ANS GEO

DRAFT GEOTECHNICAL REPORT

BRIGHTNIGHT
Power when you need it

Starfire Solar Project
Perry, Knott, & Breathitt County, Kentucky

March 29, 2024

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1 Executive Summary

ANS Geo, Inc. (ANS Geo) is pleased to provide this DRAFT Geotechnical Report (Report) to BrightNight for the proposed Starfire Solar Energy Generation Project located across Perry, Knott and Breathitt County, in Kentucky. We understand that the project is proposed with a nameplate capacity of 200 megawatts (MW).

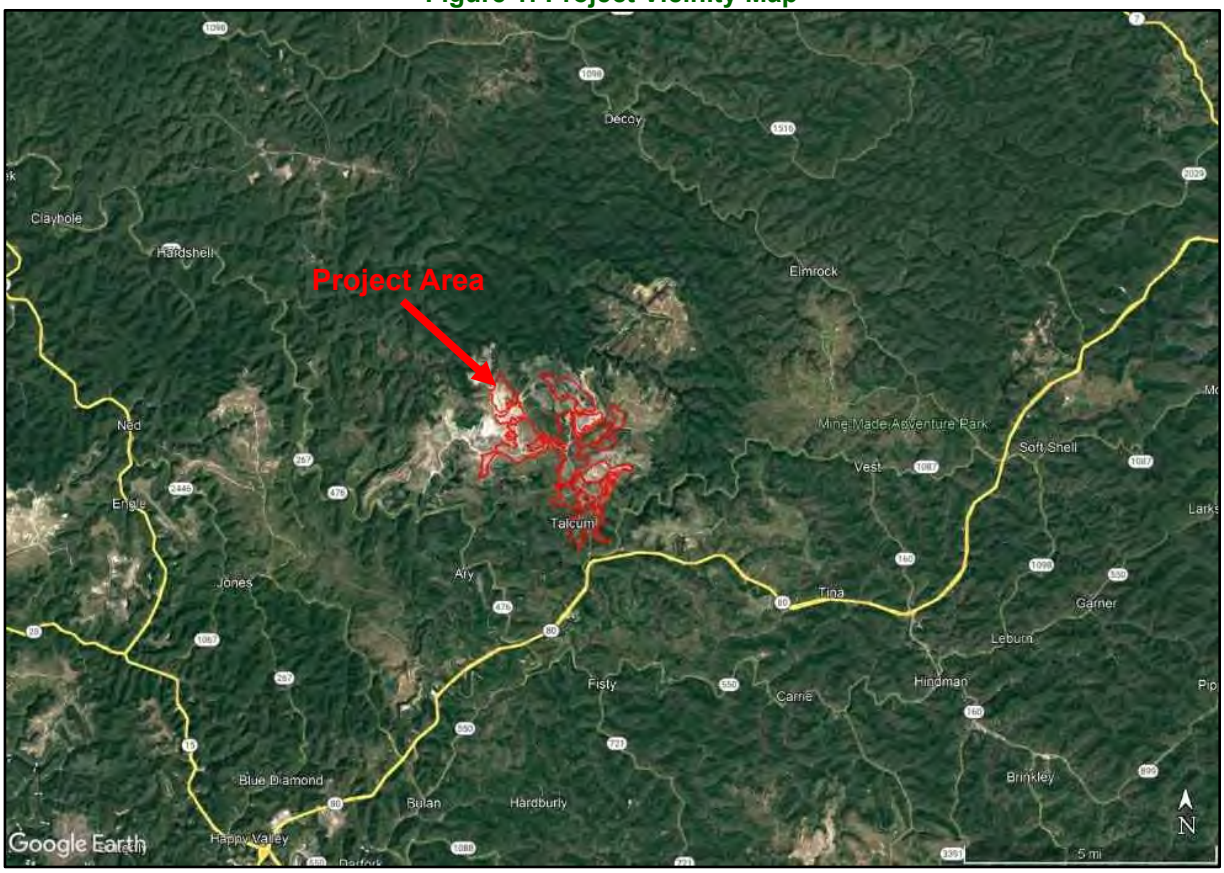
The purpose of this geotechnical investigation was to inform early-stage planning and design, as well as high-level constructability considerations such as trenchability and pile driveability using conventional means. ANS Geo has summarized, at a very high level, some of the critical observations which may impact project design and construction based on our observations during the preliminary geotechnical investigation. While items are summarized below, the reader is cautioned that this Executive Summary does not replace the detailed recommendations contained in each Section.

1. ANS Geo advanced 25 soil borings within the proposed array area, each locations was advanced to a target depth of 20 feet below ground surface (BGS). ANS Geo also completed six field Electrical Resistivity Tests (ERTs) within the projects array areas. Additionally, ANS Geo advanced 12 test pits and five double-ring infiltrometer tests as part of our investigation program. Thermal resistivity, corrosion, California Bearing Ratio, and soil index testing were conducted throughout the geotechnical investigation. A Site Investigation Location Plan is provided within **Attachment A.**
2. The soil profile observed within the upper 20 feet remained predominantly consistent, being composed of sand, silt, and gravel, with cobbles and boulders frequently encountered during test pit excavations. A very dense material was generally observed within the upper four feet, followed by a medium dense material as depths increased. While no auger refusal was observed throughout ANS Geo's field campaign, split spoon refusal was consistently encountered within the conducted soil borings, indicating the presence of very dense material. A detailed description of encountered subsurface conditions and lab test results are summarized in Section 4, and Section 5, respectively. All boring logs, test pit logs, and lab test results are provided in **Attachment C, Attachment D,** and **Attachment H**, respectively.
3. Groundwater was encountered within four of the 25 soil borings, at depths ranging from five and 18 feet below grade. It should be noted that seasonal variation may cause fluctuations in the groundwater table, alongside the possible presence of perched groundwater.
4. Ad-freeze is expected at this site for driven PV posts and buried shallow foundations. ANS Geo has recommended an ad-freeze depth of 18-inches (1.5 feet) assuming vegetative cover will be maintained across the areas where array foundations will be installed, along with an ad-freeze stress of 1,500 psf within this depth. All other foundations (such as inverters and pads) should be installed with turn-downed slabs or bottom of foundation to a minimum frost penetration depth of 24-inches (2 feet).
5. Based on laboratory California Bearing Ratio testing, access roads within the project boundary should be designed assuming a minimum subsurface CBR value of 20%. Under this assumption, access roads should be designed to include at least 8 inches of compacted crushed stone. It is possible that this thickness of stone can be reduced to as little as 6 inches if Class 2 or better geogrid with nonwoven geotextile fabric is used to reinforce the subbase. Further discussion of impacts of reduced aggregate thickness or alternative pavement designs are included in **Section 10.5**.
6. Based on corrosivity laboratory testing and currently available field electrical resistivity testing, the in-situ soil conditions generally indicate soils that may be considered "mildly corrosive". It is anticipated that appropriate protective measures for buried steel such as standard galvanic coating or similar will be employed to manage this corrosion.

2 Project Understanding

ANS Geo is pleased to provide this Geotechnical Report to BrightNight to summarize the results of our geotechnical investigation program to support the proposed Starfire Solar Project located in Perry, Knott, and Breathitt County, Kentucky. We understand that the project is proposed with an area of approximately 7,000 acres with a nameplate capacity of 200 megawatts (MW). A map showing the location of the proposed project with respect to the surrounding region is provided as Figure 1.

Figure 1: Project Vicinity Map



Source: Google Earth Imagery dated 01/30/2022

ANS Geo, in consultation with and approval from BrightNight developed a geotechnical investigation program, which was implemented by ANS Geo in March 2024 to help support the design and construction of the proposed solar facility.

ANS Geo's geotechnical investigation program included soil borings, test pits excavations, double-ring infiltration testing, pile load testing, and electrical resistivity testing (ERTs) across solar arrays, as well as engineering evaluation to provide foundation recommendations and constructability information of existing soils for the proposed development. Our work also included thermal resistivity testing for grounding and cabling design. Laboratory testing also included corrosion testing to evaluate the potential of the native soils for corrosion to buried steel and concrete, as well as CBR (California Bearing Ratio) to guide access roadway design. An as-completed site investigation map is provided within **Attachment A.**

3 Methodology

3.1 Soil Borings

ANS Geo advanced 25 soil borings completed at select locations across the project area on March 9 through March 15, 2024. The soil boring locations are depicted within the Site Investigation Mapping, provided within **Attachment A.**

The 25 array-area soil borings were advanced to a target depth of approximately 20 feet below ground surface (BGS). A Diedrich D-70 drill rig was used to collect soil samples using the Standard Penetration Test (SPT) Method through hollow-stem augers in accordance with ASTM Standard D1586. Soil samples were collected continuously within the upper 10 feet in each boring, then in five-foot intervals thereafter to the termination depth. Soil boring locations, proposed by ANS Geo and confirmed by BrightNight for review, were located at relatively evenly spread locations throughout the project's array area(s). All soil borings were overseen and logged by an ANS Geo representative under the direction of a Professional Engineer licensed in the State of Kentucky. Typed soil boring logs are presented as **Attachment C.**

At select soil boring locations, auger cuttings were collected one (1) to five (5) feet below grade with the purpose of obtaining bulk soil samples for laboratory thermal resistivity testing (TRT), corrosivity testing, and California Bearing Ratio (CBR). Upon completion, each borehole was backfilled to its existing grade with soil cuttings.

3.2 Test Pits

ANS Geo advanced 12 test pits (TP-01 through TP-12) at locations spread relatively evenly across the project site between March 10, 2024, and March 12, 2024. The location of each test pit excavation is depicted in the Site Investigation mapping provided within **Attachment A**. Each test pit was advanced using a Wacker Neuson CT-90 excavator to depths ranging between 3 and 10.5 feet below existing grade. All test pits were overseen and logged by an ANS Geo representative under the direction of a Professional Engineer licensed in the state of Kentucky. Soil strata changes, soil classification, water levels and excavation depths were documented during each test pit excavation and are presented within the test pit logs provided as **Attachment D**.

Upon completion, each test pit excavation was backfilled with native soil cuttings, bucket-tamped, and driven over several times with the excavator to minimize any post-excavation settlement.

3.3 Infiltration Testing

ANS Geo performed infiltration testing adjacent to five (5) test pits excavations during our field investigation (TP-02, TP-04, TP-06, TP-07, and TP-11). All testing was performed at grade, as testing could not be performed on the unprepared coarse grain material below grade. The test locations are depicted in the Site Investigation Map, provided within **Attachment A**.

ANS Geo performed two (2) infiltration tests at each testing location in accordance with the Double-Ring Infiltrometer test (per ASTM Standard D3385) at the proposed locations. A double-ring infiltrometer test consists of two concentric metal rings. The rings were driven into the ground and filled with water. The drop in water level or volume in the inner ring is used to calculate an infiltration rate. The infiltration rate is determined as the amount of water per surface area and time unit that infiltrates into the soil. The outer ring is placed into soil, to a minimum depth of two (2) inches. Then, the inner ring is placed in center of outer ring and into soil a minimum of two (2) inches. The bottom rim of both rings are set at the same level. The test area is pre-soaked prior to testing by filling both rings (outer ring first, then inner ring) with water to four (4) inches above the exposed subgrade for two (2), 30 minute intervals. The drop in the water level during the last 30 minutes of the presoaking period was applied to the following standard to determine the time interval between readings:

- If water level drop is 2-inches or more, ANS Geo used 10-minute measurement intervals.
- If water level drop is less than 2-inches, ANS Geo used 30 or 60-minute measurement intervals.

ANS Geo obtained a reading of the drop in water level in the center ring at selected time intervals. After each reading, per the test standard, our on-site staff re-filled both rings to the water level indicator mark. Measurement to the water level in the center ring was made from a fixed reference point and continued at the interval determined until a minimum of eight (8) readings were completed or until a stabilized rate of drop is obtained, whichever

occurred first. A stabilized rate of drop was defined as a difference of 1/4 inch or less of drop between the highest and lowest readings of four (4) consecutive readings. The average stabilized drop rate that occurs in the center ring during testing or the final period expressed as inches per hour, which represents the infiltration rate for that test location.

3.4 Electrical Resistivity Testing

As part of our field investigation program, ANS Geo completed field electrical resistivity testing (ERT) at six (6) locations within the proposed project areas between March 7 and 8, 2024.

In-situ soil resistivity measurements were obtained by utilizing the Wenner 4-Pin Method in accordance with ASTM G57 and IEEE Standard 81. Two mutually perpendicular traverses were collected at each ERT location. Six ERTs located within the array area were completed using “a” spacings of 2 ft, 5 ft, 10 ft, 20 ft, and 50 ft. Completed ERT data is presented in **Attachment F**.

3.5 Pile Load Testing

3.5.1 Pile Installation

ANS Geo conducted a pile load testing program of W6x9 steel sections across the proposed solar array areas on March 9, 2024, through March 14, 2024. A total of 10 installation locations were considered throughout the proposed site boundary. Pile embedment depths ranged between seven to nine feet below grade with total drive times ranging between roughly 30 and 122 seconds. Pile installation refusal was not encountered in any piles on site.

Table 1: Pile Installation Summary Table

Load Test ID	Embedment Depth (ft.)
PT-01 A	7
PT-01 B	9
PT-02 A	7
PT-02 B	9
PT-02 C	7
PT-03 A	7
PT-03 B	9
PT-04 A	7
PT-04 B	9
PT-05 A	7
PT-05 B	9
PT-06 A	7
PT-06 B	9
PT-07 A	7
PT-07 B	9
PT-08 A	7
PT-08 B	9
PT-08 C	7
PT-09 A	7
PT-09 B	9
PT-10 A	7
PT-10 B	9

All piles were installed via direct push to significant resistance, then driven to their targeted depths using a GAYK HRE 4000 Pile Driver. The installation program was overseen and logged by an ANS Geo geotechnical representative.

3.5.2 Uplift Testing

Once installed to the targeted embedment depth, all piles underwent a 72-hour soak period. Following the soak period, an uplift load test was performed on each “A” and “B” test pile in accordance with the ASTM D3689 (uplift) test method. The tension load was applied using a Wacker Neuson CT-90 compact excavator which applied the load concentrically to the pile by using a 10-ton rated strap. This strap was attached to a dynamometer, as well as a “pacman” clamp attachment to secure the assembly to the pile.

Tension loads were applied in one-minute, targeted 1,000-pound load increments. Loads were applied until the maximum target load of 10,000 pounds was reached or until a maximum vertical displacement of one inch (pile failure criteria) was achieved, whichever came first. Following maximum load or pile displacement, the load was released, and the final displacement was recorded. A photograph generally depicting the uplift test arrangement is provided as Figure 2.

Figure 2: Typical Uplift Test Setup



3.5.3 Lateral Testing

A lateral load test was performed at each “A” and “B” test pile following the uplift load test in general accordance with ASTM D3966 (lateral) test method. The tension load was applied using a Wacker Neuson CT-90 compact excavator which applied the load concentrically to the pile using a 10-ton rated strap. This strap was attached to a dynamometer, as well as a beam clamp to secure the assembly to the pile.

Each test load was applied in one-minute, 500-pound increments. Lateral loads were applied at 48 inches above grade. Loads were applied until the maximum specified target load of 5,500 pounds was reached or until a maximum lateral deflection of one inch (pile failure criteria), after which, the load was released, and the residual deflection was recorded. A photograph generally depicting the lateral test arrangement is provided as Figure 3.

Figure 3: Typical Lateral Test Setup



3.5.4 Compression Load Testing

A compression load test was performed at two (2) test locations across the project site and was performed in accordance with the ASTM D1143 (compression) test method. The compression load was applied using a Wacker Neuson CT-90 excavator which applied the load concentrically to the pile by using an Enerpac hydraulic jack.

Compression loads were applied in 1,000-pound intervals until a compression load of 10,000 pounds was achieved. Following the maximum load, the load was released, and the final displacement was recorded. A photograph generally depicting the compression test arrangement is provided as Figure 4.

Figure 4: Typical Compression Test Setup



At the conclusion of the program, each test pile was fully extracted. All scrap material was disposed of off-site, and all test locations were backfilled and leveled to match the original grade.

4 Geology and Subsurface Conditions

ANS Geo conducted a brief, desktop review of surficial and bedrock geology maps and reports made available by the United States Geological Survey (USGS), Federal Emergency Management Agency (FEMA), and the USDA's Natural Resources Conservation Service (NRCS).

4.1 Topographic Setting

Based on USGS topographic mapping, elevations range from approximately 950 feet above mean sea level (AMSL) to approximately 1475 feet AMSL with an average of approximately 1280 feet AMSL. The site observes a moderately sloped topography, (0~7% slope on average), however the site does contain inclines as high as 32%.

4.2 FEMA Flood Zones

Based on available mapping of Knott, Perry, and Breathitt County, the site does not contain 100-year floodplain areas mapped across the project boundary. This location within Eastern Kentucky is designated by FEMA as an Area of Minimal Flood Hazard.

4.3 Surficial Geology

The NRCS survey was initially created for agricultural purposes and is generally limited to the upper five (5) feet BGS; however, the resource provides generalized information pertaining to the soil chemistry and properties of the near-surface soil within the zone. The NRCS mapping identifies 54.4% of the site as Fiveblock and Kaymine Loam, 16.4% as Kaymine, Fairpoint, and Fiveblock Loam, 13.0% as Fairpoint and Bethesda Loam, and 12.2% Fairport Loam. The soils on site are consistently described as well drained to somewhat excessively drained. While the major constituent is listed to have slight erosion hazard, it should be noted that Fairpoint and Bethesda Loam is described to have severe erosion potential. The full NRCS soil report is provided as **Attachment J**.

4.4 Bedrock Geology

ANS Geo reviewed geologic maps made available by the United States Geological Survey (USGS) and Kentucky Geological Survey, which indicated the project area is mapped within the Breathitt Formation dating to the Pennsylvanian geologic subperiod. The majority of the site is within the Breathitt Formation, Middle Part which comprises of sandstone and shale, with siltstone, coal, and limestone as minor components. Some portions in the East and South of the project site are within the Breathitt Formation, Upper Part which comprises of sandstone and siltstone, with coal and limestone as minor constituents. Based on well data provided by the Kentucky Geological Survey, shallow bedrock has been observed south of the project site at depths between 5.5 and 22 feet BGS. It is expected, however, that the workings of the area as a former mine will lead to irregular presence of "cobbles", "boulders", and larger tailing remnants. This was confirmed by our subsurface investigation, summarized in Table 2 in **Section 4.5.**

4.5 Observed Subsurface Conditions

ANS Geo has provided the generalized subsurface conditions and a borehole summary table within Tables 2 and 3 below based upon the observations made during our geotechnical investigation. ANS Geo notes that the profile outlined in Table 2 is highly generalized and that soil boring logs provided as **Attachment C** should be reviewed for location-specific subsurface conditions.

Table 2: Generalized Subsurface Profile

Avg. Depth (ft)	Material	Avg. Consistency	Description
0' ~ 0.25'	Topsoil	---	A thin layer of surficial topsoil was consistently observed throughout the project boundary. On average, this layer was observed to extend approximately 3 inches, however topsoil may extend to greater depths throughout the project site.
0.25' ~ 4'	Silty Sand & Silty Gravel (SM/GM)	Dense	Beneath the overburden topsoil, a light brown to light gray silty sand and silty gravel material was consistently encountered. Additionally, within the test pit excavations performed on site, cobbles and boulders were consistently encountered throughout the upper four feet. Standard penetration "N" values ranged from 12 to greater than 50 blows per foot (bpfs) within this layer and averaged 33 bpfs.
4' ~ 11.5'	Silty Sand & Silty Gravel (SM/GM)	Medium Dense	Beyond the upper four feet below grade, a similar, less dense, silty sand and silty gravel soil profile was observed. This range of depths similarly observed frequent cobbles and boulders throughout the performed test pit excavations. Standard penetration "N" values ranged from 0 to greater than 50 bpfs within this layer and averaged 20 bpfs. Additionally, groundwater was encountered within three soil borings within this layer ranging from 5 to 6 feet below grade.
11.5' ~ 20'	Silty Sand & Silty Gravel (SM)	Medium Dense	Beyond approximately 10 feet below grade, a similar soil profile with greater density was observed, as silty sand and silty gravel were noted within the conducted soil borings. Standard penetration "N" values ranged from 3 to greater than 50 blows per foot within this layer and averaged 24 bpfs. Additionally, groundwater was encountered within this depth range at one soil boring location at a depth of approximately 18 feet below grade.

Table 3: Borehole Summary Table

Borehole ID	Approximate Elevation (AMSL)	Depth to Assumed Cobbles, Boulders or Weathered Rock (ft)	Termination Depth (ft)	Ground Water Depth (ft)
B-01	1237	N/E	20	N/E
B-02	1331	15	18	N/E
B-03	1385	6	20	18
B-04	1390	17	20	N/E
B-05	1357	N/E	18.3	N/E
B-06	1330	N/E	20	N/E
B-07	1187	N/E	20	N/E
B-08	1311	N/E	20	N/E
B-09	1328	N/E	20	N/E
B-10	1318	N/E	20	N/E
B-11	1292	N/E	20	N/E
B-12	1279	2	20	N/E
B-13	1358	N/E	20	N/E
B-14	1346	N/E	20	N/E
B-15	1351	3	19	N/E
B-16	1346	13	20	N/E
B-17	1402	N/E	18.1	N/E
B-18	1309	11	20	N/E
B-19	1398	N/E	20	5
B-20	1318	1	20	N/E
B-21	1345	6	20	6
B-22	1336	N/E	20	N/E
B-23	1320	N/E	20	N/E
B-24	1248	N/E	20	N/E
B-25	1350	13	18	5

N/E = Cobbles, Boulders, & Weathered Rock or Groundwater not encountered

4.6 Groundwater Conditions

At the time of our investigation, water was observed within 4 of the 25 borings conducted at depths of 5 and 18 feet below grade, which may likely represent “perched” conditions. Additionally, it is possible that snow melt, and seasonal conditions may cause the groundwater table to fluctuate as depth to groundwater is ephemeral and may be influenced by precipitation, temperature, or seasonal variations. Perched water may be present in soils where a low-permeability layer exists above a higher-permeability layer, causing water to accumulate and form a saturated zone that is isolated from the static water table.

5 Laboratory Results

5.1 Soil Index Testing

Representative soil samples were collected during our investigation and submitted to ANS's accredited materials testing laboratory. A summary of the index laboratory test results is provided within Table 4 and Table 5. Laboratory results are included within **Attachment F**.

Table 4: Soil Index Testing Summary (Atterberg Limits)

Location ID	Sample ID	Depth (feet)	Liquid Limit	Plastic Limit	Plasticity Index	% Moisture	USCS Symbol
B-04	S-7	18 - 20	35	21	14	11.2	CL
B-05	S-3	4 – 6	32	20	12	7.2	CL
B-10	S-1	0 - 2	21	15	6	9.9	CL-ML
B-11	S-5	8 - 10	27	18	9	5.4	CL
B-13	S-4	6 - 8	19	15	4	11.3	CL-ML

Table 5: Soil Index Testing Summary (Sieve Analysis)

Location ID	Sample ID	Depth (feet)	% Gravel	% Sand	% Fines (Silt and Clay)	% Moisture
B-06	S-2	2 – 4	45.2	22.0	32.8	3.3
B-07	S-3	4 – 6	42.8	37.1	20.1	7.7
B-08	S-3	4 – 6	23.3	41.7	35.0	6.8
B-09	S-1	0 – 2	38.4	19.0	42.6	6.5
B-14	S-4	6 – 8	38.9	38.1	23.0	7.7
B-15	S-6	13 – 15	23.1	51.4	25.5	6.8
B-16	S-5	8 – 10	36.1	45.9	18.0	5.7
B-17	S-2	2 – 4	42.0	35.5	22.5	6.9
B-18	S-2	2 – 4	29.6	48.2	22.2	8.2
B-19	S-7	18 – 20	13.1	70.5	16.4	10.7
B-20	S-3	4 – 6	44.1	39.4	16.5	5.4
B-21	S-4	6 – 8	40.6	35.0	24.4	6.7
B-22	S-7	18 – 20	40.7	33.1	26.2	6.6
B-23	S-5	8 – 10	36.4	43.7	19.9	4.6
B-24	S-7	18 – 20	44.0	31.3	24.7	7.25
B-25	S-5	8 – 10	12.6	22.2	65.2	14.5

5.2 Thermal Resistivity Testing

ANS Geo collected a bulk sample from six locations within the project area from three to five feet below grade for laboratory testing of Thermal Resistivity. Soil was collected in a five-gallon bucket and delivered to ANS's accredited laboratory for testing. The soil was compacted to 85 and 95 percent of its Standard Proctor Density in accordance with ASTM D698, and Thermal Resistivity Testing was conducted for both compaction densities in accordance with IEEE Standard 442-2017. Results of the thermal testing are summarized within Table 6 and Table 7. Complete, as-received results are provided within **Attachment F**.

Table 6: Thermal Resistivity Testing Summary (85% Standard Proctor Compaction)

Location ID	Thermal Resistivity Values at Various Moisture Contents						Received Moisture Content (%)	Re-Molded Dry Density (lb/ft3)
	% water	% water	% water	% water	% water	% water		
	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)		
TP-01	0.0	1.6	3.3	4.9	6.5	11.4	11.4	116.6
	210.3	**146.8**	**76.8**	**69.1**	**65.9**	**62.7**		
TP-05	0.0	2.0	4.0	5.9	7.9	9.5	9.5	112.5
	202.5	**137.4**	**67.8**	**60.7**	**57.8**	**57.1**		
TP-06	0.0	1.9	3.7	5.6	7.4	12.3	12.3	115.6
	214	**154.1**	**79.1**	**69.7**	**66**	**63.5**		
TP-07	0.0	1.7	3.4	5.1	6.8	12.2	12.2	114.0
	210.3	**156.2**	**78.3**	**68.4**	**65**	**61.7**		
TP-09	0.0	2.0	4.0	5.9	7.9	10.2	10.2	111.4
	197.9	**134.9**	**65.5**	**58.4**	**55.7**	**55**		
TP-11	0.0	1.5	3.1	4.6	6.1	10.0	10.0	115.7
	194.2	**144.4**	**72.1**	**64**	**60.8**	**58.2**		

Table 7: Thermal Resistivity Testing Summary (95% Standard Proctor Compaction)

Location ID	Thermal Resistivity Values at Various Moisture Contents						Received Moisture Content (%)	Re-Molded Dry Density (lb/ft3)
	% water	% water	% water	% water	% water	% water		
	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)	(°C-cm/W)		
TP-01	0.0	1.6	3.3	4.9	6.5	11.4	11.4	130.3
	179.2	**117.4**	**69.6**	**64.0**	**60.8**	**57.6**		
TP-05	0.0	2.0	4.0	5.9	7.9	9.5	9.5	125.7
	170.1	**108.2**	**61.3**	**56.1**	**53.4**	**52.6**		
TP-06	0.0	1.9	3.7	5.6	7.4	12.3	12.3	129.2
	182.5	**122.5**	**69.3**	**62.8**	**59.4**	**56.9**		
TP-07	0.0	1.7	3.4	5.1	6.8	12.2	12.2	127.4
	178.3	**125.1**	**69.7**	**63.1**	**59.9**	**56.5**		
TP-09	0.0	2.0	4.0	5.9	7.9	10.2	10.2	124.5
	167.0	**104.2**	**56.7**	**52.0**	**49.6**	**49.0**		
TP-11	0.0	1.5	3.1	4.6	6.1	10.0	10.0	129.3
	161.6	**114.1**	**64.4**	**58.8**	**56.1**	**53.5**		

5.3 Corrosivity Testing

ANS Geo collected eight samples from two (2) to four (4) feet below grade for the purpose of laboratory corrosivity testing. The testing was completed by ANS, and results are summarized within Table 8 and detailed within **Attachment F**.

Table 8: Corrosivity Testing Summary

Location ID	pH	Sulfate (mg/kg)	Chloride (mg/kg)	Soil Box Resistivity (Ω-cm)	Redox Potential (average) (mV)
B-02	7.5	<15	354	11,700	332
B-03	6.9	780	30	8,470	353
B-05	7.0	750	63	12,500	342
B-07	6.4	150	27	36,700	322
B-12	7.4	30	126	11,000	309
B-18	7.4	30	147	28,200	289
B-22/23	5.2	<15	69	26,600	360
B-09/25	5.8	30	105	24,300	292

5.4 California Bearing Ratio

ANS Geo collected a bulk sample from one to three feet below grade at five locations for testing of California Bearing Ratio (CBR) in accordance with ASTM D1883, at approximately 95 percent of its Standard Proctor Density (ASTM D698). The results of the testing are summarized within Table 9 and detailed within **Attachment F.**

Table 9: California Bearing Ratio Summary

Location ID	CBR Ratio (%)
TP-01	29.4
TP-03	20.9
TP-05	17.9
TP-08	21.4
TP-12	21.8

6 Infiltration Testing Results

ANS Geo performed infiltration testing at five locations (IT-1 through IT-5), with testing performed at grade, at the proposed infiltration testing locations. Complete testing results are provided within **Attachment E**; however, a summary of testing results can be seen in Table 10 below.

Table 10: Double-Ring Infiltration Test Results

Test Pit ID	Test ID	Test A Infiltration Rate (in/hr)	Test B Infiltration Rate (in/hr)	Average Infiltration Rate (in/hr)
TP-01	IT-1	1.50	1.00	1.25
TP-05	IT-2	0.25	0.25	0.25
TP-07	IT-3	0.48	0.66	0.57
TP-09	IT-4	2.58	2.52	2.55
TP-12	IT-5	0.48	0.42	0.45

7 Pile Load Testing Results

ANS Geo's complete pile load testing program results are provided as **Attachment G**; however, a summary of the recorded data is provided in Table 11 below.

Table 11: Summarized Table of Maximum Pile Test Loads

Location ID	Embedment Depth (ft)	Maximum Uplift Load (lbs)	Maximum Uplift Displacement (in)	Maximum Lateral Load (lbs)	Maximum Lateral Deflection (in)	Maximum Compression Testing (lbs)	Maximum Compression Displacement (in)
PT-01A	7	5,500	1.0000	5,500	0.6820	-	-
PT-01B	9	6,500	1.0000	5,500	0.6900	-	-
PT-02A	7	5,100	1.0000	5,500	0.9045	-	-
PT-02B	9	8,100	1.0000	5,500	0.7735	-	-
PT-02C	7	-	-	-	-	10,000	0.3050
PT-03A	7	5,700	1.1500	5,500	0.5535	-	-
PT-03B	9	10,000	0.0015	5,500	0.4095	-	-
PT-04A	7	1,600	1.1150	5,500	0.6000	-	-
PT-04B	9	2,300	1.0000	5,500	0.7230	-	-
PT-05A	7	9,100	1.0000	5,500	0.3480	-	-
PT-05B	9	9,200	1.0000	5,500	0.6115	-	-
PT-06A	7	8,500	1.0000	5,500	0.7830	-	-
PT-06B	9	3,700	1.0000	5,500	0.7615	-	-
PT-07A	7	5,100	1.0000	5,500	0.5865	-	-
PT-07B	9	9,100	1.0000	5,100	1.0000	-	-
PT-08A	7	10,000	0.8210	5,500	0.6395	-	-
PT-08B	9	10,000	0.5345	5,500	0.6010	-	-
PT-08C	7	-	-	-	-	10,000	0.2140
PT-09A	7	10,000	0.8695	5,500	0.8350	-	-
PT-09B	9	10,000	0.9180	5,500	0.9310	-	-
PT-10A	7	6,900	1.0000	5,500	0.6335	-	-
PT-10B	9	10,000	0.3550	5,500	0.6020	-	-

8 Seismic Site Classification

Based on the observations recorded within our subsurface investigation program, Site Class D and a risk category of II can be assumed as the average condition across the project site. The following Site Class D seismic ground motion values were obtained from the USGS Seismic Hazard Maps, referenced in ASCE 7-16 Standard, for this site:

- 0.2 second spectral response acceleration, S_S= 0.270 g
- 1 second spectral response acceleration, S_1= 0.090 g
- Maximum spectral acceleration for short periods, S_{MS}= 0.320 g
- Maximum spectral acceleration for a 1-second period, S_{M1}= 0.190 g
- 5% damped design spectral acceleration at short periods, S_{DS}= 0.220 g
- 5% damped design spectral acceleration at 1-second period, S_{D1}= 0.130 g

8.1 Preliminary Seismic Evaluation

The designated seismic site class is anticipated based on results from our investigation program and using select areas of the site which have been investigated by ANS Geo. Seismic support data is provided as **Attachment I**. Based on our observation of subsurface conditions, estimated Site Class ratings, and review of USGS's 2018 National Seismic Hazard Map, ANS Geo concludes that there is a low to moderate risk of significant seismic activity which may impact the proposed solar facility.

9 Foundation Considerations

ANS Geo anticipates that, as typical with solar farm construction, embedded posts, such as W6x9 H-piles, will be used to support the proposed solar panels. Given the presence of cobbles, boulders, and weathered rock in all project areas, we expect that pre-drilling may be required for this site. Conventional shallow foundations such as sonotubes, spread footings, or similar systems may also be utilized for equipment pads and associated support structures.

9.1 Corrosion Considerations

9.1.1 Buried Concrete

Corrosive soils can have a significant impact on below-grade concrete foundations by potentially damaging or weakening the concrete. One of the primary forms of concrete deterioration due to exposure to corrosive soils is sulfate attack. Sulfate attack is a common form of concrete deterioration which occurs when concrete encounters water or soil containing sulfates. Sulfates are typically found in some soils, in seawater, and in wastewater treatment plants. The principal factors which affect the rate and severity of sulfate attack are permeability of concrete, concentration of sulfates, tricalcium aluminate (C3A) content, and calcium hydroxide content. When sulfates react with C3A, it will form ettringite which will expand and create internal tension within the concrete that eventually leads to cracking. Therefore, a low C3A content is one of the main considerations when selecting cements for sulfate resistance. For example, for severe sulfate exposures, Type V cement with a maximum C3A content of 5% is specified in Table 19.3.2.1 of the ACI Building Code (ACI 318-14).

Recommended concrete properties, including cement type, to resist sulfate attack are based on the site-specific sulfate exposure class, as per ACI318-14, Table 19.3.1.1. The severity of the exposure of concrete to sulfate is divided into four classes (S0 through S3) depending on the water-soluble sulfate in soil (percent by mass) or dissolved sulfates in water (ppm). The sulfate exposure class limits are given in Table 12 below.

If desired, ANS Geo can complete a detailed corrosion evaluation for the PV array post foundations at this project site and provide computations for expected corrosion rates for zinc coatings and bare steel assuming a provided design lifespan.

Table 12: Sulfate Exposure Classification from ACI318-14 Table 19.3.1.1

Sulfate Exposure Class	Water-Soluble Sulfate (SO_4^2) in soil, percent by mass	Dissolved Sulfate (SO_4^2) in groundwater, ppm
S0	$SO_4^2 < .10$	$SO_4^2 < 150$
S1	$.10 \leq SO_4^2 < .20$	$150 \leq SO_4^2 < 1{,}500$ or seawater
S2	$.20 \leq SO_4^2 \leq 2.00$	$1{,}500 \leq SO_4^2 \leq 10{,}000$
S3	$SO_4^2 > 2.00$	$SO_4^2 > 10{,}000$

As shown in Table 8, the results of laboratory corrosion testing indicate the water-soluble sulfate concentration within soil between two to four feet is averaged to approximately 225 mg/kg or .0225 percent by mass. Based on the results of this testing, the site soils appear to have a sulfate exposure class of **S0**, which corresponds to **negligible** sulfate exposure. ANS Geo recommends that concrete adheres to the requirements of ACI 318-14, Table 19.3.2.1 for concrete properties including maximum water-cement ratio, minimum compressive strength (psi), and cement type for the site-specific sulfate exposure class. For sulfate exposure class S0, external sulfate attack is likely not a concern and there are no recommended restrictions on cement type.

ANS Geo recommends that concrete adheres to the requirements of ACI 318-14, Table 19.3.2.1 for concrete properties including maximum water-cement ratio, minimum compressive strength (psi), and cement type for the site-specific sulfate exposure class.

9.1.2 Buried Steel

Given limited testing results measuring the soil pH level, sulfate and chloride concentrations, resistivity, and redox potential summarized in Table 8 in **Section 5.3**, in consideration with the soil and moisture conditions observed, the in-situ soil conditions generally indicate soils that may be considered "mildly corrosive". Therefore, it is anticipated that hot dipped galvanized steel with a minimum zinc coating thickness in accordance with ASTM A123 should be specified to provide allowance for corrosion loss. For structural steel shapes, a minimum zinc coating thickness typically ranges from 3-mil to 4-mil depending on the steel section size as specified by ASTM A123. For example, a W6x9 shall contain a minimum zinc coating grade of 75 micrometers, or a 3-mil thick coating.

Steel section loss in piles decreases the structural load carrying capacity of the member as well as increases the member deflections. Therefore, it is recommended that the final structural design considers the useful life of galvanized (zinc) coating, followed by the anticipated loss of steel due to corrosion to ensure the structural integrity is maintained throughout the service life. Thicker pile sections, increased zinc coating thickness, or other corrosion protection measures may be necessary to accommodate any reduction in structural capacity. For example, it is possible that a W6x12 pile with a standard zinc coating thickness could corrode to W6x9-equivalent section throughout the service life depending on the corrosion-related soil properties.

If desired, ANS Geo can complete a detailed corrosion evaluation for the PV array post foundations at this project site and provide computations for expected corrosion rates for zinc coatings and bare steel assuming a provided design lifespan.

9.2 Frost & Ad-freeze Considerations

9.2.1 Frost Depth

According to the US Department of Commerce, within Knott County, Kentucky, the local frost depth is mapped to exist at approximately 24 inches below grade. ANS Geo recommends that all shallow (non-pile) foundations should be embedded at least to this depth. Shallower foundation depths may also be accommodated, provided they are appropriately frost-protected by way of appropriately designed haunched edges, foam insulation, and/or free-draining structural fill extending to the frost depth.

