modular enclosure.

## 2.3 Thermal Management System Components

The SBB 2.0 is equipped with a TMS consisting of a heating, ventilation, and air conditioning unit (HVAC) and chiller. The TMS maintains the battery modules at an optimum operating temperature.

## 2.4 Battery Management System

The SBB 2.0 is equipped with a BMS that can identify possible risks to the battery system by monitoring battery cell temperature, voltage, current, and dry contact switching value in real-time. The BMS function is intended to mitigate the potential of thermal runaway by preventing the risks of overcharge, over-discharge, over-

temperature, and overcurrent. It provides thermal runaway risk protection by safely disconnecting the batteries in case of fault conditions.

Each SBB 2.0 rack is equipped with a battery control unit (BCU) that performs monitoring and control functions for the individual rack. The BCUs report to the control BMS in each cabinet, which reports to the overall system BMS for control and monitoring.

## 2.5 System Controller and Monitoring

The BMS integrates with and monitors external systems such as the power conversion system (PCS), TMS, and the fire alarm and detection system. The BMS monitors dry contacts from the relay modules, and when safety parameters are exceeded, the BMS sends the necessary safety-related commands to the equipment's associated controller.

## 2.6 Electrical Fault Protection Devices

The SBB 2.0 is equipped with a layer of electrical fault protection devices designed to protect the battery cells from abnormal electrical conditions. These include:

- Circuit Breakers: Molded case circuit breakers and mini circuit breakers are provided to protect from overcurrent (overloads) and short circuits by interrupting the flow of electricity.
- DC Fuse: Each BCU is equipped with a high-speed DC fuse. These fuses are one-time-use-only safety devices that can interrupt the flow of an overcurrent in the battery module during an abnormal electrical event.
- Surge Protection (Lightning Protection): A surge protection device (SPD) provides overvoltage protection to the SBB 2.0. The surge protection is designed for the AC system and can prevent an overvoltage to the system, providing protection from lightning strikes. The system will be equipped with DC surge protection.

## 2.7 Explosion Control System

The SBB 2.0 BESS is equipped with an explosion control system designed by Samsung in accordance with NFPA 69, *Standard on Explosion Prevention Systems*, and a deflagration venting system designed in accordance with NFPA 68, *Standard on Explosion Protection by Deflagration Venting*. The explosion control system is a combustible gas concentration reduction system that consists of gas detection, exhaust fans, and make-up air inlet(s). The system is designed to activate upon a 10% LEL gas detector alarm to ventilate the SBB 2.0 and maintain the flammable gas concentration of the cabinet below 25% LFL, as required by NFPA 69. The signal will latch, meaning that the ventilation will continue until a manual reset occurs.

Each SBB2.0 module enclosure is equipped with a single deflagration vent located on the roof of the enclosure, as illustrated in Figure 1. The deflagration venting system is designed to provide a controlled release of an overpressure condition caused by flammable gas ignition through a pressure sensitive panel on the roof of the enclosure. The system is designed to keep the enclosure pressure under two-thirds of the designed ultimate enclosure strength, in accordance with the NFPA 68 performance requirements. The deflagration panel is a passive system designed to relieve the deflagration overpressure upwards, away from nearby personnel or equipment.

### 2.7.1 Explosion Control System Evaluation

A professional engineer will review, and validation modeling will be performed for the explosion control system and deflagration venting system. These evaluations will be included in future revisions of this analysis.

## 2.8 Fire Detection

Each SBB 2.0 is equipped with two smoke detectors and two combustible gas detectors that are monitored by an internal fire alarm control panel (FACP). The FACP monitors and controls the detection, notification, and ventilation systems for the BESS cabinets. Alarms received at the FACP will generate audible and visual alarms on the exterior of the trouble cabinet for local notification of all alarms. Two horn/strobes will be installed on the exterior of the cabinet: one horn/strobe (amber) for gas alarm and one horn/strobe (clear) for fire alarm. In addition, a site-FACP will be provided to monitor the individual BESS FACPs for alarm, trouble, gas detector alarm, and gas detector fault. Fire alarm signals will be transmitted to the Jupiter Power Remote Operation Center (ROC).

## 2.9 Product Listings

The SBB 2.0 and its subcomponents will be certified or listed to multiple national and international product design standards. These certifications and listings will apply to the cells, battery modules, inverters, power electronics, control systems, integration between the BESS and the grid, as well as the BESS as a whole. As noted previously, the development of the SBB 2.0 is still underway, with testing and certifications yet to be completed. A summary of the SBB 2.0 product certifications and listings will be included in future revisions of this analysis.

# 3. SBB 2.0 LARGE-SCALE FIRE TESTING

## 3.1 UL 9540A Testing

UL 9540A provides a method to evaluate thermal runaway and fire propagation of a lithium-ion BESS at the cell level, module level, unit level, and installation level. The data generated from the test method can be used to determine the fire and explosion protection systems/features required for a BESS installation. This includes, but is not limited to, thermal runaway characteristics of the cell; cell thermal runaway gas composition; the fire propagation potential from cell to cell, module to module, and unit to unit; products of combustion; heat release rate; smoke release rate; and performance of fire protection systems.

Initially, cells are tested to determine if further testing is required. Module level testing is required if the following observations are recorded during cell level testing:

- Thermal runaway is induced in the cell; or
- The cell vent gas is flammable in air when tested in accordance with ASTM E918.

Module level testing examines the module design, heat release rate, gas generation, external debris, and flying debris hazards. Unit level testing is required if the following observations are recorded during module level testing:

- Module design is unable to contain thermal runaway; or
- Cell vent gas is flammable.

Unit level testing assesses the BESS design of the unit, heat release rate, gas generation and composition, deflagration and flying debris hazards, BESS and wall surface temperatures, heat flux at the target walls, and reignition. Installation level testing is required if the following observations are recorded during unit level testing:

- Flaming is observed outside the initiating BESS unit.
- Surface temperature of the modules in the adjacent BESS unit exceeds the temperature at which cell level gas venting occurred.
- Surface temperatures of wall surfaces increase more than 97ºC from ambient and,
- Explosion hazards are observed.

Installation level testing assesses the effectiveness of fire protection systems installed as mitigation methods for the BESS in its intended installation configuration. The SBB 2.0 cabinet intended for installation at the Prairie Pass BESS facility will undergo a UL 9540A prior to site construction.

***Note:*** *The SBB 2.0 is still under development, with listings, UL 9540A testing, and large-scale fire testing (LSFT) yet to be completed. It is anticipated that the SBB 2.0 will be tested under UL 9540A:2026, 6th Edition. This edition allows unit level test to be skipped if an installation level LSFT is conducted. Upon completion of the UL9540A test series, the test data will be reviewed and included as part of the finalized HMA.*

*Per AHJ request, the manufacturer provided UL9540/UL9540A test certifications and test reports will be submitted as part of final approval documentation.*

## 3.2 Large-Scale Fire Testing

A LSFT aims to simulate the worst-case fire scenario within a laboratory setting. The test setup is customized for the BESS cabinet and configured to reflect the final installed configuration of the BESS, with sensors configured throughout the cabinets and on instrumented walls to represent immediate surrounding enclosures, buildings, or exposure hazards.

The test procedure designates an initiating BESS cabinet and induces forced failure using a burner, heater, or igniter. The resulting developed fire condition is evaluated for its potential impact on the surrounding target cabinets and sensors. The collected data during the LSFT may include, but is not limited to, temperature, heat flux, fire propagation timing, and smoke collection. The intent of the LSFT is to evaluate the passive BESS cabinet design performance during a worst-case scenario, assuming failure of all mitigation measures. A passing LSFT criterion should demonstrate that the initiating cabinet fire does not propagate to the surrounding target cabinets, without reliance on manual suppression or exposure cooling.

The SBB 2.0 cabinet intended for installation at the Prairie Pass BESS facility will undergo an LSFT as part of the product listing process and prior to field installation.

# 4. PRAIRIE PASS BESS SITE

The Prairie Pass BESS facility is located at East 124th Avenue and Cavanaugh Road in Adams County, Colorado, surrounded predominantly by farmland and limited residential properties, as shown in Figure 3. The facility is accessible via two entrances off Cavanaugh Road, on the northwest and southwest corners of the yard.

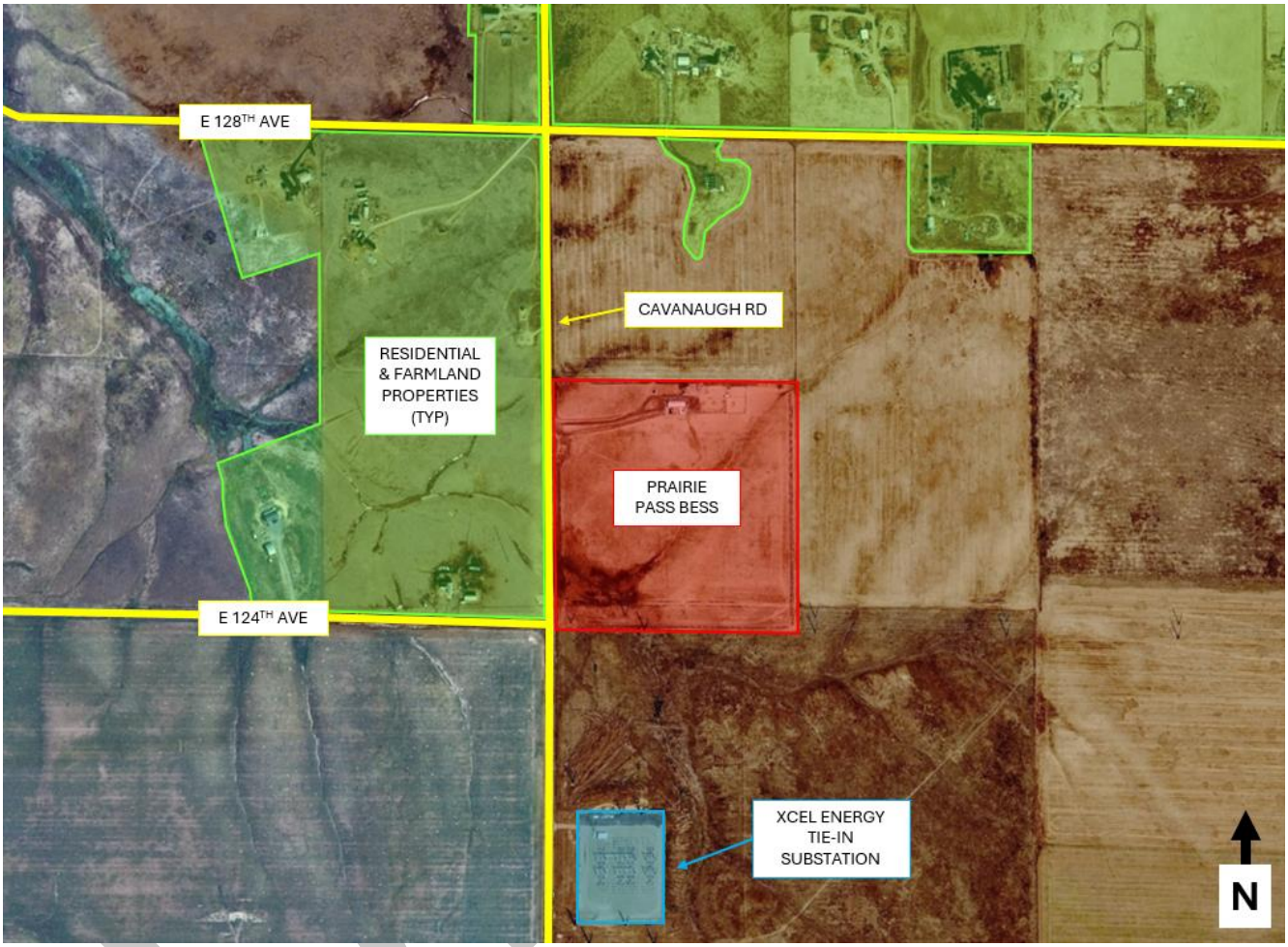



*Figure 3. Prairie Pass BESS Aerial Map*

The Prairie Pass BESS is expected to consist of approximately 438 SBB 2.0 BESS enclosures and 146 PCS (at the time of its ultimate build) with auxiliary power and distribution equipment and a new substation, as shown in Figure 4. The facility will have an estimated energy capacity of 300 MW / 1,200 MWh and tie into the existing Xcel Energy substation to the south.