For shallow foundations which are not load-bearing or sensitive to movement, such foundations may be able to be founded at shallower depths. ANS Geo should be contacted to provide recommendations for minimum embedment depth in this scenario.

9.2.2 Ad-freeze Influence

We recognize that fluctuations in air temperature, snow cover and insulation, and historic freezing indices have shown empirical correlations of shallower frost depth. For design of array and support structure pile foundations, shallower depths of frost influence may be considered, hereby referred to as "ad-freeze depth".

Given the location of the project and soils encountered, the potential for frost heave against post foundations should be considered. Fine-grained soils, or granular soils with greater than 10 percent fine-grained content are frost-susceptible due to the inability of entrapped moisture from infiltrating or evaporating prior to freezing. Trapped moisture will begin to create ice lenses, which will grip the steel posts or embedded structures, followed by ice-jacking due to frost heave. The phenomenon is more commonly referred to as "ad-freeze stress", which can be considered as an external, upward force applied to the post. The magnitude of the upward force will depend on the depth/thickness of the frost zone, the interface bond stress between embedded structure/material and the surrounding area, and the surface area of the structure/material in contact with this bond stress.

Several methods exist to evaluate frost susceptibility of soils, including determination of fine-grained content of near-surface soils, evaluation of air freezing index, and local, empirical correlations such as the Atlas of Soil Freezing Depth Extremes for the Northeastern United States. Frost penetration depth may be calculated in multiple ways, including local, County, or State building code frost depths, the US Army Corps of Engineers method using the modified Berggren Equation, and empirical data.

Using the modified Berggren Equation, frost penetration depth can also be calculated based on assumed values for soil density, moisture content, thermal conductivity, air freezing index, and volumetric latent heat of soil. Using site-specific values and assumptions, input into the modified Berggren Equation, and our professional opinion and experience, the calculated frost penetration depth for a 100-year return period, for ad-freeze stress consideration purposes, is roughly 16.1 inches.

Based on our evaluation, since conditions may exist where snow cover is not present during low temperature extremes, and using a calculated depth of frost penetration, ANS Geo recommends that piles may be designed considering an "ad-freeze depth" of 18 inches (1.5 feet) below grade with the presence of sod/vegetative cover. As predominantly coarse-grained soils were observed near grade, ANS Geo recommends that an unfactored ad-freeze (uplift) stress of 1,500 pounds per square foot (10.4 psi) be considered within the 18-inch ad-freeze depth of posts for panel foundation sizing and design.

9.3 Soil Shrink & Swell Potential

Shrinkage and swelling of soils refer to the volumetric change (decrease and increase) exhibited in primarily fine-grained soils due to a change in moisture conditions. The extent of shrinking and swelling is largely influenced by the type and amount of clay present in the native near-surface soils. Higher-risk soils generally include fine-grained material with a high clay content, greater than 50 percent by weight, and liquid limits of 50 percent or higher (fat clays). Based on our observed soil conditions and the "Swelling Clays Map of the Conterminous US", it is our professional opinion that the native on-site soils exhibit low swelling potential.

9.4 Recommended Soil Parameters for Array Post Design – Driven Piles

Based on our interpretation of the subsurface conditions observed within our limited investigation program, ANS Geo recommends the soil parameters in Table 13 be considered for preliminary pile design within array areas **only**. Other foundation types, such as slab-on-grade and shallow foundations are provided in **Section 9.5.**

Table 13: Recommended Soil (LPILE) Parameters for Driven Pile Design

Depth	Material	Total Unit Weight (lb/ft^3)	Internal Friction Angle (°)	Cohesion (lb/ft^2)	Soil Modulus (k) (lb/in^3)	Soil Strain (E_{50})	Allowable End Bearing (lb/ft^2)	Allowable Side Resistance (lb/ft^2)
0' – 1.5'	*Sand (Reese)*	115	35	---	160	---	---	---
1.5' – 4'	*Sand (Reese)*	115	35	---	190	---	3,750	215
4' – 10'	*Sand (Reese)*	110	34	---	140	---	4,000	245

1. These recommendations consider a minimum factor of safety of 2.5 for end-bearing and 1.5 for skin friction conditions.
2. Equivalent box perimeter area approach was utilized for axial capacities.
3. These recommendations assume no groundwater is encountered.

ANS Geo recommends that allowable side resistance within the upper 18 inches feet (1.5 feet) be neglected due to frost impact and ad-freeze stresses for native soils within the project site. The values provided within Table 13 are curve-fit and justified by a limited investigation program conducted March of 2024. It is our recommendation that verification load testing using the proposed pile section, embedment depth, and driving equipment, as well as detailed structural calculations, be performed prior to construction to confirm these recommendations.

An effective unit weight value (62.4 lb/ft^3 subtracted from the Total Unit Weight values prescribed in Table 13) should be considered for soil layers below the design groundwater table.

ANS Geo further notes that the parameters provided in Table 13 are considering direct embedment of piles using conventional installation techniques into native. Should pre-drilling be completed, or ground screws be used, Table 13 should not be used since the diameter of pre-drilling, pre-drilled hole backfill, and ground contact/socket resistance of the pile or screw against the hole will influence the design recommendations. Recommended design parameters for pre-drilled and installed piles or ground screws should be determined using field-scale testing, using the means-and-methods planned during construction, to simulate the performance of those piles and provide design guidance for the alternate means of installation.

9.5 Recommended Soil Parameters – Shallow Foundations

ANS Geo anticipates that shallow foundations such as concrete footings, housekeeping pads, inverter pads, or sonotubes will be used to support non-critical and lightly loaded structures. As such, we recommend the soil parameters depicted within Table 14 be considered for such foundation designs, assuming a maximum post-construction settlement of one-inch. Load-bearing foundations should be installed atop properly prepared subgrade as indicated in **Section 10.3**.

Table 14: Recommended Soil Parameters for Shallow Foundation (Slab) Design

Depth	Material	Effective Unit Weight	Internal Friction Angle	Cohesion	Allowable Bearing Capacity	Coefficient of Sliding Resistance
1' – 2'	Silty Sand	115 lb/ft^3	34	---	1,000 lb/ft^2	0.33
2' – 3'	Silty Sand	115 lb/ft^3	34	---	2,000 lb/ft^2	0.33
3'+	Silty Sand	115 lb/ft^3	34	---	2,000 lb/ft^2	0.33

ANS Geo notes that Table 14 includes bearing capacities for layers which may be impacted by frost. For foundations which are founded within the frost depth, these foundations should be frost-protected by way of appropriately designed haunched edges, foam insulation, and/or free-draining structural fill extending to the frost depth. The recommended parameters in Table 14 assume that shallow foundations are founded on compacted structural fill atop proof-rolled and properly prepared native material, free from any cobbles or deleterious material.

Should the maximum allowable bearing capacity be lower than necessary, ANS Geo recommends additional over-excavation (in addition to the recommended 12-inch minimum) and replacement with compacted structural fill. For each additional 12-inches of over-excavation and replacement of structural fill, an increase of 250 psf can be achieved up to a maximum allowable bearing capacity of 2,500 psf.

The above recommendation in Table 14 is based on isolated footings with dimensions producing less than 100 square feet. Mat foundations (100 square feet or larger, such as larger substation slabs) should be founded at a depth of at least 24 inches or greater on at least 16 inches of properly compacted structural fill**.** Rigid mat foundations placed on properly compacted fill may be designed for a maximum allowable bearing capacity of 600 lb/ft^2 and may be designed for a maximum settlement of two (2) inches. For the foundation soils, the modulus of subgrade reaction for the mat foundation system could be taken as 105 lbs/in^3. The modulus of subgrade reaction across the mat varies based on the imposed bearing pressure concentrations on the mat. Based on the estimated bearing capacity and center and edge settlements, the modulus of subgrade reaction can vary on the order of 25 to 75 lbs/in^3. The mat foundation should be constructed on the 16-inch compacted structural fill layer, as mentioned above. Adequate construction joints and reinforcement should be provided to reduce the potential for cracking of the floor slab due to differential movement.

Lastly, sliding resistance of any shallow foundations will be largely provided by the friction between the concrete foundation and the underlying subgrade soils, as well as the passive resistance provided by the surrounding overburden. Although the concrete foundation will be separated from the native soil by a compacted structural fill layer, we have conservatively considered direct contact on native soils for purposes of obtaining a design value. The base friction coefficient for the foundation on silty sand soils may be taken as 0.33. The strains required to mobilize base friction are not compatible with the strains required to mobilize passive resistance. Therefore, we recommend that passive earth pressure be ignored.

10 Construction Recommendations

10.1 Excavation

Depending on proposed foundation configurations, degree of earthwork, and depth of utilities, some excavations may extend deeper than four feet below grade. Excavations deeper than four feet should be shored or sloped and benched, in accordance with OSHA regulations, to ensure safe working conditions within the excavations. For benching purposes, silty sand material may be considered as "Type B" material which should be sloped no steeper than 1H:1V (horizontal to vertical). All OSHA soil classifications should be field-determined by the contractor's "competent person" prior to excavation. Any proposed shoring systems should be designed by the contractor's "competent person", be certified by a Professional Engineer licensed in the State of Kentucky and should be submitted to the engineer for review.

Within our test pit excavations, cobbles and boulders were consistently observed throughout the project boundary, being encountered as shallow as at grade. Additionally, the conducted soil borings regularly achieved high blow counts alongside split spoon refusal (>50 bpfs), being observed as shallow as within the upper two feet. As such the contractor should be aware of the possibility for cobbles, and/or boulders within excavations and earthwork activities. ANS Geo notes that pre-drilling for post locations, if required and identified during subsequent pull-out testing at the site, should also be considered and is further discussed in **Section 10.6**.

10.2 Dewatering

At the time of our geotechnical investigation, water was observed within four of the conducted soil borings at depths between five and 18 feet below grade. Additionally, snow and rain can create significant surface water ponding and localized areas of perched groundwater. The contractor should be prepared to manage seasonal groundwater, perched water, and/or infiltrated stormwater as needed using localized sump-and-pump or similar techniques to allow for concrete foundation construction in-the-dry. Provisions should be made to protect areas which have been recently stripped and prepared, as well as to control surface water which may become perched groundwater if unabated. Water discharge should be managed in compliance with applicable state and local regulations. The contractor should be sure to grade the surface as necessary to divert stormwater away from open excavation to the extent possible.

10.3 Subgrade Preparation

Prior to the installation of shallow concrete foundations, ANS Geo recommends over-excavating the subgrade below each proposed bottom of foundation by at least 10 inches, proof-rolling the subgrade, lining the exposed material with a geotextile separation fabric, and bringing the subgrade back up to the design foundation elevation with compacted structural fill as specified within Table 15. Native material beneath the separation fabric should be inspected for unsatisfactory conditions such as standing water, frozen soil, organics, protruding cobbles or boulders, or deleterious materials. Should any unsatisfactory conditions exist within the native subgrade, the excavation should be undercut an additional six inches (16 total inches beneath proposed foundation depth) prior to placement of the geotextile separation fabric.

Table 15: Recommended Gradation of Structural Fill

Sieve Size	Percent Passing
2-inch	100
1 ½-inch	60 – 100
No. 4	30 – 60
No. 200	0 – 10

Should structural fill material not be available, in accordance with the specifications highlighted in Table 15, ANS Geo should be contacted to evaluate alternate materials. Structural fill should be placed in loose lifts not exceeding 12-inches if using large equipment, or 8-inches if using hand-operated tools such as jumping jacks, tamping plates, or similar equipment. Structural fill should be placed within two (2) percent of its optimum moisture content and be compacted to at least 95 percent of its Modified Proctor Density (ASTM D1557). The subgrade preparation (over-excavation, fabric, and structural fill) should horizontally extend at least two (2) times the compacted vertical structural fill thickness beyond each edge of the foundation. For example, a 12-inch over-excavation and compacted structural fill thickness should extend at least 24 inches laterally beyond each foundation edge.

10.4 Backfilling and Re-use of Native Soils

10.4.1 Re-Use of Native soils

ANS Geo notes that any native soils with considerable fine-grained content (more than 20 percent) may be difficult to handle, place, and compact without proper moisture conditioning and protection. ANS Geo recommends the following measures be considered to reduce the adverse impacts of moisture-sensitive soils:

- Positive measures should be implemented and maintained to intercept and direct surface water away from moisture-sensitive subgrade surfaces.
- Subgrade surfaces should be sloped and, as appropriate, seal-rolled to facilitate proper drainage. Surfaces should be properly prepared in anticipation of inclement weather. Moisture should not be allowed to collect on subgrade surfaces.
- To the extent practical, the limits of exposed subgrade soils should be minimized.
- Construction traffic should be limited to properly constructed haul roads.
- Disturbed soils should be removed and replaced with compacted controlled fill material.
- In place moisture contents should be maintained with two percent wet/dry of the optimum moisture content as determined by the Modified Proctor Test (ASTM D1557).

These soils may be re-used across the project area for fill in landscaped areas; however, it should not be used under, or above foundations or load-bearing structures where typically imported structural fill is used. Native material used as backfill for cable trenches should be handled and placed at a moisture content at or above its optimum value to ensure representative thermal properties are maintained. Native soils may also be used in required “fill” areas within the PV array footprint(s), provided that the material is placed and compacted consistent with the “general backfill” recommendations described herein.

10.4.2 General Backfill

In areas around and above installed foundations, large utilities, and other buried site features, ANS Geo recommends well-graded granular soils with less than 20 percent fine-grained content may be used as general backfill. Native soils meeting these criteria, if present, may also be used. General backfill material should be screened of any cobbles, boulders, and any particles larger than 3 inches in diameter, and should not be used beneath any load-bearing structures. General backfill should be placed in loose lift thicknesses not exceeding 12 inches and be compacted to at least 95 percent of its Modified Proctor Density (ASTM D1557). Soil used as backfill should not be handled when frozen and should be free of excessive moisture, organics, and deleterious material.

In fill areas beneath foundations, access roads, and load-bearing structures, ANS Geo recommends structural fill as described in **Section 10.3** and Table 15.

10.4.3 Compaction Testing

Compaction testing should be performed at each discrete equipment foundation location for each compacted lift at a minimum of one test per 2,500 square feet. For linear sections such as trenches, the contractor and/or the owner’s representative should perform a visual trench bottom inspection along the length of the trench to confirm no angular, sharp, deleterious, frozen, trash, organic material, or standing water exists at the bottom of trench. For backfilling and compaction of trenches, a minimum of one compaction test per 500 linear feet and minimum one per lift, should be performed. In all cases, the subgrade should be maintained, covered, or protected if concrete is not immediately placed. Excessively wet or dry material should be removed or improved prior to the placement of foundations.

10.5 Interior Site Access Roads

ANS Geo understands that, as part of the work, access roads will be constructed to provide access for heavy equipment such as a main power transformer, poles, and other ancillary structures, as well as long-term access for site maintenance purposes. It is expected that new, unpaved paths will be constructed of aggregate material placed on native, compacted and proof-rolled subgrade stripped of topsoil and other organic material.

During construction, the delivery and movement of heavier loads such as transformers, inverters, delivery of steel and concrete, and transportation of cabling is expected. Construction loads and vehicles are larger and heavier than the expected vehicles during long-term operation; however, the duration of these activities will be much shorter considering the access road life. Designing for short-duration, construction-phase access road would require increased thickness of aggregate, the use of geogrid, or other soil improvement, but these increased roads would be over-designed for long-term operation including routine light-duty trucks, maintenance vehicles, and infrequent accessibility to emergency personnel including fire-fighting rigs. Therefore, it is typical for access road design to be completed considering the thickness of road base required for long-term use since it is expected that the site subcontractor will be able to maintain serviceable access roads throughout construction and at turn-over of the facility by backfilling ruts greater than two-inches, back-blading and re-compacting loose and rutted areas, re-shaping roads to promote drainage and safe passage of traffic, and other improvements.

Considering the above, ANS Geo has performed an evaluation of the required access road thickness based on infrequent emergency access for firefighting vehicles as well as occasional light vehicular traffic. Our preliminary road evaluation for a post-construction access road assumed the following:

Table 16: Access Road Design Considerations

Design Consideration	Design Assumption
Equivalent Single-Axle Loads (ESALs)	5,000
Allowable Rut Depth	3 inches
Service Life	30 years
Subgrade Soil	Very stiff, proof-rolled silty sand
Assumed Min. Design Subgrade CBR	20% (following proof-rolling and 98% modified proctor compaction)

Assuming a three-inch allowable rut depth, proof-rolling and compaction of the subgrade, and over-excavation and replacement with compacted stone where soft areas are observed, ANS Geo recommends conventional stone access roads (without geosynthetics) be constructed to a compacted thickness of at least 8 inches. This number can be reduced if the recommendations and improvements within this Section and Table 18 are followed. ANS Geo recommends that the access road material consists of clean, crushed stone with the material property gradations presented in Table 17.

Table 17: Recommended Gradation of Crushed Stone

Sieve Size	Percent Passing
2-inch	100
0.25-inch	25 – 60
No. 40	5 – 40
No. 200	0 – 5

Given the required thickness of a conventional, stone-only access road, we understand the owner may desire a more cost-efficient design. The use of a non-woven geotextile fabric is recommended and can reduce the overall cross sectional stone thickness when followed by the use of a Class 2 geogrid, or better. The access road thickness for each alternative, is described in Table 18:

Table 18: Recommended Aggregate Thickness for Permanent Site Access Roads

Aggregate Construction Option	Min. Access Road Cross Section
Aggregate with no geotextile or geogrid	8 inches of Crushed Stone
Aggregate with geotextile fabric	7 Inches of Crushed Stone over non-woven geotextile
Aggregate with Class 2 or better geogrid	6 inches of Crushed Stone over Class 2 geogrid and non-woven geotextile

It is recommended that a nonwoven geotextile fabric be placed atop the prepared silty sand subgrade and beneath any geogrid to provide separation and avoid the stone aggregate to be blinded with fines. The geogrid should be placed in accordance with manufacturer's recommendations such as three-foot overlap, fastening or tying overlapping areas, and material storage and handling.

The subgrade should be shaped and sloped with a 4% crown to promote positive drainage into collector ditches or away from the access road to minimize saturating and weakening the subgrade, as well as blinding the stone with fines. The prepared subgrade should be confirmed to maintain a minimum CBR value of 20. Depending on field conditions at the time of construction, this may require scarifying the native subgrade soil by several inches, moisture-conditioning the soil, then backfilling and re-compacting the soil to achieve the required performance.

Field CBR testing, or plate load testing should be completed during construction to confirm the subbase compaction has been met. To increase productivity during construction, a test section may also be created prior to the start of production work to determine field CBR of various compaction methods and passes, and dynamic cone penetrometer (DCP) tooling be used to correlate the approximate resistance correlating to the required CBR. This will allow for rapid evaluation and confirmation of field proof-rolling of subgrade. In the event field CBR testing is not desired, material can be evaluated using the Standard Proctor Maximum Dry Density. It is recommended that the subbase be proof-rolled to a minimum 98% Standard Proctor Maximum Dry Density (ASTM D698), and within two percentage points of optimum moisture content. Similarly, crushed stone should be placed in loose lifts not exceeding twelve (12) inches in height and be compacted to at least 95 percent of its Modified Proctor Density (ASTM D1557).

Temporary construction roads may also be left in place as permanent access roads, where appropriate. These re-purposed roadways should be back-bladed post-construction and graded to an even, level surface with maximum permissible longitudinal and cross slopes in accordance with the site's civil design criteria. Per the International Fire Code, permanent and temporary access roads, haul roads, and fire apparatus access roads, shall not exceed a maximum grade of 10 percent for greater than 1,000 feet, or greater than 8% for longer lengths. Roads should not exceed a maximum cross-slope of 2 percent across roads. The Civil Engineer of Record may also place water drainage features to promote drainage away from roadways.

Similar to permanent and long-duration access roads, it is expected that aggregate-surfaced access roads will require ongoing maintenance during construction and over the life of the permanent facility to keep them in a serviceable condition, regardless of the aggregate thickness and subgrade preparation. It is not practical to design an aggregate section of adequate thickness that prevents ongoing maintenance. Ruts, depressions, and soft subgrade should be repaired as needed to facilitate traffic. Throughout the operational life of the project, additional aggregate may be placed in ruts and depressions, or the entire aggregate section and soft subgrade may be removed and replaced with a new aggregate section.

10.6 Pile Drivability

ANS Geo anticipates that, as typical with solar farm construction, solar panels will be supported by steel H-Piles (wide-flanged sections) which are directly-driven. These steel piles are typically installed via direct-push, vibration, and/or percussive hammer methods.

Of the conventionally driven piles installed on site, each location was able to reach its respective target embedment depths. However, cobbles and boulders were observed within all test pits performed on site, observed as shallow as at grade. Additionally, split spoon refusals, indicating very dense material, were consistently encountered throughout the soil borings performed within the project boundary. Therefore, the contractor should be prepared for the possibility of predrilling within the project boundary. Should predrilling be necessary during remediation, long drive times, or to clear localized obstructions, ANS Geo recommends that pre-drilled holes be completed to a diameter smaller than the diagonal dimension of the proposed pile section to ensure a tight fit once the pile is driven to its targeted depth. For example, an under-sized, four-inch diameter hole may be drilled and utilized for W6x9 section (approx. 7.1-inch diagonal measurement). For all other pile sizes, we recommend a minimum pre-drill diameter of 55 to 70% of the pile “diameter”. The contractor should be aware, however, that heavier sections (ie. W6x12 or W6x15) may have limiting “bending” capacity in its flanges, and therefore require a hole of a slightly larger proportion. Once pre-drilled, the hole should be backfilled with granular, native cuttings and/or imported sand backfill. Backfill material should be placed in 12-inch layers and compacted in lifts, to ensure proper soil properties are maintained for lateral and axial capacity.

Verification testing should follow the requirements of the Authority Having Jurisdiction, the EPC’s racking manufacturer/supplier, or the EPC’s structural engineer’s quality control testing frequency for pile installation during constriction. If no recommendations are provided by the foundation engineer-of-record, ANS Geo recommends a minimum of 0.2% of piles or two piles per block during construction. Quality control testing quantities should meet industry standards and costs of axial tension and/or axial compression, depending on the governing design capacity, along with lateral load testing. We recommend that piles be allowed a minimum 72-hour “setup” time between installation and testing during verification load testing to maximize soil contact and strength.

11 Limitations

ANS Geo notes that the findings and recommendations presented within this Geotechnical Report are based on our limited investigation program conducted during March 2024 and our engineering judgment. Should the scope of the project or proposed site layout change, ANS Geo should be given the opportunity to review the applicability of the collected information and modify our recommendations, as needed. If actual site subsurface conditions differ from the inferred conditions on which ANS Geo has based our confirmation-dependent recommendations, ANS Geo will need to modify our confirmation-dependent recommendations to develop final recommendations.

It is expected that BrightNight will complete additional investigations to support final design and construction. If ANS Geo's limited and preliminary investigation is used for final design, our recommendations shall only be valid for the exact and specific locations at which field investigations or laboratory testing was completed. All other areas and regions of the site which are not investigated under a final investigation to confirm if our preliminary and limited investigation is valid for the entire project site will be on the risk of the individual or entity using this Report.

Attachment A

Site Investigation Mapping

ANS GEO

Client:

BRIGHTNIGHT
Power when you need it

INVESTIGATION LOCATION PLAN

BRIGHTNIGHT POWER
STARFIRE SOLAR PROJECT
KNOTT COUNTY, KENTUCKY

Legend

- ERT Locations
- Test Pit Locations
- Soil Borings
- PLT Locations
- Project Boundary

0 2,500 5,000 ft

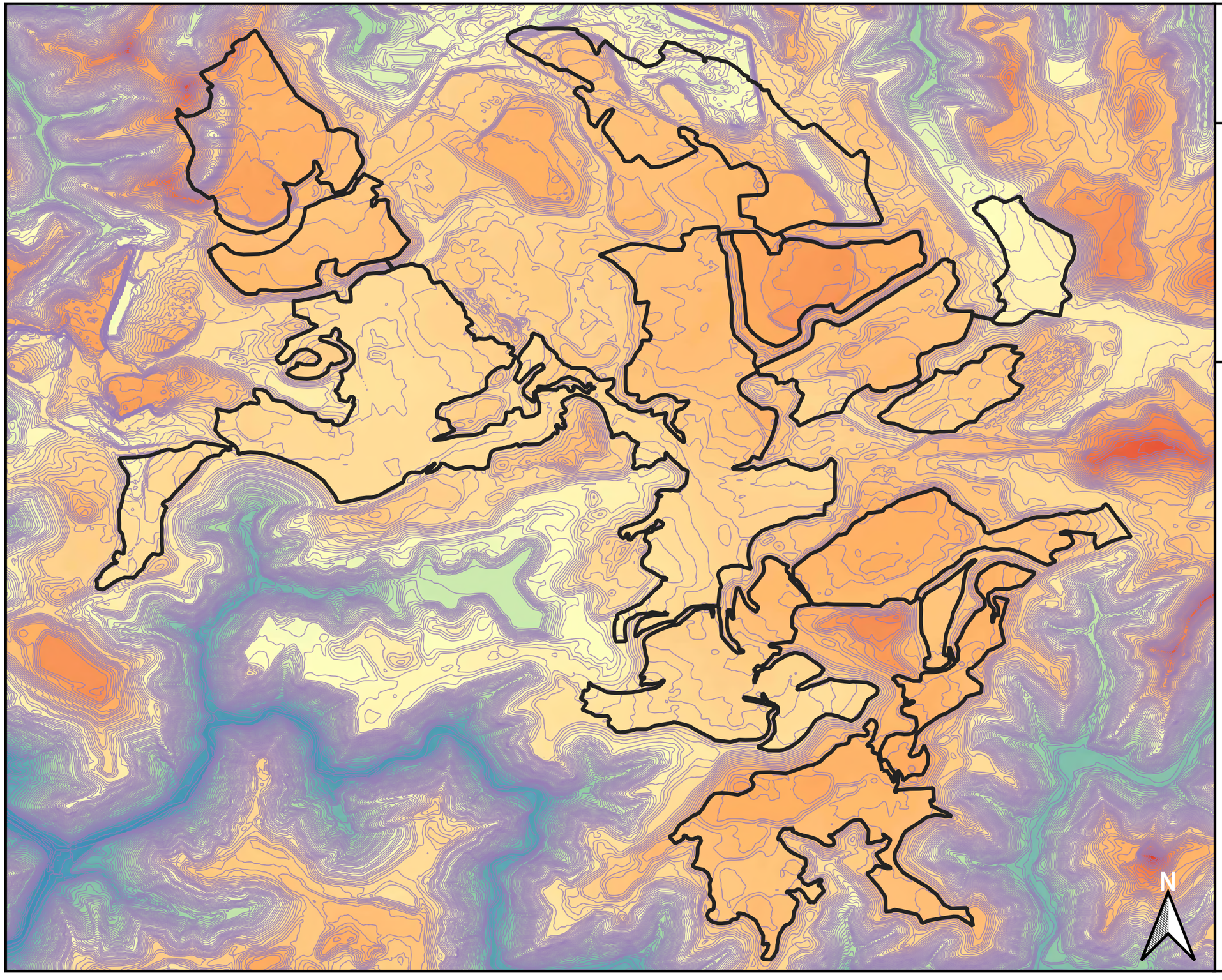
Absolute Scale: 1 inch = 2500 feet
Scale at 11" x 17" AS SHOWN

N

Prepared by: Jeff Nogaj
Date: March 29, 2024
Drawing Number: ILP-1 Rev.0

Attachment B

Geologic Mapping



ANS GEO

Client:

BRIGHTNIGHT
Power when you need it

ELEVATION MAP

BRIGHTNIGHT POWER
STARFIRE SOLAR PROJECT
KNOTT COUNTY, KENTUCKY

Legend

- Project Boundary
- Elevation Contours (10-ft Intervals)

Elevation (ft)

Band 1 (Gray)

- 800
- 1000
- 1200
- 1400
- 1600

0 1,500 3,000 ft

Absolute Scale: 1 inch = 1,500 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Adam Sherman
Date: December 21, 2023
Drawing Number: ELV-1 Rev.0

ANS GEO

Client:

BRIGHTNIGHT
Power when you need it

PERCENT SLOPE MAP

BRIGHTNIGHT POWER
STARFIRE SOLAR PROJECT
KNOTT COUNTY, KENTUCKY

Legend

Project Boundary

Percent Slope

Band 1 (Gray)

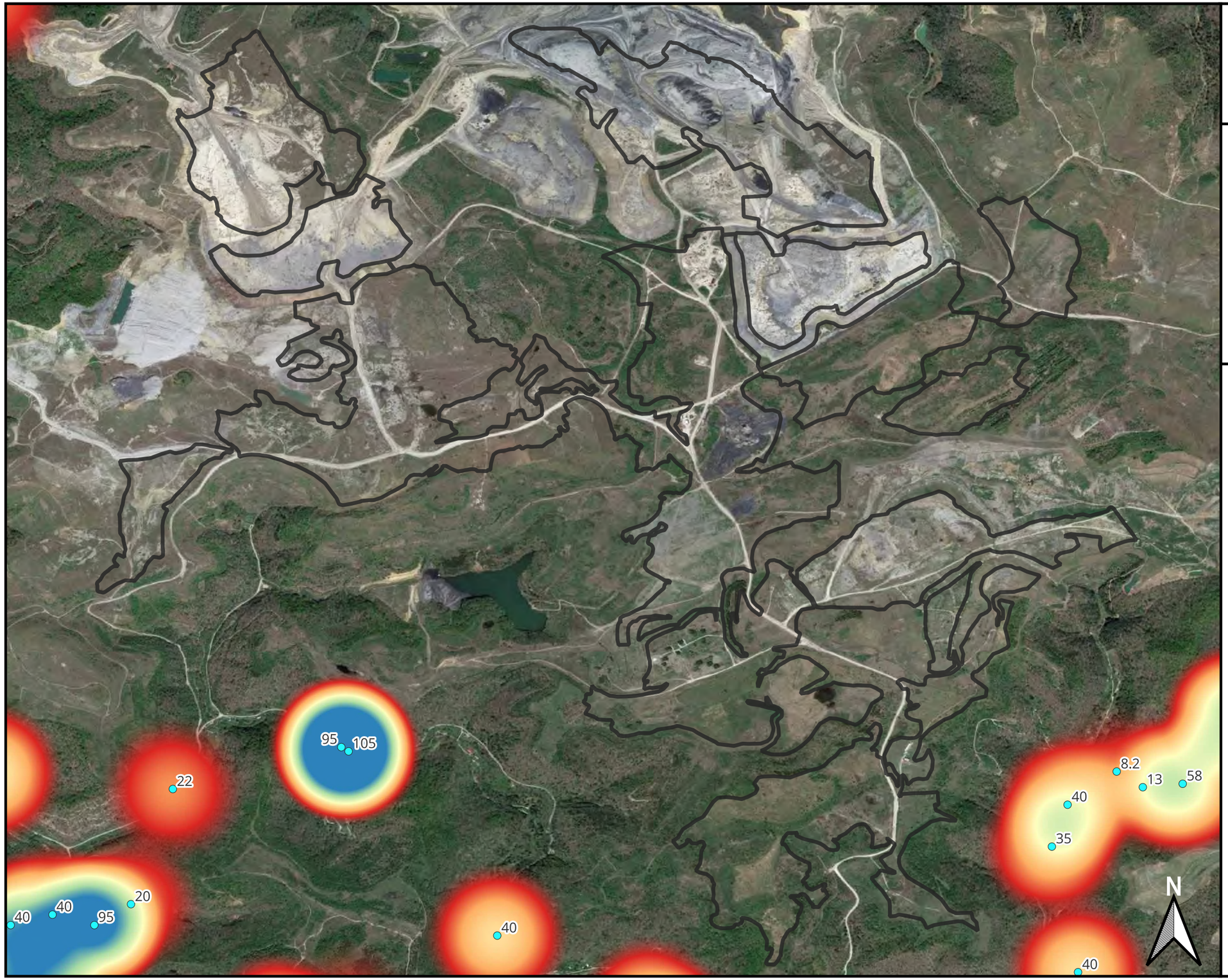
- 0
- 3
- 8
- 15
- 25
- 35

0 1,500 3,000 ft

Absolute Scale: 1 inch = 1,500 feet
Scale at 11" x 17" AS SHOWN

N

Prepared by: Adam Sherman
Date: December 21, 2023
Drawing Number: SLP-1 Rev.0



ANS GEO

Client:

BRIGHTNIGHT
Power when you need it

GROUNDWATER DEPTH MAP

BRIGHTNIGHT POWER
STARFIRE SOLAR PROJECT
KNOTT COUNTY, KENTUCKY

Legend

- Project Boundary
- Groundwater Depth (ft)

0 1,500 3,000 ft

Absolute Scale: 1 inch = 1,500 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Adam Sherman
Date: December 21, 2023
Drawing Number: WTR-1 Rev.0



ANS GEO

Client:

BRIGHTNIGHT
Power when you need it

FLOOD HAZARD MAP

BRIGHTNIGHT POWER
STARFIRE SOLAR PROJECT
KNOTT COUNTY, KENTUCKY

Legend

Project Boundary

Flood Zone

Zone X - Minimal Flood Risk

Zone A - 100-Year Floodplain

0 1,500 3,000 ft

Absolute Scale: 1 inch = 1,500 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Adam Sherman
Date: December 21, 2023
Drawing Number: FLD-1 Rev.0

Attachment C

Soil Boring Logs

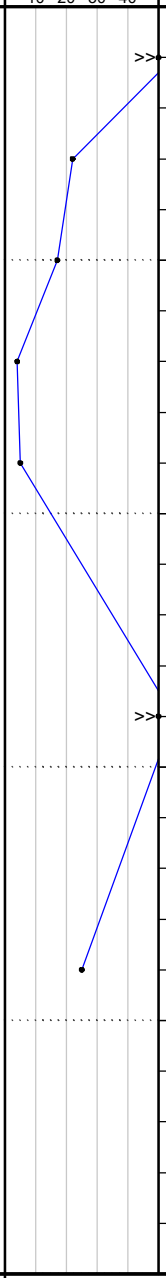
Soil Boring Log

B-01

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.405803 N, -83.154802 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/09/24 10:00 AM	**Elevation:**	1237
Inspector:	Logan Campbell	**Boring End:**	03/09/24 11:15 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	17	10 12 50/5"	> 50	ML	Top 9": Yellowish red to brownish yellow SILT, some medium to fine Sand, moist (ML)	H	L	4.5	2.0	Possible rock fill obsered.
					SP	Bottom 8": Dark gray to light gray Gravelly coarse to fine SAND, trace Silt, moist (SP)					
	S-2	13	18 7 15 4	22		Medium dense gray to light gray Gravelly coarse to fine SAND, moist (SP)					
5	S-3	13	4 5 12 9	17	SM	Medium dense gray to light gray Gravelly coarse to fine SAND, little Silt, moist (SM)					
	S-4	13	2 2 2 5	4		Very loose, gray to light gray Gravelly coarse to fine SAND, little Silt, moist (SM)					
	S-5	10	2 1 4 7	5		Loose, gray to light gray Silty coarse to fine SAND, little coarse to fine Gravel, moist (SM)					
10											
	S-6	2	50/2"	> 50		Very dense, gray to light gray Silty coarse to fine SAND, little coarse to fine Gravel, moist (SM)					
15											
	S-7	25	10 12 13 12	25		Medium dense, gray to light gray Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)					Coal fragments observed at 18 feet BGS.
20						End of boring 20 feet BGS. Borehole backfilled with soil cuttings.					



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

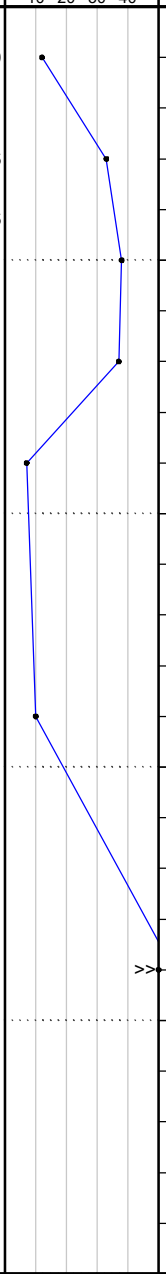
Soil Boring Log

B-02

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.407759 N, -83.141855 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/12/24 12:35 PM	**Elevation:**	1331
Inspector:	Logan Campbell	**Boring End:**	03/12/24 01:35 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						2" TOPSOIL				
	S-1	17	4 5 7 8	12	ML	Stiff, brown to light brown Sandy SILT, trace coarse to fine Gravel, moist (ML)	M	L	2.0	0.10
	S-2	14	10 16 17 33	33		Hard, brown to light brown Sandy SILT, trace coarse to fine Gravel, moist (ML)	M	M	0.75	0.05
	S-3	18	4 19 19 9	38		Top 6": Brown to light brown Sandy SILT, trace coarse to fine Gravel, moist (ML) Bottom 12": Light gray to gray Gravelly coarse to fine SAND, moist (SP)	M	M	1.5	0.05
5	S-4	37	12 18 19 13	37		Dense, light gray to gray Gravelly coarse to fine SAND, moist (SP)				
	S-5	0	4 5 2 5	7		No recovery (Assume same as above)				
10					SP					
	S-6	6	23 4 6 4	10		Medium dense, light gray to gray Gravelly coarse to fine SAND, trace Silt, dry (SP)				
15										
	S-7	0	50/0	> 50		End of boring 18 feet BGS. Borehole backfilled with soil cuttings.				
20										



Drilling & Strata Notes

Auger grinding at 15 feet to 15.5 feet below grade.

Splitspoon refusal at 18 feet BGS. Potential cobble obstruction.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Split spoon refusal at 15.5 feet below grade.
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

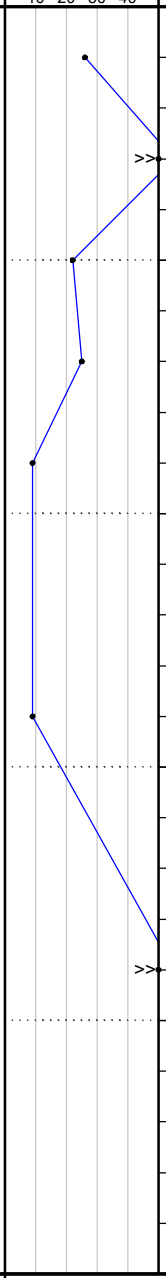
Soil Boring Log

B-03

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.415753 N, -83.138365 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/12/24 10:30 AM	**Elevation:**	1385
Inspector:	Logan Campbell	**Boring End:**	03/12/24 11:25 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	24	12 15 11 6	26	SM	3" TOPSOIL Medium dense, brown to light brown coarse to fine SAND, little Silt, trace coarse to fine Gravel, moist (SM)				
	S-2	11	8 27 26 24	> 50	SP	Very dense, light brown to light gray coarse to fine SAND, trace coarse to fine Gravel, trace Silt, moist (SP)				
5	S-3	16	5 8 14 7	22		Medium dense, light brown to light gray coarse to fine SAND, trace coarse to fine Gravel, trace Silt, moist (SP)				
	S-4	13	10 13 12 9	25	GM	Medium dense, light brown to light gray Sandy coarse to fine GRAVEL, little Silt, dry (GM)				
	S-5	16	2 2 7 9	9		Medium dense, light brown to light gray Sandy coarse to fine GRAVEL, little Silt, dry (GM)				
10										
	S-6	8	4 6 3 1	9	SM	Loose, light brown to light gray coarse to fine SAND, some coarse to fine Gravel, little Silt, dry (SM)				
15										
	S-7	24	4 24 45 50/4"	> 50		Very dense, brown to gray Silty coarse to fine SAND, little coarse to fine Gravel, wet (SM)				
20						End of boring 20 feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

Rock fragments observed 6 to 15 feet BGS.

Mottling observed 18 to 20 feet BGS.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
03/12/24 11:25 AM	AD		20	19.5
03/12/24 11:15 AM	ATD		20	18

General Notes

BGS = Below Ground Surface
Mottling observed in the sample.
Groundwater encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

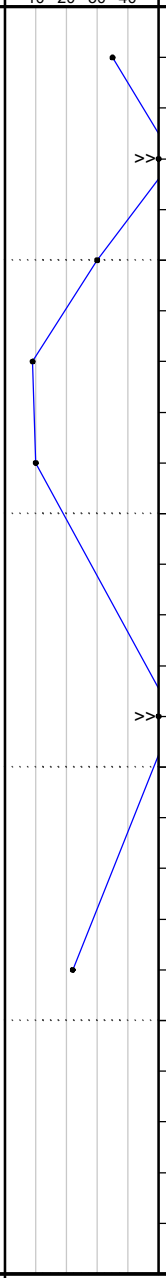
Soil Boring Log

B-04

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.417834 N, -83.135634 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/12/24 09:20 AM	**Elevation:**	1390
Inspector:	Logan Campbell	**Boring End:**	03/12/24 10:15 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	20	7 19 16 8	35	SP	3" TOPSOIL Dense, brownish yellow to light brown coarse to fine SAND, trace coarse to fine Gravel, trace Silt, moist (SP)				
	S-2	20	8 16 34 83	> 50	SM	Very dense, brown to light brown Silty coarse to fine SAND, little coarse to fine Gravel, moist (SM)				
5	S-3	19	20 15 15 50/5"	30		Dense, gray to light gray Silty coarse to fine SAND, little coarse to fine Gravel, dry (SM)				
	S-4	8	4 4 5 3	9		Loose, light gray to light brown coarse to fine SAND, little coarse to fine Gravel, little Silt, moist (SM)				
	S-5	0	7 5 5 6	10		No recovery (Assume same as above)				
10										
	S-6	7	28 50/2"	> 50	ML	Hard, brown SILT, little coarse to fine Gravel, trace coarse to fine Sand, dry (ML)	M	L		
15										
	S-7	24	10 11 11 11	22	CL	Very stiff, brown to dark brown CLAY, little Silt, trace coarse to fine Gravel, moist (CL)	M	M	2.0	0.1
20						End of boring 20 feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

Coal fragments encountered at 2.5 feet BGS.

Auger grinding at 17 feet BGS.

Mottling observed 18 to 20 feet BGS.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Soil Boring Log

B-05

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.411256 N, -83.132622 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/12/24 08:10 AM	**Elevation:**	1357
Inspector:	Logan Campbell	**Boring End:**	03/12/24 09:00 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	3 8 23 17	31	ML	Hard, brown to light gray SILT, some coarse to fine Gravel, trace coarse to fine Sand, moist (ML)	M	L	2.75	0.25	
	S-2	24	18 22 23 33	45		Hard, gray to light gray Gravelly SILT, little coarse to fine Sand, moist (ML)	M	L	3.50	0.10	
5	S-3	24	6 7 9 9	16		Very stiff, gray to light gray SILT, little coarse to fine Gravel, trace coarse to fine Sand, moist (ML)	M	L	3.50	0.15	
	S-4	22	18 18 18 17	36		Hard, gray to light gray SILT, little coarse to fine Gravel, trace coarse to fine Sand, moist (ML)	M	L	2.50	0.05	
	S-5	18	3 4 4 5	8		Stiff, gray to light gray SILT, little coarse to fine Gravel, trace coarse to fine Sand, moist (ML)	M	L	1.50	0.10	
10											
	S-6	18	3 5 3 8	8		Stiff, brown to gray SILT, little coarse to fine Gravel, little coarse to fine Sand, moist (ML)	M	L	1.50	0.10	Mottling observed
15											
	S-7	2	50/3"	> 50		No soil recovered (Sandstone fragments collected) End of boring 18.25 feet BGS. Borehole backfilled with soil cuttings.					
20											

N-Value: 10 20 30 40

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Mottling observed in the sample.
Groundwater encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

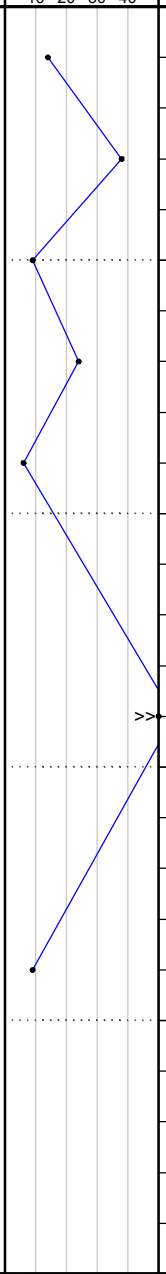
Soil Boring Log

B-06

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.415808 N, -83.122766 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/14/24 10:55 AM	**Elevation:**	1330
Inspector:	Jack Gallucci	**Boring End:**	03/14/24 11:40 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	14	5 7 7 15	14	SM	2" TOPSOIL Medium dense, light gray to light brown Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)				
	S-2	14	10 19 19 29	38	GM	Dense, light gray Sandy coarse to fine GRAVEL, some Silt, moist (SM)				
5	S-3	16	8 5 4 5	9		Loose, light gray to brownish yellow Silty coarse to fine GRAVEL, some coarse to fine Sand, moist (GM)				
	S-4	14	25 13 11 12	24		Medium dense, light gray coarse to fine GRAVEL, some coarse to fine Sand, little Silt, moist (GM)				
	S-5	16	3 1 5 18	6	SM	Loose, light gray Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)				
10										
	S-6	20	16 36 38 41	> 50		Very dense, light gray coarse to fine SAND, little coarse to fine Gravel, little Silt, moist (SM)				
15										
	S-7	17	6 4 5 6	9		Loose, light gray Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

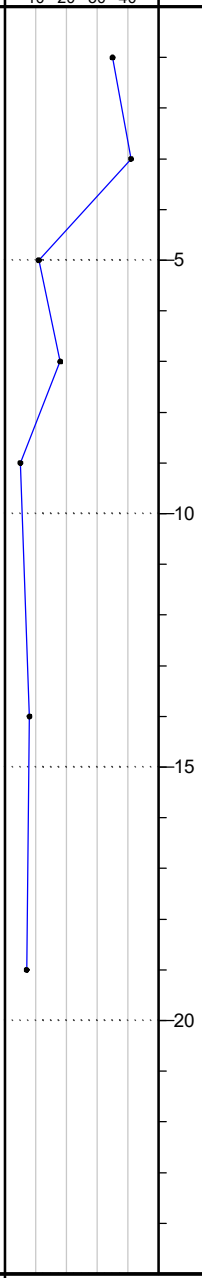
Soil Boring Log

B-07

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.421931 N, -83.120756 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/14/24 09:55 AM	**Elevation:**	1187
Inspector:	Jack Gallucci	**Boring End:**	03/14/24 10:35 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	15	8 17 18 15	35	SM	3" TOPSOIL Dense, brownish yellow to light gray coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)				
	S-2	14	9 19 22 23	41		Dense, brownish yellow to light gray coarse to fine SAND, some coarse to fine Gravel, some Silt, moist (SM)				
5	S-3	15	5 6 5 2	11		Medium dense, light brown to light gray Gravelly coarse to fine SAND, some Silt, moist (SM)				
	S-4	12	6 9 9 8	18	GM	Medium dense, brownish yellow to light gray Sandy coarse to fine GRAVEL, some Silt, moist (GM)				
	S-5	11	2 3 2 2	5	SM	Loose, dark brown coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)				
10										
	S-6	11	4 4 4 4	8		Loose, dark brown coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)				
15										
	S-7	12	3 3 4 5	7		Loose, dark brown coarse to fine SAND, some Silt, trace coarse to fine Gravel, trace Clay, moist (SM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

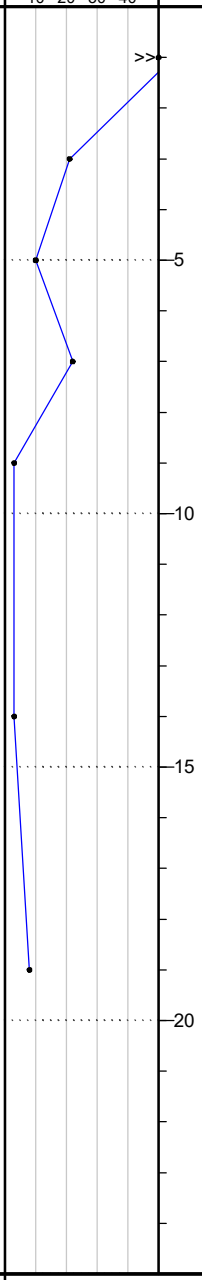
Soil Boring Log

B-08

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.441523 N, -83.093405 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/15/24 12:30 PM	**Elevation:**	1311
Inspector:	Jack Gallucci	**Boring End:**	03/15/24 01:05 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	22	7 24 36 44	> 50		4" TOPSOIL Very dense, light brown to light gray coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)				
	S-2	15	12 10 11 7	21		Medium dense, light brown Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)				
5	S-3	14	4 5 5 5	10		Medium dense, light brown Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)				
	S-4	11	9 10 12 25	22		Medium dense, light brown to light gray Silty coarse to fine SAND, little coarse to fine Gravel, moist (SM)				
	S-5	2	7 2 1 2	3		Very loose, light brown Silty coarse to fine SAND, moist (SM)				
10					SM					
	S-6	3	4 1 2 4	3		Very loose, light brown Silty coarse to fine SAND, moist (SM)				
15										
	S-7	13	4 2 6 8	8		Loose light, brown to brownish yellow Silty coarse to fine SAND, little coarse to fine Gravel, moist (SM)				
20						End of boring 20 feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

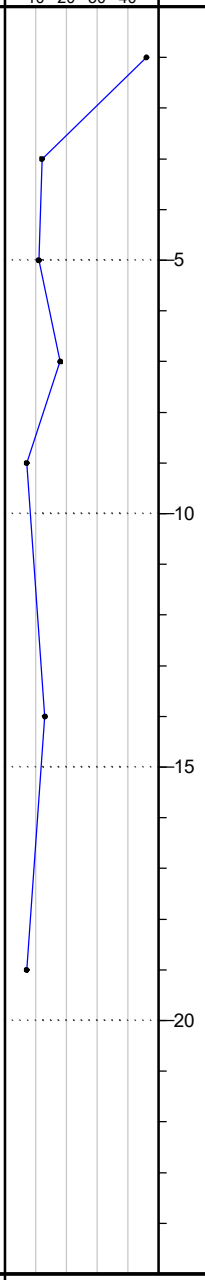
Soil Boring Log

B-09

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.432669 N, -83.068957 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/15/24 09:30 AM	**Elevation:**	1328
Inspector:	Jack Gallucci	**Boring End:**	03/15/24 10:20 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						3" TOPSOIL				
	S-1	16	6 9 37 17	46		Dense, light gray to brown coarse to fine SAND, some coarse to fine Gravel, some Silt, moist (SM)				
	S-2	16	7 6 6 6	12		Medium dense, lighty gray to brown coarse to fine SAND, some coarse to fine Gravel, some Silt, moist (SM)				
5	S-3	14	6 6 5 7	11		Medium dense, light gray to light brown Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)				
	S-4	15	13 10 8 7	18		Medium dense, light gray to brown coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)				
	S-5	16	2 3 4 4	7		Loose, light gray to brown coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)				
10					SM					
	S-6	13	7 6 7 7	13		Medium dense, light gray coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)				
15										
	S-7	12	9 4 3 50	7		Loose, light gray coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Soil Boring Log

B-10

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.399253 N, -83.140812 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/09/24 12:00 PM	**Elevation:**	1318
Inspector:	Logan Campbell	**Boring End:**	03/09/24 12:50 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	22	3 5 9 11	14	ML	Stiff, light gray Sandy SILT, little coarse to fine Gravel, moist (ML)	M	L	1.50	0.10	Mottling observed 0 to 2 feet BGS.
	S-2	23	6 25 24 32	49	ML / SM	Top 7": Light gray Sandy SILT, little coarse to fine Gravel, moist (ML) Bottom 16": Brown to light gray Silty coarse to fine SAND, little coarse to fine Gravel, moist (SM)	M	L	1.50	0.05	
5	S-3	12	11 9 7 7	16	ML	Stiff, gray to dark gray Gravelly SILT, little coarse to fine Sand, moist (ML)	L	L	0.50	0.05	Mottling observed 4 to 6 feet BGS.
	S-4	14	5 5 7 9	12	SM	Medium dense, gray to light gray Silty coarse to fine SAND, little coarse Gravel, moist (SM)					
	S-5	12	5 4 8 4	12	SP	Medium dense, gray to light gray Gravelly coarse to fine SAND, trace Silt, moist (SP)					
10											
	S-6	17	8 7 8 9	15	SM	Medium dense, gray to light gray Silty coarse to fine SAND, little coarse Gravel, moist (SM)					
15											
	S-7	18	6 6 5 8	11	ML	Stiff, gray to dark gray SILT, little coarse to fine Gravel, trace coarse to fine Sand, moist (ML)	M	L	1.25	0.10	Mottling observed 18 to 20 feet BGS.
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.					

N-Value: 10 20 30 40

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Mottling observed in the sample.
Weathered sandstone present in the sample.
Groundwater encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

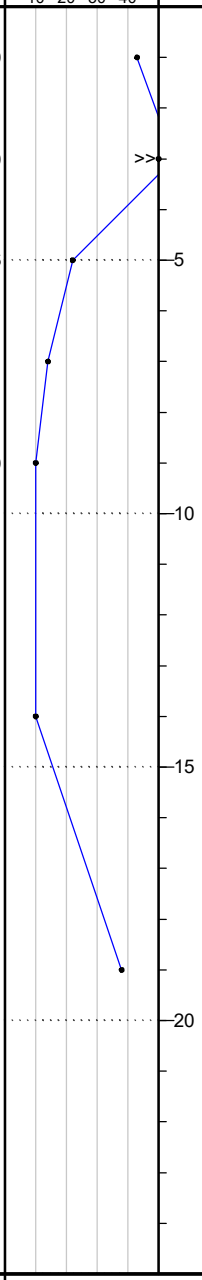
Soil Boring Log

B-11

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.401363 N, -83.135444 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/09/24 01:30 PM	**Elevation:**	1292
Inspector:	Logan Campbell	**Boring End:**	03/09/24 02:30 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	13 28 15 19	43	ML		Hard, light gray to gray Gravelly SILT, trace coarse to fine SAND, moist (ML)	M	L	1.75	0.10	Coal fragments observed at 0 to 2 feet BGS.
	S-2	24	14 20 30 30	> 50	CL		Hard, brown to brownish yellow Sandy CLAY, little coarse to fine Gravel, moist (CL)	M	M	1.25	0.10	Mottling Observed from 2 to 6 feet BGS.
5	S-3	20	3 5 17 50/5"	22			Very stiff, brown to brownish yellow Sandy CLAY, little coarse to fine Gravel, moist (CL)	M	M	1.50	0.05	
	S-4	18	4 7 7 7	14	ML		Stiff, light gray to gray Gravelly SILT, trace coarse to fine Sand, dry (ML)	L	L			
	S-5	16	4 5 5 9	10			Stiff, light gray to gray Gravelly SILT, trace coarse to fine Sand, moist (ML)	L	L	1.75	0.10	Coal fragments 8 to 10 feet BGS.
10												
	S-6	16	3 4 6 5	10			Stiff, light gray to gray Gravelly SILT, trace coarse to fine Sand, dry (ML)	L	L			
15												
	S-7	15	4 6 32 20	38			Hard, light gray to gray Gravelly SILT, trace coarse to fine Sand, dry (ML)	L	L			
20							End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.					



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Coal fragments present in the sample.
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

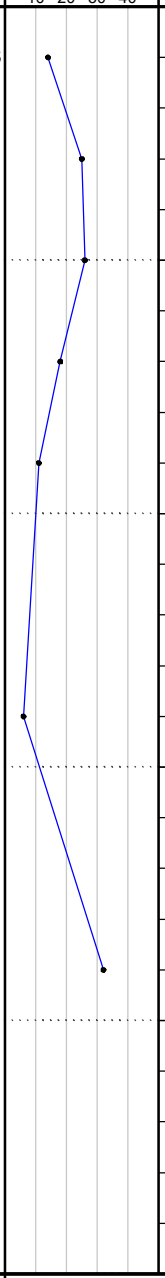
Soil Boring Log

B-12

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.405422 N, -83.130795 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/10/24 08:30 AM	**Elevation:**	1279
Inspector:	Logan Campbell	**Boring End:**	03/10/24 09:25 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	24	4 7 7 9	14	ML	Stiff, gray to light gray Gravelly SILT, trace coarse to fine Sand, moist (ML)	M	L	2.5	0.05	Coal fragments encountered at 2 feet BGS.
	S-2	17	13 10 15 21	25	GM	Medium dense, gray to light gray Silty coarse to fine GRAVEL, little coarse to fine Sand, moist (GM)					
5	S-3	17	4 7 19 9	26		Medium dense, gray to light gray Silty coarse to fine GRAVEL, little coarse to fine Sand, moist (GM)					Shale fragments encountered from 2 to 6 feet BGS.
	S-4	13	3 5 13 19	18		Medium dense, gray to light gray Silty coarse to fine GRAVEL, little coarse to fine Sand, moist (GM)					
	S-5	9	5 8 3 2	11	ML	Stiff, gray to light gray SILT, some coarse to fine Gravel, moist (ML)	M	L			
10											
	S-6	15	5 3 3 6	6		Medium stiff, gray to light gray SILT, some coarse to fine Gravel, trace coarse to fine Sand, dry (ML)	M	L			Sandstone fragments encountered at 15 feet BGS.
15											
	S-7	24	14 15 17 15	32		Hard, gray to light gray SILT, some coarse to fine Gravel, trace coarse to fine Sand, moist (ML)	M	L	1.75	0.1	Yellow sand and rock fragments encountered at 20 feet BGS.
20						End of boring 20 feet BGS. Borehole Backfilled with soil cuttings.					



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

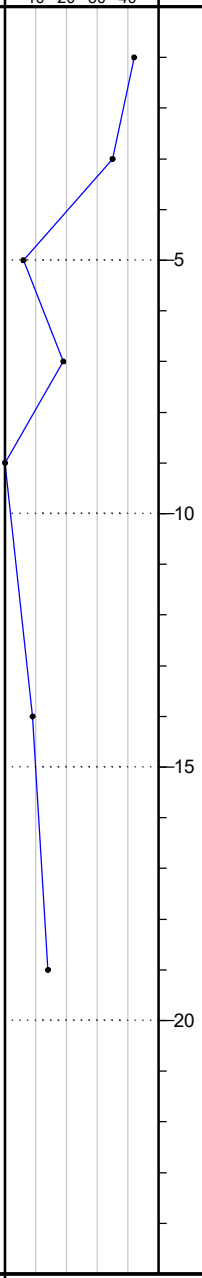
Soil Boring Log

B-13

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.40829 N, -83.116261 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/12/24 02:15 PM	**Elevation:**	1358
Inspector:	Logan Campbell	**Boring End:**	03/12/24 03:05 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						6" TOPSOIL				
	S-1	16	5 30 12 18	42	SM	Dense, brown to light brown coarse to fine SAND, some Silt, moist (SM)				
	S-2	17	14 13 22 20	35		Dense, brown to light brown coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)				
5	S-3	7	3 3 3 3	6		Loose, brown to brownish yellow Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)				
	S-4	8	9 10 9 5	19	SP	Medium dense, brownish yellow to yellowish red coarse to fine SAND, moist (SP)				
	S-5	2	1 0 0 2	0	ML	Very soft, brown to light brown SILT, some coarse to fine Sand, moist (ML)	M	L		
10										
	S-6	6	3 5 4 3	9	SM	Loose, brown to brownish yellow coarse to fine SAND, little Silt, moist (SM)				
15										
	S-7	10	19 8 6 10	14		Medium dense, brown to brownish yellow coarse to fine SAND, little Silt, moist (SM)				
20						End of boring 20 feet BGS. Borehole Backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

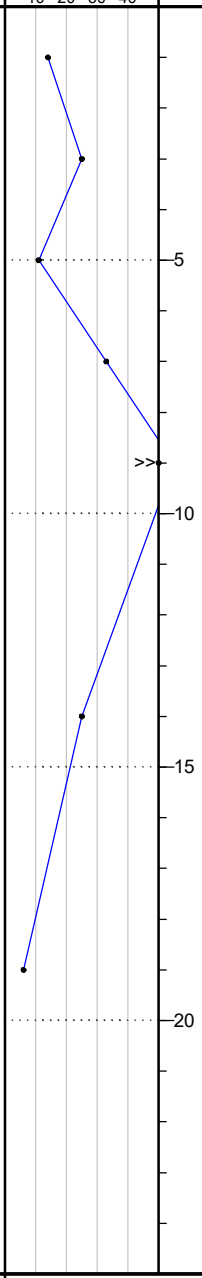
Soil Boring Log

B-14

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.410614 N, -83.109214 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/14/24 08:45 AM	**Elevation:**	1346
Inspector:	Jack Gallucci	**Boring End:**	03/14/24 09:25 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						3" TOPSOIL				
	S-1	16	4 5 9 10	14	SM	Medium dense, dark brown to light gray Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)				
	S-2	15	7 9 16 15	25		Medium dense, dark gray to light gray Gravelly coarse to fine SAND, some Silt, moist (SM)				
5	S-3	14	4 6 5 6	11		Medium dense, dark gray to light gray Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)				
	S-4	17	10 15 18 15	33	GM	Dense, light gray to dark brown coarse to fine GRAVEL, some coarse to fine Sand, some Silt, trace Clay, moist (GM)				
	S-5	10	6 15 50/4	> 50	SM	Very dense, light brown to light gray Silty coarse to fine SAND, trace coarse to fine Gravel, trace Clay, moist (SM)				
10										
	S-6	13	15 12 13 9	25	GM	Medium dense, light brown to light gray Silty coarse to fine GRAVEL, some coarse to fine Sand, moist (GM)				
15										
	S-7	9	6 2 4 4	6	SM	Loose, light brown coarse to fine SAND, little coarse to fine Gravel, little Silt, moist (SM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

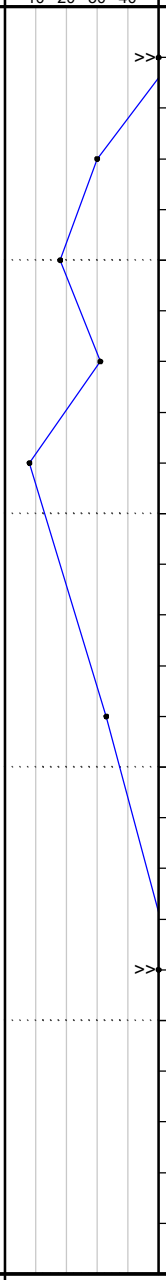
Soil Boring Log

B-15

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.408387 N, -83.101846 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/14/24 01:35 PM	**Elevation:**	1351
Inspector:	Jack Gallucci	**Boring End:**	03/14/24 02:40 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
						4" TOPSOIL					
	S-1	18	4 22 38 21	> 50	SM	Very dense, dark brown to light gray coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)					
	S-2	14	9 12 18 16	30		Dense, dark brown to light gray Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)					Auger grinding 3 feet BGS.
5	S-3	15	6 11 7 4	18		Medium dense, dark brown to light gray Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)					
	S-4	18	6 9 22 14	31		Dense, light gray Gravelly coarse to fine SAND, some Silt, moist (SM)					
	S-5	14	5 5 3 7	8		Loose, light brown to light gray Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)					
10											
	S-6	16	14 16 17 15	33		Dense, light gray to brownish yellow coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)					Auger grinding 15 feet BGS.
15											
	S-7	12	9 50/4	> 50		Very dense, light gray to brownish yellow Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)					
						End of the boring 19 Feet BGS. Borehole backfilled with soil cuttings.					
20											



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

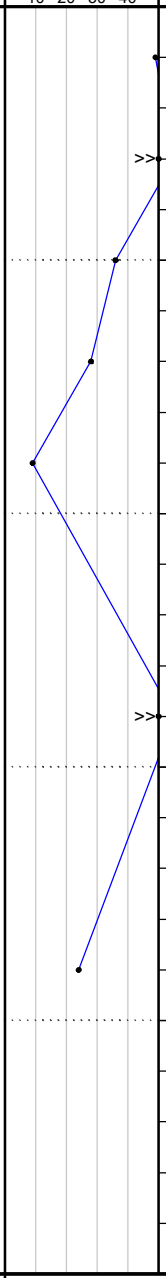
Soil Boring Log

B-16

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.417807 N, -83.094006 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/14/24 03:45 PM	**Elevation:**	1346
Inspector:	Jack Gallucci	**Boring End:**	03/14/24 04:30 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
						3" TOPSOIL					
	S-1	20	9 19 30 35	49		Dense, brownish yellow to light gray coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)					
	S-2	14	29 25 32 45	> 50		Very dense, light gray coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)					
5	S-3	15	8 8 28 17	36		Dense, light gray coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)					
	S-4	12	14 15 13 21	28		Medium dense, light brown coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)					
	S-5	13	5 4 5 4	9		Loose, light brown coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)					
10					SM						
	S-6	1	50/2	> 50		Very dense, light brown Silty medium to fine SAND, moist (SM)					Auger grinding 13 feet BGS.
15											
	S-7	16	6 11 13 14	24		Medium dense, light gray to brownish yellow coarse to fine SAND, some coarse to fine Gravel, some Silt, moist (SM)					
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.					



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Soil Boring Log

B-17

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.413561 N, -83.084782 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/14/24 02:45 PM	**Elevation:**	1402
Inspector:	Jack Gallucci	**Boring End:**	03/14/24 03:25 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	15	2 19 6 6	25	SM	Medium dense, brown to light gray Silty coarse to fine SAND, little Clay, moist (SM)				
	S-2	15	5 8 18 16	26		Medium dense, light gray coarse to fine SAND, some coarse to fine Gravel, some Silt, trace Clay, moist (SM)				
5	S-3	11	5 4 4 3	8		Loose, brown to light gray Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)				
	S-4	15	9 10 8 8	18		Medium dense, brown to light gray Silty coarse to fine SAND, little Clay, trace coarse to fine Gravel, moist (SM)				
	S-5	24	0 0 0 1	0	CL	Very soft, light gray CLAY, moist (CL)	M	M	0.5	0.2
10										
	S-6	14	0 1 50/5	> 50		Top 11": Brownish yellow to dark gray CLAY, little coarse to fine Sand, little Silt, moist (CL)				
15					SP	Bottom 3": Light gray coarse to fine SAND, moist (SP)				
					SM					
	S-7	1	50/1	> 50		Very dense, light brown Silty coarse to fine SAND, moist (SM)				
20						End of the boring 18.1 Feet BGS. Borehole backfilled with soil cuttings.				

N-Value

10 20 30 40

Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

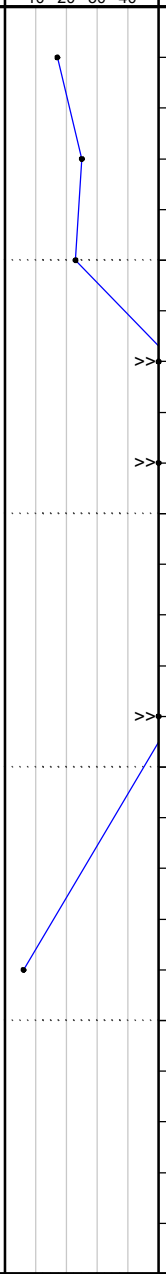
Soil Boring Log

B-18

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.39798 N, -83.112988 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/13/24 12:00 PM	**Elevation:**	1309
Inspector:	Jack Gallucci	**Boring End:**	03/13/24 01:00 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-50	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	20	2 5 12 17	17	GM	2" TOPSOIL Medium dense, dark gray to brown coarse to fine GRAVEL, little coarse to fine Sand, little Silt, little Clay, moist (GM)				
	S-2	17	11 14 11 17	25	GP	Medium dense, dark gray coarse to fine GRAVEL, some coarse to fine Sand, moist (GP)				
5	S-3	16	4 10 13 16	23		Medium dense, dark gray coarse to fine GRAVEL, some coarse to fine Sand, trace Clay, moist (GP)				
	S-4	15	23 27 31 31	> 50		Very dense, dark gray coarse to fine GRAVEL, some coarse to fine Sand, moist (GP)				
	S-5	8	38 50/1	> 50	GM	Very dense, light gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)				
10										
	S-6	15	6 29 33 22	> 50		Very dense, light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
15										
	S-7	11	9 4 2 7	6		Loose, light gray to brownish yellow Sandy coarse to fine GRAVEL, little Silt, trace Clay, moist (GM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

Coal observed from 1 to 8 feet BGS.

Auger grinding at 11 feet BGS.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

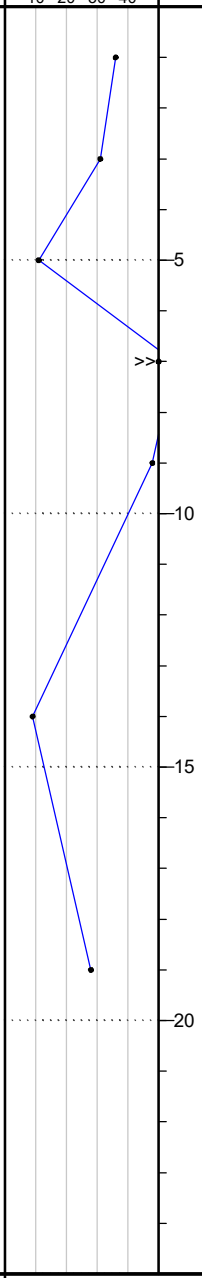
Soil Boring Log

B-19

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.395055 N, -83.10507 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/11/24 03:45 PM	**Elevation:**	1398
Inspector:	Jack Gallucci	**Boring End:**	03/11/24 05:00 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						3" TOPSOIL				
	S-1	17	7 17 19 -	36	GM	Dense, light gray coarse to fine GRAVEL, little coarse to fine Sand, little Silt, moist (GM)				
	S-2	18	9 19 12 19	31	GP	Dense, light gray coarse to fine GRAVEL, little coarse to fine Sand, moist (GP)				
5	S-3	15	3 5 6 7	11	GP	Top 11": Light gray coarse to fine GRAVEL, little coarse to fine Sand, moist (GP)				
					CL	Bottom 4": Dark gray to brownish yellow Sandy CLAY, little Silt, moist (CL)				
	S-4	13	46 50/2	> 50	SM	Very dense, light gray coarse to fine SAND, some Silt, trace Clay, wet (SM)				
	S-5	14	30 30 18 21	48		Dense, brownish yellow medium to fine SAND, little Silt, wet (SM)				
10										
	S-6	5	2 3 6 4	9		Loose, brownish yellow medium to fine SAND, little Silt, wet (SM)				
15										
	S-7	7	22 21 7 5	28		Medium dense, brownish yellow medium to fine SAND, some Silt, wet (SM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

Blow counts could not be recorded due to a drill rig mechanical error.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
03/11/24 05:00 PM	ATD		20	5

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

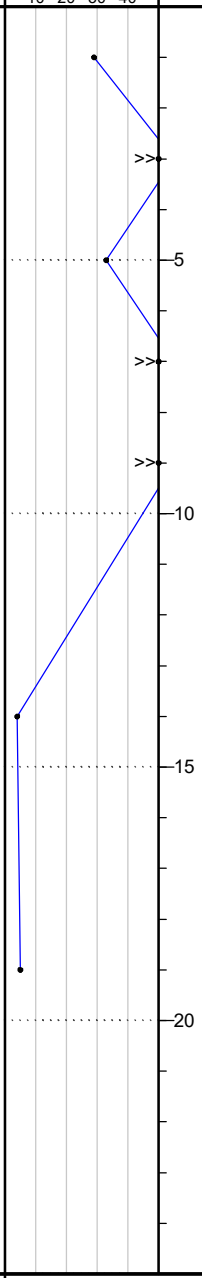
Soil Boring Log

B-20

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.390163 N, -83.112356 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/13/24 10:45 AM	**Elevation:**	1318
Inspector:	Jack Gallucci	**Boring End:**	03/13/24 11:40 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						6" TOPSOIL				
	S-1	14	12 15 14 10	29	GM	Medium stiff, light gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)				
	S-2	15	13 14 42 29	> 50		Very dense, light gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)				
5	S-3	11	7 18 15 9	33		Dense, light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
	S-4	16	6 15 43 48	> 50		Very dense, light gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, some Clay, moist (GM)				
	S-5	16	26 28 42 25	> 50		Very dense, light gray to brownish yellow Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
10										
	S-6	14	1 2 2 4	4		Very loose, brownish yellow to light gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, some Clay, moist (GM)				
15										
	S-7	8	3 3 2 4	5		Loose, brownish yellow to light gray coarse to fine GRAVEL, some coarse to fine Sand, little Silt, moist (GM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

Cobbles encountered at less than 1 foot BGS.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

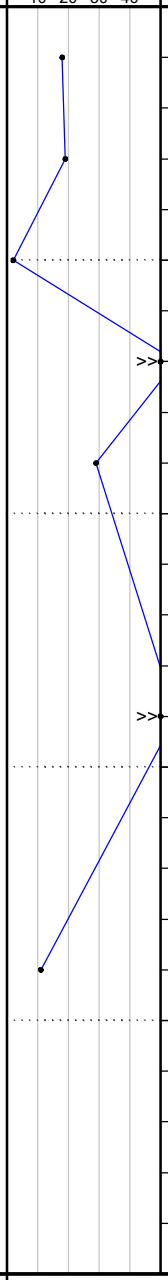
Soil Boring Log

B-21

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.397848 N, -83.098419 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/13/24 08:15 AM	**Elevation:**	1345
Inspector:	Jack Gallucci	**Boring End:**	03/13/24 09:20 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						3" TOPSOIL				
	S-1	9	6 11 7 5	18		Medium dense, light gray coarse to fine GRAVEL, some coarse to fine Sand, little Silt, moist (GM)				
	S-2	9	4 7 12 5	19		Medium dense, dark brown to light gray coarse to fine GRAVEL, some coarse to fine Sand, little Silt, moist (GM)				
5	S-3	4	1 1 1 2	2		Very loose, brown coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)				
	S-4	13	35 39 29 23	> 50		Very dense, light gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, wet (GM)				
	S-5	14	17 19 10 17	29	GM	Medium dense, coarse to fine GRAVEL, some coarse to fine Sand, some Silt, wet (GM)				
10										
	S-6	15	27 30 26 18	> 50		Very dense, light gray Sandy coarse to fine GRAVEL, some Silt, moist (GM)				
15										
	S-7	12	5 5 6 6	11	SM	Medium dense, dark brown coarse to fine SAND, little coarse to fine Gravel, little Silt, trace Clay, moist (SM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Cobbles observed from 6 to 15 feet BGS.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
03/13/24 09:20 AM	ATD		20	6

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

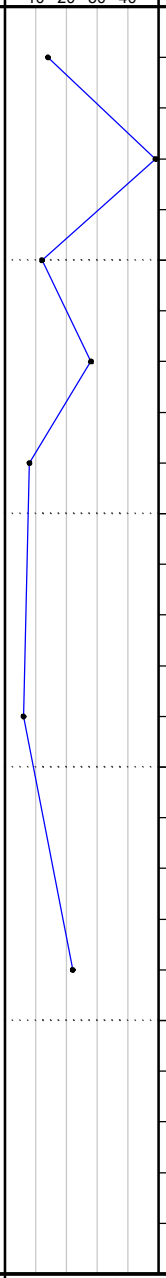
Soil Boring Log

B-22

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.401946 N, -83.099075 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/13/24 01:55 PM	**Elevation:**	1336
Inspector:	Jack Gallucci	**Boring End:**	03/13/24 03:00 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						2" TOPSOIL				
	S-1	13	3 7 7 12	14	GM	Medium dense, dark brown coarse to fine GRAVEL, some coarse to fine Sand, little Silt, moist (GM)				
	S-2	1	8 30 19 12	49		Dense, dark brown coarse to fine GRAVEL, some coarse to fine Sand, little Silt, moist (GM)				
5	S-3	8	7 8 4 5	12		Medium dense, dark brown to light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
	S-4	7	17 14 14 11	28		Medium dense, dark gray to light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
	S-5	8	5 4 4 10	8		Loose, light gray to dark gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
10										
	S-6	9	2 2 4 4	6		Loose, light gray to dark gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
15										
	S-7	12	7 15 7 10	22		Medium dense, light gray to dark gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

Coal observed 9 to 10 feet BGS.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

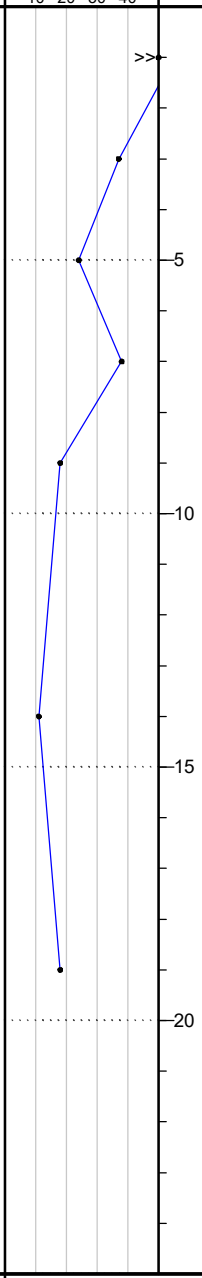
Soil Boring Log

B-23

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.401735 N, -83.105061 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/13/24 03:05 PM	**Elevation:**	1320
Inspector:	Jack Gallucci	**Boring End:**	03/13/24 03:50 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						4" TOPSOIL				
	S-1	13	7 23 44 50/4	> 50	GM	Very dense, light gray to brownish yellow Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
	S-2	13	33 21 16 8	37		Dense, light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
5	S-3	16	6 11 13 19	24		Medium dense, light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
	S-4	15	16 18 20 30	38		Dense, light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)				
	S-5	16	15 11 7 20	18		Medium dense, light gray to dark gray Sandy coarse to fine GRAVEL, some Silt, moist (GM)				
10										
	S-6	14	5 5 6 4	11		Medium dense, dark brown to light gray Sandy coarse to fine GRAVEL, little Silt, little Clay, moist (GM)				
15										
	S-7	16	8 7 11 14	18		Medium dense, dark brown to light gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

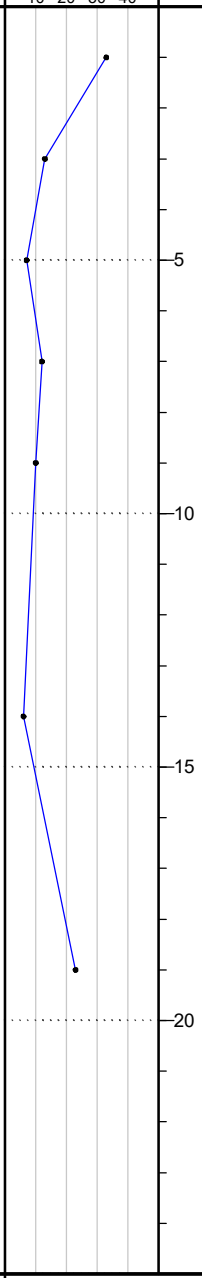
Soil Boring Log

B-24

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.406861 N, -83.088168 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/15/24 08:15 AM	**Elevation:**	1248
Inspector:	Jack Gallucci	**Boring End:**	03/15/24 08:50 AM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
						3" TOPSOIL				
	S-1	13	6 19 14 11	33		Dense, light gray to brown coarse to fine SAND, some Silt, trace coarse to fine Gravel, trace Clay, moist (SM)				
	S-2	13	7 7 6 4	13		Medium dense, light gray coarse to fine SAND, some Silt, little coarse to fine Gravel, moist (SM)				
5	S-3	13	4 4 3 3	7		Loose, light brown Silty coarse to fine SAND, trace coarse to fine Gravel, moist (SM)				
	S-4	14	5 6 6 8	12		Medium dense, light gray to brownish yellow Silty coarse to fine SAND, little Clay, moist (SM)				
	S-5	12	2 6 4 8	10		Medium dense, dark brown to light brown Silty coarse to fine SAND, moist (SM)				
10					SM					
	S-6	12	2 2 4 6	6		Loose, dark brown to light gray coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)				
15										
	S-7	17	7 8 15 7	23		Medium dense, brown to light gray Silty coarse to fine SAND, some coarse to fine Gravel, moist (SM)				
20						End of the boring 20 Feet BGS. Borehole backfilled with soil cuttings.				