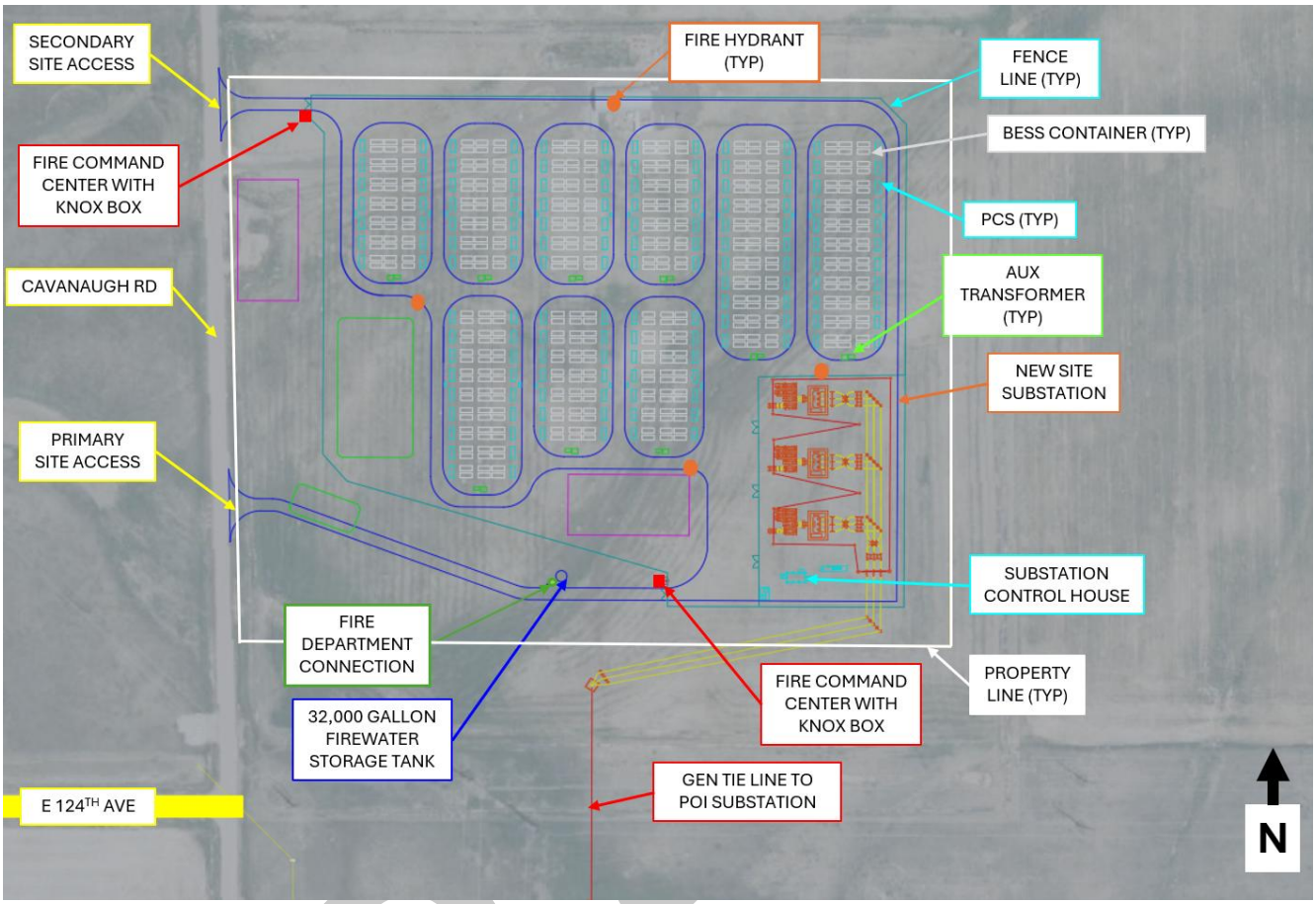



*Figure 4. Prairie Pass BESS Site Plan*

## 4.1 Site Level Fire Safety Features

Based on a review of the drawing provided and the SBB 2.0 product documentation, the Prairie Pass BESS will have a number of site-level fire safety systems and features as described in the following sections.

### 4.1.1 BESS Monitoring and Emergency Notification

Per information provided by Jupiter, the fire alarm control panels will transmit signals to the Jupiter Power ROC. The Jupiter ROC serves as the monitoring station for the site equipment, including the BESS cabinets. If an alarm, trouble, or supervisory signal is received, the necessary parties will be contacted for response and remediation.

### 4.1.2 Periodic Maintenance

It is anticipated that the Prairie Pass BESS will be periodically inspected and serviced by trained operation and maintenance (O&M) service personnel in accordance with Samsung documentation and guidance.

## 4.1.3 BESS Security

Based on the drawing provided, a chain-link fence will be installed around the perimeter of the Prairie Pass BESS to prohibit unauthorized access to the SBB 2.0 BESS. The secured area around the Prairie Pass BESS will include two 20 ft wide access gates at the northwest and southwest ends of the facility.

## 4.1.4 Fire Department Access

Brighton Fire Rescue District Station 54 is the closest fire department to the Prairie Pass BESS facility and is approximately 8.5 miles away from the BESS installation. The site is accessible via two 20 ft wide access gates off Cavanaugh Road. Knox box will be provided at the primary and secondary access gates.

***Note:*** *The 2018 IFC, as amended by Adams County, requires 24 ft wide fire department access roads. Per AHJ approval, the BESS facility is permitted to be served by 20 ft wide fire department access roads, as aerial apparatus is not expected to be used for BESS facility response.*

## 4.1.5 Fire Water Supply

The facility will be equipped with a 32,000-gallon firewater storage tank located at the southwest (primary) entrance to the facility, designed and monitored in accordance with 2018 IFC and NFPA 22. A dedicated fire department connection will be located adjacent to the storage tank that is intended for the fire department to charge the manual dry fire hydrant loop on the interior of the facility, designed in accordance with NFPA 24. The fire water supply system will be inspected, tested, and maintained in accordance with NFPA 25. The proposed locations of the site fire hydrants are illustrated in Figure 4.5

***Note:*** *Typical BESS firefighting response procedures do not require or recommend offensive firefighting tactics to manually suppress a BESS fire. If manual firefighting tactics are used, water is considered the preferred agent for managing lithium-ion battery fires, suppressing nearby combustibles, cooling nearby exposures, and controlling smoke. Other fire suppression methods, such as gaseous agents (CO2, Halon), dry chemical suppressants, or foams, are unlikely to be effective.*

*The dry manual fire hydrant loop is still in design. Per AHJ request, the volume of the manual dry loop will be considered in the sizing of the firewater storage tank. A well pump is proposed to meet the required NFPA 22 fill time of 8 hours, contingent upon the results of a well study. Should the well study prove insufficient, a supplemental water truck supply agreement will be established as a contingency or if requested by the AHJ.*

## 4.1.6 Fire Alarm and Notification System

Each SBB 2.0 is equipped with two smoke detectors and two combustible gas detectors that are monitored by an internal FACP. The FACP monitors and controls the detection, notification, and ventilation systems for the BESS cabinets. Alarms received at the FACP will generate audible and visual alarms on the exterior of the trouble cabinet for local notification of all alarms. Two horn/strobes will be installed on the exterior of the cabinet: one horn/strobe (amber) for gas alarm and one horn/strobe (clear) for fire alarm. The local BESS FACPs will be networked to a master FACP in the substation control house enclosure that will transmit alarm and trouble signals to a supervising station. A remote Fire Command Center (FCC) will be provided at the southwest (primary) entrance and northeast (secondary) entrance, which includes a remote annunciator panel that can

indicate the location of the BESS cabinet in alarm. The site fire alarm system will be designed, installed, and commissioned in accordance with NFPA 72.

## 4.2 Permanent Public Exposure Hazards

All permanently installed public exposures (lot lines, public ways, buildings, stored combustible materials, hazardous materials, high-piled stock, and exposure hazards not associated with electrical grid infrastructure) are greater than 100 ft from the nearest SBB 2.0. As described in the site drawing and aerial map, clearance distances to site equipment are summarized in Table 1, and clearance distances to public exposures are summarized in Table 2.

*Table 1. Clearances to Site Equipment*

| Exposure | Distance |
|---|---|
| Power Conversion Systems | 10 ft |
| Auxiliary Power and Distribution Panels | 12 ft |
| Substation Main Power Transformers | 75 ft |
| Site Property Line | 100 ft |
| Substation Control House Enclosure | 270 ft |
| Substation Storage Container | 270 ft |

*Table 2. Distance to Permanent Public Exposures*

| Exposure | Approximate Distance |
|---|---|
| Cavanaugh Road | 245 ft |
| Propane Tank / Oil Pump to the Northwest | 530 ft |
| Residential Property to the Southwest | 880 ft |
| Residential Properties to the North | 1,180 ft |
| Xcel Energy Substation | 1,270 ft |

# 5. BESS SITE DESIGN CODE ANALYSIS

As required by the Brighton Fire Rescue District, the Authority Having Jurisdiction (AHJ), the proposed Prairie PASS BESS facility will be regulated in accordance with the 2024 IFC and NFPA 855. The IFC 2018 remains the governing fire code for all non-BESS designs and systems. As such, this code analysis relating to BESS site installation has been performed in accordance with 2024 IFC and NFPA 855.

Compliance with 2024 IFC §1207, Electrical Energy Storage Systems, is required when a lithium-ion BESS installation has an energy capacity greater than 20 kWh [IFC §1207.1.3 & Table 1207.1.3]. Similarly, compliance with NFPA 855 is required for lithium-ion BESS installations with an energy capacity greater than 20 kWh [NFPA 855 §1.3 & Table 1.3]. Since each individual BESS has a capacity greater than 20 kWh, compliance with 2024 IFC §1207 and NFPA 855 is required.

***Note:*** *The code analysis applies only to site design elements of the Prairie Pass BESS pertaining to fire and life safety. Other aspects of the site design, including the electrical or structural design, are outside the scope of this review. In addition, as this is a site design review, elements related to the installation itself are also outside the scope of this analysis. It is assumed that the BESS and its associated equipment, as well as all fire protection systems, will be installed, commissioned, inspected, tested, and maintained as required by the manufacturer(s), the IFC, and/or other applicable codes and standards.*

*For outdoor BESS installations, the ESS code requirements are based on the proximity and location of the BESS equipment from adjacent lot lines and other exposures. The two outdoor installation classifications are as follows:*

- **Remote Locations:** BESS located more than 100 ft from buildings, lot lines that can be built upon, public ways, stored combustible materials, hazardous materials, high-piled stock, and other exposure hazards not associated with electrical grid infrastructure.
- **Locations Near Exposures:** BESS locations that do not comply with remote outdoor location requirements.

The Prairie Pass BESS facility is proposed to maintain 100 ft separation from lot lines, buildings, public ways, stored combustible materials, and high-piled stock. As such, the code analysis will consider a remote location installation classification, and is summarized in Table 3. Other IFC requirements that apply to all facilities regulated by the IFC, BESS, or otherwise, include fire apparatus access roads [IFC §503], key boxes [IFC §506], and fire protection water supplies [IFC §507].

*Table 3. Outdoor Remote BESS Installation Requirements*

| Requirement | Compliance Required | 2024 IFC Code Reference | NFPA 855 |
|---|---|---|---|
| **All ESS installations** | Yes | §1207.4 | §4.1 - §4.7 |
| **Size and separation** | No | §1207.5.1 | §9.4.2 |
| **Maximum allowable quantities** | No | §1207.5.2 | §9.4.1 |
| **Smoke and automatic fire detection** | Yes | §1207.5.4 | §9.6.1 |
| **Fire suppression systems** | Yes (Note B) | §1207.5.5 | §9.6.2 |
| **Maximum enclosure size** | Yes | §1207.5.6 | §9.5.2.4 |
| **Vegetation control** | Yes | §1207.5.7 | §9.5.2.2 |
| **Means of egress separation** | No | §1207.5.8 | §9.5.2.6.1.7 |
| **Clearance to exposures** | No | §1207.8.3 | §9.5.2.6.1 |
| **Technology Specific Protection – Lithium-Ion Batteries** | | | |
| **Explosion control** | Yes | §1207.6.3 | §9.6.5.6 |
| **Thermal runaway** | Yes (Note A) | §1207.6.5 | §9.6.5.5 |
| **Other IFC Requirements – All Facilities** | | | |
| **Fire Apparatus Access Roads** | Yes | 2018 IFC §503 | - |
| **Key Boxes** | Yes | 2018 IFC §506 | - |
| **Fire Protection Water Supply** | Yes | 2018 IFC §507 | §9.6.3 |

# 5.1 All ESS Installations

2024 IFC §1207.4 and NFPA 855 §4.1-§4.7 apply to all ESS installations: indoors, outdoors, stationary, or mobile. Only the fire and life safety general installation requirements applicable to the site design of a remote, outdoor NWI-style BESS installation are summarized in the following sections. Requirements unrelated to fire and life safety or pertaining to other types of BESS installations, such as indoor, are not discussed. These include fire-resistance-rated separations, seismic and structural design, occupied work centers, open rack, and walk-in units.

## 5.1.1 Electrical Disconnect

2024 IFC §1207.4.1 requires placards or directories to be installed at the location of the main electrical service disconnecting means, indicating the location of the stationary storage battery system disconnecting means in accordance with the NFPA 70 when the ESS disconnecting means is not within sight of the main electrical service disconnecting means. Appropriate signage and location will be examined as part of the final HMA.

## 5.1.2 Working Clearances

2024 IFC §1207.4.2 requires access and working space to be provided and maintained about all electrical equipment to permit ready and safe operation and maintenance of such equipment in accordance with NFPA 70 and the manufacturer's instructions.

## 5.1.3 Vehicle Impact Protection

2024 IFC §1207.4.5 requires impact protection to be provided in accordance with IFC §312 where ESS are subject to impact by a motor vehicle, including forklifts. Vehicle impact protection is not necessary as the Prairie Pass BESS is a secure installation that does not have personnel on site each day. In addition, there is no motor vehicle traffic moving through the site other than the occasional maintenance vehicle (re. there are no public roads/ways on the site). Therefore, vehicle impact protection is not necessary for the Prairie Pass BESS. As such, the Prairie Pass BESS site design complies with the IFC vehicle impact protection requirement.

## 5.1.4 Combustible Storage

2024 IFC §1207.4.6 and NFPA 855 §4.5 do not permit combustible materials to be stored in ESS rooms, areas, or walk-in units. The SBB 2.0 is an NWI-style BESS that is unoccupiable, with all internal components accessible via exterior doors. It does not have free open space within the SBB 2.0 cabinet to store additional combustible materials. As such, the Prairie Pass BESS site design complies with the IFC combustible storage requirement.

## 5.1.5 Toxic and Highly Toxic Gases

2024 IFC §1207.4.7 and NFPA 855 §4.6.11 require ESS that have the potential to release toxic and highly toxic gas during charging, discharging, and normal use conditions to be provided with a hazardous exhaust system in accordance with IMC §502.8. The proposed BESS lithium-ion cells do not vent toxic or highly toxic gases (or any gases) during charging, discharging, or normal use conditions.

## 5.1.6 Signage

2024 IFC §1207.4.8 and NFPA 855 §4.7.4 require approved signs to be provided on or adjacent to all entry doors for ESS rooms or areas and on enclosures of ESS cabinets and walk-in units located outdoors, on rooftops, or in open parking garages. Signs designed to meet both the requirements of this section and NFPA 70 are permitted. The signage must include the following or equivalent:

1. “ENERGY STORAGE SYSTEM,” “BATTERY STORAGE SYSTEM,” “CAPACITOR ENERGY STORAGE SYSTEM” or the equivalent.
2. The identification of the electrochemical ESS technology present.
3. “ENERGIZED ELECTRICAL CIRCUITS”.
4. Where water reactive electrochemical ESS are present, the signage shall include “APPLY NO WATER”.
5. Current contact information, including phone number, for personnel authorized to service the equipment and for the fire mitigation personnel required by §1207.1.6.1.

Appropriate signage and location will be examined and reviewed as part of the final HMA.

## 5.1.7 Security of Installation

2024 IFC §1207.4.9 and NFPA 855 §4.7.6 requires rooms, areas, and walk-in units in which electrochemical ESS are located to be secured against unauthorized entry and safeguarded in an approved manner. The proposed Prairie Pass BESS facility will be provided with security fencing and security cameras.

# 5.2 Remote Outdoor ESS Installations

## 5.2.1 Size and Separation

2024 IFC §1207.5.1 and NFPA 855 §9.4.2 require electrochemical ESS to be segregated into groups not exceeding 50 kWh and each group to be separated by a minimum of 3 ft from other groups. However, this requirement does not extend to remote outdoor installation classification.

***Note:*** *Regardless of the remote installation classification. The Samsung SBB 2.0 will undergo the UL 9540A test series. The result of the test will be included as part of the final HMA.*

## 5.2.2 Maximum Allowable Quantities

2024 IFC §1207.5.2 and NFPA 855 §9.4.1 require fire areas within rooms, areas, and walk-in units containing electrochemical ESS to not exceed the 600 kWh maximum allowable quantities in Table 1207.5. While this requirement does not extend to remote outdoor installation classification, NFPA 855 requires an HMA to be conducted for outdoor installations exceeding 600 kWh [NFPA 855 §9.5.2.1]

The Prairie Pass BESS will have a capacity of 1,200 MWh, which exceeds the 600 kWh threshold, and an HMA will be developed. A summary of the UL 9540A testing and large-scale fire testing will be included upon completion of the test series. The data from the tests will be used to evaluate the proposed configuration of the Prairie Pass BESS facility. In addition, this HMA will be updated to evaluate how the site design complies with all IFC requirements.

## 5.2.3 Smoke and Fire Detection

IFC §1207.5.4 and NFPA 855 §9.6.1 require an approved automatic smoke or radiant energy-sensing fire detection system to be installed in rooms, indoor areas, and walk-in units containing ESS. In addition, alarm signals from detection systems must be transmitted to a central station, proprietary or remote station service in accordance with NFPA 72. IFC §1207.5.4.1 permits the AHJ to require an exterior visible annunciation on the cabinet exterior or in approved locations to indicate that potentially hazardous conditions associated with the ESS exist.

The SBB 2.0 will be equipped with smoke detection that will be monitored by the cabinet's internal FACP and site-FACP at the substation control house enclosure. In addition, remote notification will be accomplished through the two fire command centers located at each facility's access roads, equipped with a remote fire alarm annunciator.

## 5.2.4 Fire Suppression Systems

2024 IFC §1207.5.5 and NFPA 855 §9.6.2 requires an automatic fire suppression system to be installed in rooms and areas within buildings and walk-in units containing ESS. The SBB 2.0 is an NWI-style BESS that is unoccupiable, with all internal components accessible via exterior doors. It is not being installed inside a room or areas within a building. Therefore, the SBB 2.0 installation at the Prairie Pass BESS facility does not require a fire extinguishing system. As such, the Prairie Pass BESS site design complies with the fire extinguishing systems requirement.

### 5.2.5 Maximum Enclosure Size

2024 IFC §1207.5.6 and NFPA 855 §9.5.2.4 limit outdoor walk-in units housing ESS to a maximum size of 53 ft × 8 ft × 9.5 ft high, not including bolt-on HVAC and related equipment. The IFC only requires walk-in containers or enclosures to meet these requirements. The SBB 2.0 measures 20 ft long, 8 ft deep, and 9.5 ft high and is compliant.

### 5.2.6 Vegetation Control

2024 IFC §1207.5.7 and NFPA 855 §9.5.2.2 require areas within 10 ft on each side of outdoor ESS to be cleared of combustible vegetation and other combustible growth. Vegetation control will be provided for the Prairie Pass BESS facility.

### 5.2.7 Means of Egress

2024 IFC §1207.5.8 and NFPA 855 §9.5.2.6.1.7 require stationary storage battery systems located outdoors to be separated from any means of egress as required by the AHJ to ensure safe egress under fire conditions, but not less than 10 feet. This requirement does not extend to outdoor remote installation classification. Regardless, based on a review of the drawing provided, no buildings are located within 10 ft from the nearest SBB 2.0 cabinet. Therefore, there are no building's means of egress located within 10 ft of the nearest SBB 2.0. As such, the Prairie Pass BESS site design complies with the means of egress requirement.

### 5.2.8 Clearance to Exposures

2024 IFC §1207.8.3 and NFPA 855 §9.5.2.6.1 require ESS located outdoors to be separated by a minimum of 10 feet from the following exposures: lot lines, public ways, buildings, stored combustible materials, hazardous materials, high-piled stock, and other exposure hazards. This requirement does not extend to outdoor remote installation classification. Regardless, based on a review of the drawing provided, no exposures will be located within 10 ft from the nearest SBB 2.0 cabinet.

## 5.3 Technology Specific Protection

2024 IFC §1207.6 and NFPA 855 §9.6.5 require electrochemical ESS to comply with the requirements as outlined in IFC Table 1207.6 and NFPA Table 9.6.5. Lithium-ion batteries require compliance with the explosion control requirements and the thermal runaway requirements.

***Note:*** *Lithium-ion batteries do not need to meet the exhaust ventilation requirements, the spill control and neutralization requirements, or the safety cap requirements*.

### 5.3.1 Explosion Control

2024 IFC §1207.6.3 and NFPA 855 §9.6.5.6.3 require explosion control to be provided for rooms, areas, or walk-in units containing electrochemical ESS technologies in accordance with §911. The explosion control system shall consist of one of the following:

1. Combustible Concentration Reduction (CCR) ventilation explosion prevention systems designed, installed, operated, maintained, and tested in accordance with NFPA 69.

2. Deflagration venting installed and maintained in accordance with NFPA 68.

The SBB 2.0 is equipped with a CCR ventilation and a deflagration panel venting system. It is anticipated that a professional engineer will review, and validation modeling will be performed for the explosion control system and deflagration venting system. These evaluations will be included in future revisions of this analysis.

### 5.3.2 Thermal Runaway

2024 IFC §1207.6.5 and NFPA 855 §9.6.5.5 require batteries and other ESS to be provided with a listed device or other approved method to prevent, detect, and minimize the impact of thermal runaway. The thermal runaway protection is permitted to be part of a BMS that has been evaluated to UL 1973 or UL 9540.

The SBB 2.0 listing information will be reviewed once made available by the manufacturer. The confirmation of the listed protection will be included in future revisions of this analysis.

## 5.4 All Facilities

2018 IFC §501.1 requires facilities regulated by the IFC to comply with Chapter 5, Fire Service Features. For outdoor BESS, that requires, or could require, compliance with the fire apparatus access road requirements of §503, the key box requirements of §506, and the fire protection water supply requirements of §507. Other sections of Chapter 5 would not be applicable to an outdoor BESS facility.