Drilling & Strata Notes

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

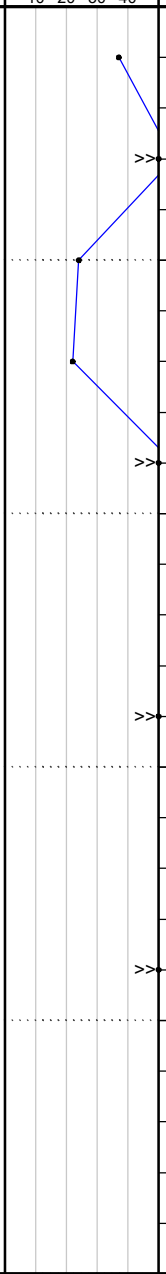
Soil Boring Log

B-25

Client:	BrightNight	**Drilling Firm:**	Core Co. USA	**Coordinates:**	37.438397 N, -83.082506 E
Project:	Starfire Solar Energy Generation Project	**Drill Crew:**	Chris Rios / Justin	**Horiz. Datum:**	WGS84
Location:	Knott County, Kentucky	**Boring Start:**	03/15/24 10:45 AM	**Elevation:**	1350
Inspector:	Jack Gallucci	**Boring End:**	03/15/24 12:00 PM	**Vert. Datum:**	N/A

Rig Model:	Diedrich D-70	**Sampler Type:**	Split Spoon	**Casing Type:**	N/A
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	N/A
Drill Method:	Solid Stem Auger	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	N/A
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	N/A
Drilling Fluid:	None	**Hammer Fall:**	30 inches	**Hammer Fall:**	N/A

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	14	7 17 20 25	37	SM	3" TOPSOIL Dense, light brown to light gray coarse to fine SAND, some Silt, trace coarse to fine Gravel, moist (SM)					
	S-2	1	50/2	> 50	SM	Very dense, light gray Silty medium to fine SAND, moist (SM)					
5	S-3	8	32 20 4 3	24	SM	Medium dense, light gray Silty medium to fine SAND, moist (SM)					
	S-4	15	3 4 18 46	22	SC	Medium dense, light gray Clayey coarse to fine SAND, some Silt, wet (SC)					
	S-5	13	34 50/2	> 50	SM	Very dense, light gray Silty coarse to fine SAND, little Clay, wet (SM)					
10											
	S-6	1	50/1	> 50	ML	Hard, light gray Sandy SILT, wet (ML)					Auger grinding at 13 feet BGS.
15											
	S-7	0	50/0	> 50		End of boring 18 feet BGS. Borehole backfilled with soil cuttings.					Splitspoon refusal at 18 feet BGS. Potential cobble obstruction.
20											



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)
03/15/24 12:00 PM	ATD		20	5

General Notes

BGS = Below Ground Surface
Groundwater not encountered at time of boring.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Attachment D

Test Pit Logs

Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-01
Site Location	Knott County, KY	Date	3/10/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Logan Campbell
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/40s
Final Test Pit Depth (feet)	6 feet (72 inches)	Time Opened	2:10 PM
Groundwater Depth (feet)	N/A	Time Closed	2:40 PM

0-72”
Brown to light gray SILT, some coarse to fine Gravel, some coarse to fine Sand, moist (ML)

72” Refusal
Large Boulder encountered



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-02
Site Location	Knott County, KY	Date	3/9/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Jack Gallucci
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Overcast/40s
Final Test Pit Depth (feet)	6.2 feet (74 inches)	Time Opened	12:50 PM
Groundwater Depth (feet)	N/A	Time Closed	1:30 PM

0-10”
Dark gray SILT, some coarse to fine Gravel, some coarse to fine Sand, moist (ML)

10-74”
Dark gray Sandy coarse to fine GRAVEL, some Silt, moist (GM)

Cobbles and Boulders observed

74” Refusal
Large Boulder observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-03
Site Location	Knott County, KY	Date	3/10/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Logan Campbell
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/40s
Final Test Pit Depth (feet)	8.4 feet (101 inches)	Time Opened	9:40 AM
Groundwater Depth (feet)	N/A	Time Closed	10:10 AM

0-101”
Brown Gravelly SILT, little coarse to fine Sand, moist (ML)

Cobbles and Boulders observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-04
Site Location	Knott County, KY	Date	3/10/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Logan Campbell
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/40s
Final Test Pit Depth (feet)	8.4 feet (101 inches)	Time Opened	4:15 PM
Groundwater Depth (feet)	N/A	Time Closed	4:45 PM

0-42”
Gray to dark gray Silty coarse to fine GRAVEL, little coarse to fine Sand, moist (GM)

Cobbles and Boulders observed

42-101”
Brown to dark gray Clayey coarse to fine GRAVEL, little Silt, trace coarse to fine Sand, moist (GC)

Cobbles and Boulders observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-05
Site Location	Knott County, KY	Date	3/12/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Jack Gallucci
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50s
Final Test Pit Depth (feet)	9 feet (108 inches)	Time Opened	11:05 AM
Groundwater Depth (feet)	N/A	Time Closed	11:50 AM

0-5”
TOPSOIL

5-108”
Light brown to light gray Silty coarse to fine GRAVEL, some coarse to fine Sand, moist (GM)

Cobbles and Boulders Observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-06
Site Location	Knott County, KY	Date	3/12/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Jack Gallucci
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50s
Final Test Pit Depth (feet)	9.5 feet (114 inches)	Time Opened	12:05 PM
Groundwater Depth (feet)	3.6 feet (43 inches)	Time Closed	12:50 PM

0-5”
TOPSOIL

5-47”
Light brown to light gray coarse to fine Sandy coarse to fine GRAVEL, little Silt, moist (GM)

Cobbles and Boulders observed

43”
Perched water observed

47-114”
Dark gray coarse to fine GRAVEL, some coarse to fine Sand, some Clay, little Silt, moist (GC)

Cobbles and Boulders observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-07
Site Location	Knott County, KY	Date	3/11/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Jack Gallucci
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50°F
Final Test Pit Depth (feet)	9.7 feet (116 inches)	Time Opened	4:40 PM
Groundwater Depth (feet)	N/A	Time Closed	5:20 PM

0-3”
TOPSOIL

3-56”
Dark gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)

Cobbles and Boulders observed

56-116”
Brownish yellow coarse to fine GRAVEL, some coarse to fine Sand, some Silt, little Clay, moist (GM)

Cobbles and Boulders observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-08
Site Location	Knott County, KY	Date	3/11/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Jack Gallucci
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50°F
Final Test Pit Depth (feet)	5.3 feet (64 inches)	Time Opened	3:25 PM
Groundwater Depth (feet)	N/A	Time Closed	3:55 PM

0-3”
TOPSOIL

3-64”
Dark gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)

Cobbles and Boulders observed

64” Refusal
Large boulder observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-09
Site Location	Knott County, KY	Date	3/10/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Logan Campbell
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50°F
Final Test Pit Depth (feet)	10 feet (120 inches)	Time Opened	11:25 AM
Groundwater Depth (feet)	N/A	Time Closed	11:55 AM

0-120”
Dark brown to dark gray Gravelly SILT, trace coarse to fine Sand, moist (ML)

Cobbles and Boulders observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-10
Site Location	Knott County, KY	Date	3/11/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Logan Campbell
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50°F
Final Test Pit Depth (feet)	10.5 feet (126 inches)	Time Opened	12:10 PM
Groundwater Depth (feet)	N/A	Time Closed	12:45 PM

0-126”
Dark gray SILT, some coarse to fine Gravel, trace coarse to fine Sand, moist (ML)

Cobbles and Boulders observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-11
Site Location	Knott County, KY	Date	3/11/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Logan Campbell
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50°F
Final Test Pit Depth (feet)	7 feet (84 inches)	Time Opened	1:40 PM
Groundwater Depth (feet)	6 feet (72 inches)	Time Closed	2:10 PM

0-84”
Dark gray Gravelly coarse to fine SAND, some Silt, moist (SM)

Cobbles and Boulders observed



Test Pit Photo Log

Project Name	BrightNight – Starfire Solar	Test Pit ID	TP-12
Site Location	Knott County, KY	Date	3/10/2024
Test Pit Contractor	ALTA Energy Services	ANS Geo Representative	Logan Campbell
Equipment Used	Wacker Neuson CT-90	Weather/Temp	Partly Cloudy/50°F
Final Test Pit Depth (feet)	3 feet (36 inches)	Time Opened	1:40 PM
Groundwater Depth (feet)	6 feet (72 inches)	Time Closed	2:10 PM

0-36”
Brown to brownish yellow coarse to fine SAND, some coarse to fine Gravel, trace Silt, moist (SP)

Cobbles and Boulders observed

36” Refusal
Cobbles and Boulders Observed



Attachment E

Infiltration Testing Logs

INFILTRATION TEST LOG

Project Name: BrightNight Starfire	**Date: 3/9/2024 Inspector: Jack Gallucci**
Site Location: Knott County, Kentucky	**Time of Test: 1:35 – 4:35 PM**
Test Pit Contractor: ALTA Energy Services	**Equipment Used: Wacker Neuson CT-90**
Weather/Temp: Partly Cloudy 50°F	**Test Pit ID: TP-02**
Groundwater Depth: N/A	**Double Ring Infiltration Test ID: IT-01**
Infiltration Test Depth: Grade	**Final Test Pit Depth: 6.2 feet (74 inches)**

Depth (inches)		**Test Pit Description for Infiltration Tests**	**Field Tests**
Top	**Bottom**	**Soil/Rock Layers**	**PP/TV = tsf**
0	10	TOPSOIL	N/A
10	74	Dark gray SILT, some coarse to fine Gravel, some coarse to fine Sand, moist (ML)	N/A

Infiltration Test (Double Ring Infiltrometer)									
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**1.50”**
Grade	0.75”	0.75”	0.75”	0.75”	0.75”	0.75”	-	-	
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**1.00”**
Grade	0.75”	0.50”	0.50”	0.50”	0.50”	0.50”	-	-	

INFILTRATION TEST LOG

Project Name: BrightNight Starfire	**Date: 3/10/2024 Inspector: Jack Gallucci**
Site Location: Knott County, Kentucky	**Time of Test: 8:40 AM – 11:40 PM**
Test Pit Contractor: ALTA Energy Services	**Equipment Used: Wacker Neuson CT-90**
Weather/Temp: Partly Cloudy / 50°F	**Test Pit ID: TP-04**
Groundwater Depth: N/A	**Double Ring Infiltration Test ID: IT-02**
Infiltration Test Depth: Grade	**Final Test Pit Depth: 8.4 feet (101 inches)**

Depth (inches)		**Test Pit Description for Infiltration Tests**	**Field Tests**
Top	**Bottom**	**Soil/Rock Layers**	**PP/TV = tsf**
0	42	Gray to dark gray Silty coarse to fine GRAVEL, little coarse to fine Sand, moist (GM)	N/A
42	101	Brown to dark gray Clayey coarse to fine GRAVEL, little Silt, trace coarse to fine Sand, moist (GC)	N/A

Infiltration Test (Double Ring Infiltrometer)									
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**2.58”**
Grade	2.16”	1.32”	1.20”	1.32”	1.20”	1.44”	-	-	
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**2.52”**
Grade	1.44”	1.44”	1.20”	1.20”	1.32”	1.32”	-	-	

INFILTRATION TEST LOG

Project Name: BrightNight Starfire	**Date: 3/12/2024 Inspector: Jack Gallucci**
Site Location: Knott County, Kentucky	**Time of Test: 11:55 AM – 3:55 PM**
Test Pit Contractor: ALTA Energy Services	**Equipment Used: Wacker Neuson CT-90**
Weather/Temp: Partly Cloudy / 50°F	**Test Pit ID: TP-06**
Groundwater Depth: 3.6 feet	**Double Ring Infiltration Test ID: IT-03**
Infiltration Test Depth: Grade	**Final Test Pit Depth: 6.2 feet (114 inches)**

Depth (inches)		**Test Pit Description for Infiltration Tests**	**Field Tests**
Top	**Bottom**	**Soil/Rock Layers**	**PP/TV = tsf**
0	5	TOPSOIL	N/A
5	47	Light brown to light gray Sandy coarse to fine GRAVEL, little Silt, moist (GM)	N/A
47	114	Dark gray coarse to fine GRAVEL, some coarse to fine Sand, some Clay, little Silt, moist (GC)	N/A

Infiltration Test (Double Ring Infiltrometer)									
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**0.25”**
Grade	0.25”	0.125”	0.125”	0.125”	0.125”	0.125”	-	-	
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**0.25”**
Grade	0.25”	0.125”	0.125”	0.125”	0.125”	0.125”	-	-	

INFILTRATION TEST LOG

Project Name: BrightNight Starfire	**Date: 3/11/2024 Inspector: Jack Gallucci**
Site Location: Knott County, Kentucky	**Time of Test: 11:40 AM – 2:40 PM**
Test Pit Contractor: ALTA Energy Services	**Equipment Used: Wacker Neuson CT-90**
Weather/Temp: Partly Cloudy / 50°F	**Test Pit ID: TP-07**
Groundwater Depth: N/A	**Double Ring Infiltration Test ID: IT-04**
Infiltration Test Depth: Grade	**Final Test Pit Depth: 9.7 feet (116 inches)**

Depth (inches)		**Test Pit Description for Infiltration Tests**	**Field Tests**
Top	**Bottom**	**Soil/Rock Layers**	**PP/TV = tsf**
0	3	Topsoil	N/A
3	56	Dark gray coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)	N/A
56	116	Brownish yellow coarse to fine GRAVEL, some coarse to fine Sand, some Silt, little Clay, moist (GM)	N/A

Infiltration Test (Double Ring Infiltrometer)									
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**0.48”**
Grade	0.24”	0.24”	0.24”	0.24”	0.24”	0.24”	-	-	
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**0.66”**
Grade	0.36”	0.36”	0.24”	0.36”	0.36”	0.36”	-	-	

INFILTRATION TEST LOG

Project Name: BrightNight Starfire	**Date: 3/11/2024 Inspector: Jack Gallucci**
Site Location: Knott County, Kentucky	**Time of Test: 1:50 PM – 4:50 PM**
Test Pit Contractor: ALTA Energy Services	**Equipment Used: Wacker Neuson CT-90**
Weather/Temp: Partly Cloudy / 50°F	**Test Pit ID: TP-11**
Groundwater Depth: N/A	**Double Ring Infiltration Test ID: IT-05**
Infiltration Test Depth: Grade	**Final Test Pit Depth: 7 feet (84 inches)**

Depth (inches)		**Test Pit Description for Infiltration Tests**	**Field Tests**
Top	**Bottom**	**Soil/Rock Layers**	**PP/TV = tsf**
0	84	Dark gray Gravelly coarse to fine SAND, some Silt, moist (SM)	N/A

Infiltration Test (Double Ring Infiltrometer)									
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**0.48”**
Grade	0.24”	0.24”	0.24”	0.24”	0.24”	0.24”	-	-	
Time (min.)	**30 (Presoak)**	**30 (Presoak)**	**30**	**30**	**30**	**30**	**30**	**30**	**Infiltration Rate (in/hr)**
Test Depth (feet)	Reading No. 1	Reading No.2	Reading No. 3	Reading No. 4	Reading No. 5	Reading No. 6	Reading No. 7	Reading No. 8	**0.42”**
Grade	0.48”	0.48”	0.48”	0.36”	0.36”	0.48”	-	-	

Attachment F

Electrical Resistivity Test Data

Soil Resistivity Results

Client:	Brighnight	Date:	3/7/2023
Project Name:	Starfire Solar	Weather:	Partly Cloudy
Project Location:	Perry, Knott, and Breahitt County Kentucky	Temperature:	50°F
Equipment:	AGI MiniSting		
Test Method:	Wenner 4 Electrode Array		

Array		Data	Array spacing (ft)				
			2	5	10	20	50
ERT-01	N-S	Measured Resistance (Ω)	11.31	4.29	2.56	1.25	0.45
		Apparent Resistivity (Ω-m)	43.34	41.12	49.01	48.04	43.49
	E-W	Measured Resistance (Ω)	11.70	5.27	2.58	1.27	0.45
		Apparent Resistivity (Ω-m)	44.81	50.29	49.29	48.49	43.43
ERT-02	N-S	Measured Resistance (Ω)	10.74	6.87	4.22	2.60	1.56
		Apparent Resistivity (Ω-m)	41.15	65.84	80.92	99.64	149.53
	E-W	Measured Resistance (Ω)	11.77	6.60	3.97	2.91	1.37
		Apparent Resistivity (Ω-m)	45.11	63.22	75.99	117.56	131.40
ERT-03	N-S	Measured Resistance (Ω)	8.62	4.67	3.05	1.17	0.65
		Apparent Resistivity (Ω-m)	33.01	44.68	58.43	64.56	62.21
	E-W	Measured Resistance (Ω)	9.27	4.61	2.47	1.53	0.64
		Apparent Resistivity (Ω-m)	35.48	44.17	47.24	58.40	61.20
ERT-04	N-S	Measured Resistance (Ω)	15.73	8.66	3.88	2.27	0.72
		Apparent Resistivity (Ω-m)	60.26	82.97	74.31	86.96	68.79
	E-W	Measured Resistance (Ω)	13.01	7.54	4.28	2.15	0.83
		Apparent Resistivity (Ω-m)	49.83	72.24	81.90	82.45	79.25
ERT-05	N-S	Measured Resistance (Ω)	27.18	15.06	9.38	3.60	0.93
		Apparent Resistivity (Ω-m)	104.12	144.14	179.53	137.71	89.52
	E-W	Measured Resistance (Ω)	28.20	15.20	8.30	4.21	1.00
		Apparent Resistivity (Ω-m)	108.02	145.54	158.89	161.15	96.19
ERT-06	N-S	Measured Resistance (Ω)	13.35	4.89	2.82	1.49	0.84
		Apparent Resistivity (Ω-m)	51.15	46.82	54.01	57.00	80.16
	E-W	Measured Resistance (Ω)	11.30	5.12	2.84	1.53	0.69
		Apparent Resistivity (Ω-m)	43.37	48.98	54.35	58.67	65.87
		Site Average (Ω)	14.35	7.40	4.19	2.16	0.84
		Site Average (Ω-m)	54.97	70.83	80.32	85.05	80.92

Attachment G

Pile Load Test Logs

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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-01A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	1.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	57.85
Location:	37.405812°, -83.154796°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.3

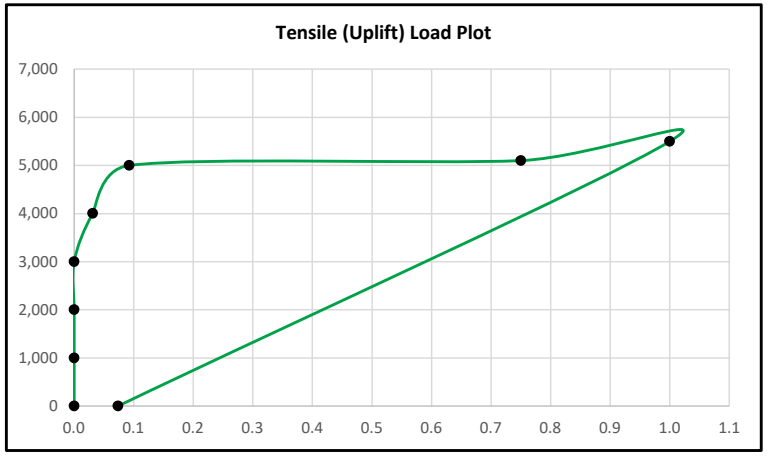
Embedment Data

Depth (ft)	Time (s)
1	0
2	4.48
3	8.66
4	10.59
5	13.17
6	10.42
7	10.53
Total Time (s) =	57.85

Field Notes

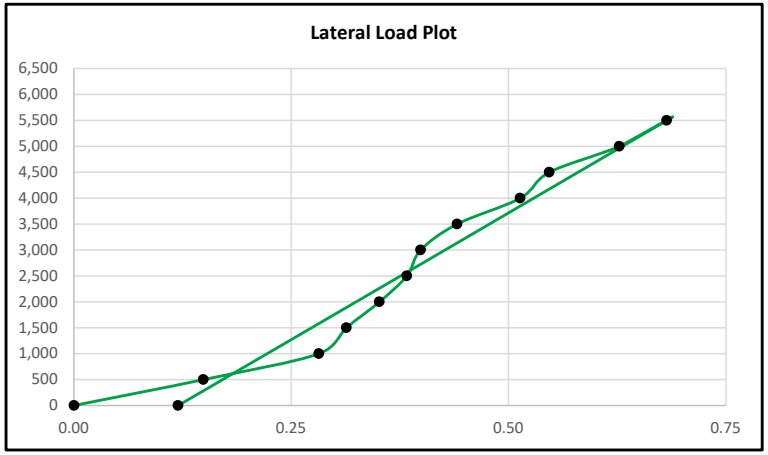
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0320	0.0310	0.0315
1	5,000	5,000	0.0930	0.0920	0.0925
1	5,100	5,100	0.7500	0.7500	0.7500
1	6,000	5,500	1.0000	1.0000	1.0000
1	0	0	0.0770	0.0710	0.0740



Lateral Testing

Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.1500	0.1480	0.1490
1	1,000	1,000	0.2830	0.2810	0.2820
1	1,500	1,500	0.3150	0.3120	0.3135
1	2,000	2,000	0.3550	0.3480	0.3515
1	2,500	2,500	0.3860	0.3800	0.3830
1	3,000	3,000	0.4000	0.3980	0.3990
1	3,500	3,500	0.4420	0.4400	0.4410
1	4,000	4,000	0.5150	0.5120	0.5135
1	4,500	4,500	0.5480	0.5460	0.5470
1	5,000	5,000	0.6290	0.6260	0.6275
1	5,500	5,500	0.6830	0.6810	0.6820
1	0	0	0.1220	0.1180	0.1200



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-01B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	54.4
Location:	37.405812°, -83.154796°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	6.0

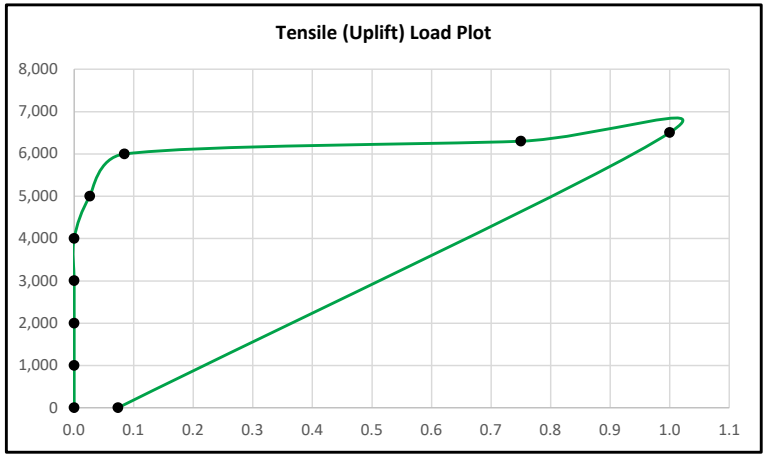
Embedment Data

Depth (ft)	Time (s)
1	6.42
2	7.84
3	5.47
4	6.75
5	7.33
6	7.77
7	5.57
8	3.45
9	3.8
Total Time (s) =	54.4

Field Notes

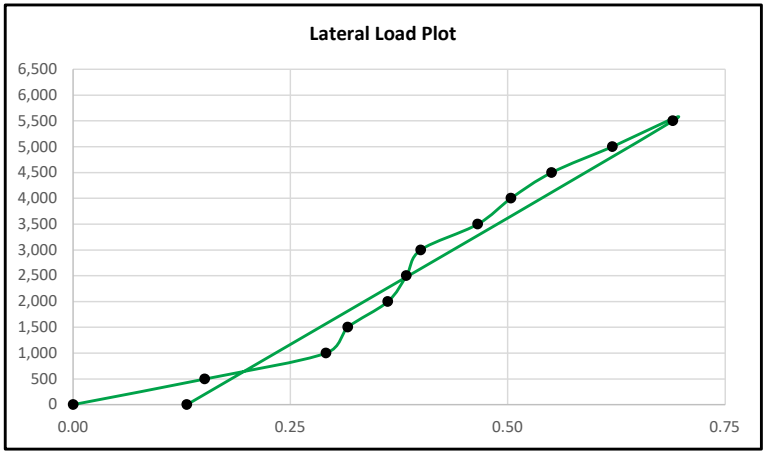
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0280	0.0250	0.0265
1	6,000	6,000	0.0860	0.0830	0.0845
1	6,300	6,300	0.7500	0.7500	0.7500
1	6,500	6,500	1.0000	1.0000	1.0000
1	0	0	0.0770	0.0710	0.0740



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.1530	0.1500	0.1515
1	1,000	1,000	0.2930	0.2890	0.2910
1	1,500	1,500	0.3170	0.3150	0.3160
1	2,000	2,000	0.3630	0.3610	0.3620
1	2,500	2,500	0.3850	0.3820	0.3835
1	3,000	3,000	0.4010	0.3990	0.4000
1	3,500	3,500	0.4510	0.4800	0.4655
1	4,000	4,000	0.5050	0.5030	0.5040
1	4,500	4,500	0.5510	0.5500	0.5505
1	5,000	5,000	0.6330	0.6080	0.6205
1	5,500	5,500	0.6950	0.6850	0.6900
1	0	0	0.1320	0.1300	0.1310



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-02A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	56.18
Location:	37.417834°, -83.135634°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.0

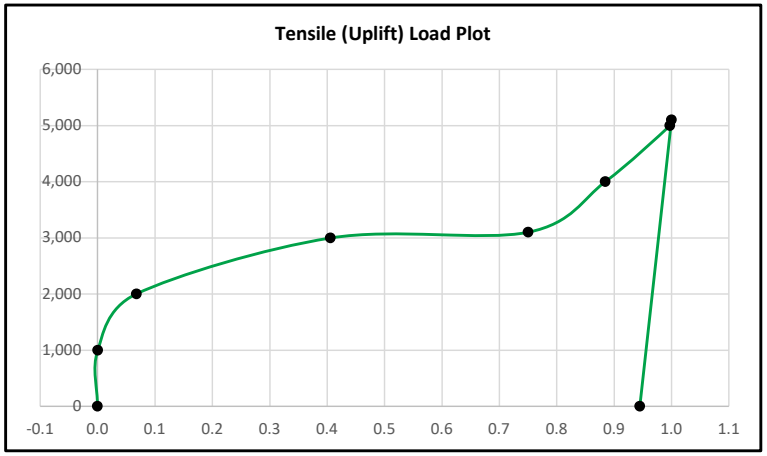
Embedment Data

Depth (ft)	Time (s)
1	2.48
2	6.16
3	5.49
4	8.37
5	9.24
6	10.53
7	13.91
Total Time (s) =	56.18

Field Notes

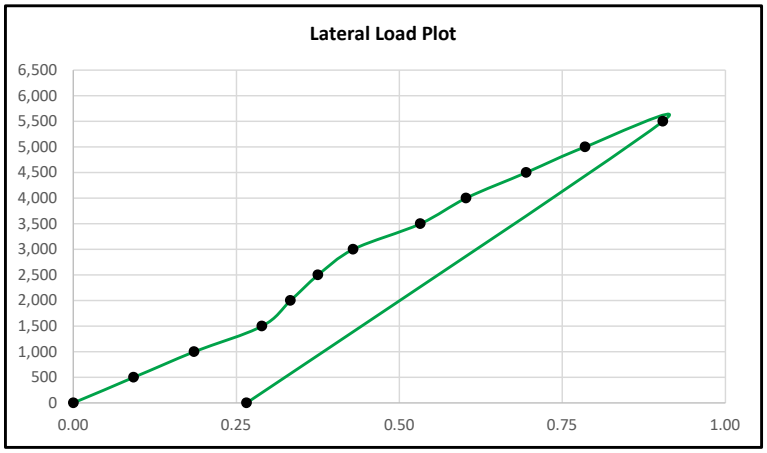
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0010	0.0000	0.0005
1	2,000	2,000	0.0690	0.0660	0.0675
1	3,000	3,000	0.4070	0.4040	0.4055
1	3,100	3,100	0.7500	0.7500	0.7500
1	4,000	4,000	0.8880	0.8810	0.8845
1	5,000	5,000	0.9980	0.9960	0.9970
1	5,100	5,100	1.0000	1.0000	1.0000
1	0	0	0.9460	0.9440	0.9450



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0880	0.0970	0.0925
1	1,000	1,000	0.1870	0.1840	0.1855
1	1,500	1,500	0.2900	0.2890	0.2895
1	2,000	2,000	0.3350	0.3310	0.3330
1	2,500	2,500	0.3770	0.3740	0.3755
1	3,000	3,000	0.4310	0.4280	0.4295
1	3,500	3,500	0.5340	0.5310	0.5325
1	4,000	4,000	0.6050	0.6000	0.6025
1	4,500	4,500	0.6970	0.6930	0.6950
1	5,000	5,000	0.7810	0.7890	0.7850
1	5,500	5,500	0.9060	0.9030	0.9045
1	0	0	0.2430	0.2890	0.2660



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-02B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	80.09
Location:	37.417834°, -83.135634°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.9

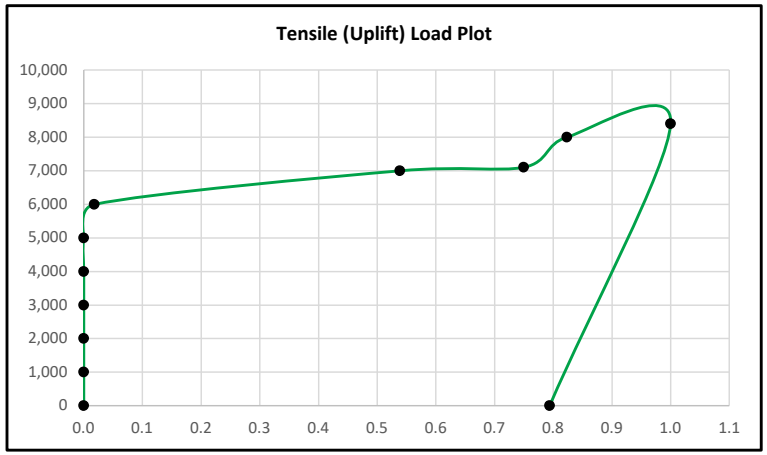
Embedment Data

Depth (ft)	Time (s)
1	2.07
2	8.87
3	9.89
4	7.76
5	11.37
6	10.03
7	11.35
8	7.92
9	10.83
Total Time (s) =	80.09

Field Notes

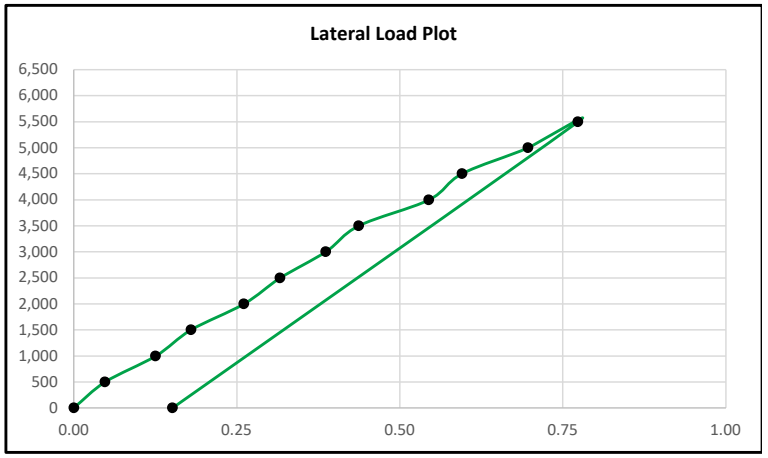
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0000	0.0000	0.0000
1	6,000	6,000	0.0190	0.0170	0.0180
1	7,000	7,000	0.5900	0.4880	0.5390
1	7,100	7,100	0.7500	0.7500	0.7500
1	8,000	8,000	0.8250	0.8220	0.8235
1	8,400	8,400	1.0000	1.0000	1.0000
1	0	0	0.7950	0.7930	0.7940



Lateral Testing

Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0490	0.0470	0.0480
1	1,000	1,000	0.1290	0.1220	0.1255
1	1,500	1,500	0.1810	0.1790	0.1800
1	2,000	2,000	0.2620	0.2600	0.2610
1	2,500	2,500	0.3180	0.3150	0.3165
1	3,000	3,000	0.3870	0.3860	0.3865
1	3,500	3,500	0.4380	0.4360	0.4370
1	4,000	4,000	0.5460	0.5430	0.5445
1	4,500	4,500	0.5970	0.5940	0.5955
1	5,000	5,000	0.6980	0.6960	0.6970
1	5,500	5,500	0.7640	0.7830	0.7735
1	0	0	0.1530	0.1500	0.1515



Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-02C
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	59.12
Location:	37.417834°, -83.135634°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.4

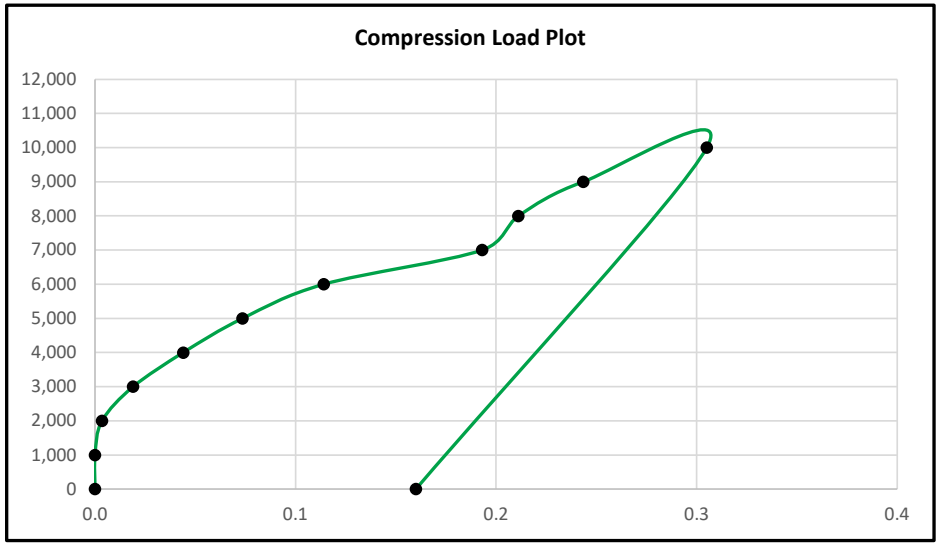
Embedment Data

Depth (ft)	Time (s)
1	2.58
2	6.02
3	5.39
4	9.61
5	10.94
6	9.75
7	14.83
Total Time (s) =	59.12

Field Notes

Compression Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0040	0.0030	0.0035
1	3,000	3,000	0.0200	0.0180	0.0190
1	4,000	4,000	0.0450	0.0430	0.0440
1	5,000	5,000	0.0750	0.0720	0.0735
1	6,000	6,000	0.1150	0.1130	0.1140
1	7,000	7,000	0.1990	0.1870	0.1930
1	8,000	8,000	0.2120	0.2100	0.2110
1	9,000	9,000	0.2460	0.2410	0.2435
1	10,000	10,000	0.3080	0.3020	0.3050
1	0	0	0.1620	0.1580	0.1600



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-03A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	66.39
Location:	37.421931°, -83.120756°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	9.5

Embedment Data

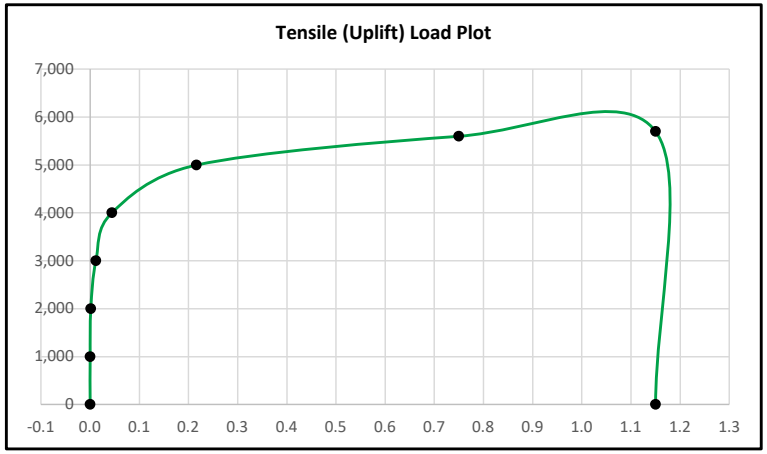
Depth (ft)	Time (s)
1	9.64
2	19.66
3	6.29
4	9.11
5	6.77
6	6.31
7	8.61
Total Time (s) =	66.39

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0020	0.0010	0.0015
1	3,000	3,000	0.0130	0.0110	0.0120
1	4,000	4,000	0.0430	0.0460	0.0445
1	5,000	5,000	0.2180	0.2150	0.2165
1	5,600	5,600	0.7500	0.7500	0.7500
1	5,700	5,700	1.1800	1.1200	1.1500
1	0	0	1.1800	1.1200	1.1500

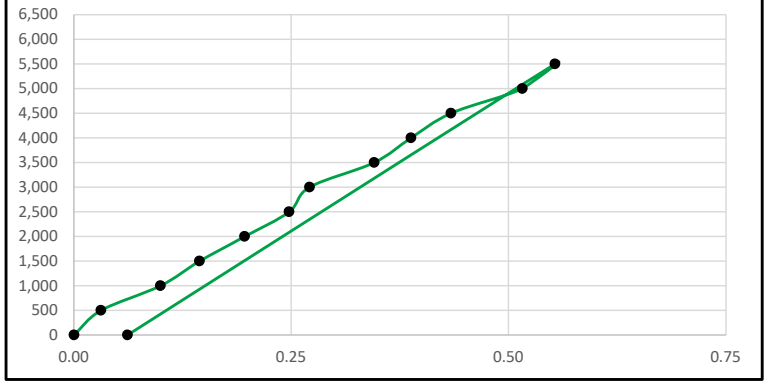
Tensile (Uplift) Load Plot



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0070	0.0550	0.0310
1	1,000	1,000	0.1010	0.0980	0.0995
1	1,500	1,500	0.1460	0.1430	0.1445
1	2,000	2,000	0.1980	0.1950	0.1965
1	2,500	2,500	0.2490	0.2460	0.2475
1	3,000	3,000	0.2900	0.2520	0.2710
1	3,500	3,500	0.3500	0.3410	0.3455
1	4,000	4,000	0.3920	0.3840	0.3880
1	4,500	4,500	0.4380	0.4300	0.4340
1	5,000	5,000	0.5170	0.5150	0.5160
1	5,500	5,500	0.5540	0.5530	0.5535
1	0	0	0.0630	0.0600	0.0615

Lateral Load Plot



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-03B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	122.36
Location:	37.421931°, -83.120756°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	13.6

Embedment Data

Depth (ft)	Time (s)
1	4.87
2	10.18
3	15.71
4	17.09
5	16.07
6	12.15
7	13.34
8	16.39
9	16.56
Total Time (s) =	122.36

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0000	0.0000	0.0000
1	6,000	6,000	0.0000	0.0000	0.0000
1	7,000	7,000	0.0000	0.0000	0.0000
1	8,000	8,000	0.0010	0.0010	0.0010
1	9,000	9,000	0.0020	0.0010	0.0015
1	10,000	10,000	0.0020	0.0010	0.0015
1	0	0	0.0010	0.0010	0.0010

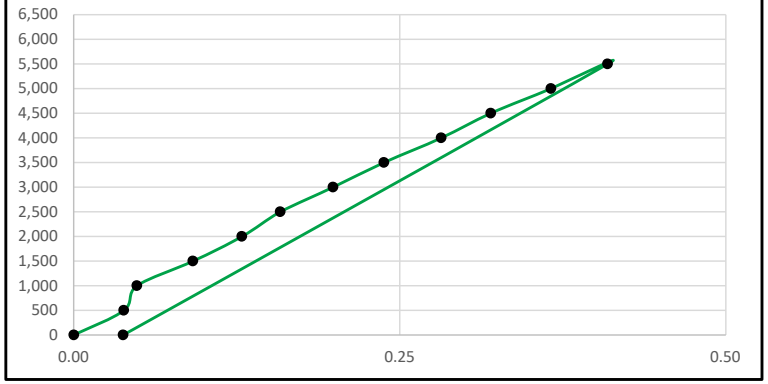
Tensile (Uplift) Load Plot



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0400	0.0370	0.0385
1	1,000	1,000	0.0620	0.0350	0.0485
1	1,500	1,500	0.0950	0.0880	0.0915
1	2,000	2,000	0.1320	0.1260	0.1290
1	2,500	2,500	0.1650	0.1520	0.1585
1	3,000	3,000	0.2010	0.1970	0.1990
1	3,500	3,500	0.2450	0.2310	0.2380
1	4,000	4,000	0.2880	0.2760	0.2820
1	4,500	4,500	0.3220	0.3180	0.3200
1	5,000	5,000	0.3700	0.3620	0.3660
1	5,500	5,500	0.4110	0.4080	0.4095
1	0	0	0.0390	0.0370	0.0380

Lateral Load Plot



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-04A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	40.24
Location:	37.441523°, -83.093405°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	5.7

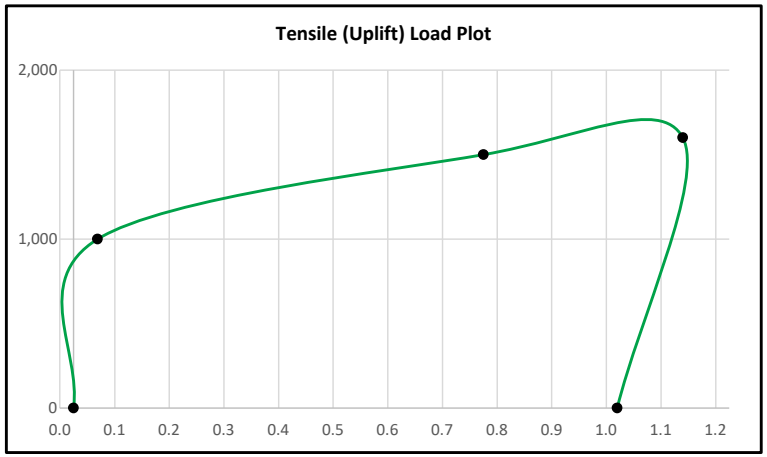
Embedment Data

Depth (ft)	Time (s)
1	3.86
2	13.33
3	8.49
4	4.56
5	4.31
6	2.74
7	2.95
Total Time (s) =	40.24

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0450	0.0430	0.0440
1	1,500	1,500	0.7500	0.7500	0.7500
1	1,600	1,600	1.1200	1.1100	1.1150
1	0	0	1.0000	0.9900	0.9950



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0800	0.0780	0.0790
1	1,000	1,000	0.1270	0.1220	0.1245
1	1,500	1,500	0.1840	0.1810	0.1825
1	2,000	2,000	0.2340	0.2280	0.2310
1	2,500	2,500	0.2820	0.2750	0.2785
1	3,000	3,000	0.3350	0.3280	0.3315
1	3,500	3,500	0.3810	0.3720	0.3765
1	4,000	4,000	0.4340	0.4210	0.4275
1	4,500	4,500	0.4990	0.4780	0.4885
1	5,000	5,000	0.5480	0.5320	0.5400
1	5,500	5,500	0.6040	0.5960	0.6000
1	0	0	0.0880	0.0830	0.0855



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-04B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	47.81
Location:	37.441523°, -83.093405°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	5.3

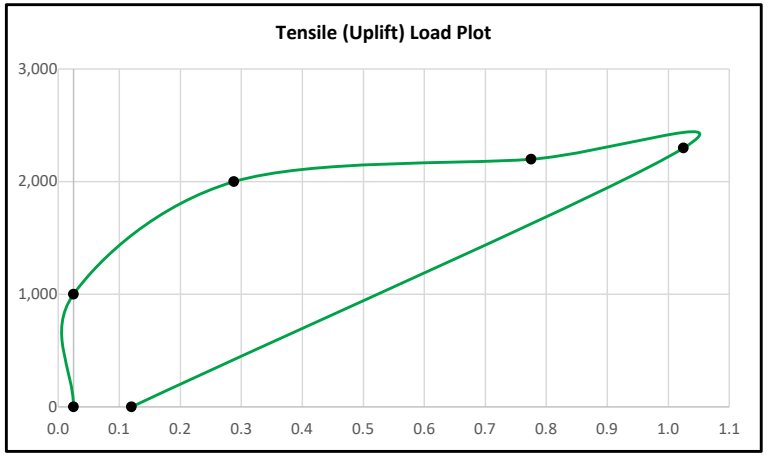
Embedment Data

Depth (ft)	Time (s)
1	9.85
2	8.99
3	4.63
4	6.1
5	5.2
6	3.28
7	3.76
8	3.28
9	2.72
Total Time (s) =	47.81

Field Notes

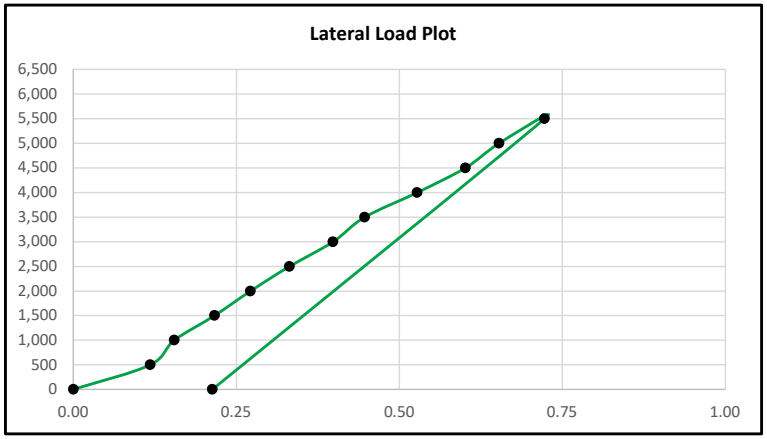
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.2640	0.2620	0.2630
1	2,200	2,200	0.7500	0.7500	0.7500
1	2,300	2,300	1.0000	1.0000	1.0000
1	0	0.0000	0.0960	0.0940	0.0950



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.1190	0.1170	0.1180
1	1,000	1,000	0.1570	0.1530	0.1550
1	1,500	1,500	0.2180	0.2150	0.2165
1	2,000	2,000	0.2730	0.2700	0.2715
1	2,500	2,500	0.3320	0.3310	0.3315
1	3,000	3,000	0.4000	0.3970	0.3985
1	3,500	3,500	0.4500	0.4440	0.4470
1	4,000	4,000	0.5290	0.5260	0.5275
1	4,500	4,500	0.6030	0.6000	0.6015
1	5,000	5,000	0.6550	0.6510	0.6530
1	5,500	5,500	0.7270	0.7190	0.7230
1	0	0	0.2170	0.2100	0.2135



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-05A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	53.95
Location:	37.405422°, -83.130795°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	7.7

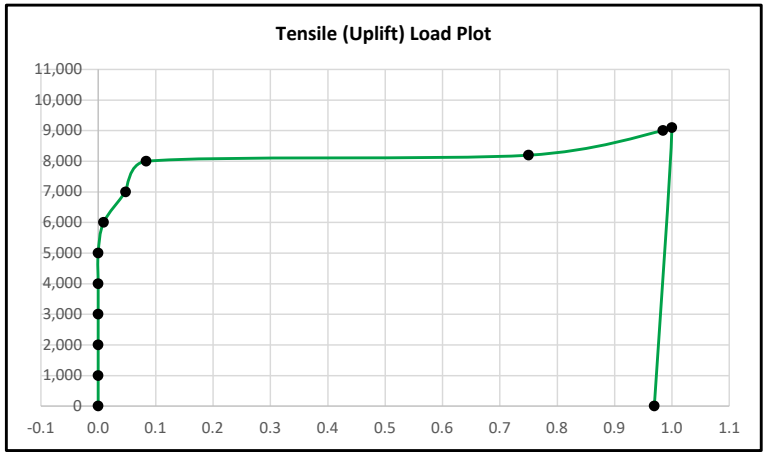
Embedment Data

Depth (ft)	Time (s)
1	6.14
2	12.23
3	10.41
4	8.7
5	6.43
6	5.54
7	4.5
Total Time (s) =	53.95

Field Notes

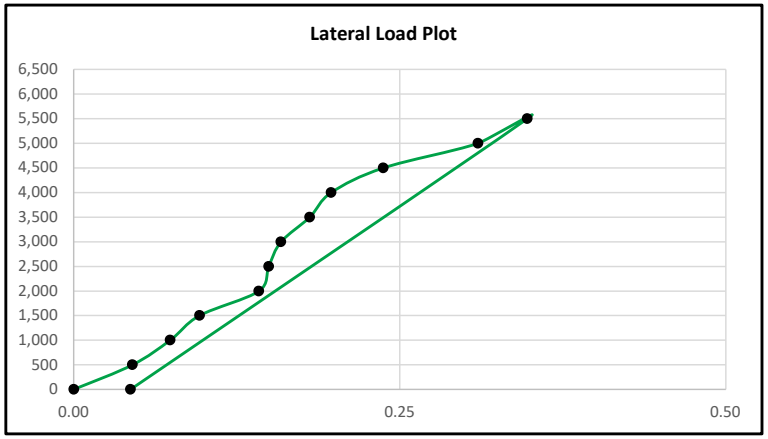
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0000	0.0000	0.0000
1	6,000	6,000	0.0100	0.0090	0.0095
1	7,000	7,000	0.0460	0.0490	0.0475
1	8,000	8,000	0.0860	0.0810	0.0835
1	8,200	8,200	0.7500	0.7500	0.7500
1	9,000	9,000	0.9870	0.9820	0.9845
1	10,000	9,100	1.0000	1.0000	1.0000
1	0	0	0.9710	0.9680	0.9695



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0460	0.0440	0.0450
1	1,000	1,000	0.0750	0.0730	0.0740
1	1,500	1,500	0.0970	0.0960	0.0965
1	2,000	2,000	0.1430	0.1410	0.1420
1	2,500	2,500	0.1500	0.1490	0.1495
1	3,000	3,000	0.1600	0.1580	0.1590
1	3,500	3,500	0.1830	0.1790	0.1810
1	4,000	4,000	0.1980	0.1970	0.1975
1	4,500	4,500	0.2380	0.2370	0.2375
1	5,000	5,000	0.3110	0.3090	0.3100
1	5,500	5,500	0.3470	0.3490	0.3480
1	0	0	0.0450	0.0420	0.0435



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-05B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/10/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/14/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	65.75
Location:	37.405422°, -83.130795°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	7.3

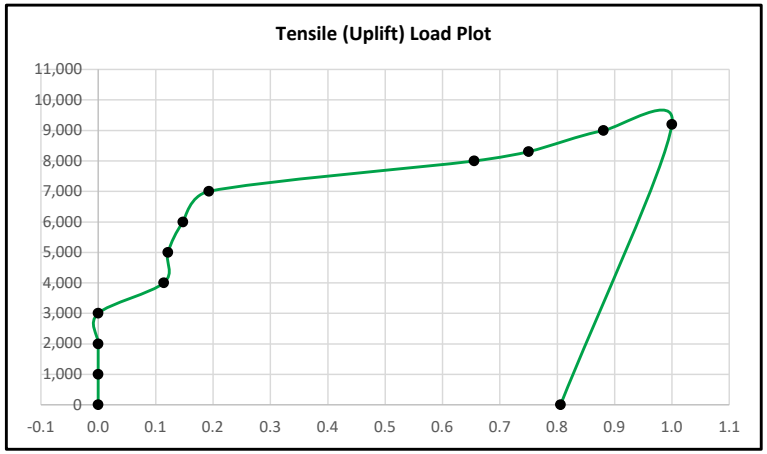
Embedment Data

Depth (ft)	Time (s)
1	2.18
2	10.56
3	8.23
4	8.25
5	8.36
6	4.68
7	10.14
8	7.7
9	5.65
Total Time (s) =	65.75

Field Notes

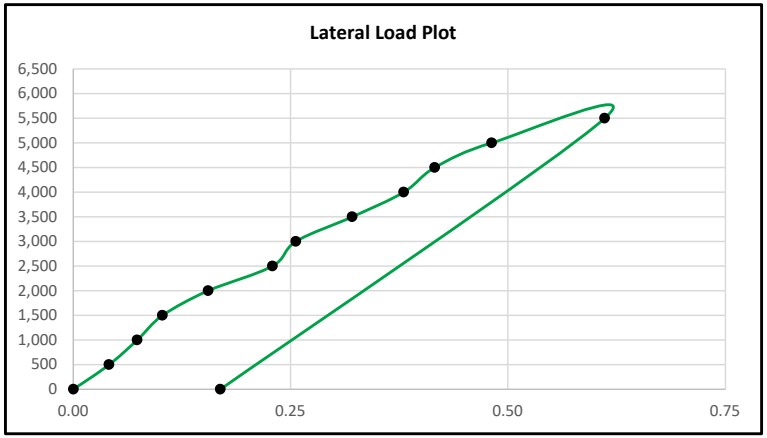
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.1150	0.1130	0.1140
1	5,000	5,000	0.1220	0.1210	0.1215
1	6,000	6,000	0.1460	0.1490	0.1475
1	7,000	7,000	0.1950	0.1910	0.1930
1	8,000	8,000	0.6590	0.6520	0.6555
1	8,300	8,300	0.7500	0.7500	0.7500
1	9,000	9,000	0.8880	0.8730	0.8805
1	10,000	9,200	1.0000	1.0000	1.0000
1	0	0	0.8080	0.8040	0.8060



Lateral Testing

Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0420	0.0400	0.0410
1	1,000	1,000	0.0750	0.0720	0.0735
1	1,500	1,500	0.1050	0.1000	0.1025
1	2,000	2,000	0.1590	0.1510	0.1550
1	2,500	2,500	0.2300	0.2280	0.2290
1	3,000	3,000	0.2570	0.2550	0.2560
1	3,500	3,500	0.3220	0.3200	0.3210
1	4,000	4,000	0.3810	0.3790	0.3800
1	4,500	4,500	0.4170	0.4150	0.4160
1	5,000	5,000	0.4820	0.4810	0.4815
1	5,500	5,500	0.6120	0.6110	0.6115
1	0	0	0.1450	0.1930	0.1690



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-06A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	60.29
Location:	37.408290°, -83.116261°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.6

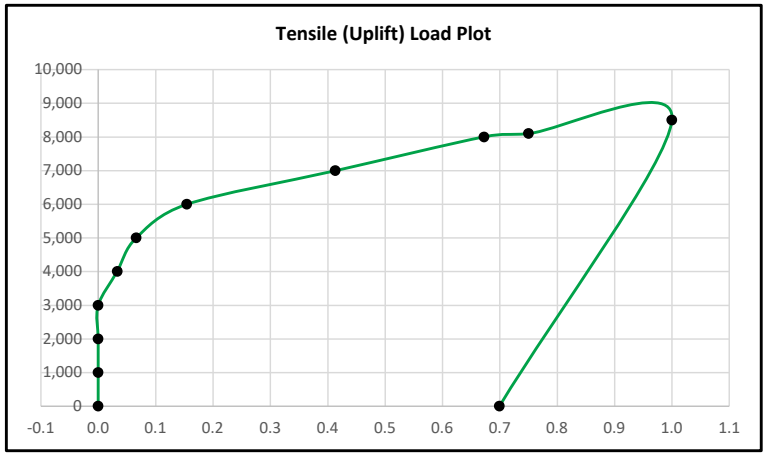
Embedment Data

Depth (ft)	Time (s)
1	5.39
2	7.12
3	15.33
4	8.87
5	6.95
6	11.06
7	5.57
Total Time (s) =	60.29

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0350	0.0310	0.0330
1	5,000	5,000	0.0690	0.0630	0.0660
1	6,000	6,000	0.1410	0.1680	0.1545
1	7,000	7,000	0.4160	0.4100	0.4130
1	8,000	8,000	0.6740	0.6710	0.6725
1	8,100	8,100	0.7500	0.7500	0.7500
1	9,000	8,500	1.0000	1.0000	1.0000
1	0	0	0.7010	0.6980	0.6995



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0550	0.0340	0.0445
1	1,000	1,000	0.1220	0.1230	0.1225
1	1,500	1,500	0.2000	0.1990	0.1995
1	2,000	2,000	0.2340	0.2520	0.2430
1	2,500	2,500	0.3280	0.3250	0.3265
1	3,000	3,000	0.3870	0.3830	0.3850
1	3,500	3,500	0.4520	0.4500	0.4510
1	4,000	4,000	0.4910	0.4900	0.4905
1	4,500	4,500	0.5420	0.5390	0.5405
1	5,000	5,000	0.6280	0.6260	0.6270
1	5,500	5,500	0.7840	0.7820	0.7830
1	0	0	0.1370	0.1340	0.1355



ANS GEO

Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-06B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	65.92
Location:	37.408290°, -83.116261°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	7.3

Embedment Data

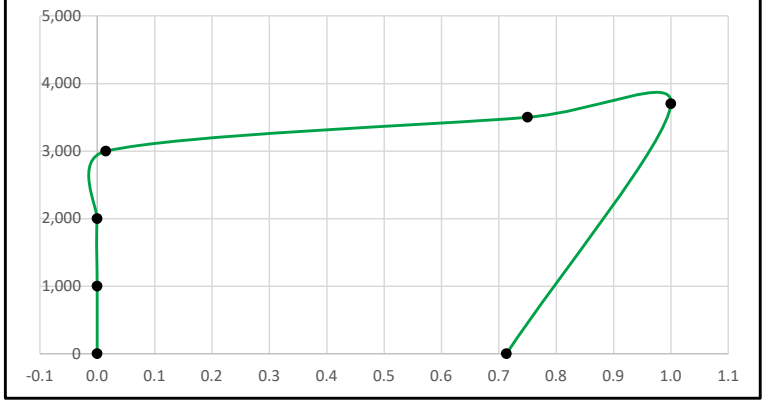
Depth (ft)	Time (s)
1	3.14
2	6.53
3	11.04
4	9.55
5	14.64
6	6.5
7	4.9
8	4.54
9	5.08
Total Time (s) =	65.92

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0160	0.0140	0.0150
1	3,500	3,500	0.7500	0.7500	0.7500
1	4,000	3,700	1.0000	1.0000	1.0000
1	0	0	0.7160	0.7110	0.7135

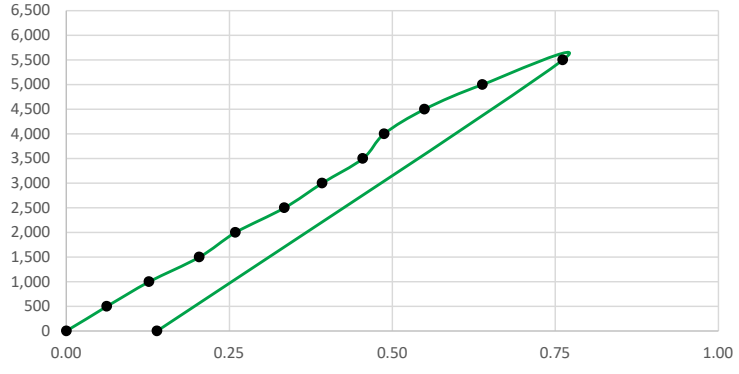
Tensile (Uplift) Load Plot



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0630	0.0610	0.0620
1	1,000	1,000	0.1290	0.1250	0.1270
1	1,500	1,500	0.2080	0.2000	0.2040
1	2,000	2,000	0.2610	0.2580	0.2595
1	2,500	2,500	0.3320	0.3370	0.3345
1	3,000	3,000	0.3970	0.3880	0.3925
1	3,500	3,500	0.4580	0.4520	0.4550
1	4,000	4,000	0.4930	0.4820	0.4875
1	4,500	4,500	0.5530	0.5460	0.5495
1	5,000	5,000	0.6440	0.6330	0.6385
1	5,500	5,500	0.7690	0.7540	0.7615
1	0	0	0.1400	0.1380	0.1390

Lateral Load Plot



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-07A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	29.55
Location:	37.408387°, -83.101846°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	4.2

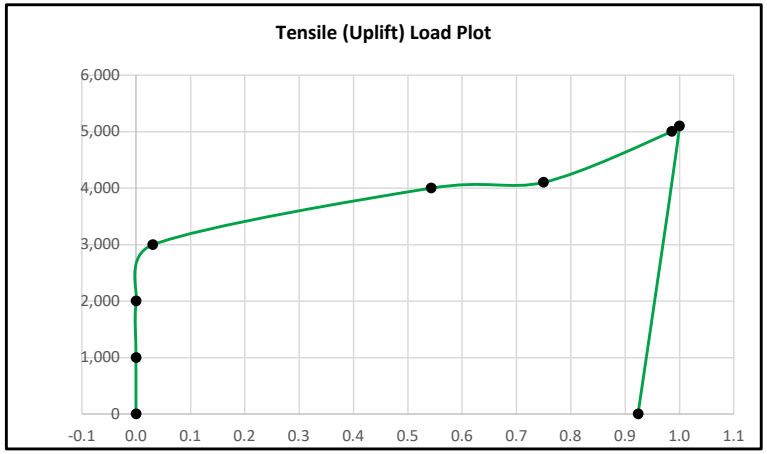
Embedment Data

Depth (ft)	Time (s)
1	2.39
2	2.23
3	3.76
4	9.31
5	3.8
6	4.85
7	3.21
Total Time (s) =	29.55

Field Notes

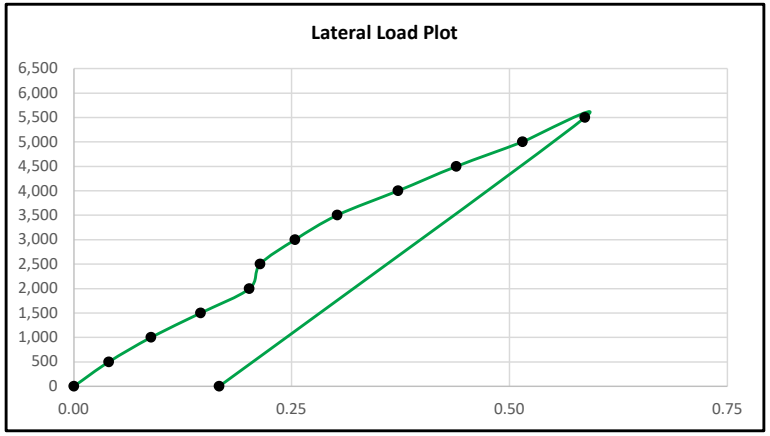
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0010	0.0000	0.0005
1	3,000	3,000	0.0320	0.0300	0.0310
1	4,000	4,000	0.5440	0.5430	0.5435
1	4,100	4,100	0.7500	0.7500	0.7500
1	5,000	5,000	0.9870	0.9850	0.9860
1	5,100	5,100	1.0000	1.0000	1.0000
1	0	0	0.9250	0.9230	0.9240



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0410	0.0390	0.0400
1	1,000	1,000	0.0900	0.0870	0.0885
1	1,500	1,500	0.1470	0.1440	0.1455
1	2,000	2,000	0.2030	0.2000	0.2015
1	2,500	2,500	0.2150	0.2130	0.2140
1	3,000	3,000	0.2550	0.2530	0.2540
1	3,500	3,500	0.3040	0.3010	0.3025
1	4,000	4,000	0.3730	0.3710	0.3720
1	4,500	4,500	0.4410	0.4370	0.4390
1	5,000	5,000	0.5180	0.5120	0.5150
1	5,500	5,500	0.5880	0.5850	0.5865
1	0	0	0.1680	0.1660	0.1670



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-07B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	75.87
Location:	37.408387°, -83.101846°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.4

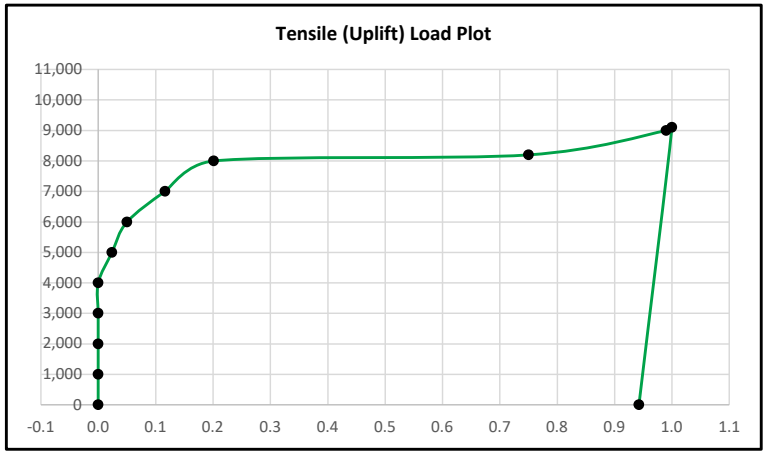
Embedment Data

Depth (ft)	Time (s)
1	1.66
2	13.02
3	4.37
4	3.39
5	3.49
6	9.11
7	18.22
8	12.47
9	10.14
Total Time (s) =	75.87

Field Notes

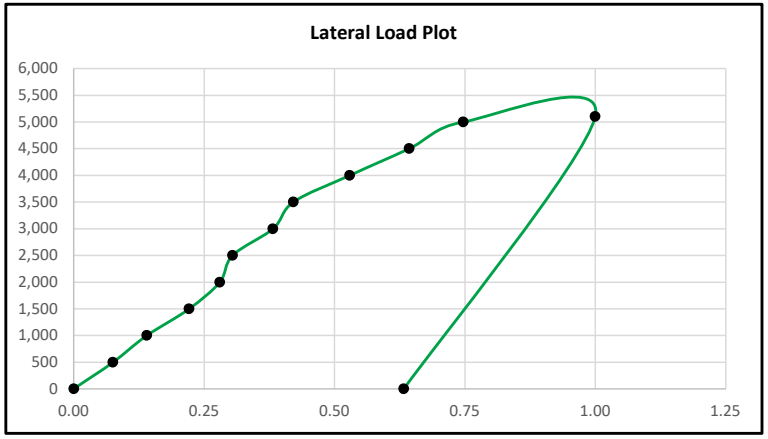
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0260	0.0220	0.0240
1	6,000	6,000	0.0510	0.0490	0.0500
1	7,000	7,000	0.1180	0.1150	0.1165
1	8,000	8,000	0.2020	0.2000	0.2010
1	8,200	8,200	0.7500	0.7500	0.7500
1	9,000	9,000	0.9930	0.9870	0.9900
1	9,100	9,100	1.0000	1.0000	1.0000
1	0	0.0000	0.9440	0.9410	0.9425



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0770	0.0730	0.0750
1	1,000	1,000	0.1410	0.1390	0.1400
1	1,500	1,500	0.2230	0.2200	0.2215
1	2,000	2,000	0.2810	0.2790	0.2800
1	2,500	2,500	0.3060	0.3030	0.3045
1	3,000	3,000	0.3800	0.3840	0.3820
1	3,500	3,500	0.4200	0.4220	0.4210
1	4,000	4,000	0.5300	0.5280	0.5290
1	4,500	4,500	0.6450	0.6420	0.6435
1	5,000	5,000	0.7480	0.7460	0.7470
1	5,100	5,100	1.0000	1.0000	1.0000
1	0	0	0.6350	0.6310	0.6330



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-08A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	50.69
Location:	37.413556°, -83.084781°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	7.2

Embedment Data

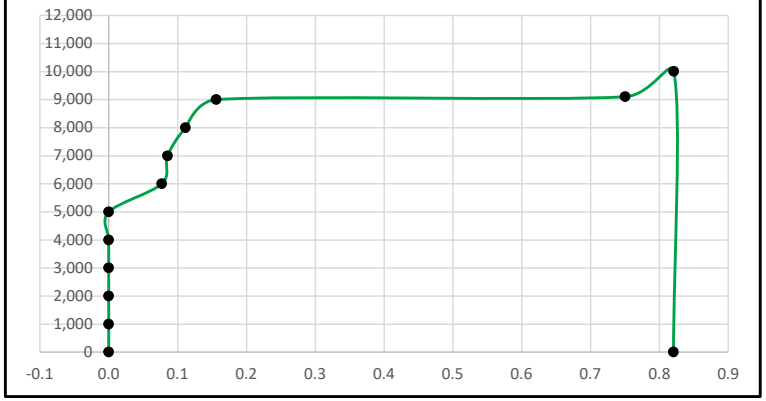
Depth (ft)	Time (s)
1	2.74
2	6.91
3	5.6
4	9.28
5	8.83
6	8.53
7	8.8
Total Time (s) =	50.69

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0000	0.0000	0.0000
1	6,000	6,000	0.0780	0.0760	0.0770
1	7,000	7,000	0.0880	0.0830	0.0855
1	8,000	8,000	0.1130	0.1100	0.1115
1	9,000	9,000	0.1570	0.1550	0.1560
1	9,100	9,100	0.7500	0.7500	0.7500
1	10,000	10,000	0.8230	0.8190	0.8210
1	0	0.0000	0.8210	0.8200	0.8205

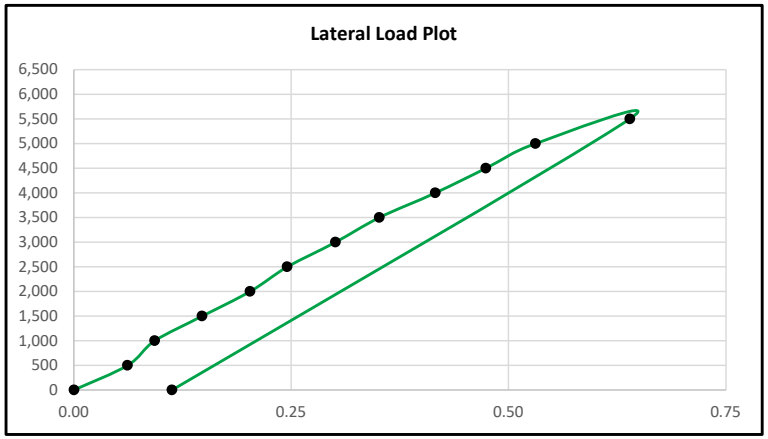
Tensile (Uplift) Load Plot



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0660	0.0570	0.0615
1	1,000	1,000	0.0940	0.0920	0.0930
1	1,500	1,500	0.1490	0.1460	0.1475
1	2,000	2,000	0.2040	0.2010	0.2025
1	2,500	2,500	0.2480	0.2430	0.2455
1	3,000	3,000	0.3020	0.3000	0.3010
1	3,500	3,500	0.3520	0.3510	0.3515
1	4,000	4,000	0.4190	0.4130	0.4160
1	4,500	4,500	0.4760	0.4720	0.4740
1	5,000	5,000	0.5320	0.5300	0.5310
1	5,500	5,500	0.6400	0.6390	0.6395
1	0	0	0.1140	0.1120	0.1130

Lateral Load Plot



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Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-08B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	76.1
Location:	37.413556°, -83.084781°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.5