### 5.4.1 Fire Apparatus Access Roads

2018 IFC §503.1.1 requires fire apparatus roads to be provided in accordance with IFC §503 for every facility, building, or portion of a building hereafter constructed or moved into or within the jurisdiction. IFC Appendix D provides additional information and recommended guidance for design considerations for fire access roads. Fire apparatus access roads must be provided in accordance with the requirements of IFC §503. At a minimum, the fire apparatus access roads must meet the following:

1. Extend to within 150 feet (45.72 m) of all portions of the facility and all portions of the exterior walls of the first story of the building as measured by an approved route around the exterior of the building or facility [IFC §503.1.1].
2. Have an unobstructed width of not less than 24 ft (county amendment), exclusive of shoulders, except for approved security gates in accordance with Section 503.6, and an unobstructed vertical clearance of not less than 13 feet 6 inches [IFC §503.2.1].

   ***Note:*** *The 2018 IFC, as amended by Adams County, requires 24 ft wide fire department access roads. Per AHJ approval, the BESS facility is permitted to be served by 20 ft wide fire department access roads, as aerial apparatus is not expected to be used for BESS facility response.*

3. Be designed and maintained to support the imposed loads of fire apparatus and shall be surfaced so as to provide all-weather driving capabilities [IFC §503.2.3].
4. Have a turning radius, angles of approach and departure that are approved by the FCO [IFC §503.2.4 and §503.2.8].
5. Dead-end fire apparatus access roads in excess of 150 feet in length shall be provided with an approved area for turning around fire apparatus [IFC §503.2.5]. Appendix D provides guidance for recommended turnaround provisions [IFC Appendix D §D103.4].

6. The grade of the fire apparatus access road shall be within the limits established by the FCO based on the fire department's apparatus [IFC §503.2.7]. Appendix D recommends fire apparatus access roads not to exceed 10 percent in grade [IFC Appendix D §D103.2].

The proposed facility access roads extend to within 150 feet of all portions of the Prairie Pass BESS facility with no dead-ends present. The width of the access roads must be evaluated to ensure the minimum 20-foot width requirement is satisfied. In addition, to ensure compliance, the FCO must approve of the turning radii, angles of approach and departure, grade, and imposed loads.

### 5.4.2 Key Boxes

2018 IFC §506.1 permits the FCO to require a key box to be installed in an approved location when an area is restricted. The key box must be of an approved type in accordance with UL 1037 and must contain keys to gain access. Based on a review of the drawing provided, a Knox Box will be provided at the fire command center located at the primary and secondary entrance of the facility.

### 5.4.3 Fire Protection Water Supplies

2018 IFC §507.1 requires an approved water supply capable of supplying the required fire flow for fire protection to be provided to premises on which facilities, buildings or portions of buildings are hereafter constructed or moved into or within the jurisdiction. Where a portion of the facility or building hereafter constructed or moved into or within the jurisdiction is more than 400 feet from a hydrant on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains shall be provided where required by the FCO [IFC §507.5.1]. The facility will be equipped with a 32,000-gallon firewater storage tank located at the south (primary) entrance to the facility. A dedicated fire department connection will be located adjacent to the storage tank that is intended for the fire department to charge the dry fire hydrant loop on the interior of the facility. Proposed water supply approach and water supply requirements must be coordinated with the AHJ.

***Note**: Typical BESS firefighting response procedures do not require or recommend offensive firefighting tactics to manually suppress a BESS fire. If manual firefighting tactics are used, water is considered the preferred agent for managing lithium-ion battery fires, suppressing nearby combustibles, cooling nearby exposures, and controlling smoke. Other fire suppression methods, such as gaseous agents (CO2, Halon), dry chemical suppressants, or foams, are unlikely to be effective.*

## 5.5 Site Design Code Analysis Summary

Based on a review of the SBB 2.0 and the drawing set, the Prairie Pass BESS site is currently being designed to meet the 2018 IFC installation level requirements for an outdoor, NWI style BESS. A final site design code review will be included in future revisions of this analysis upon receipt of additional SBB 2.0 documentation.

# 6. BESS PLANS AND TRAINING

A new BESS installation typically requires a number of plans to be developed for a site prior to energizing the batteries. Oftentimes, these documents are developed during construction or after substantial completion of the facility, such that they include site specific details that would not be available prior (such as during the design phase of the project).

## 6.1 Commissioning, Operation, Decommissioning, and ITM

A commissioning plan is typically developed for the integration of the new BESS equipment into the electrical utility grid. The commissioning documentation is to capture the commissioning roles and responsibilities, list of equipment, conditions, BESS operation compliance, fire protection feature compliance, and operability. An operation and maintenance manual is typically developed and provided to both the Owner, or their authorized agent, and the BESS operator before the BESS is put into operation. A decommissioning plan is typically developed to provide the organization, documentation requirements, contingencies, and methods and tools necessary to indicate how the safety systems, Prairie Pass BESS, and components will be decommissioned and removed from the site. In addition, all fire protection systems must be designed, installed, commissioned, inspected, tested, and maintained as required by the IFC and their respective NFPA standards.

Commissioning, operation/maintenance, and decommissioning plans are being developed for the Prairie Pass BESS facility. Product level manuals including an installation manual, an operations and maintenance manual, and emergency response guide have not been provided, however it is expected that Samsung will provide product level manuals that can be utilized by site Owners/Operators to develop their own site-specific documents. FRA recommends all commissioning, operations and maintenance, and decommissioning plans be developed prior to energizing the Prairie Pass BESS.

## 6.2 Emergency Response Plan

An Emergency Response Plan (ERP) is typically developed to be readily available at the Prairie Pass BESS for use by facility operations and maintenance personnel. The ERP is a living document that should be updated when conditions change that affects the response considerations and procedure changes. At a minimum, the ERP shall include the following: procedures for safe operational shutdown, inspection testing and maintenance, Prairie Pass BESS response procedures, fire response procedures, safety data sheets, emergency contact information, AHJ operations and response procedures. The ERP should be shared with and approved by the local AHJ/fire responders prior to commercial operation of the Prairie Pass BESS.

An ERP for Prairie Pass is being developed by FRA. The ERP will also include information and procedures for responding to the site during a thermal event or power outage where the SBB 2.0 fire safety systems may not be functional, such as the explosion control system. When responding during these events, FRA recommends that all site personnel and first responders remain at a safe distance, upwind from a distressed SBB 2.0 cabinet, as designated in the Prairie Pass BESS ERP, to ensure they are not momentarily exposed to dangerous conditions. In addition, FRA recommends that the ERP be finalized and approved prior to energizing the Prairie Pass BESS.

## 6.3 Emergency Response Training

The owner of the BESS or their authorized representative typically engages in emergency planning and training of emergency responders such that any foreseeable hazards associated with the on-site systems can be effectively addressed. This typically includes having all personnel responsible for the operation, maintenance, repair, servicing, and response of the Prairie Pass BESS to be trained in the procedures included in the ERP. In addition, annual refresher training is typically provided, with records of the training being retained.

FRA recommends that all site personnel and emergency response personnel, who could be responsible for responding to a Prairie Pass BESS emergency, be trained on the ERP prior to energizing the Prairie Pass BESS. In addition, refresher training should be provided as appropriate, typically annually, as requested by the FCO.

# 7. HAZARD MITIGATION ANALYSIS

This HMA is being prepared following the guidance provided by the 2024 IFC and NFPA 855. The HMA evaluates four items:

1. The fire safety features of the SBB 2.0
2. The findings of the UL 9540A cell, module, and unit level tests (to be provided)
3. The findings of the large-scale fire test (to be provided), and
4. The site level fire safety features of the Prairie Pass BESS.

Based on the product level and site level safety features, the fire and life safety consequences associated with typical BESS failure modes can be evaluated to determine the impact to site personnel, the general public, and adjacent exposures. Per 2024 IFC §1207.1.6.1 & NFPA 855 §4.4.2.1, the consequences of the following failure modes must be evaluated in an HMA:

1. A thermal runaway or mechanical failure condition in a single ESS unit.
2. Failure of any battery (energy) management system or fire protection system within the ESS equipment that is not covered by the product listing failure mode and effects analysis (FMEA).
3. Failure of any required protection system external to the ESS, including but not limited to ventilation (HVAC), exhaust ventilation, smoke detection, fire detection, gas detection or fire suppression system.

Only single failure-modes must be evaluated. A product-level failure modes and effects analysis has not been provided by Samsung for incorporation into this analysis at the time of draft HMA development. As such, a high-level review of the consequences of each failure mode noted above is evaluated in Sections 7.1 through 7.4 of this report.

## 7.1 Thermal Runaway Condition

### 7.1.1 Description

Thermal runaway is a condition in which a self-heating chemical reaction occurs within a battery cell. This occurs when the battery cell generates heat faster than the battery cell is able to dissipate heat. Thermal runaway can be caused by physical damage (e.g. puncture, crushing), electrical malfunctions (e.g. overcharging), exposure to elevated ambient temperatures (e.g. adjacent cells in thermal runaway with elevated temperatures), manufacturing defects, and other internal conditions which may develop inside of aging battery cells (e.g. dendrites).

Thermal runaway typically results in an overpressure event within the battery cell due to internal heat generation inside the casing causing battery gases to be ejected from the cell through the pressure relief valve. Depending on the conditions, thermal runaway may be limited to the initiating cell(s) or thermal runaway may propagate to adjacent cells. Thermal runaway propagation typically occurs through conductive and convective heating or physical damage of adjacent cells due to swelling of the initiating cell. Conductive heating is the primary mode of heat transfer to adjacent cells for a non-flaming event and convective heating is the primary mode of heat transfer to adjacent cells for a flaming event.

While UL 9540A testing has not yet been completed, it is anticipated that the SBB 2.0 cells will generate flammable and toxic gases, as is typical of LFP cells. Depending on the conditions of release, flammable gases

released during a thermal runaway event may present an explosion or fire hazard. An explosion hazard exists when sufficient flammable gases are released in the absence of an ignition source and build-up within the cabinet. A fire hazard exists when the flammable gases are released in the presence of an ignition source or self-ignite. It should be noted, the fire hazard and explosion hazard are not mutually exclusive, and both may exist at different time periods throughout a propagating thermal runaway event. In addition, toxic gases present a health exposure hazard to site personnel and first responders located in the vicinity of a BESS failure.

## 7.1.2 Barriers

Passive and active mitigation strategies are provided to prevent batteries from entering thermal runaway and cool adjacent batteries to prevent thermal runaway propagation. The following barriers are provided in the SBB 2.0:

- The cells, modules and the SBB 2.0 will be tested to UL 9540A.
- The SBB 2.0 will undergo an evaluation to UL 9540.
- The SBB 2.0 is equipped with a BMS which monitors cell health and shuts down power to modules/racks when cells are operating outside of their normal conditions.
- The SBB 2.0 must be regularly maintained to ensure it is operating within its specific parameters and to verify the batteries are in good working condition.

## 7.1.3 Consequences

The consequences of thermal runaway can vary widely depending on the gas release scenario and level of confinement; however, the primary consequences of thermal runaway can be grouped into the following hazard categories: fire and radiant heat, deflagrations and explosions, and toxic gases.

### 7.1.3.1.FIRE & RADIANT HEAT EXPOSURE HAZARD

UL 9540A and large-scale fire testing will be completed to evaluate the fire and radiant heat exposure hazards associated with the SBB 2.0. The data and results of these tests will be summarized in future revisions of this analysis.

### 7.1.3.2.DEFLAGRATION & EXPLOSION HAZARD

UL 9540A and large-scale fire testing will be completed to evaluate the deflagration and explosion hazards associated with the SBB 2.0. The data and results of these tests will be summarized in future revisions of this analysis. In addition, it is anticipated that explosion control analyses will be performed for the SBB 2.0 and evaluated by a registered design professional.

### 7.1.3.3.TOXIC GAS HAZARD

The SBB 2.0 is not occupiable; therefore, toxic or highly toxic gas exposure is limited to individuals standing outside, in the open ambient air, in proximity to the SBB 2.0 cabinet during a failure/fire event. Flammable and toxic gases released from the SBB 2.0 cells during thermal runaway will be outlined the UL 9540A and large-scale fire tests.

To mitigate the hazard associated with fire, deflagrations and toxic gases it is anticipated that the SBB 2.0 will be equipped with fire detection and notification (both locally and remotely). These systems can detect and notify local site personnel, should anyone be in the area, of a thermal event so that they can evacuate to a safe location before toxic gases can impact site personnel. Additional mitigation measures include emergency response procedures and training that will advise site personnel and first responders to stand at a safe distance, upwind from a distressed SBB 2.0, to wear appropriate personal protective equipment (PPE) including a self-contained breathing apparatus and to monitor the air for toxic gases, as they would during any fire event.

# 7.2 Failure of Any Emergency Management System

## 7.2.1 Description

The SBB 2.0 is equipped with a BMS. The BMS tracks the performance, voltage, current, and state of charge (SOC) of the cells to ensure they are operating within manufacturer specifications. The BMS is required to disconnect electrical connections to the ESS if potentially hazardous conditions occur. Consequences due to BMS failure are evaluated in this section.

## 7.2.2 Barriers

The following barriers are provided to prevent BMS failure and minimize the consequences of BMS failure:

- The BMS will undergo a performance evaluation during the UL 9540 listing process.
- The BMS will be regularly maintained to ensure it operates within its specific parameters.
- Electrical fault protection devices are integrated into the equipment, as discussed in Section 2.6.
- The cells, modules, and the SBB 2.0 will be tested to UL 9540A.

## 7.2.3 Consequences

Failure of the BMS will prevent active monitoring of battery cell conditions. It should be noted, BMS failure alone will not cause battery failure. In a worst-case scenario, a BMS failure in conjunction with a secondary failure condition (such as over voltage, excess temperature, etc.) may result in a thermal runaway event. Barriers and consequences of thermal runaway are provided in Section 7.1.2 and 7.1.3 of this report.

# 7.3 Failure of Any Required Ventilation System

## 7.3.1 Description

A failure scenario involving any required ventilation or exhaust may expose the batteries to elevated operating temperatures. Depending on the resulting ambient temperature, ventilation failure may cause batteries to be exposed to temperatures outside of the manufacturer's recommended operating conditions or temperatures at which the cell fails. The SBB 2.0 is provided with a TMS consisting of an HVAC and chiller.

## 7.3.2 Barriers

The following barriers are provided to prevent thermal management system failure and reduce the consequences of a failure event:

- The TMS shall be regularly maintained to ensure it operates within its specific parameters.
- The BMS monitors the thermal management system.

### 7.3.3 Consequences

Failure of the cooling system may expose batteries to ambient temperatures. The BMS provides redundancy and will also cut power to the affected cells and send a signal to the EMS, which alerts the ROC, such that a failure will be quickly detected and remediated. The average peak ambient temperature in Adams County, Colorado is 88°F (31°C) and occurs in July. It is expected that the peak temperature will be less than the cell venting temperature determined during UL 9540A cell level testing; therefore, failure of the cooling system is not anticipated to lead to a thermal runaway event. In a worst-case scenario, batteries operating at elevated temperatures for extended periods of time may degrade and have a higher likelihood of failure over time, possibly leading to thermal runaway.

## 7.4 Failure of a Fire Protection System

### 7.4.1 Description

A failure of a fire protection system can include a smoke detection, fire detection, fire suppression, gas detection system or explosion control system. The SBB 2.0 will be equipped with smoke detection, gas detection, an explosion control system, and a deflagration venting system. Therefore, this failure scenario evaluates the consequences associated with the failure of these systems.

### 7.4.2 Barriers

The fire protection systems are provided with the following features to prevent failure and minimize consequences associated with failure:

- The SBB 2.0 is equipped with a BMS which monitors cell health and shuts down power to modules/racks with cells operating outside of their operating conditions. The BMS operates independently from the fire and gas detection system.
- The fire and gas detection system can provide a trouble signal to the Jupiter ROC and to the remote approved supervising station, such that repair operation can take place.
- It is anticipated that backup power will be provided for the fire alarm system via backup batteries (to be verified).
- It is anticipated that backup power will be provided for the explosion control system (to be verified by Samsung).
- Electrical fault protection devices are integrated into the equipment and act independently from the fire and gas detection system.

### 7.4.3 Consequences

Independent failure of a component of either the fire and gas detection system or the explosion control system will have no effect on the battery cabinet and will not induce a thermal runaway event.

Failure of the detection systems may result in the inability of the system to detect fire conditions within the SBB 2.0 and notify site personnel to evacuate the area. The primary potential causes for this failure would be the

fault in a listed fire alarm initiating device, an initial installation error, or degradation of a fire alarm device/wiring over time. The likelihood of these occurring with a properly designed, installed, commissioned, monitored, inspected, tested, and maintained fire alarm system is historically low based on data from the National Fire Protection Association. The fire alarm system is an addressable system where the status of each device is monitored by the FACP; therefore, a failure of a component of this system would be reported and can be remediated. Periodic ITM is also performed to inspect the fire alarm system for damage/degradation and to test the devices for proper performance. All these traditional fire alarm system mitigation strategies are in place to minimize the likelihood of a fire alarm system failure over the life span of the SBB 2.0.

Similarly, failure of the explosion control system may result in the accumulation of flammable gases in the cabinet and subsequent deflagration. The primary potential causes mirror those of component failures in the fire alarm system noted above. It is expected that the system will be properly designed, installed, commissioned, monitored, inspected, tested, and maintained to minimize likelihood of failure within these components. Should the explosion control system fail, the enclosure deflagration vent is a passive feature that is automatically activated during an overpressure condition in the SBB 2.0. Failure of the vent panel to release may result in an accumulation of flammable gases and potential for an explosion and failure of the cabinet. This will be mitigated by the presence of the fire alarm system which will detect the thermal event and sound the local fire notification appliance and transmit signals off-site. This appliance can alert local site personnel and/or first responders, should any be in the area, of the hazard. The ERP and training of site personnel/first responders can then direct all personnel to evacuate from the area immediately upon activation of the fire alarm notification appliance. By immediately evacuating to a designated safe area, site personnel and first responders will be remote from the distressed SBB 2.0, physically separating them from the potential deflagration and explosion hazard.

## 7.5 HMA Analysis Approval

The Prairie Pass BESS will be evaluated for compliance with the HMA approval criteria in 2024 IFC §1207.1.6.2 and NFPA 855 §4.4.3 upon completion of the SBB 2.0 design development phase. As such, the Prairie Pass installation is being designed to comply with the following:

1. Fires will be contained within unoccupied ESS rooms or areas for the minimum duration of the fire-resistance-rated separations [...].
2. Fires involving the ESS will allow occupants or the general public to evacuate to a safe location.
3. Deflagration hazards will be addressed by an explosion control or other system.

# 8. RECOMMENDATIONS

Throughout the report, FRA provided several recommendations related to the Prairie Pass BESS installation and emergency response to mitigate the hazards of a fire event. These recommendations are based on our review of the available materials, our background, experience and training, the analyses performed to date described above, common industry best practices for responding to a thermal event involving lithium-ion BESS, as well as FRA's experience with lithium-ion battery hazards, lithium-ion battery BESS hazards, and previous BESS fires. These recommendations do not provide opinions or conclusions meant to address specific circumstances or all possible scenarios of an emergency. As with all emergency events, emergency response actions should be evaluated and performed based on real time fire conditions and observations (i.e., wind direction/speed, fire intensity, proximity of flames to adjacent electrical equipment and structures) during the actual emergency. Below is a summarized list of the recommendations provided throughout the report:

1. **Site Design:** FRA recommends that the final site design must be evaluated for compliance with the 2024 IFC, 2018 IFC and NFPA 855.
2. **SBB 2.0 Documentation**: FRA recommends that all SBB 2.0 documentation, including drawings, manuals, test reports, listing certificates, etc. be provided for review.
3. **Explosion Control Analyses**: FRA recommends that a registered design professional evaluate the explosion control and deflagration venting systems for compliance with NFPA 69 and NFPA 68, respectively.
4. **BESS Plans:** FRA recommends that all plans required by the 2024 IFC (commissioning, operations and maintenance, decommissioning and emergency response/operations plans) be completed prior to energizing the Prairie Pass BESS.
5. **Emergency Response Training**: FRA recommends that all site personnel and emergency response personnel, who could be responsible for responding to a Prairie Pass BESS emergency, be trained on the ERP prior to energizing the Prairie Pass BESS. Refresher training should be provided as appropriate, typically annually, or as required by the AHJ.
6. **Fire Protection Systems**:
   a. FRA recommends that all fire protection systems be designed, installed, commissioned, and periodically inspected, tested, and maintained as required by the 2018 IFC and their respective NFPA standards.
   b. FRA recommends providing documentation of central service monitoring of the fire alarm system upon installation completion.
7. **Minimum Approach Distance (MAD):** When responding to a battery emergency, FRA recommends that all site personnel and first responders remain at a safe distance, upwind from a distressed SBB 2.0 to ensure they are not exposed to dangerous conditions. In addition, site personnel and first responders should not approach the front of distressed SBB 2.0(s), and all first responders should wear proper PPE when approaching a distressed SBB 2.0 during a battery emergency.

# 9. CONCLUSIONS

Based on our review of the available materials, our background, experience, and training, and the analysis performed to date described above, the following conclusions are submitted within a reasonable degree of scientific and engineering certainty:

1. The SBB 2.0 and the Prairie Pass BESS site design will be evaluated for compliance with IFC requirements upon receipt of additional SBB 2.0 documentation.
2. The Prairie Pass BESS is currently being designed to meet the HMA performance criteria for approval outlined in 2024 IFC §1207.1.6.2 and NFPA 855 §4.4.3. Compliance with the approval criteria will be evaluated upon receipt of additional SBB 2.0 documentation.