Embedment Data

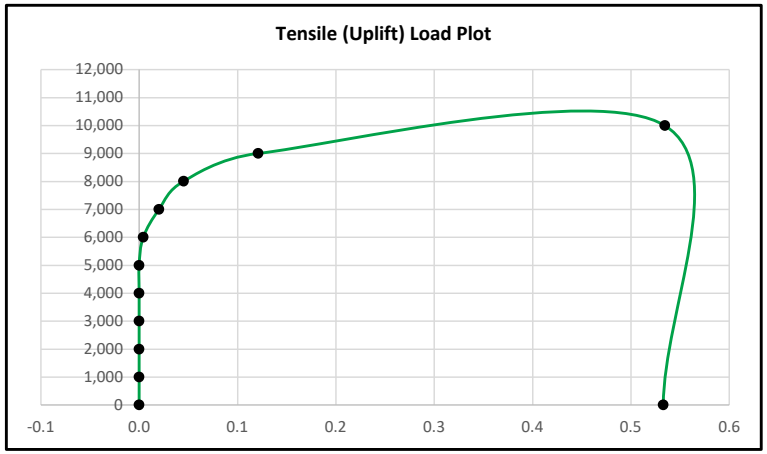
Depth (ft)	Time (s)
1	2.43
2	4.4
3	9.29
4	8.33
5	11.66
6	9.56
7	7.45
8	12.99
9	9.99
Total Time (s) =	76.1

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0000	0.0000	0.0000
1	6,000	6,000	0.0050	0.0030	0.0040
1	7,000	7,000	0.0210	0.0190	0.0200
1	8,000	8,000	0.0460	0.0440	0.0450
1	9,000	9,000	0.1230	0.1190	0.1210
1	10,000	10,000	0.5370	0.5320	0.5345
1	0	0.0000	0.5350	0.5310	0.5330

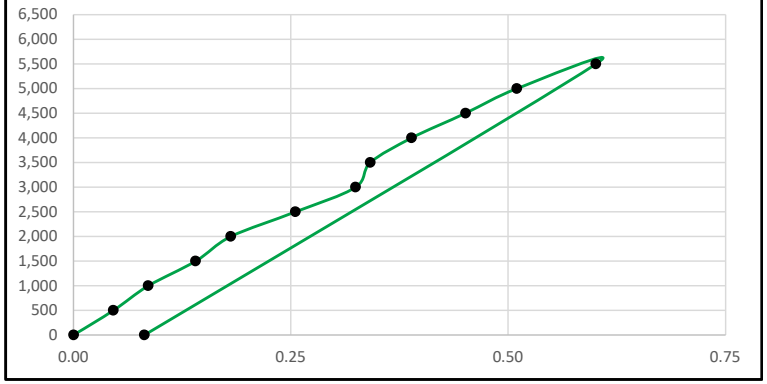
Tensile (Uplift) Load Plot



Lateral Testing

Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0490	0.0430	0.0460
1	1,000	1,000	0.0840	0.0880	0.0860
1	1,500	1,500	0.1440	0.1370	0.1405
1	2,000	2,000	0.1820	0.1800	0.1810
1	2,500	2,500	0.2580	0.2530	0.2555
1	3,000	3,000	0.3270	0.3220	0.3245
1	3,500	3,500	0.3430	0.3400	0.3415
1	4,000	4,000	0.3900	0.3880	0.3890
1	4,500	4,500	0.4550	0.4470	0.4510
1	5,000	5,000	0.5110	0.5090	0.5100
1	5,500	5,500	0.6030	0.5990	0.6010
1	0	0	0.0830	0.0800	0.0815

Lateral Load Plot



Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-08C
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	62.1
Location:	37.413556°, -83.084781°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	8.9

Embedment Data

Depth (ft)	Time (s)
1	2.85
2	8.68
3	9.86
4	7.67
5	11.3
6	10.77
7	10.97
Total Time (s) =	62.1

Field Notes

Compression Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0210	0.0260	0.0235
1	2,000	2,000	0.0400	0.0390	0.0395
1	3,000	3,000	0.0560	0.0540	0.0550
1	4,000	4,000	0.0660	0.0650	0.0655
1	5,000	5,000	0.0750	0.0740	0.0745
1	6,000	6,000	0.0860	0.0890	0.0875
1	7,000	7,000	0.1020	0.1000	0.1010
1	8,000	8,000	0.1360	0.1350	0.1355
1	9,000	9,000	0.1960	0.1950	0.1955
1	10,000	10,000	0.2150	0.2130	0.2140
1	0	0	0.0890	0.0850	0.0870



ANS GEO

Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-09A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	37.25
Location:	37.397982°, -83.112988°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	5.3

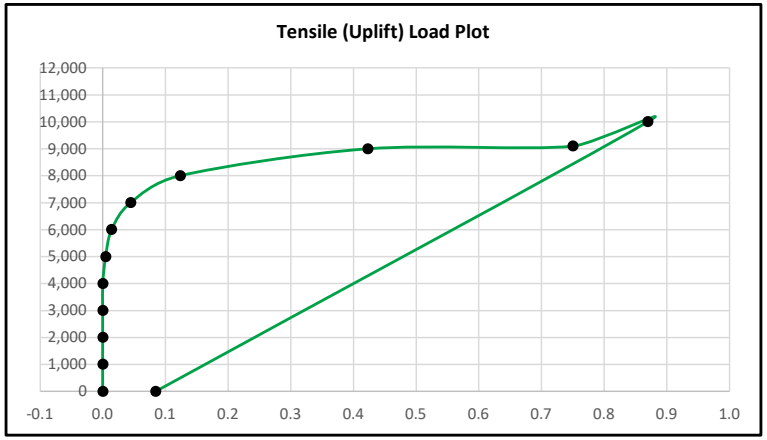
Embedment Data

Depth (ft)	Time (s)
1	2.1
2	2.92
3	2.86
4	9.72
5	7.86
6	3.71
7	8.08
Total Time (s) =	37.25

Field Notes

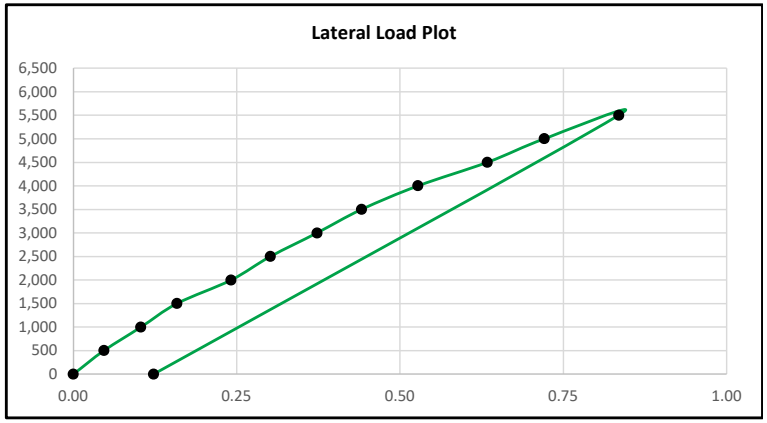
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0060	0.0030	0.0045
1	6,000	6,000	0.0150	0.0130	0.0140
1	7,000	7,000	0.0450	0.0440	0.0445
1	8,000	8,000	0.1250	0.1220	0.1235
1	9,000	9,000	0.4260	0.4200	0.4230
1	9,100	9,100	0.7500	0.7500	0.7500
1	10,000	10,000	0.8720	0.8670	0.8695
1	0	0.0000	0.0870	0.0820	0.0845



Lateral Testing

Lateral Load Height Above Grade (ft):		4.0	Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0480	0.0460	0.0470
1	1,000	1,000	0.1060	0.1010	0.1035
1	1,500	1,500	0.1600	0.1570	0.1585
1	2,000	2,000	0.2430	0.2400	0.2415
1	2,500	2,500	0.3020	0.3010	0.3015
1	3,000	3,000	0.3740	0.3720	0.3730
1	3,500	3,500	0.4430	0.4400	0.4415
	4,000	4,000	0.5290	0.5260	0.5275
1	4,500	4,500	0.6350	0.6330	0.6340
1	5,000	5,000	0.7220	0.7200	0.7210
1	5,500	5,500	0.8360	0.8340	0.8350
1	0	0	0.1240	0.1220	0.1230



ANS GEO

Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-09B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	67.45
Location:	37.397982°, -83.112988°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	7.5

Embedment Data

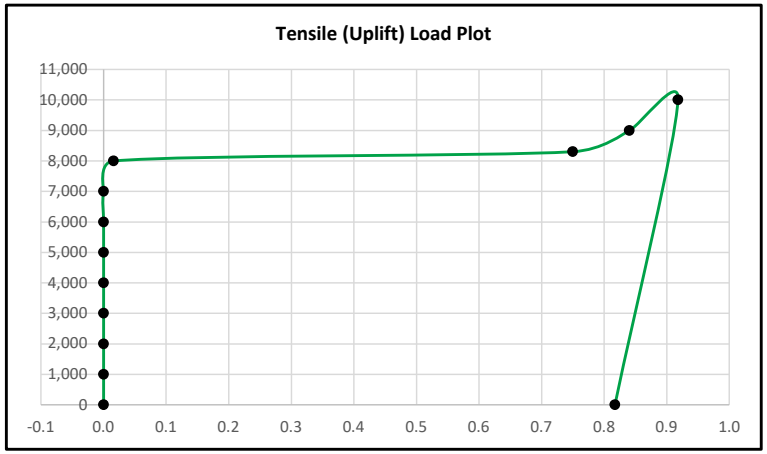
Depth (ft)	Time (s)
1	3.11
2	3.67
3	3.31
4	12.78
5	9.24
6	7.02
7	10.26
8	7.44
9	10.62
Total Time (s) =	67.45

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0000	0.0000	0.0000
1	5,000	5,000	0.0000	0.0000	0.0000
1	6,000	6,000	0.0000	0.0000	0.0000
1	7,000	7,000	0.0000	0.0000	0.0000
1	8,000	8,000	0.0170	0.0150	0.0160
1	8,300	8,300	0.7500	0.7500	0.7500
1	9,000	9,000	0.8470	0.8340	0.8405
1	10,000	10,000	0.9280	0.9080	0.9180
1	0	0	0.8200	0.8150	0.8175

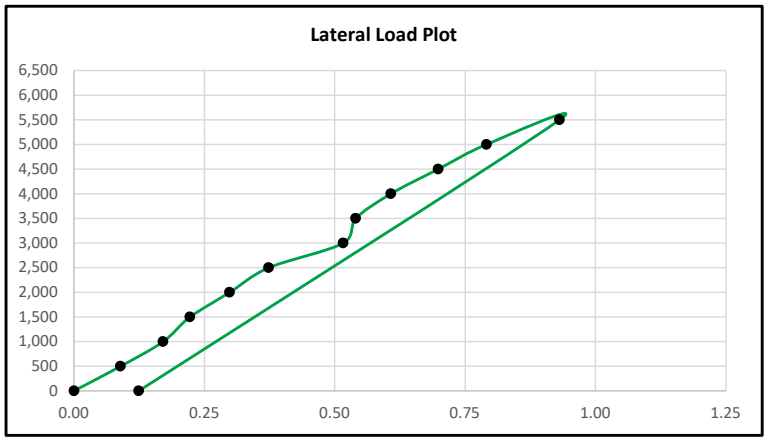
Tensile (Uplift) Load Plot



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0910	0.0870	0.0890
1	1,000	1,000	0.1730	0.1690	0.1710
1	1,500	1,500	0.2290	0.2160	0.2225
1	2,000	2,000	0.3020	0.2950	0.2985
1	2,500	2,500	0.3800	0.3670	0.3735
1	3,000	3,000	0.4710	0.5620	0.5165
1	3,500	3,500	0.5780	0.5030	0.5405
1	4,000	4,000	0.6150	0.6010	0.6080
1	4,500	4,500	0.7020	0.6950	0.6985
1	5,000	5,000	0.7950	0.7870	0.7910
1	5,500	5,500	0.9340	0.9280	0.9310
1	0	0	0.1270	0.1210	0.1240

Lateral Load Plot



ANS GEO

Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	7.0	Pile ID:	PT-10A
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	39.85
Location:	37.390163°, -83.112356°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	5.7

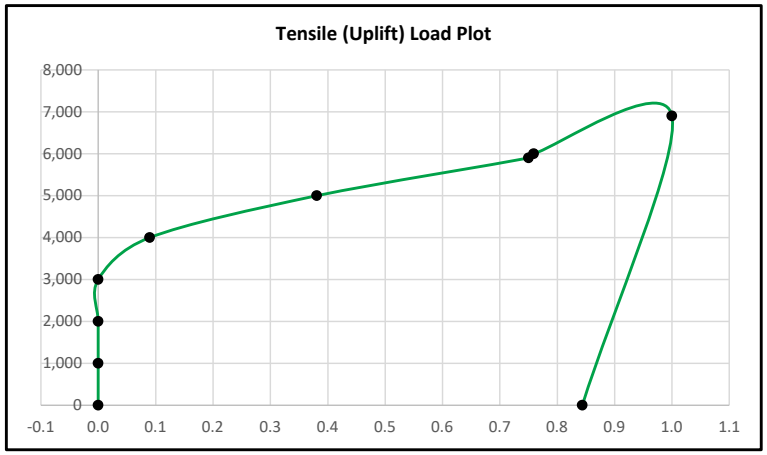
Embedment Data

Depth (ft)	Time (s)
1	4.34
2	6.38
3	3.56
4	3.19
5	4.22
6	8.23
7	9.93
Total Time (s) =	39.85

Field Notes

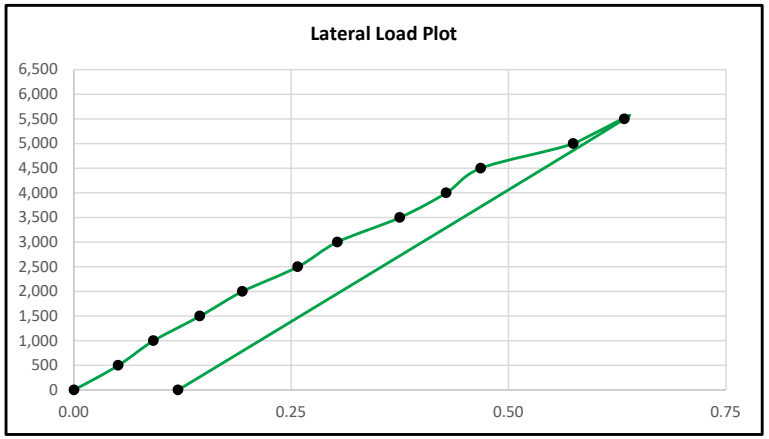
Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0000	0.0000	0.0000
1	4,000	4,000	0.0920	0.0870	0.0895
1	5,000	5,000	0.3820	0.3800	0.3810
1	5,900	5,900	0.7500	0.7500	0.7500
1	6,000	6,000	0.7680	0.7500	0.7590
1	6,900	6,900	1.0000	1.0000	1.0000
1	0	0	0.8490	0.8390	0.8440



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0		Deflection Gauge Height (in):		6
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0530	0.0490	0.0510
1	1,000	1,000	0.0930	0.0900	0.0915
1	1,500	1,500	0.1480	0.1420	0.1450
1	2,000	2,000	0.1950	0.1930	0.1940
1	2,500	2,500	0.2610	0.2540	0.2575
1	3,000	3,000	0.3060	0.3000	0.3030
1	3,500	3,500	0.3770	0.3730	0.3750
1	4,000	4,000	0.4300	0.4270	0.4285
1	4,500	4,500	0.4850	0.4510	0.4680
1	5,000	5,000	0.5760	0.5730	0.5745
1	5,500	5,500	0.6350	0.6320	0.6335
1	0	0	0.1210	0.1190	0.1200



ANS GEO

Pile Load Test Log

Project Name:	BrightNight - Starfire Solar Energy	Embedment Depth (ft):	9.0	Pile ID:	PT-10B
Site Location:	Perry, Knott, and Breathitt County, KY	Pushed to Depth (ft):	0.0	Pile Section:	W6x9
Date Installed:	3/9/2024	Pre-Excavation Depth (ft):	N/A	Pile Length (ft):	15.0
Date Tested:	3/13/2024	Pre-Drill Diameter (in):	N/A	Total Drive Time (sec):	96.66
Location:	37.390163°, -83.112356°	Pre-Drill Depth (ft):	N/A	Avg. Installation Rate (sec/ft):	10.7

Embedment Data

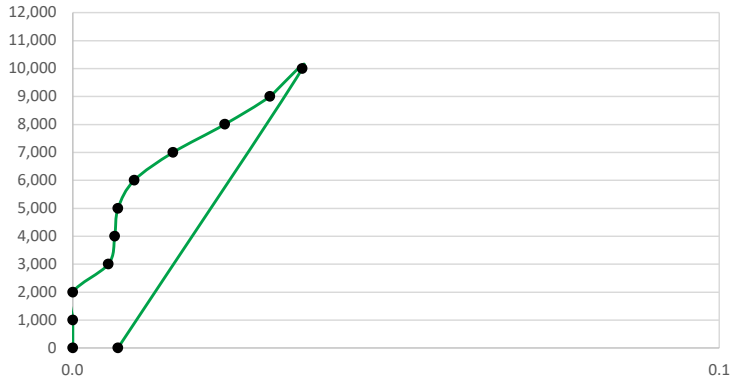
Depth (ft)	Time (s)
1	9.14
2	12.33
3	4.82
4	4.21
5	4.15
6	3.92
7	7.07
8	18.27
9	32.75
Total Time (s) =	96.66

Field Notes

Tensile (Uplift) Testing

Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	1,000	1,000	0.0000	0.0000	0.0000
1	2,000	2,000	0.0000	0.0000	0.0000
1	3,000	3,000	0.0090	0.0020	0.0055
1	4,000	4,000	0.0070	0.0060	0.0065
1	5,000	5,000	0.0090	0.0050	0.0070
1	6,000	6,000	0.0100	0.0090	0.0095
1	7,000	7,000	0.0190	0.0120	0.0155
1	8,000	8,000	0.0250	0.0220	0.0235
1	9,000	9,000	0.0310	0.0300	0.0305
1	10,000	10,000	0.0360	0.0350	0.0355
1	0	0	0.0080	0.0060	0.0070

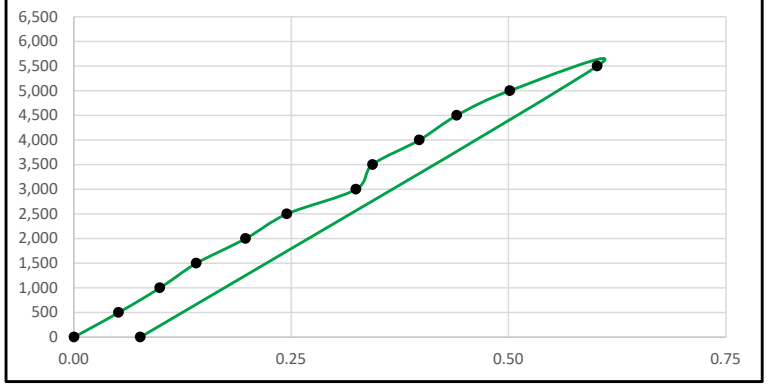
Tensile (Uplift) Load Plot



Lateral Testing

Lateral Load Height Above Grade (ft):	4.0	Deflection Gauge Height (in):	6		
Hold Time (min)	Target Load (lbs)	Applied Load (lbs)	Deflection 1 (in.)	Deflection 2 (in.)	Average Deflection (in.)
1	0	0	0.0000	0.0000	0.0000
1	500	500	0.0550	0.0480	0.0515
1	1,000	1,000	0.1020	0.0960	0.0990
1	1,500	1,500	0.1420	0.1400	0.1410
1	2,000	2,000	0.1990	0.1960	0.1975
1	2,500	2,500	0.2470	0.2430	0.2450
1	3,000	3,000	0.3270	0.3220	0.3245
1	3,500	3,500	0.3460	0.3410	0.3435
1	4,000	4,000	0.4010	0.3940	0.3975
1	4,500	4,500	0.4440	0.4370	0.4405
1	5,000	5,000	0.5040	0.4990	0.5015
1	5,500	5,500	0.6040	0.6000	0.6020
1	0	0	0.0780	0.0750	0.0765

Lateral Load Plot

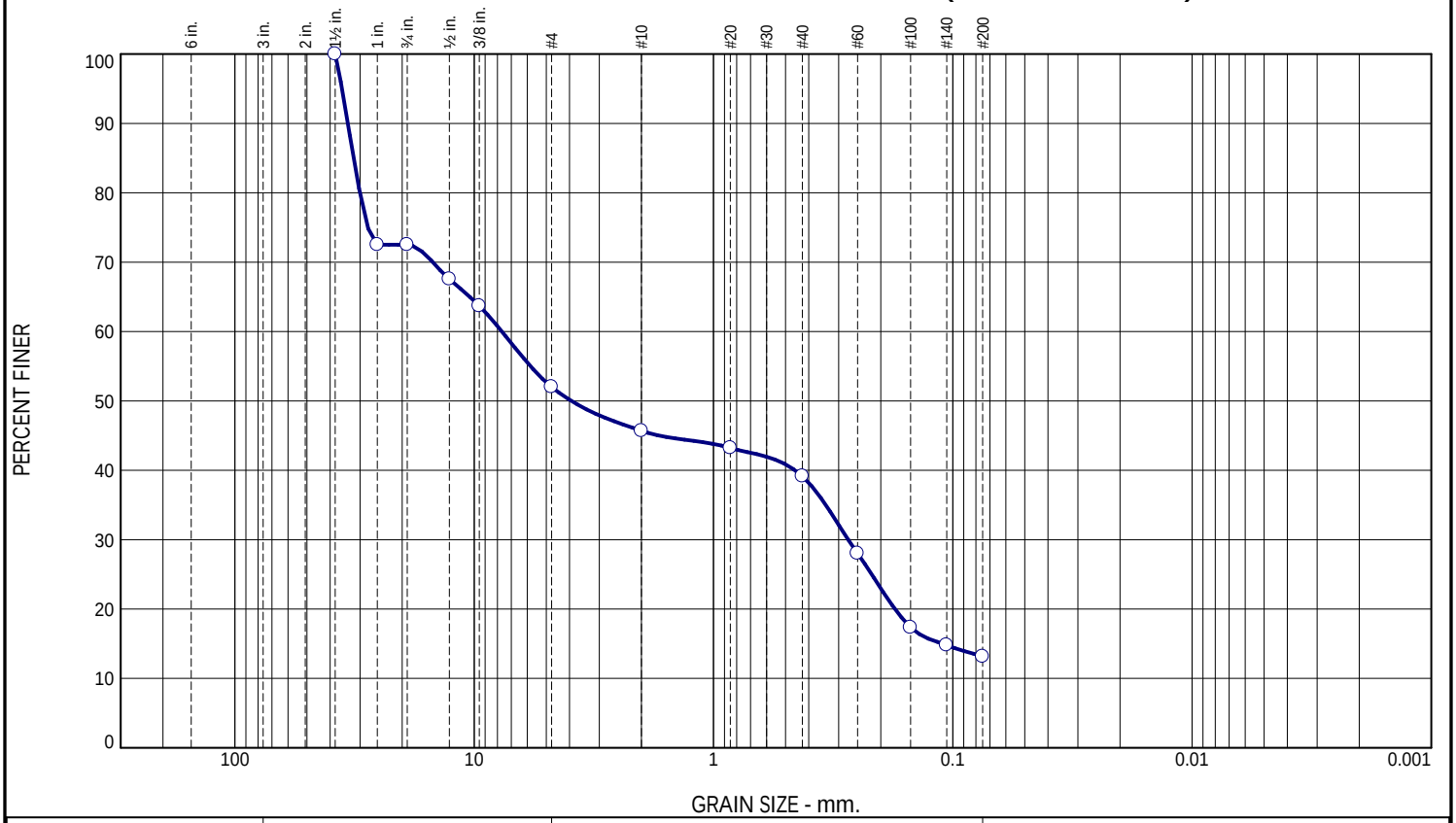


Attachment H

Lab Test Results

SIEVE ANALYSIS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	27.5	20.5	6.3	6.6	25.9	13.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1.0"	72.5		
0.75"	72.5		
0.5"	67.5		
0.375"	63.7		
#4	52.0		
#10	45.7		
#20	43.2		
#40	39.1		
#60	28.0		
#100	17.3		
#140	14.8		
#200	13.2		

* (no specification provided)

Soil Description

Gray silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 33.7282 D_{85}= 31.9017 D_{60}= 7.6640
D_{50}= 3.9281 D_{30}= 0.2736 D_{15}= 0.1101
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

Undersized specimen

Sample Number: B-01, S-3 Depth: 4'-6'

Date: 3/20/2024

ANS CONSULTANTS, INC.

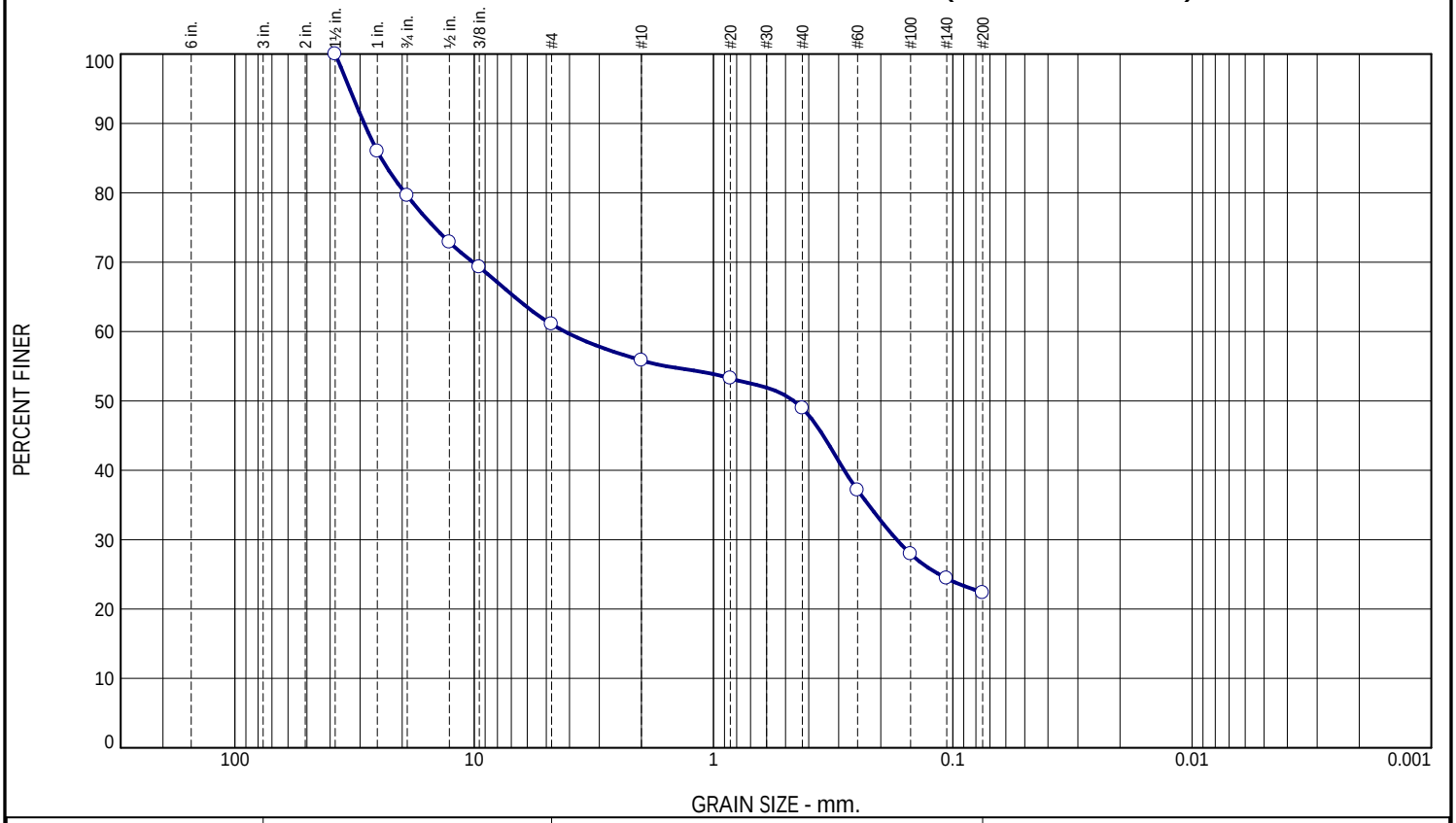
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-108 Figure

Tested By: AM Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	20.4	18.5	5.3	6.9	26.6	22.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1.0"	86.0		
0.75"	79.6		
0.5"	72.9		
0.375"	69.3		
#4	61.1		
#10	55.8		
#20	53.2		
#40	48.9		
#60	37.1		
#100	27.9		
#140	24.4		
#200	22.3		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 28.8415 D_{85}= 24.5041 D_{60}= 4.1833
D_{50}= 0.4620 D_{30}= 0.1715 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized specimen

Sample Number: B-02, S-1 Depth: 0'-2'

Date: 3/20/2024

ANS CONSULTANTS, INC.

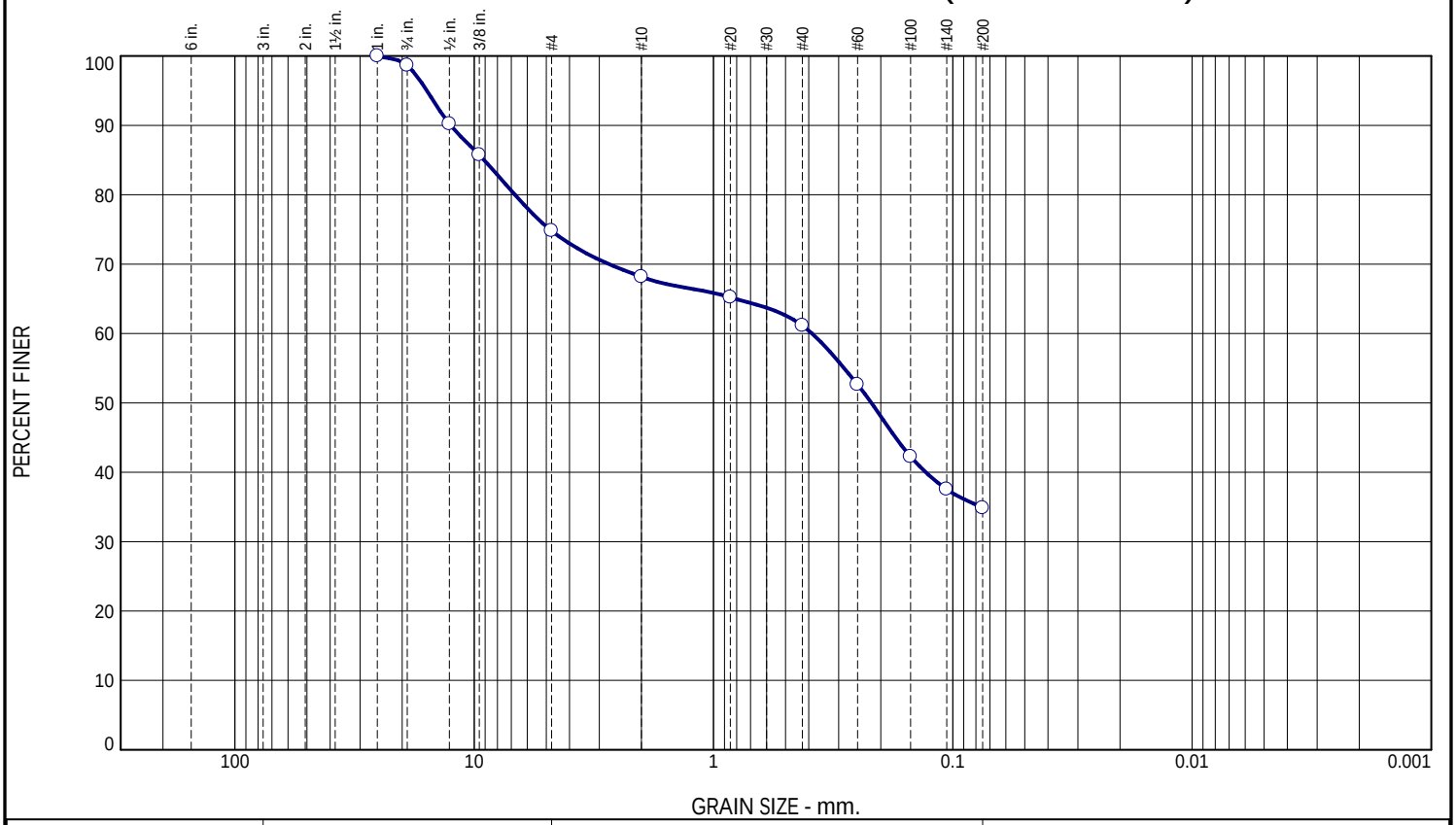
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-108 Figure

Tested By: AM Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.4	23.8	6.6	7.1	26.3	34.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.0"	100.0		
0.75"	98.6		
0.5"	90.2		
0.375"	85.7		
#4	74.8		
#10	68.2		
#20	65.2		
#40	61.1		
#60	52.6		
#100	42.2		
#140	37.5		
#200	34.8		

* (no specification provided)

Soil Description

Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 12.5482 D_{85}= 9.0924 D_{60}= 0.3870
D_{50}= 0.2188 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized specimen

Sample Number: B-03, S-7 Depth: 18'-20'

Date: 3/20/2024

ANS CONSULTANTS, INC.

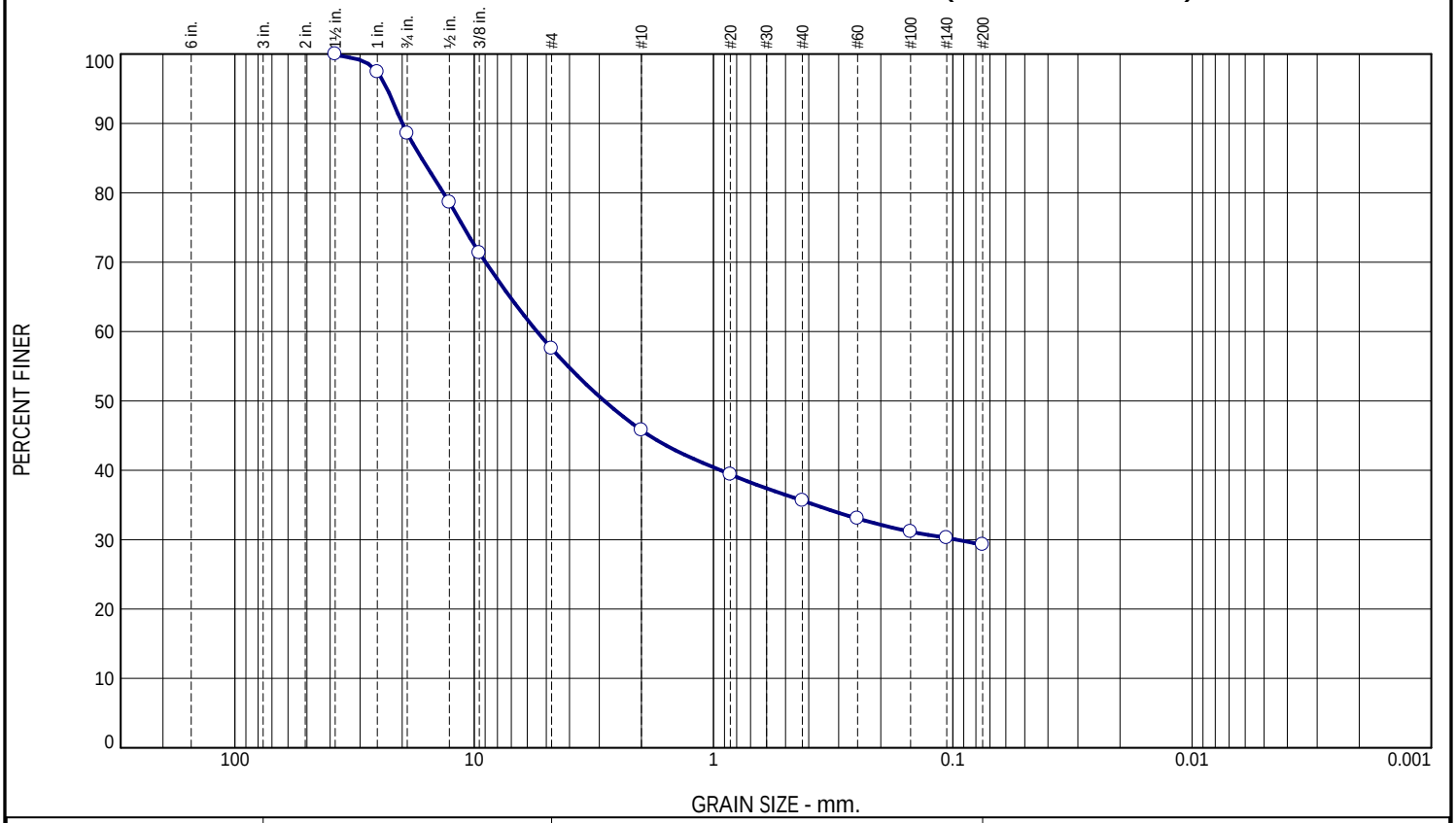
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-108 Figure

Tested By: AM Checked By: ANS

PARTICLE SIZE DISTRIBUTION REPORT (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.4	31.0	11.8	10.2	6.3	29.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1.0"	97.4		
0.75"	88.6		
0.5"	78.6		
0.375"	71.4		
#4	57.6		
#10	45.8		
#20	39.4		
#40	35.6		
#60	33.0		
#100	31.1		
#140	30.3		
#200	29.3		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 19.9791 D_{85}= 16.6015 D_{60}= 5.4653
D_{50}= 2.8600 D_{30}= 0.0968 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized specimen

Sample Number: B-12, S-3 Depth: 4'-6'

Date: 3/20/2024

ANS CONSULTANTS, INC.