## GENERAL NOTES

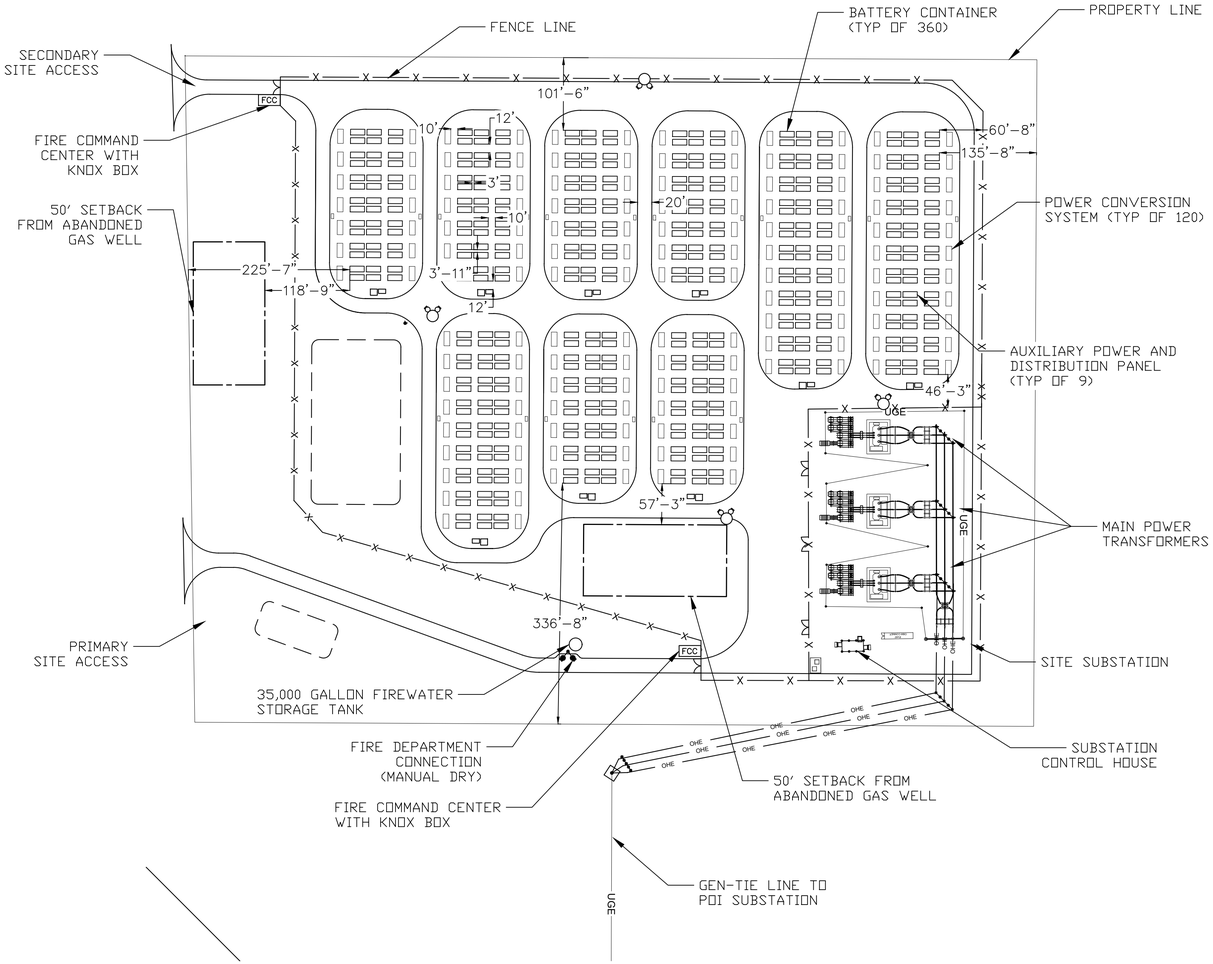
1. THIS DRAWING IS INTENDED FOR REFERENCE ONLY AND IS BASED UPON INFORMATION PROVIDED TO FRA. NOTE, THIS ANALYSIS ONLY APPLIES TO SITE DESIGN ELEMENTS OF THE PRAIRIE PASS BESS PERTAINING TO FIRE AND LIFE SAFETY. ALL SYSTEM DESIGN AND INSTALLATION WORK IS PROVIDED BY OTHERS. IT IS ASSUMED THAT THE BESS AND ITS ASSOCIATED EQUIPMENT, AS WELL AS THE FIRE PROTECTION SYSTEMS, WILL BE INSTALLED, COMMISSIONED, INSPECTED, TESTED, AND MAINTAINED AS REQUIRED BY THE MANUFACTURER(S), THE IFC, AND OTHER APPLICABLE CODES AND STANDARDS.
2. IT IS THE RESPONSIBILITY OF THE CLIENT TO ENGAGE WITH THE FIRE CODE OFFICIAL OR AUTHORITY HAVING JURISDICTION REGARDING THE ITEMS NOTED IN THE CODE REVIEW HEREIN. IN ADDITION, ALL ITEMS IN THE PRELIMINARY CODE REVIEW DENOTED AS "WILL COMPLY" ARE THE RESPONSIBILITY OF THE CLIENT.
3. THIS PLAN REFERENCES THE 2024 INTERNATIONAL FIRE CODE (2024 IFC) AND NFPA 855, 2023 EDITION, AS REQUIRED BY THE BRIGHTON FIRE RESCUE DISTRICT, THE AUTHORITY HAVING JURISDICTION (AHJ). ADAMS COUNTY ADOPTS THE 2018 INTERNATIONAL FIRE CODE (2018 IFC) WITH AMENDMENTS, THE 2024 IFC AND NFPA 855 APPLY SPECIFICALLY TO THE BESS. THE IFC 2018 REMAINS THE GOVERNING FIRE CODE FOR ALL NON-BESS DESIGNS AND SYSTEMS.
4. THE DRY MANUAL HYDRANT SYSTEM IS INTENDED FOR THE FIRE DEPARTMENT TO DRAFT FROM THE 32,000 GALLON WATER STORAGE TANK INTO THE DRY MANUAL FIRE DEPARTMENT CONNECTION.

## BESS SITE INFORMATION

SITE NAME: PRAIRIE PASS BATTERY ENERGY STORAGE SYSTEM
SITE CAPACITY: 300MW / 1,200MWh
SITE LOCATION: ADAMS COUNTY, COLORADO
BATTERY CHEMISTRY: LITHIUM-IRON PHOSPHATE
PRELIMINARY BESS TECHNOLOGY: SBB 2.0
BESS NAMEPLATE CAPACITY: 4,990 kWH
ELECTRIC UTILITY: XCEL ENERGY

## LEGEND

- PROPERTY LINE
- FENCE LINE
- FIRE HYDRANT (DRY MANUAL)
- FIRE DEPARTMENT CONNECTION (DRY MANUAL)
- FCC — FIRE COMMAND CENTER




1 **PRAIRIE PASS BESS PRELIMINARY SITE PLAN**
SCALE: 1" = 100'

0 100' 200'
1"=100'

## APPLICABLE CODES

1. NFPA 855 – 2023 EDITION, AS REQUIRED BY BRIGHTON FIRE RESCUE DISTRICT.
2. INTERNATIONAL FIRE CODE – 2024 EDITION, AS REQUIRED BY BRIGHTON FIRE RESCUE DISTRICT.

### PRELIMINARY NFPA 855 – 2023 CODE REVIEW

| SECTION | CODE LANGUAGE | COMPLIANT |
|---|---|---|
| §4.5.2 | COMBUSTIBLE MATERIALS RELATED TO THE ESS SHALL NOT BE STORED WITHIN 3 FT FROM ESS EQUIPMENT. | COMPLIANT |
| §4.6.1 | ESS SHALL BE LISTED IN ACCORDANCE WITH UL 9540, UNLESS SPECIFICALLY EXEMPTED IN OTHER SECTIONS OF THIS STANDARD. | COMPLIANT |
| §4.6.12.1 | ENCLOSURES SHALL BE OF NONCOMBUSTIBLE CONSTRUCTION. | COMPLIANT |
| §4.6.12.2 | ESS CIRCUITRY SHALL BE WITHIN WEATHERPROOF ENCLOSURES MARKED WITH THE ENVIRONMENTAL RATING SUITABLE FOR THE TYPE OF EXPOSURE REQUIRED BY NFPA 70. | COMPLIANT. |
| §4.7.4.1 | APPROVED SIGNAGE SHALL BE PROVIDED IN THE FOLLOWING LOCATIONS:<br>– ON THE FRONT OF DOORS TO ROOMS OR AREAS CONTAINING ESS OR IN APPROVED LOCATIONS NEAR ENTRANCES TO ESS ROOMS<br>– ON THE FRONT OF DOORS TO OUTDOOR OCCUPIABLE ESS CONTAINERS<br>– IN APPROVED LOCATIONS ON OUTDOOR ESS THAT ARE NOT ENCLOSED IN OCCUPIABLE CONTAINERS OR OTHERWISE ENCLOSED | WILL BE COMPLIANT. APPROVED SIGNAGE WILL BE PROVIDED |
| §4.7.4.2 | THE SIGNAGE REQUIRED IN 4.7.4.1 SHALL BE IN COMPLIANCE WITH ANSI Z535 AND INCLUDE THE FOLLOWING INFORMATION:<br>– "ENERGY STORAGE SYSTEMS" WITH SYMBOL OF LIGHTNING BOLT IN A TRIANGLE<br>– TYPE OF TECHNOLOGY ASSOCIATED WITH THE ESS<br>– SPECIAL HAZARDS ASSOCIATED AS IDENTIFIED IN CHAPTERS 9 THROUGH 15<br>– TYPE OF SUPPRESSION SYSTEM INSTALLED IN THE AREA OF THE ESS<br>– EMERGENCY CONTACT INFORMATION | WILL BE COMPLIANT. APPROVED SIGNAGE WILL BE PROVIDED |
| §4.7.4.3 | A PERMANENT PLAQUE OR DIRECTORY DENOTING THE LOCATION OF THE DISCONNECTING MEANS FOR ALL ESS ON OR IN THE PREMISES SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ESS CAPABLE OF BEING INTERCONNECTED. | WILL BE COMPLIANT. APPROVED SIGNAGE WILL BE PROVIDED |
| §4.7.5.1 | ESS SHALL BE LOCATED OR PROTECTED TO PREVENT PHYSICAL DAMAGE FROM IMPACT WHERE SUCH RISKS ARE IDENTIFIED. | COMPLIANT, SECURED WITH NO PUBLIC ROADS IN FACILITY. |
| §4.7.5.2 | VEHICLE IMPACT PROTECTION CONSISTING OF GUARD POSTS OR OTHER APPROVED MEANS SHALL BE PROVIDED WHERE ESS ARE SUBJECT TO IMPACT BY MOTOR VEHICLES. | NOT APPLICABLE. |
| §4.7.6.1 | ESS SHALL BE SECURED AGAINST UNAUTHORIZED ENTRY AND SAFEGUARDED IN AN APPROVED MANNER. | COMPLIANT, SECURITY FENCE PROVIDED. |
| §4.7.8.1 | ALL AREAS CONTAINING ESS SHALL PROVIDE EGRESS FROM THE AREA IN WHICH THEY ARE LOCATED IN ACCORDANCE WITH THE LOCAL BUILDING CODE. | COMPLIANT. |
| §4.7.11 | FIRE DEPARTMENT ACCESS ROADS SHALL BE PROVIDED TO OUTDOOR ESS INSTALLATIONS IN ACCORDANCE WITH THE LOCAL FIRE CODE. | WILL COMPLY. |
| §4.8.1 | WHERE REQUIRED ELSEWHERE IN THIS STANDARD, AREAS CONTAINING ESS SYSTEMS SHALL BE PROVIDED WITH A SMOKE DETECTION OR RADIANT ENERGY-SENSING SYSTEM IN ACCORDANCE WITH NFPA 72, UNLESS MODIFIED BY THE REQUIREMENTS IN CHAPTERS 9 THROUGH 13. | WILL COMPLY. |
| §4.8.2.1 | ALL REQUIRED ANNUNCIATION MEANS SHALL BE LOCATED AS REQUIRED BY THE AUTHORITY HAVING JURISDICTION TO FACILITATE AN EFFICIENT RESPONSE TO THE SITUATION. | WILL COMPLY. |
| §4.8.2.2 | MULTIPLE PANELS SHALL BE AGGREGATED TO A MASTER OR ANNUNCIATOR PANEL AT A LOCATION APPROVED BY THE AHJ. | WILL COMPLY. |
| §4.9.1 | WHERE REQUIRED ELSEWHERE IN THIS STANDARD, FIRE CONTROL AND SUPPRESSION FOR ROOMS OR AREAS WITHIN BUILDINGS AND OUTDOOR WALK-IN UNITS CONTAINING ESS SHALL BE PROVIDED. | NOT APPLICABLE. NON-WALK IN UNIT. |
| §4.9.4.1 | WHERE REQUIRED ELSEWHERE IN THIS STANDARD, SITES WHERE NONMECHANICAL ESS ARE INSTALLED SHALL BE PROVIDED WITH A PERMANENT SOURCE OF WATER FOR FIRE PROTECTION, UNLESS MODIFIED IN CHAPTERS 9 THROUGH 13. | WILL COMPLY. |
| §9.4.1 | OUTDOOR ESS INSTALLATIONS IN LOCATIONS NEAR EXPOSURES SHALL NOT EXCEED A MAXIMUM STORED ENERGY OF 600 kWh FOR LITHIUM-ION BATTERIES. WHERE APPROVED BY THE AHJ, OUTDOOR ESS INSTALLATIONS, ESS INSTALLATIONS IN OPEN PARKING GARAGES AND ON ROOFTOPS OF BUILDINGS, AND MOBILE ESS EQUIPMENT THAT EXCEED THE AMOUNTS IN TABLE 9.4.1 SHALL BE PERMITTED BASED ON A HAZARD MITIGATION ANALYSIS IN ACCORDANCE WITH SECTION 4.4 AND FIRE AND EXPLOSION TESTING IN ACCORDANCE WITH 9.1.5. | WILL COMPLY. HMA WILL BE PROVIDED FOR APPROVAL. |
| §9.4.2 | ESS SHALL BE COMPRISED OF GROUPS WITH A MAXIMUM STORED ENERGY OF 50 kWh EACH. ESS SHALL BE SPACED A MINIMUM OF 3 FT FROM OTHER GROUPS. THE AHJ SHALL BE PERMITTED TO APPROVE GROUPS WITH LARGER ENERGY CAPACITIES OR SMALLER GROUP SPACING BASED ON PERFORMANCE CRITERIA FROM FIRE AND EXPLOSION TESTING COMPLYING WITH 9.1.5. | WILL COMPLY. HMA WILL BE PROVIDED FOR APPROVAL. |
| §9.5.2.2.1 | AREAS WITHIN 10 FT (3 M) ON EACH SIDE OF OUTDOOR ESS SHALL BE CLEARED OF COMBUSTIBLE VEGETATION AND OTHER COMBUSTIBLE GROWTH. | COMPLIANT. |
| §9.5.2.4.1 | OUTDOOR ESS WALK-IN UNITS OR ESS CABINETS SHALL NOT EXCEED 53 FT ×8.5 FT ×9.5 FT (16.2 M ×2.6 M ×2.9 M), NOT INCLUDING HVAC AND OTHER EQUIPMENT. | COMPLIANT. |
| §9.5.2.6.1 | ESS LOCATED OUTDOORS SHALL BE SEPARATED BY A MINIMUM OF 10 FT (3 M) FROM LOT LINES, PUBLIC WAYS, BUILDINGS, STORED COMBUSTIBLE MATERIALS, HAZARDOUS MATERIALS, HIGH-PILED STOCK, OTHER EXPOSURE HAZARDS NOT ASSOCIATED WITH ELECTRICAL GRID INFRASTRUCTURE. | COMPLIANT. |
| §9.5.2.6.1.7 | ESS LOCATED OUTDOORS SHALL BE SEPARATED FROM ANY ACCESSIBLE MEANS OF EGRESS AS REQUIRED BY THE AHJ TO ENSURE SAFE EGRESS UNDER FIRE CONDITIONS BUT IN NO CASE LESS THAN 10 FT (3 M). | COMPLIANT. NO BUILDINGS WITHIN 10 FT OF BESS. |
| §9.6.3.1 | SITES WHERE NONMECHANICAL ESS ARE INSTALLED SHALL BE PROVIDED WITH A PERMANENT SOURCE OF WATER FOR FIRE PROTECTION IN ACCORDANCE WITH 4.9.4, UNLESS MODIFIED BY THIS CHAPTER. | WILL COMPLY. |
| §9.6.5.5 | WHERE REQUIRED BY TABLE 9.6.5, A LISTED DEVICE EVALUATED AS PART OF THE ESS OR OTHER APPROVED METHOD SHALL BE PROVIDED TO MANAGE CHARGING AND DISCHARGING DURING NORMAL OPERATION OF THE ESS TO MAINTAIN BATTERIES AND CAPACITORS WITHIN THEIR SAFE OPERATING PARAMETERS AND PRECLUDE THERMAL RUNAWAY. | COMPLIANT. HMA WILL BE PROVIDED WITH ADDITIONAL INFORMATION FOR APPROVAL. |
| §9.6.5.5.2 | THERMAL RUNAWAY PROTECTION SHALL BE PERMITTED TO BE PROVIDED BY THE BATTERY MANAGEMENT SYSTEM OR A CAPACITOR ESS MANAGEMENT SYSTEM THAT HAS BEEN EVALUATED AS PART OF THE UL 1973 OR UL 9540 LISTING. | COMPLIANT. |
| §9.6.5.6.3 | ESS INSTALLED WITHIN A ROOM, BUILDING, ESS CABINET, ESS WALK-IN UNIT, OR OTHERWISE UNOCCUPIABLE ENCLOSURE SHALL BE PROVIDED WITH ONE OF THE FOLLOWING:<br>1. EXPLOSION PREVENTION SYSTEMS DESIGNED, INSTALLED, OPERATED, MAINTAINED, AND TESTED IN ACCORDANCE WITH NFPA 69.<br>2. DEFLAGRATION VENTING INSTALLED AND MAINTAINED IN ACCORDANCE WITH NFPA 68. | COMPLIANT. |
| §9.6.5.6.4 | WHERE APPROVED, ESS CABINETS DESIGNED TO ENSURE THAT NO HAZARDOUS PRESSURE WAVES, DEBRIS, SHRAPNEL, OR ENCLOSURE PIECES ARE EJECTED, AS VALIDATED BY INSTALLATION LEVEL FIRE AND EXPLOSION TESTING AND AN ENGINEERING EVALUATION COMPLYING WITH 9.1.5 THAT INCLUDES THE CABINET, SHALL BE PERMITTED IN LIEU OF PROVIDING EXPLOSION CONTROL THAT COMPLIES WITH NFPA 68 OR NFPA 69. | COMPLIANT. FIRE TESTING AND ENGINEERING EVALUATION WILL BE PROVIDED FOR APPROVAL. |

### PRELIMINARY IFC – 2024 CODE REVIEW

| SECTION | CODE LANGUAGE | COMPLIANT |
|---|---|---|
| §503.1.1 | APPROVED FIRE APPARATUS ACCESS ROADS SHALL BE PROVIDED FOR EVERY FACILITY, BUILDING, OR PORTION HEREAFTER CONSTRUCTED OR MOVED INTO OR WITHIN THE JURISDICTION. EACH FIRE APPARATUS ACCESS ROAD SHALL COMPLY WITH THE REQUIREMENTS OF APPENDIX D. | COMPLIANT |
| §503.1.2 | THE FIRE CODE OFFICIAL IN CONJUNCTION WITH THE FIRE CHIEF IS AUTHORIZED TO REQUIRE MORE THAN ONE FIRE APPARATUS ACCESS ROAD BASED ON THE POTENTIAL FOR IMPAIRMENT OF A SINGLE ROAD BY VEHICLE CONGESTION, CONDITION OF TERRAIN, CLIMATE CONDITIONS OR OTHER FACTORS THAT COULD LIMIT ACCESS. | WILL COMPLY. |
| §503.3 | WHERE REQUIRED BY THE FIRE CODE OFFICIAL, APPROVED SIGNS OR OTHER APPROVED NOTICES OR MARKINGS THAT INCLUDE THE WORDS "NO PARKING – FIRE LANE" SHALL BE PROVIDED FOR FIRE APPARATUS ROADS TO IDENTIFY SUCH ROADS OR PROHIBIT THE OBSTRUCTION THEREOF. THE MEANS BY WHICH FIRE LANES ARE DESIGNATED SHALL BE MAINTAINED IN A CLEAN AND LEGIBLE CONDITION AT ALL TIMES AND REPLACED OR REPAIRED WHEN NECESSARY TO PROVIDE ADEQUATE VISIBILITY. | WILL COMPLY. |
| §506.1 | WHERE ACCESS TO OR WITHIN A STRUCTURE OR AREA IS RESTRICTED BECAUSE OF SECURED OPENINGS OR WHERE IMMEDIATE ACCESS IS NECESSARY FOR LIFE SAVING PURPOSES, THE FIRE CODE OFFICIAL IS AUTHORIZED TO REQUIRE A KEY BOX TO BE INSTALLED IN AN APPROVED LOCATION. THE KEY BOX SHALL BE OF AN APPROVED TYPE LISTED IN ACCORDANCE WITH UL 1037, AND SHALL CONTAIN KEYS TO GAIN NECESSARY ACCESS AS REQUIRED BY THE FIRE CODE OFFICIAL. | COMPLIANT. |
| §506.1.1 | AN APPROVED LOCK SHALL BE INSTALLED ON GATES OR SIMILAR BARRIERS WHERE REQUIRED BY THE FIRE CODE OFFICIAL. | WILL COMPLY. |
| §507.5.1 | WHERE A PORTION OF THE FACILITY OR BUILDING HEREAFTER CONSTRUCTED OR MOVED INTO OR WITHIN THE JURISDICTION IS MORE THAN 400 FEET FROM A HYDRANT ON A FIRE APPARATUS ACCESS ROAD, AS MEASURED BY AN APPROVED ROUTE AROUND THE EXTERIOR OF THE FACILITY OR BUILDING, ON-SITE FIRE HYDRANTS AND MAINS SHALL BE PROVIDED WHERE REQUIRED BY THE FIRE CODE OFFICIAL. | WILL COMPLY. |
| §1207.3.5 | ENCLOSURES OF ESS SHALL BE OF NONCOMBUSTIBLE CONSTRUCTION. | COMPLIANT. |
| §1207.4.1 | WHERE THE ESS DISCONNECTING MEANS IS NOT WITHIN SIGHT OF THE MAIN ELECTRICAL SERVICE DISCONNECTING MEANS, PLACARDS OR DIRECTORIES SHALL BE INSTALLED AT THE LOCATION OF THE MAIN ELECTRICAL SERVICE DISCONNECTING MEANS INDICATING THE LOCATION OF STATIONARY STORAGE BATTERY SYSTEM DISCONNECTING MEANS IN ACCORDANCE WITH NFPA 70. | COMPLIANT. |
| §1207.4.2 | ACCESS AND WORKING SPACE SHALL BE PROVIDED AND MAINTAINED ABOUT ALL ELECTRICAL EQUIPMENT TO PERMIT READY AND SAFE OPERATION AND MAINTENANCE OF SUCH EQUIPMENT IN ACCORDANCE WITH NFPA 70 AND THE MANUFACTURER'S INSTRUCTIONS. | COMPLIANT. |
| §1207.4.4 | STATIONARY ESS SHALL COMPLY WITH THE SEISMIC DESIGN REQUIREMENTS IN CHAPTER 16 OF THE INTERNATIONAL BUILDING CODE, AND SHALL NOT EXCEED THE FLOOR LOADING LIMITATION OF THE BUILDING. | NOT APPLICABLE FOR SITE. |
| §1207.4.5 | WHERE ESS ARE SUBJECT TO IMPACT BY A MOTOR VEHICLE, INCLUDING FORK LIFTS, VEHICLE IMPACT PROTECTION SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 312. | WILL COMPLY. |
| §1207.4.6 | COMBUSTIBLE MATERIALS SHALL NOT BE STORED IN ESS ROOMS, AREAS OR WALK-IN UNITS. | COMPLIANT. |
| §1207.4.8 | APPROVED SIGNS SHALL BE PROVIDED ON OR ADJACENT TO ALL ENTRY DOORS FOR ESS ROOMS OR AREAS AND ON ENCLOSURES OF ESS CABINETS AND WALK-IN UNITS LOCATED OUTDOORS, ON ROOFTOPS, OR IN OPEN PARKING GARAGES. SIGNS DESIGNED TO MEET BOTH THE REQUIREMENTS OF THIS SECTION AND NFPA 70 ARE PERMITTED. THE SIGNAGE MUST INCLUDE THE FOLLOWING OR EQUIVALENT:<br>1. "ENERGY STORAGE SYSTEM", "BATTERY STORAGE SYSTEM"<br>2. THE IDENTIFICATION OF THE ELECTROCHEMICAL ESS TECHNOLOGY PRESENT.<br>3. "ENERGIZED ELECTRICAL CIRCUITS".<br>4. WHERE WATER REACTIVE ELECTROCHEMICAL ESS ARE PRESENT THE SIGNAGE SHALL INCLUDE "APPLY NO WATER".<br>5. CURRENT CONTACT INFORMATION, INCLUDING PHONE NUMBER, FOR PERSONNEL AUTHORIZED TO SERVICE THE EQUIPMENT AND FOR THE FIRE MITIGATION PERSONNEL REQUIRED BY §1207.1.8.1. | WILL COMPLY. |
| §1207.4.9 | ROOMS, AREAS, AND WALK-IN UNITS IN WHICH ELECTROCHEMICAL ESS ARE LOCATED SHALL BE SECURED AGAINST UNAUTHORIZED ENTRY AND SAFEGUARDED IN AN APPROVED MANNER. SECURITY BARRIERS, FENCES, LANDSCAPING, AND OTHER ENCLOSURES SHALL NOT INHIBIT THE REQUIRED AIR FLOW TO OR EXHAUST FROM THE ELECTROCHEMICAL ESS AND ITS COMPONENTS. | COMPLIANT, SECURITY FENCE WILL BE PROVIDED. |
| §1207.5.1 | ELECTROCHEMICAL ESS SHALL BE SEGREGATED INTO GROUPS NOT EXCEEDING 50 kWh. EACH GROUP SHALL BE SEPARATED A MINIMUM OF 3 FEET FROM OTHER GROUPS. THE FIRE CODE OFFICIAL IS AUTHORIZED TO APPROVE LARGER CAPACITIES OR SMALLER SEPARATION DISTANCES BASED ON LARGE-SCALE FIRE TESTING COMPLYING WITH SECTION 1207.1.7. | COMPLIANT. |
| §1207.5.2 | FIRE AREAS WITHIN ROOMS, AREAS, AND WALK-IN UNITS CONTAINING ELECTROCHEMICAL ESS SHALL NOT EXCEED THE MAXIMUM ALLOWABLE QUANTITIES IN TABLE 1207.5. WHERE APPROVED BY THE FIRE CODE OFFICIAL, ROOMS, AREAS, AND WALK-IN UNITS CONTAINING ELECTROCHEMICAL ESS THAT EXCEED THE AMOUNTS IN TABLE 1207.5 SHALL BE PERMITTED BASED ON A HAZARDOUS MITIGATION ANALYSIS IN ACCORDANCE WITH SECTION 1207.1.6 AND LARGE-SCALE FIRE TESTING COMPLYING WITH SECTION 1207.1.7. | WILL COMPLY. |
| §1207.5.4 | AN APPROVED AUTOMATIC SMOKE DETECTION SYSTEM OR RADIANT ENERGY-SENSING FIRE DETECTION SYSTEM COMPLYING WITH SECTION 907.2 SHALL BE INSTALLED IN ROOMS, INDOOR AREAS, AND WALK-IN UNITS CONTAINING ELECTROCHEMICAL ESS. ALARM SIGNALS FROM DETECTION SYSTEMS SHALL BE TRANSMITTED TO A CENTRAL STATION, PROPRIETARY OR REMOTE STATION SERVICE IN ACCORDANCE WITH NFPA 72, OR WHERE APPROVED TO A CONSTANTLY ATTENDED LOCATION. | WILL COMPLY. |
| §1207.5.5 | ROOMS AND AREAS WITHIN BUILDINGS AND WALK-IN UNITS CONTAINING ELECTROCHEMICAL ESS SHALL BE PROTECTED BY AN AUTOMATIC FIRE SUPPRESSION SYSTEM. | NOT APPLICABLE, OUTDOOR SITE WITH NON-WALK IN UNITS. |
| §1207.5.6 | OUTDOOR WALK-IN UNITS HOUSING ESS SHALL NOT EXCEED 53 FT BY 8 FT BY 9.5 FT HIGH, NOT INCLUDING BOLT-ON HVAC AND RELATED EQUIPMENT, AS APPROVED. | COMPLIANT. |
| §1207.5.7 | AREAS WITHIN 10 FT ON EACH SIDE OF OUTDOOR ESS TO BE CLEARED OF COMBUSTIBLE VEGETATION AND OTHER COMBUSTIBLE GROWTH. | COMPLIANT. |
| §1207.5.8 | ESS LOCATED OUTDOORS AND IN OPEN PARKING GARAGES SHALL BE SEPARATED FROM ANY MEANS OF EGRESS AS REQUIRED BY THE FIRE CODE OFFICIAL TO ENSURE SAFE EGRESS UNDER FIRE CONDITIONS, BUT NOT LESS THAN 10 FEET. | WILL COMPLY. |
| §1207.6.3 | WHERE REQUIRED BY TABLE 1207.6 OR ELSEWHERE IN THIS CODE, EXPLOSION CONTROL COMPLYING WITH SECTION 911 SHALL BE PROVIDED FOR ROOMS, AREAS, ESS CABINETS OR ESS WALK-IN UNITS CONTAINING ELECTROCHEMICAL ESS TECHNOLOGIES. | COMPLIANT. |
| §1207.6.5 | WHERE REQUIRED BY TABLE 1207.6 OR ELSEWHERE IN THIS CODE, BATTERIES AND OTHER ESS SHALL BE PROVIDED WITH A LISTED DEVICE OR OTHER APPROVED MEANS TO PREVENT, DETECT, AND MINIMIZE THE IMPACT OF THERMAL RUNAWAY. | COMPLIANT. |
| §1207.6.6 | THE THERMAL RUNAWAY DETECTOR SHALL ACTIVATE UPON DETECTION OF GAS VAPORS PRODUCED BY LIQUID ELECTROLYTE IN A LITHIUM-ION CELL AT THE START OF A BATTERY VENTING EVENT. UPON DETECTION OF GAS VAPORS, THE DETECTION SYSTEM SHALL SHUT DOWN THE AFFECTED ESS RACK AND TRANSMIT A FIRE ALARM SIGNAL. DETECTION OF A THERMAL RUNAWAY EVENT SHALL ACTIVATE THE MECHANICAL VENTILATION WHEN IT IS PROVIDED AS A METHOD OF EXPLOSION CONTROL. | NOT APPLICABLE. |
| §1207.8.3 | ESS LOCATED OUTDOORS SHALL BE SEPARATED BY A MINIMUM OF 10 FEET FROM LOT LINES, PUBLIC WAYS, BUILDINGS, STORED COMBUSTIBLE MATERIALS, HAZARDOUS MATERIALS, HIGH-PILED STOCK, OTHER EXPOSURE HAZARDS. | COMPLIANT. |