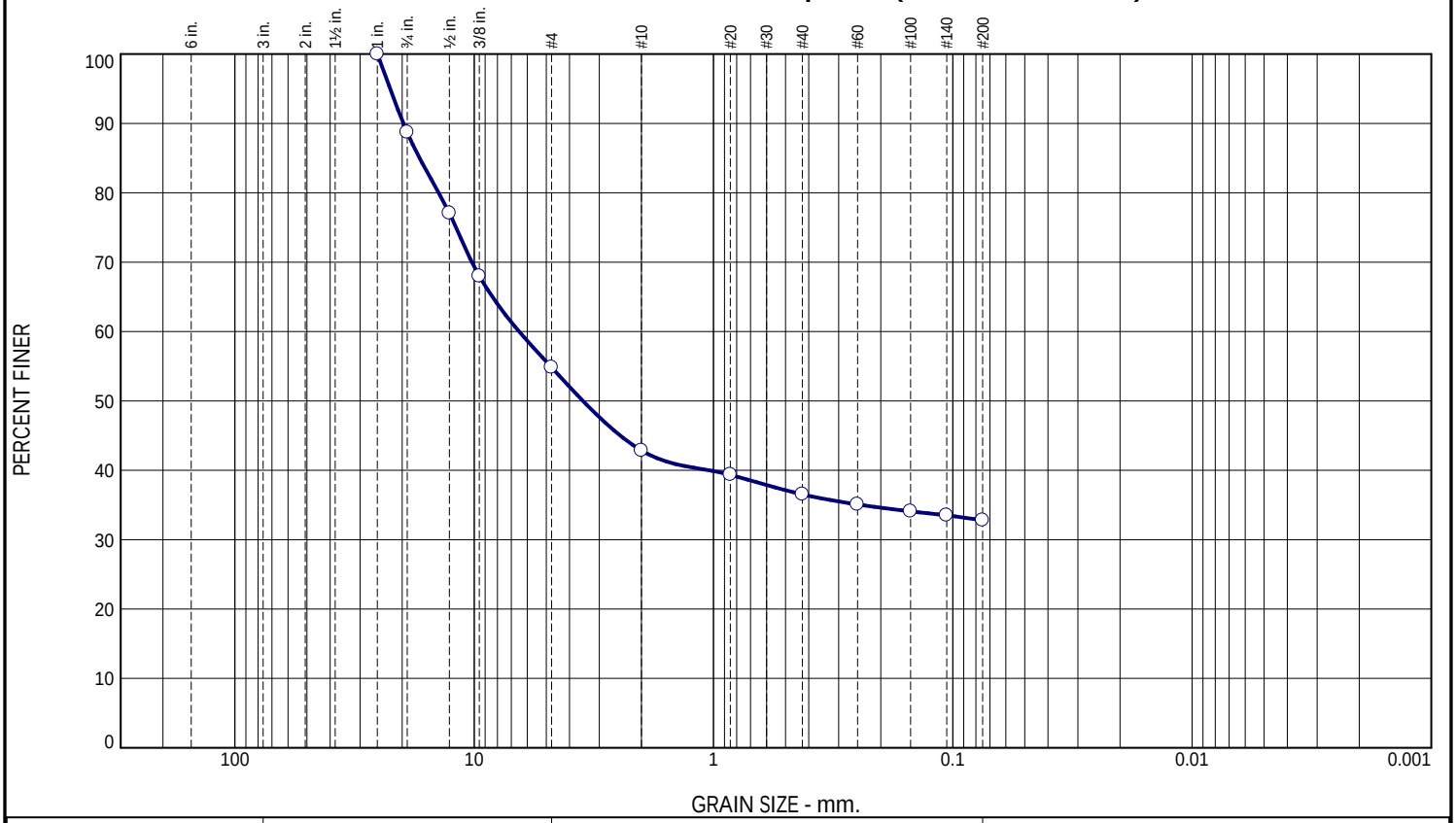
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-108 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.3	33.9	12.0	6.3	3.7	32.8	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
0.75"	88.7		
0.5"	77.1		
0.375"	68.0		
#4	54.8		
#10	42.8		
#20	39.4		
#40	36.5		
#60	35.1		
#100	34.1		
#140	33.5		
#200	32.8		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 19.7664 D_{85}= 16.9093 D_{60}= 6.4911
D_{50}= 3.5126 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: B-06, S-2 Depth: 2'-4'

Date: 3/25/2024

ANS CONSULTANTS, INC.

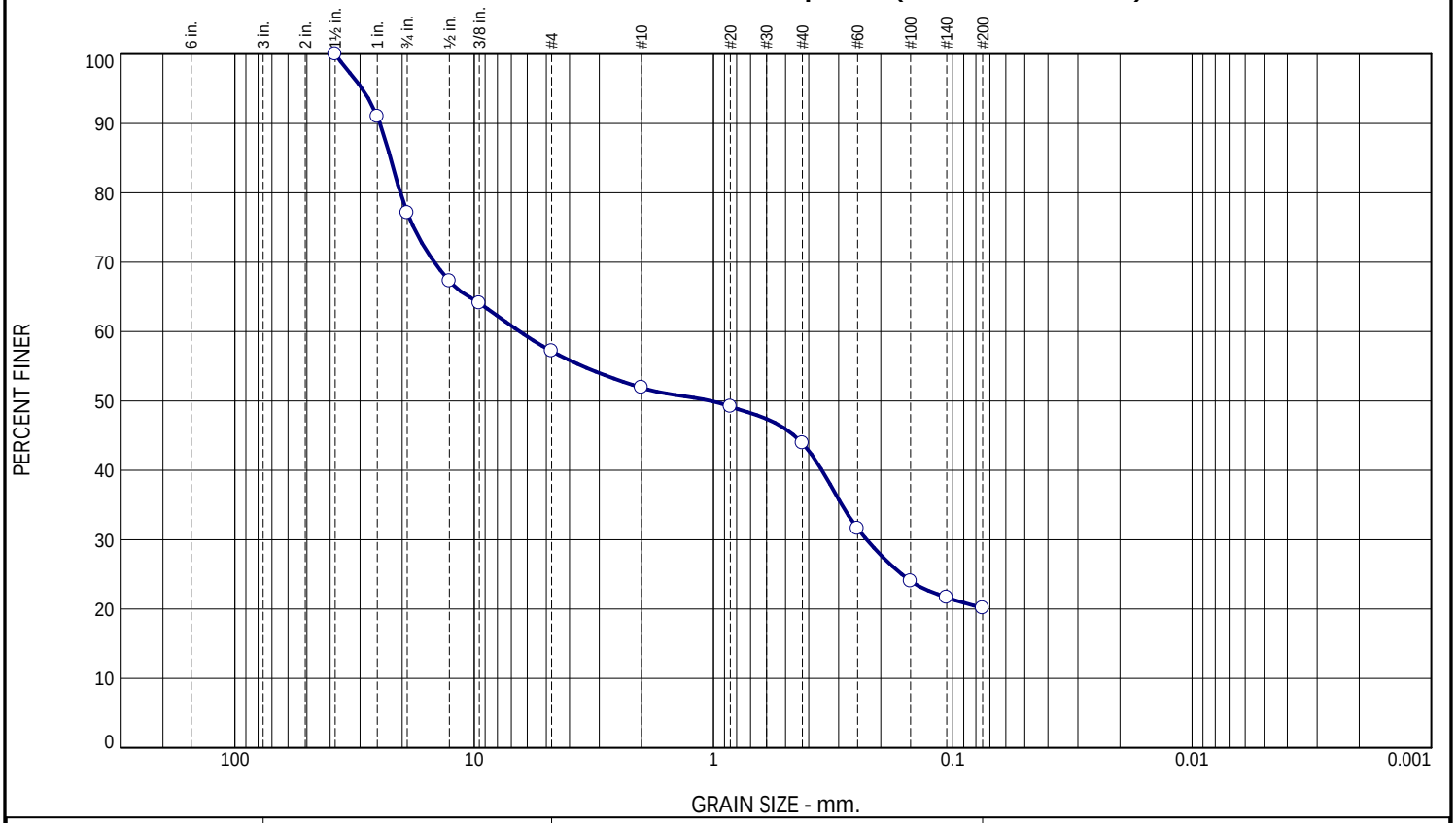
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	22.9	19.9	5.3	8.0	23.8	20.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	91.0		
0.75"	77.1		
0.5"	67.3		
0.375"	64.1		
#4	57.2		
#10	51.9		
#20	49.2		
#40	43.9		
#60	31.6		
#100	24.0		
#140	21.7		
#200	20.1		

* (no specification provided)

Soil Description

Grayish Brown silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 24.7591 D_{85}= 22.3722 D_{60}= 6.4532
D_{50}= 1.0268 D_{30}= 0.2289 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

Undersized Specimen

Sample Number: B-07, S-3 Depth: 4'-6'

Date: 3/25/2024

ANS CONSULTANTS, INC.

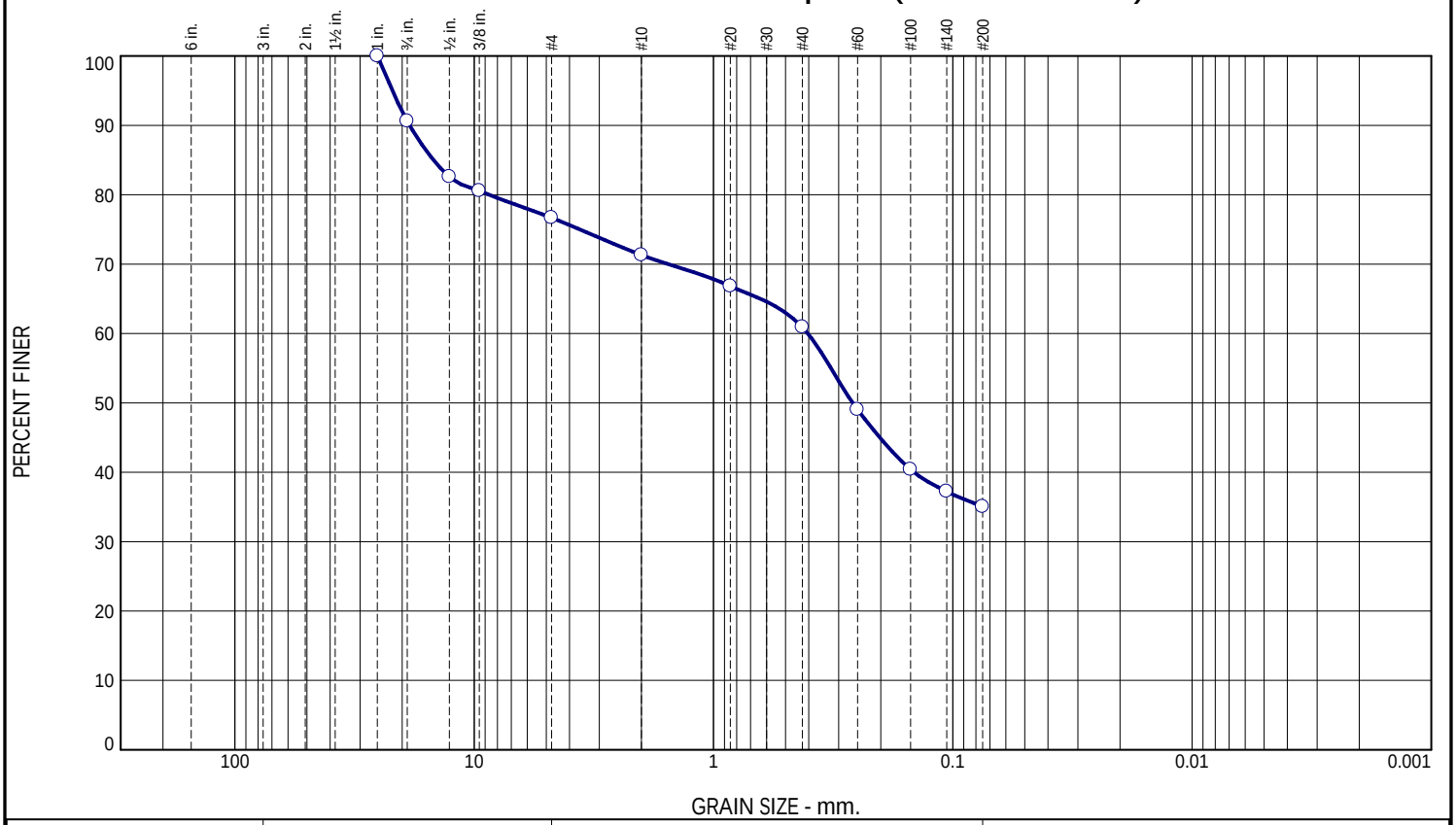
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.4	13.9	5.4	10.4	25.9	35.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
0.75"	90.6		
0.5"	82.6		
0.375"	80.6		
#4	76.7		
#10	71.3		
#20	66.8		
#40	60.9		
#60	49.0		
#100	40.4		
#140	37.2		
#200	35.0		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 18.6027 D_{85}= 14.7960 D_{60}= 0.4030
D_{50}= 0.2621 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: B-08, S-3 Depth: 4'-6'

Date: 3/25/2024

ANS CONSULTANTS, INC.

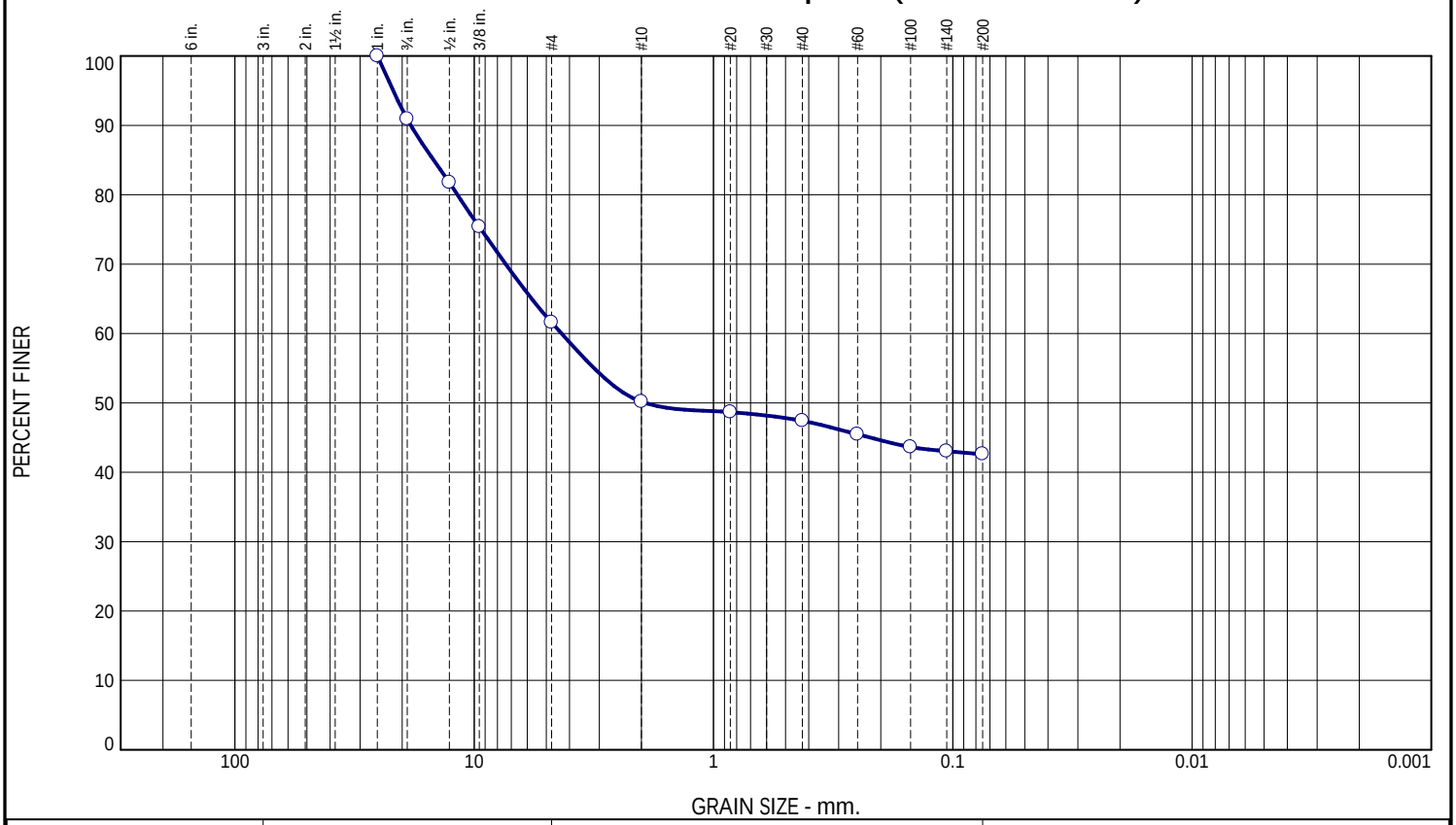
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.1	29.3	11.4	2.8	4.8	42.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
0.75"	90.9		
0.5"	81.8		
0.375"	75.4		
#4	61.6		
#10	50.2		
#20	48.7		
#40	47.4		
#60	45.5		
#100	43.6		
#140	43.0		
#200	42.6		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 18.3985 D_{85}= 14.7694 D_{60}= 4.3138
D_{50}= 1.9334 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: B-09, S-1 Depth: 0'-2'

Date: 3/25/2024

ANS CONSULTANTS, INC.

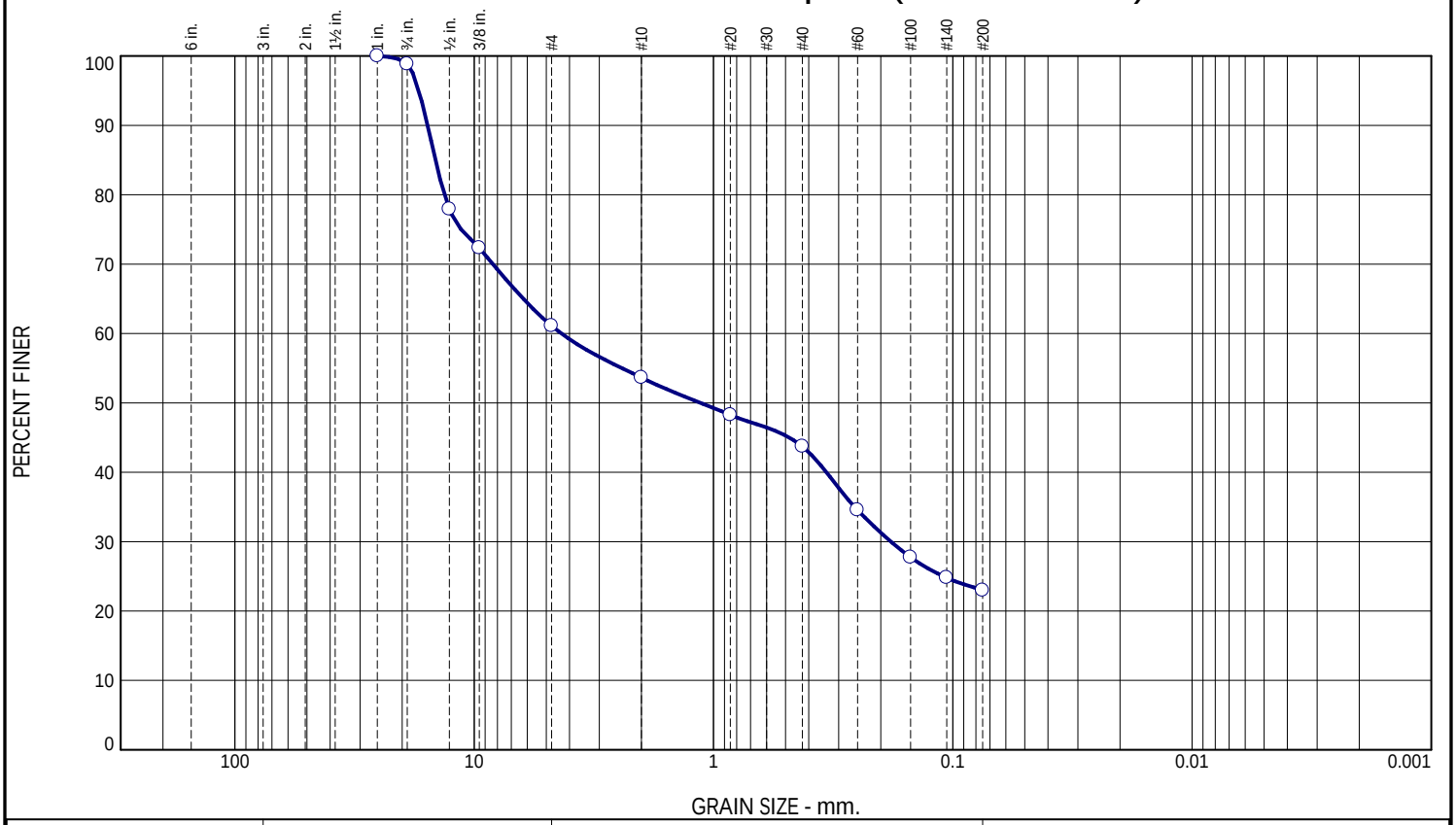
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.2	37.7	7.5	9.9	20.7	23.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
0.75"	98.8		
0.5"	77.9		
0.375"	72.3		
#4	61.1		
#10	53.6		
#20	48.3		
#40	43.7		
#60	34.5		
#100	27.7		
#140	24.8		
#200	23.0		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 15.6592 D_{85}= 14.5129 D_{60}= 4.3182
D_{50}= 1.1317 D_{30}= 0.1815 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: B-14, S-4 Depth: 6'-8'

Date: 3/25/2024

ANS CONSULTANTS, INC.

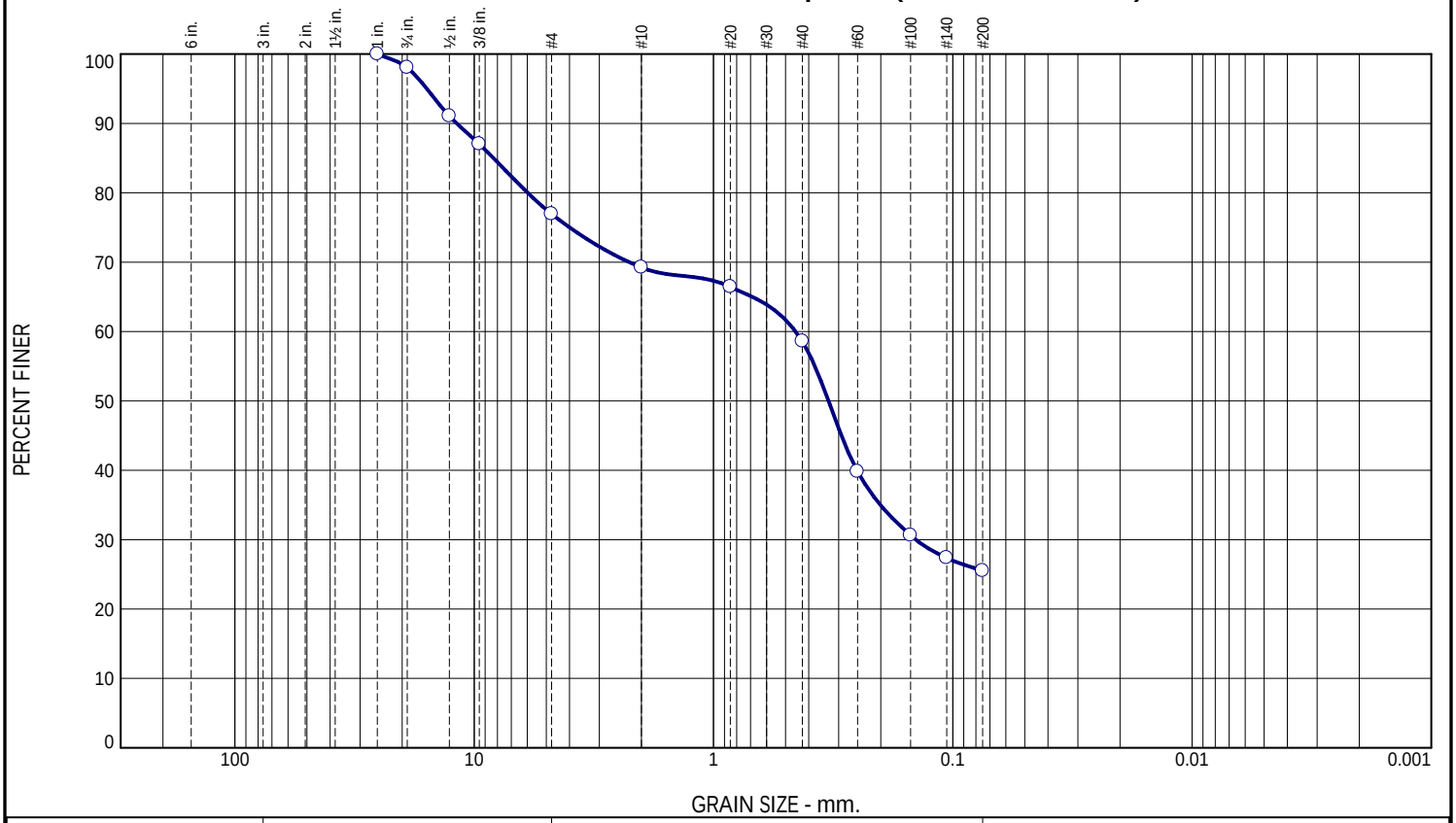
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.0	21.1	7.7	10.6	33.1	25.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
0.75"	98.0		
0.5"	91.1		
0.375"	87.0		
#4	76.9		
#10	69.2		
#20	66.4		
#40	58.6		
#60	39.8		
#100	30.6		
#140	27.4		
#200	25.5		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 11.8321 D_{85}= 8.3087 D_{60}= 0.4537
D_{50}= 0.3306 D_{30}= 0.1429 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: B-15, S-6 Depth: 13'-15'

Date: 3/25/2024

ANS CONSULTANTS, INC.

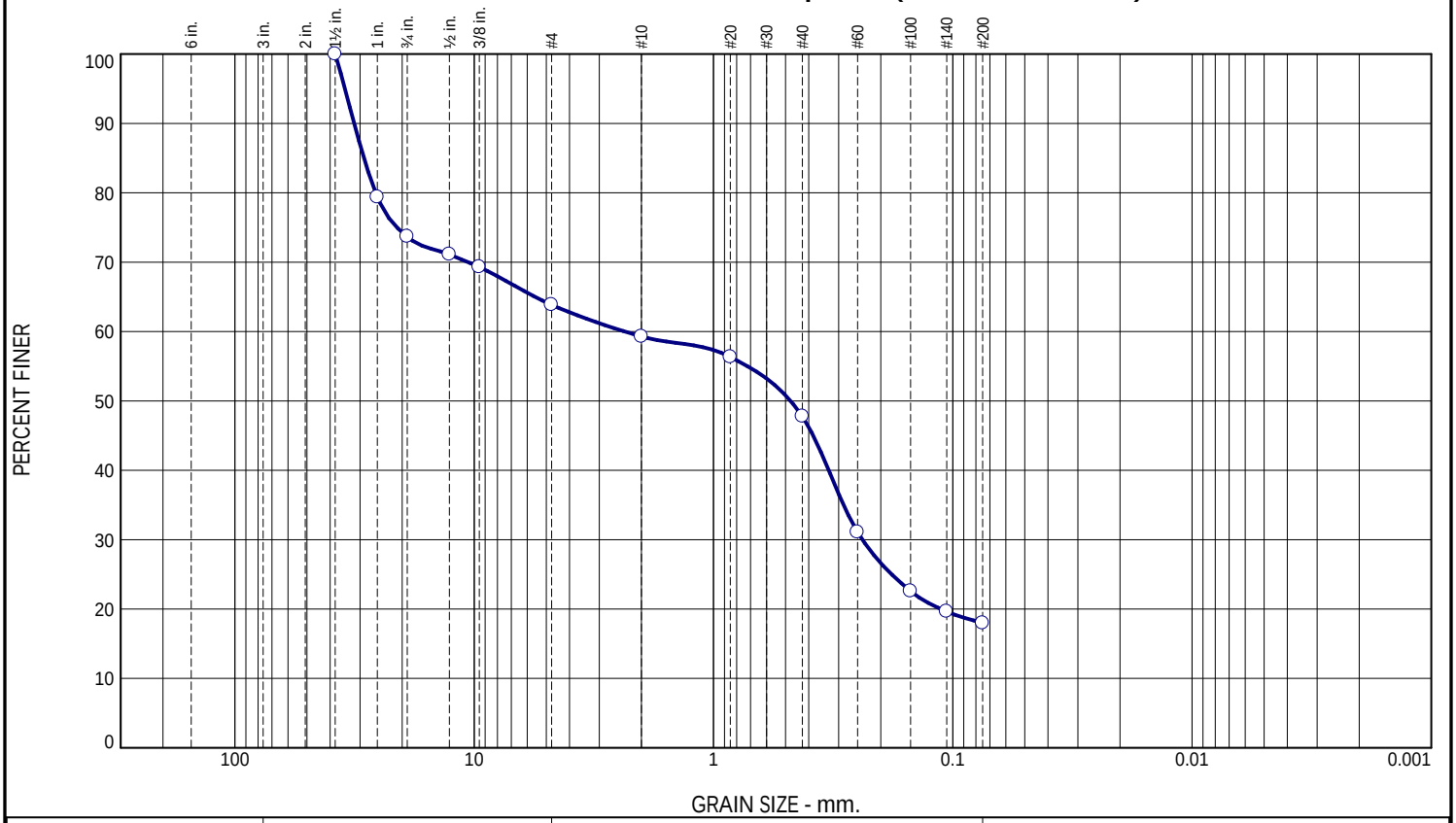
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	26.3	9.8	4.6	11.5	29.8	18.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	79.4		
0.75"	73.7		
0.5"	71.1		
0.375"	69.3		
#4	63.9		
#10	59.3		
#20	56.3		
#40	47.8		
#60	31.1		
#100	22.6		
#140	19.6		
#200	18.0		

* (no specification provided)

Soil Description

Light Brown silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 31.7361 D_{85}= 28.8948 D_{60}= 2.3443
D_{50}= 0.4763 D_{30}= 0.2386 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Undersized Specimen

Sample Number: B-16, S-5 Depth: 8'-10'

Date: 3/25/2024

ANS CONSULTANTS, INC.

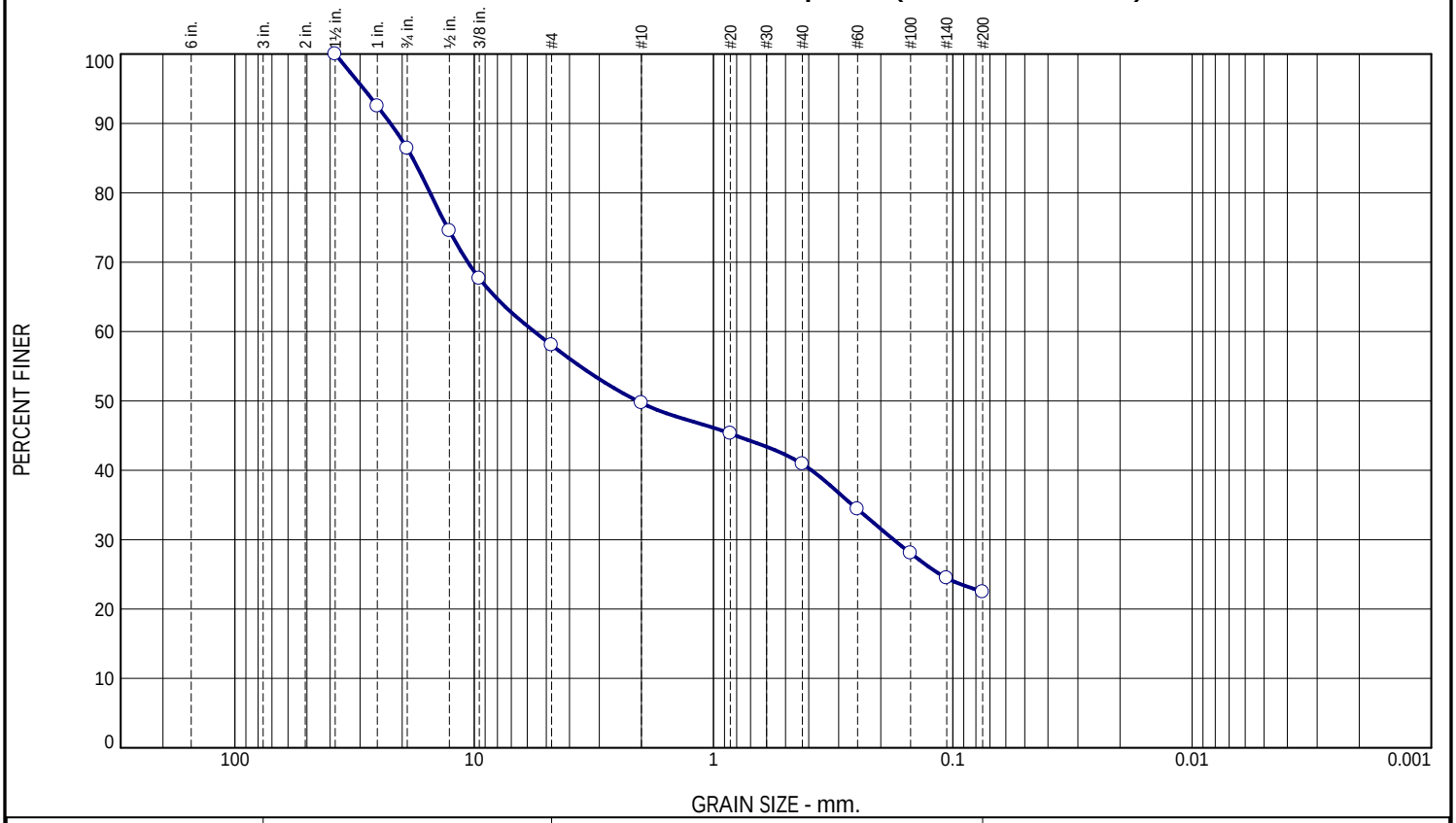
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	13.6	28.4	8.3	8.8	18.4	22.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	92.5		
0.75"	86.4		
0.5"	74.5		
0.375"	67.7		
#4	58.0		
#10	49.7		
#20	45.3		
#40	40.9		
#60	34.4		
#100	28.0		
#140	24.5		
#200	22.5		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 22.3897 D_{85}= 18.0681 D_{60}= 5.6122
D_{50}= 2.0802 D_{30}= 0.1767 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: B-17, S-2 Depth: 2'-4'

Date: 3/25/2024

ANS CONSULTANTS, INC.

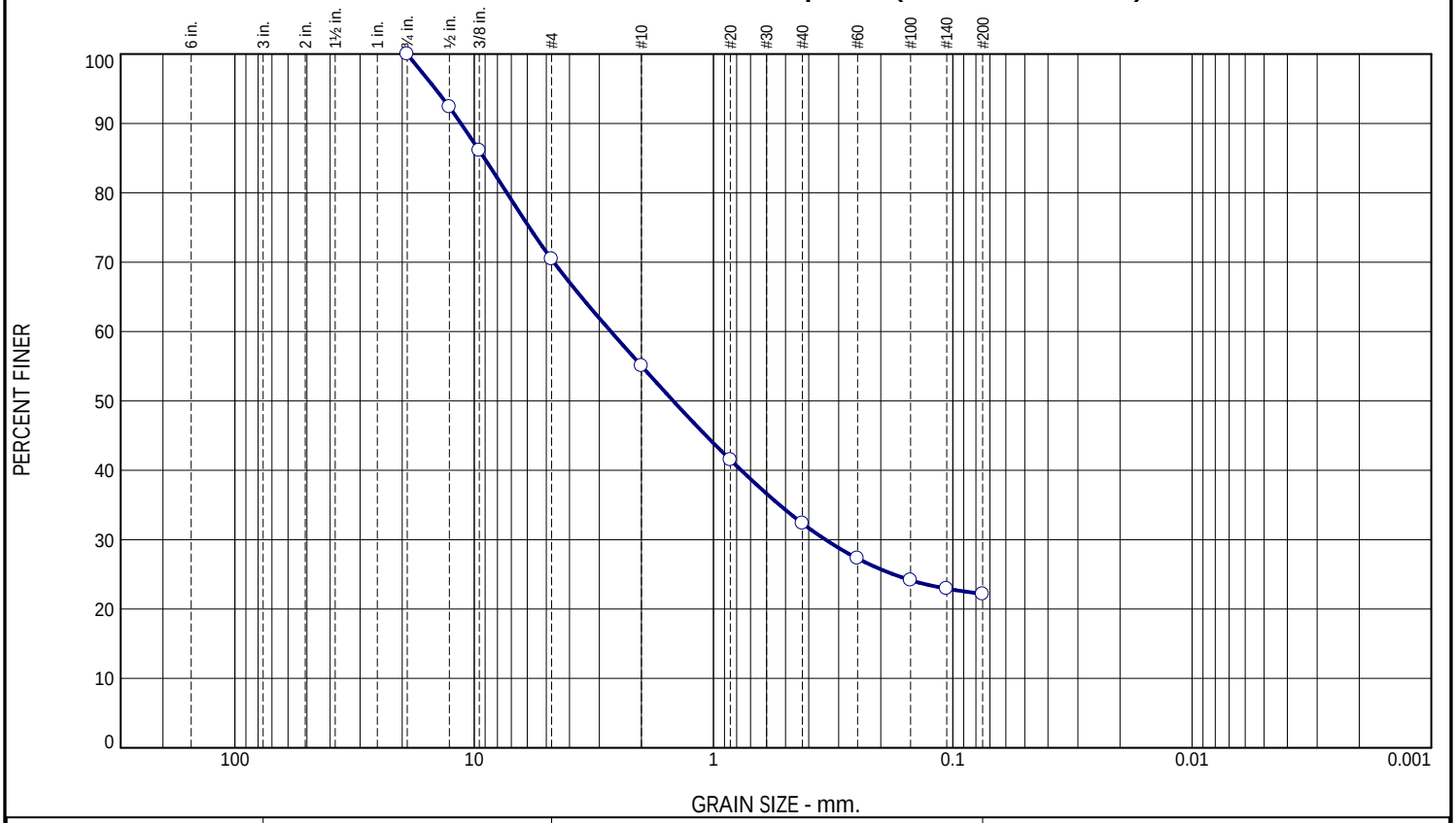
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	29.6	15.3	22.7	10.2	22.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75"	100.0		
0.5"	92.4		
0.375"	86.1		
#4	70.4		
#10	55.1		
#20	41.5		
#40	32.4		
#60	27.3		
#100	24.1		
#140	22.9		
#200	22.2		

* (no specification provided)

Soil Description

Very Dark Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 11.3619 D_{85}= 9.0751 D_{60}= 2.6830
D_{50}= 1.4734 D_{30}= 0.3403 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: B-18, S-2 Depth: 2'-4'

Date: 3/25/2024

ANS CONSULTANTS, INC.