FIRE&RISK ALLIANCE
7620 Standish Place
Rockville, MD 20855
Tel. 301-658-3060
Fax. 888-851-7016


**PRAIRIE PASS BESS**
**FIRE MASTER PLAN**
Adams County, CO

| REV. | DATE | REVISION DESCRIPTION | DRN. BY | ENG. BY | APP. BY |
|---|---|---|---|---|---|
| D | 04/10/26 | CODE REVIEW UPDATE | CW | MK | GM |
| C | 03/18/26 | CODE REVIEW UPDATE | CW | MK | GM |
| B | 03/09/26 | SITE PLAN UPDATE | IK | WB | GM |
| A | 08/07/25 | FOR REVIEW | IK | WB | GM |

DRN BY: IK
ENG BY: WB
APP BY: GM
DATE 04/10/26
PROJ NUM 465-048

**PRAIRIE PASS BESS**
**PRELIMINARY SITE PLAN**
**NFPA 855 AND IFC CODE REVIEW**

SCALE 1" = 100'
DRAWING NO. FP-1
REV. D


## GENERAL NOTES

1. THE CONTENTS OF THIS DRAWING ARE CONCEPTUAL IN NATURE AND ARE INTENDED TO BE USED AS A GENERAL REFERENCE FOR EMERGENCY RESPONSE PURPOSES. IT IS THE RESPONSIBILITY OF THE CLIENT TO ENGAGE THE AUTHORITY HAVING JURISDICTION FOR COORDINATION WITH ANY REQUIRED EMERGENCY RESPONSE PLANS AND FIRST RESPONDER TRAINING.

## BESS SITE INFORMATION

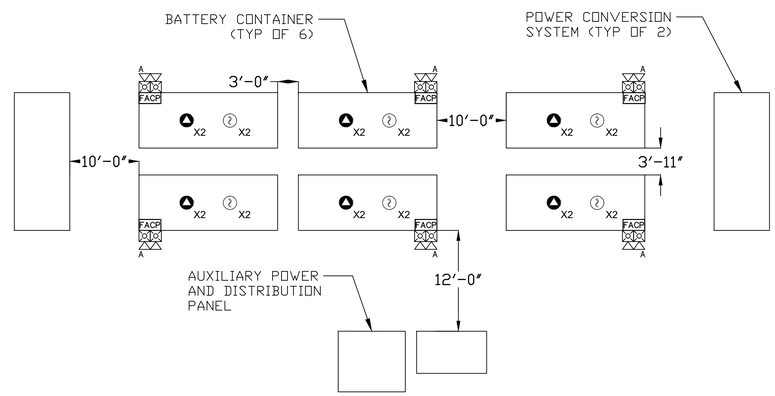
SITE NAME: PRAIRIE PASS BATTERY ENERGY STORAGE SYSTEM
SITE CAPACITY: 300MW / 1,200MWh
SITE LOCATION: ADAMS COUNTY, COLORADO
BATTERY CHEMISTRY: LITHIUM-IRON PHOSPHATE
PRELIMINARY BESS TECHNOLOGY: SBB 2.0
BESS NAMEPLATE CAPACITY: 4,990 kWH
ELECTRIC UTILITY: XCEL ENERGY

## SHEET NOTES

1. EXISTING XCEL ENERGY TIE-IN SUBSTATION IS LOCATED APPROXIMATELY 1,050 FT SOUTH OF THE SITE AND APPEARS TO INCLUDE A CONTROL BUILDING AND CIRCUIT BREAKERS.
2. LIMITED AGRICULTURAL EXPOSURE HAZARDS EXIST TO THE EAST.
3. RESIDENTIAL AND FARMLAND PROPERTIES ARE LOCATED TO THE NORTH AND WEST OF THE SITE. THE NEAREST BUILDING IS LOCATED APPROXIMATELY 930 FEET FROM THE NEAREST CONTAINER.
4. ADDITIONAL EXPOSURES EXIST TO THE NORTHWEST INCLUDING A POSSIBLE PROPANE TANK, STORAGE TANK, AND OIL PUMP, LOCATED APPROXIMATELY 475 FEET FROM THE NEAREST CONTAINER.
5. EXISTING TRANSMISSION LINES TO THE SOUTH LOCATED APPROXIMATELY 640 FEET FROM THE NEAREST CONTAINER
6. MASTER FACP TO BE LOCATED IN SUBSTATION CONTROL HOUSE.
7. SITE ANNUNCIATOR TO BE LOCATED AT FIRE COMMAND CENTER.
8. OIL-FILLED AUXILIARY TRANSFORMERS ARE LOCATED THROUGHOUT THE SITE.
9. MAIN POWER TRANSFORMERS LOCATED WITHIN THE SITE SUBSTATION.

## LEGEND

- PROPERTY LINE
- FENCE LINE
- FIRE HYDRANT (DRY MANUAL)
- FIRE DEPARTMENT CONNECTION (DRY MANUAL)
- FACP — FIRE ALARM CONTROL PANEL
- ANN — SITE ANNUNCIATOR
- GAS DETECTOR
- SMOKE DETECTOR
- FIRE ALARM HORN STROBE (A DENOTES AMBER)
- FIRE ALARM HORN STROBE (CLEAR)
- FCC — FIRE COMMAND CENTER




## 1 PRAIRIE PASS BESS EMERGENCY RESPONSE REFERENCE

SCALE: 1" = 200'

0 200' 400'
1"=200'

## 2 TYPICAL BESS EQUIPMENT SPACING

SCALE: NTS

FIRE&RISK ALLIANCE
7620 Standish Place
Rockville, MD 20855
Tel. 301-658-3060
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# PRAIRIE PASS BESS FIRE MASTER PLAN

Adams County, CO

| REV. | DATE | REVISION DESCRIPTION | DRN. BY | ENG. BY | APP. BY |
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| D | 04/10/26 | CODE REVIEW UPDATE | CW | MK | GM |
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DRN BY: IK
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PROJ NUM 465-048

PRAIRIE PASS BESS
EMERGENCY RESPONSE REFERENCE
AND TYPICAL BESS EQUIPMENT SPACING

SCALE 1" = 200'
DRAWING NO. FP-2
REV. D