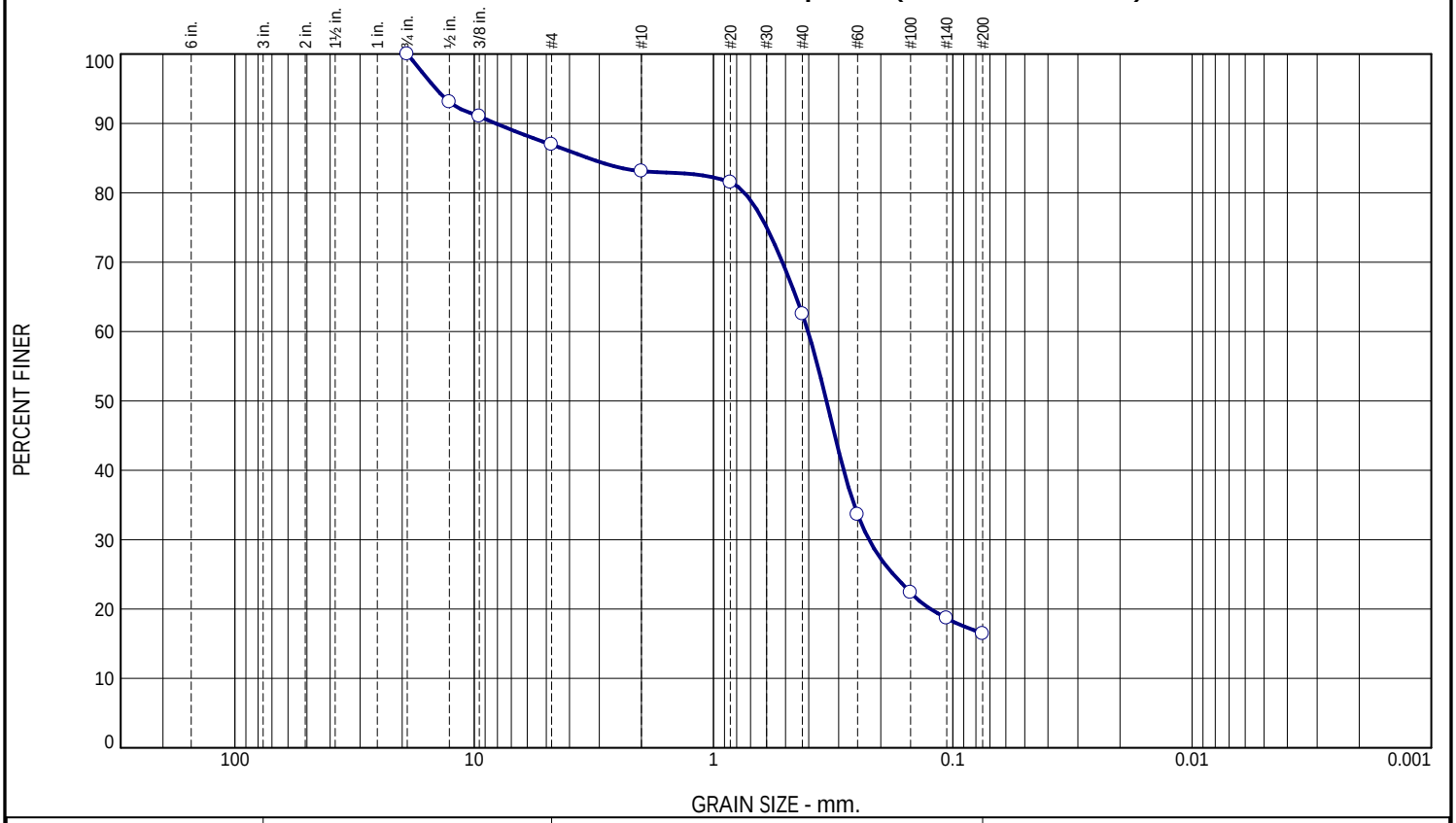
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.1	3.8	20.6	46.1	16.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75"	100.0		
0.5"	93.1		
0.375"	91.0		
#4	86.9		
#10	83.1		
#20	81.5		
#40	62.5		
#60	33.6		
#100	22.4		
#140	18.7		
#200	16.4		

* (no specification provided)

Soil Description

Yellowish Brown silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 8.1245 D_{85}= 3.3271 D_{60}= 0.4020
D_{50}= 0.3372 D_{30}= 0.2240 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample Number: B-19, S-7 Depth: 18'-20'

Date: 3/25/2024

ANS CONSULTANTS, INC.

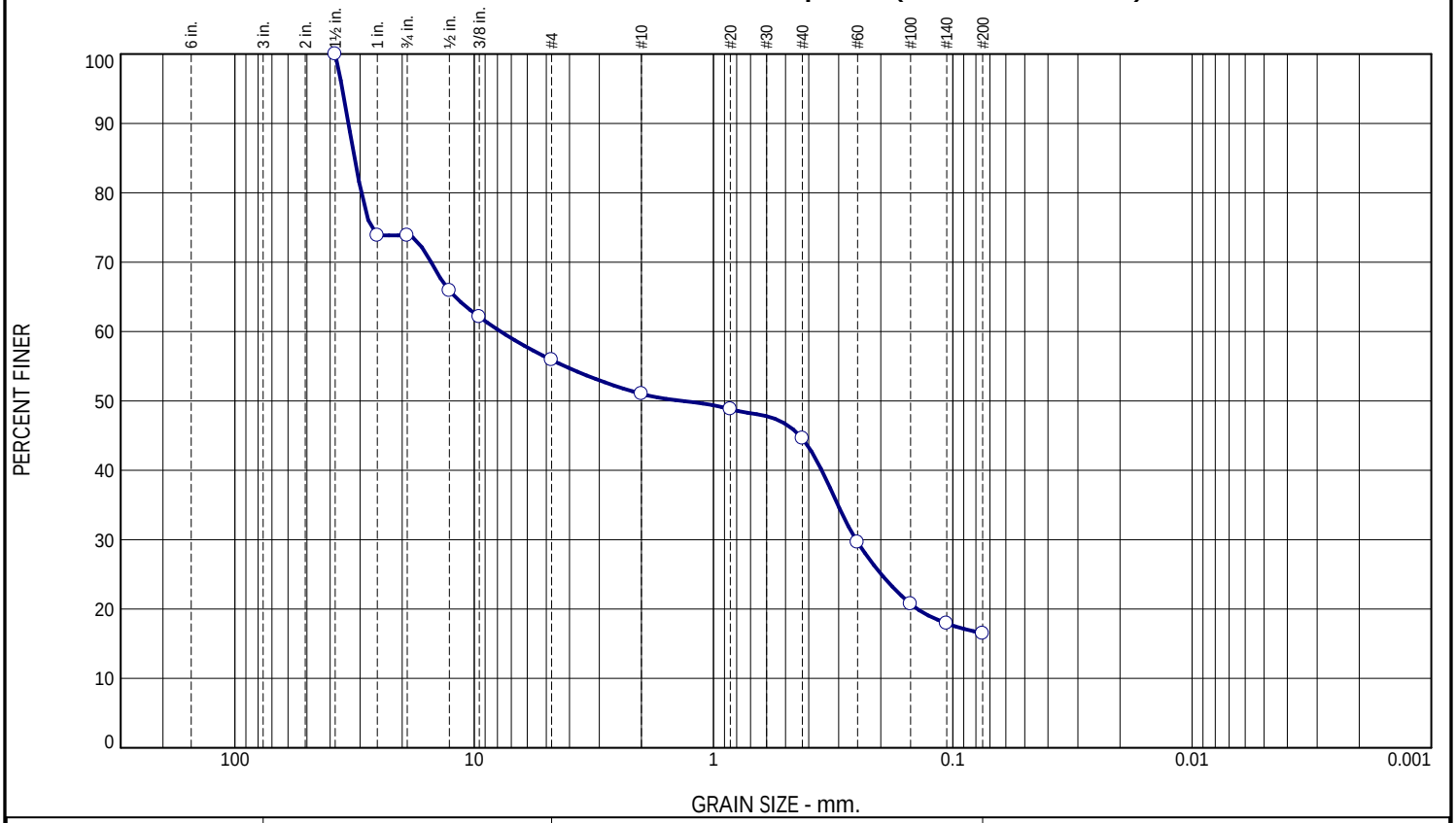
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	26.1	18.0	4.9	6.4	28.1	16.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	73.9		
0.75"	73.9		
0.5"	65.9		
0.375"	62.1		
#4	55.9		
#10	51.0		
#20	48.8		
#40	44.6		
#60	29.6		
#100	20.7		
#140	17.9		
#200	16.5		

* (no specification provided)

Soil Description

Light Gray silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 33.5363 D_{85}= 31.6219 D_{60}= 7.7485
D_{50}= 1.3531 D_{30}= 0.2541 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

Undersized Specimen

Sample Number: B-20, S-3 Depth: 4'-6'

Date: 3/25/2024

ANS CONSULTANTS, INC.

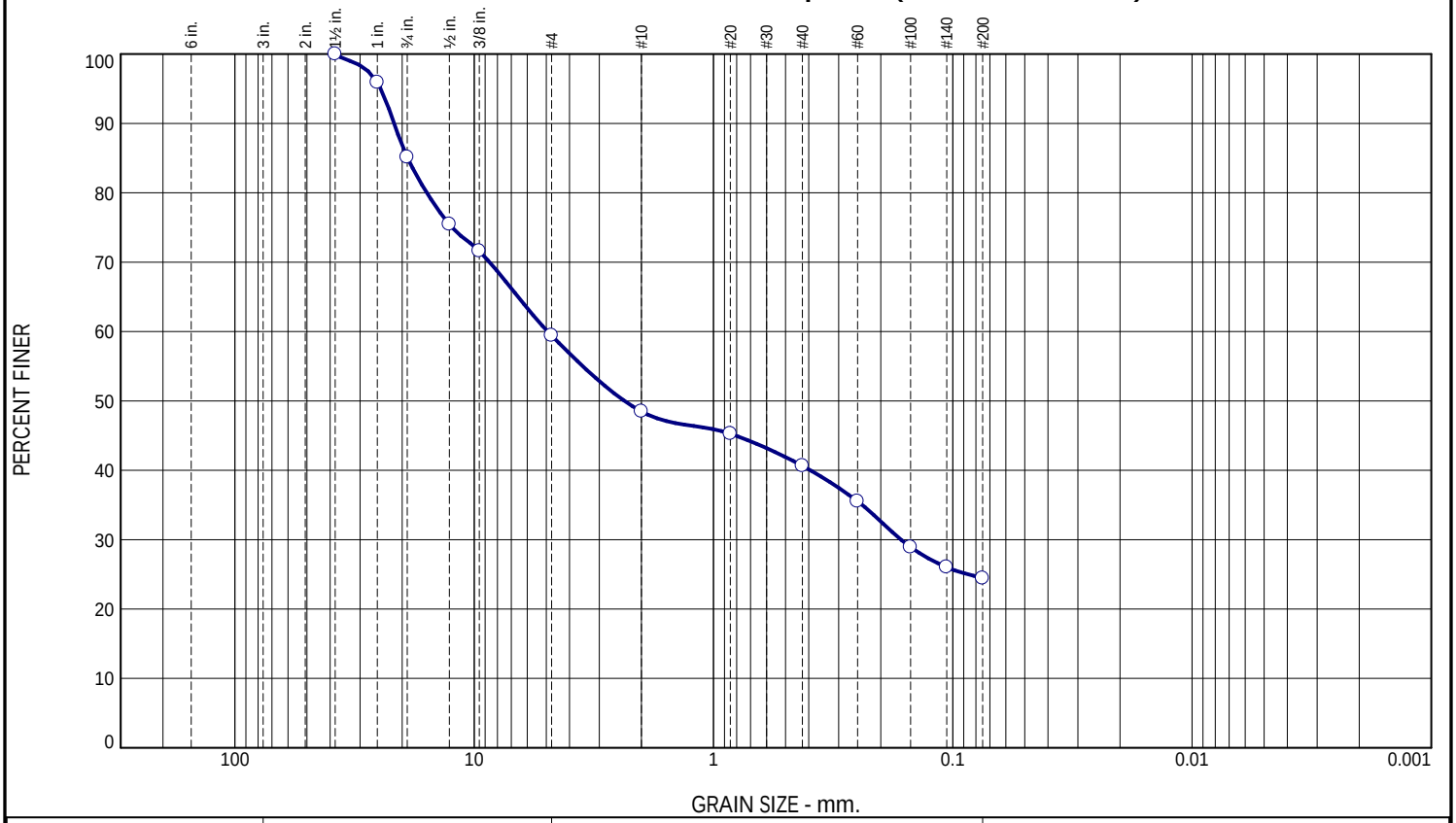
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.9	25.7	10.9	7.9	16.2	24.4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	95.9		
0.75"	85.1		
0.5"	75.4		
0.375"	71.6		
#4	59.4		
#10	48.5		
#20	45.3		
#40	40.6		
#60	35.5		
#100	28.9		
#140	26.0		
#200	24.4		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 21.6131 D_{85}= 18.9807 D_{60}= 4.9327
D_{50}= 2.3550 D_{30}= 0.1646 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: B-21, S-4 Depth: 6'-8'

Date: 3/25/2024

ANS CONSULTANTS, INC.

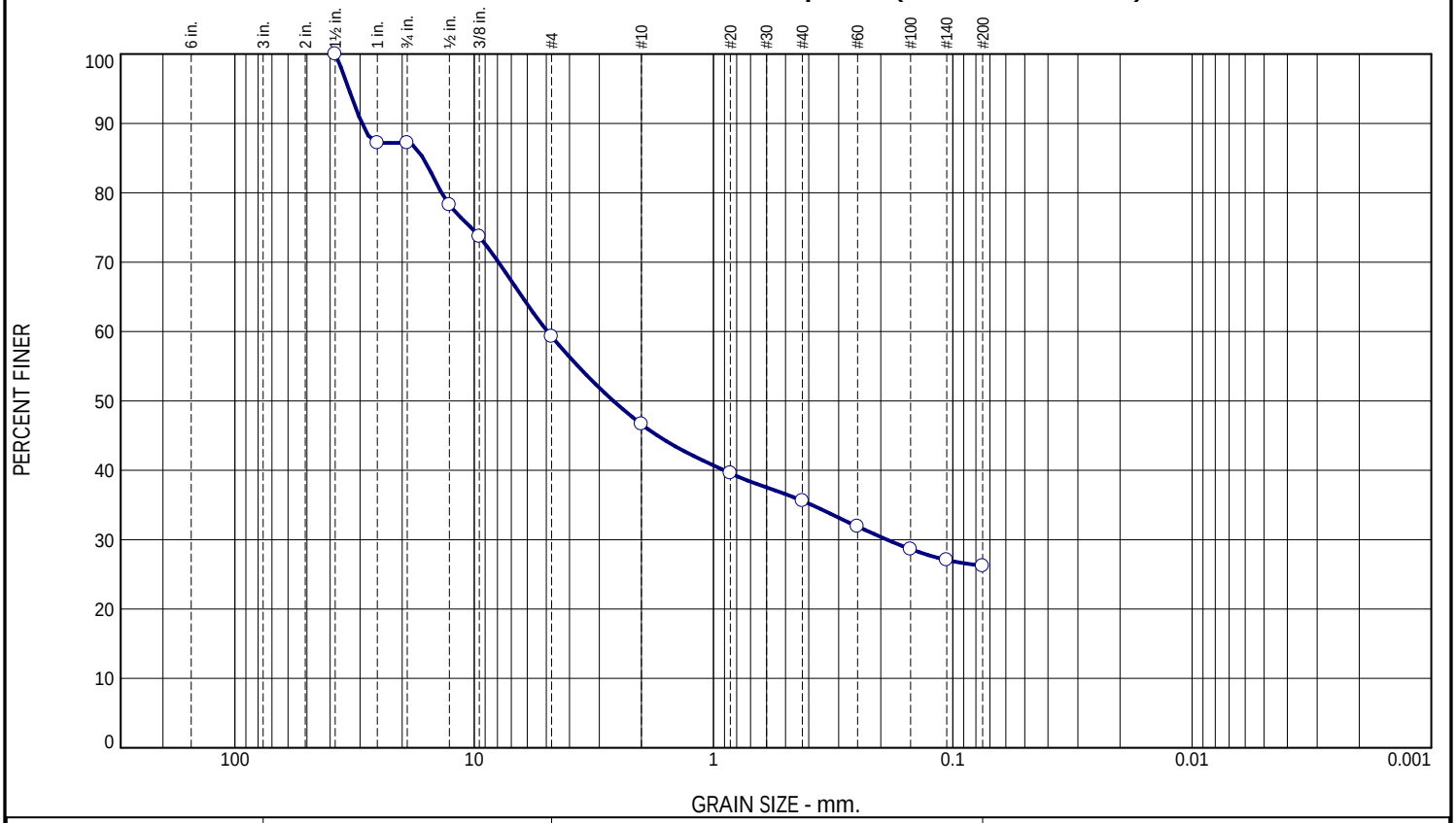
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.8	27.9	12.7	11.0	9.4	26.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	87.2		
0.75"	87.2		
0.5"	78.2		
0.375"	73.7		
#4	59.3		
#10	46.6		
#20	39.6		
#40	35.6		
#60	31.9		
#100	28.6		
#140	27.1		
#200	26.2		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 29.4684 D_{85}= 16.3401 D_{60}= 4.9401
D_{50}= 2.6195 D_{30}= 0.1884 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: B-22, S-7 Depth: 18'-20'

Date: 3/25/2024

ANS CONSULTANTS, INC.

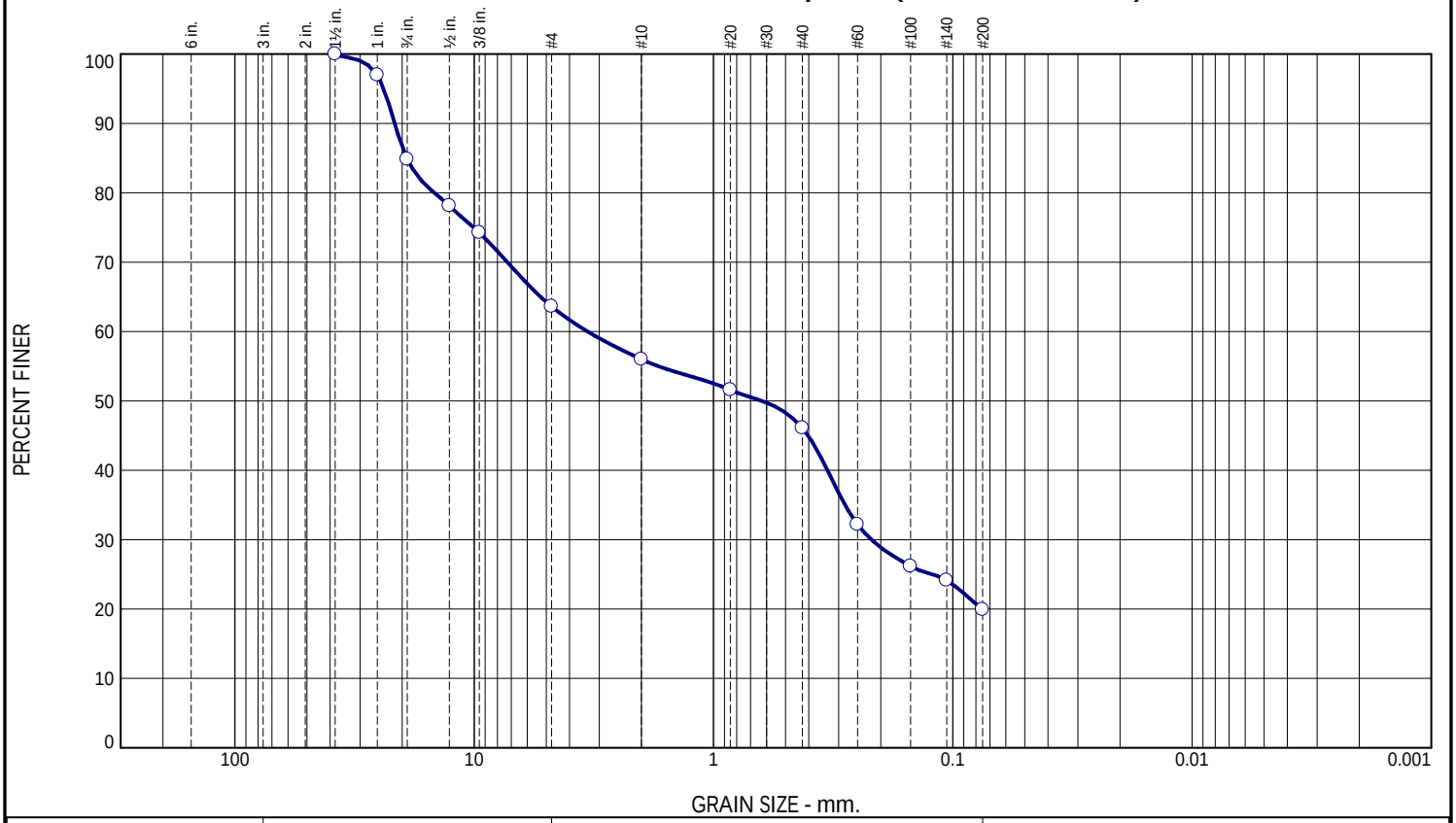
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.2	21.2	7.6	9.9	26.2	19.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	97.0		
0.75"	84.8		
0.5"	78.1		
0.375"	74.3		
#4	63.6		
#10	56.0		
#20	51.6		
#40	46.1		
#60	32.2		
#100	26.2		
#140	24.1		
#200	19.9		

* (no specification provided)

Soil Description

Gray silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 21.4946 D_{85}= 19.1578 D_{60}= 3.3592
D_{50}= 0.6275 D_{30}= 0.2187 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Undersized Specimen

Sample Number: B-23, S-5 Depth: 8'-10'

Date: 3/25/2024

ANS CONSULTANTS, INC.

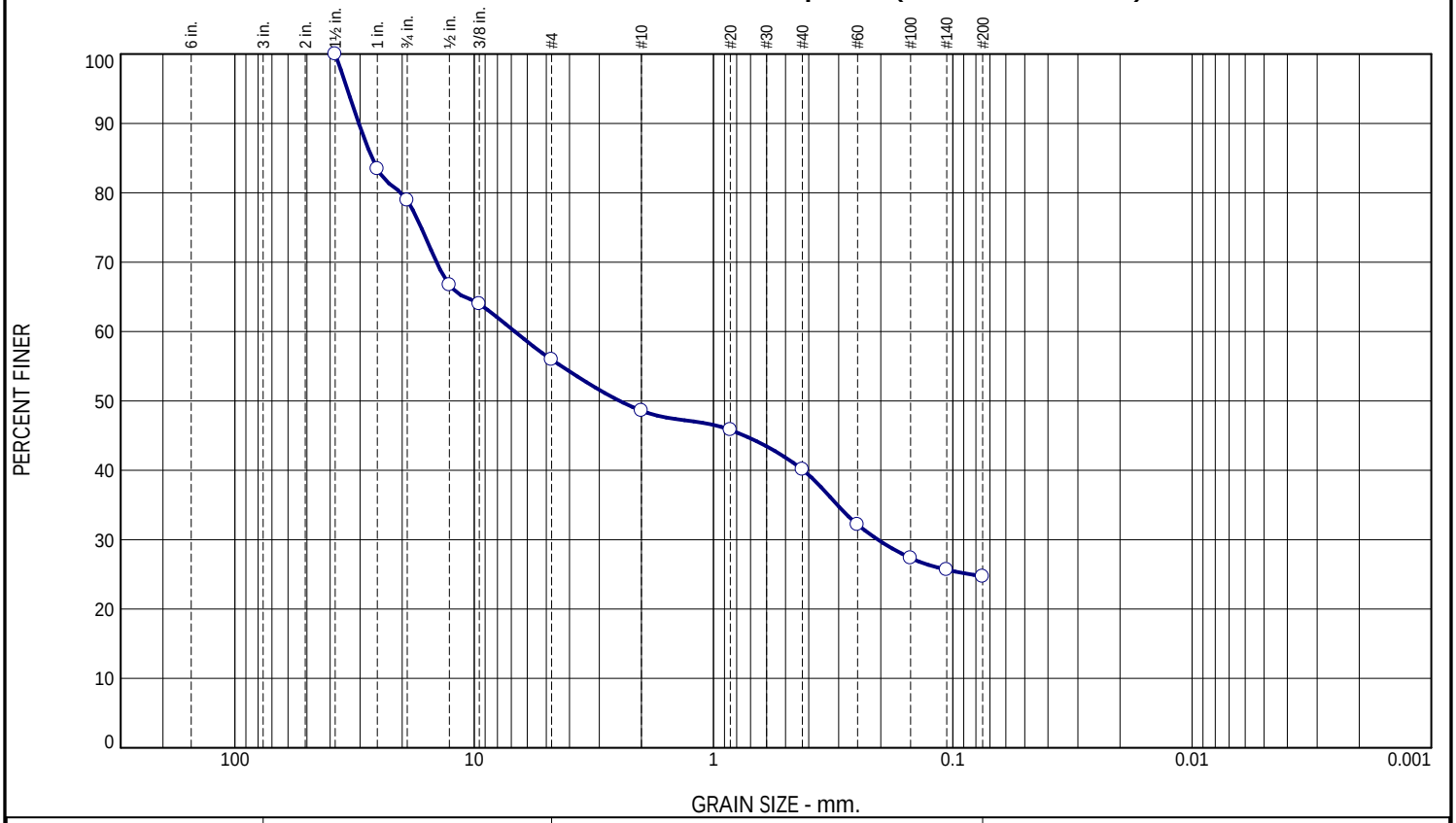
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.1	22.9	7.4	8.5	15.4	24.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	83.4		
0.75"	78.9		
0.5"	66.7		
0.375"	64.0		
#4	56.0		
#10	48.6		
#20	45.8		
#40	40.1		
#60	32.2		
#100	27.3		
#140	25.7		
#200	24.7		

* (no specification provided)

Soil Description

Brownish Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 30.3495 D_{85}= 26.7104 D_{60}= 6.7624
D_{50}= 2.4668 D_{30}= 0.2056 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Undersized Specimen

Sample Number: B-24, S-7 Depth: 18'-20'

Date: 3/25/2024

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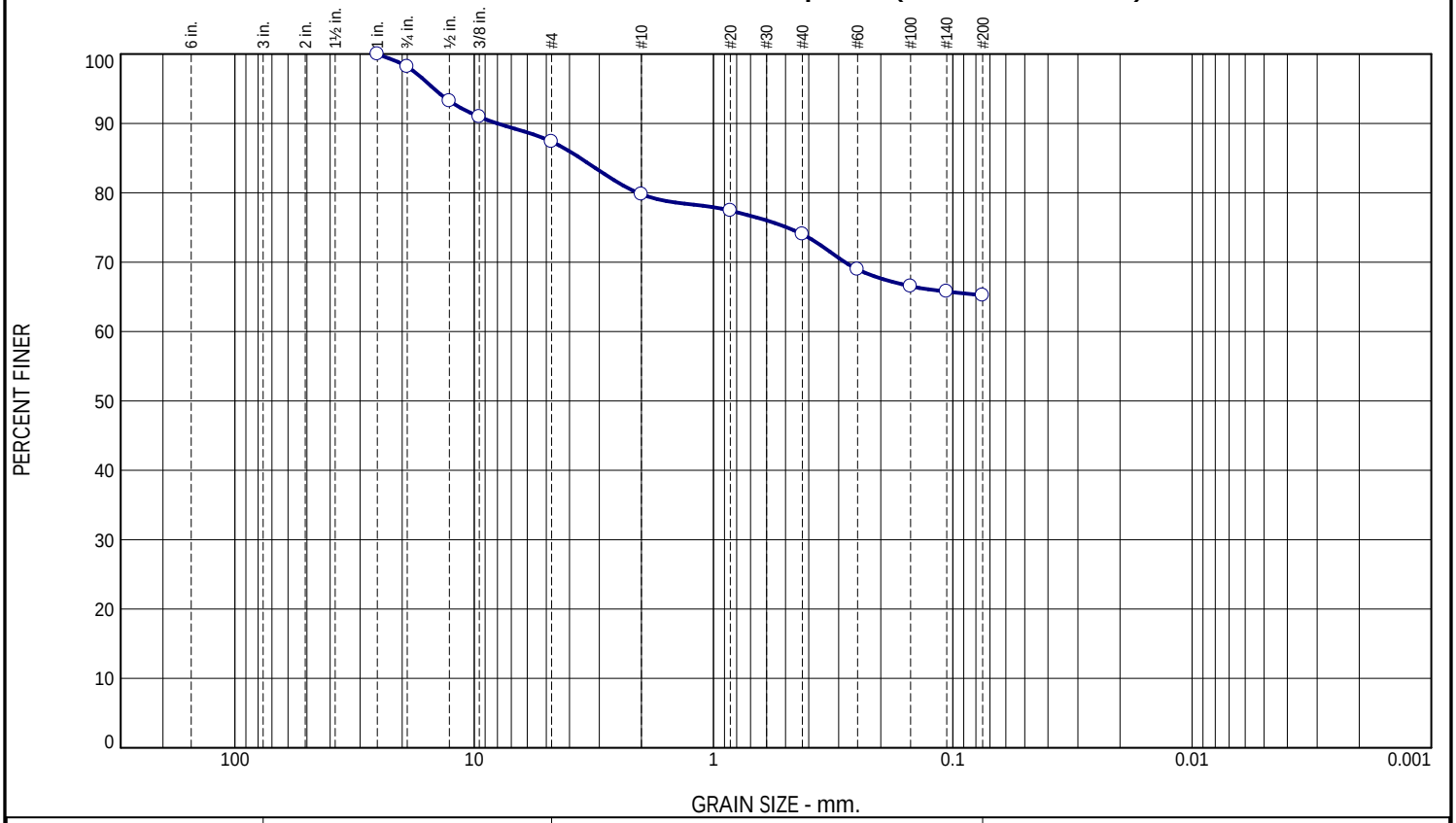
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.8	10.8	7.6	5.8	8.8	65.2	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
0.75"	98.2		
0.5"	93.2		
0.375"	91.0		
#4	87.4		
#10	79.8		
#20	77.4		
#40	74.0		
#60	69.0		
#100	66.5		
#140	65.8		
#200	65.2		

* (no specification provided)

Soil Description

Gray

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 8.0150 D_{85}= 3.6000 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: B-25, S-5 Depth: 8'-10'

Date: 3/25/2024

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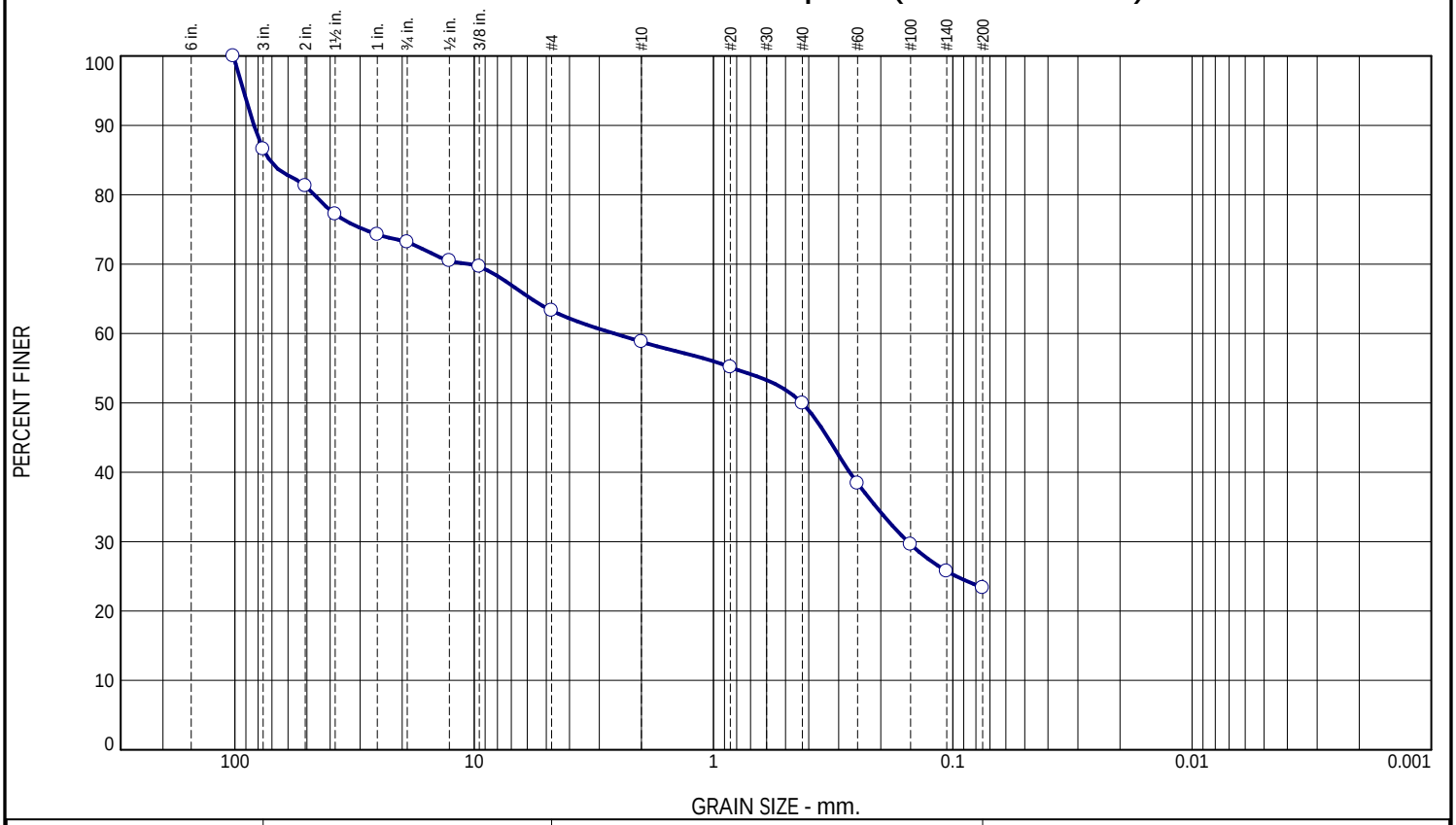
South Plainfield, New Jersey

Client: Bright Night, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-124 Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
13.4	13.4	9.9	4.5	8.9	26.6	23.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.0"	100.0		
3.0"	86.6		
2.0"	81.3		
1.5"	77.2		
1.0"	74.3		
0.75"	73.2		
0.5"	70.5		
0.375"	69.6		
#4	63.3		
#10	58.8		
#20	55.1		
#40	49.9		
#60	38.4		
#100	29.6		
#140	25.7		
#200	23.3		

* (no specification provided)

Soil Description

Pale Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 83.2787 D_{85}= 71.5784 D_{60}= 2.5973
D_{50}= 0.4267 D_{30}= 0.1542 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: TP-03, CBR-3 Depth: 1'-3'

Date: 3/28/2024

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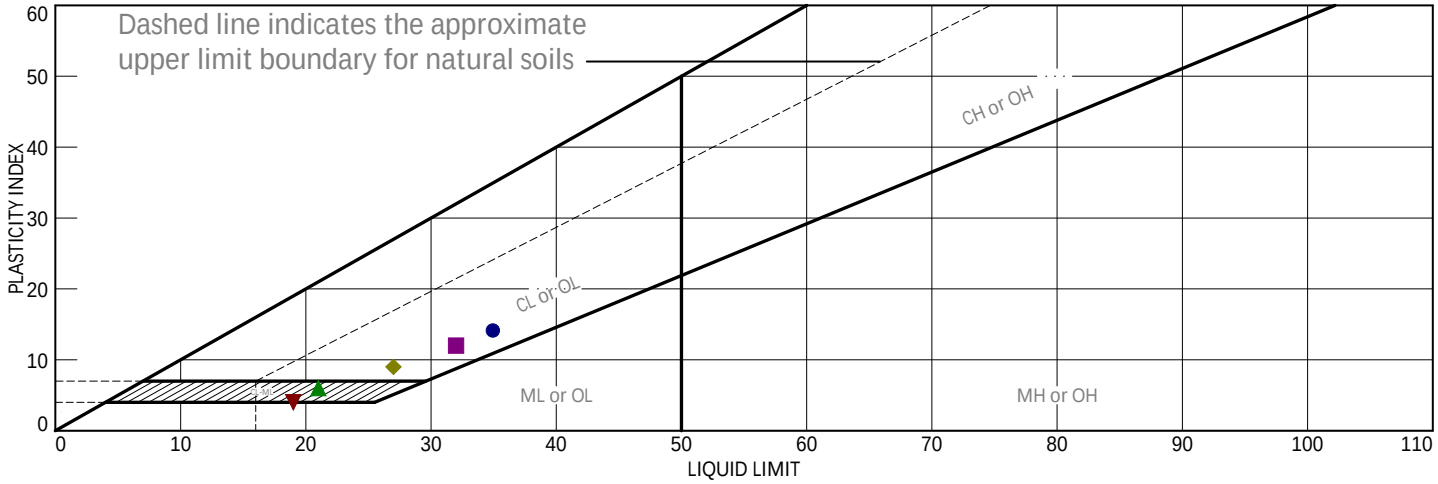
Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY

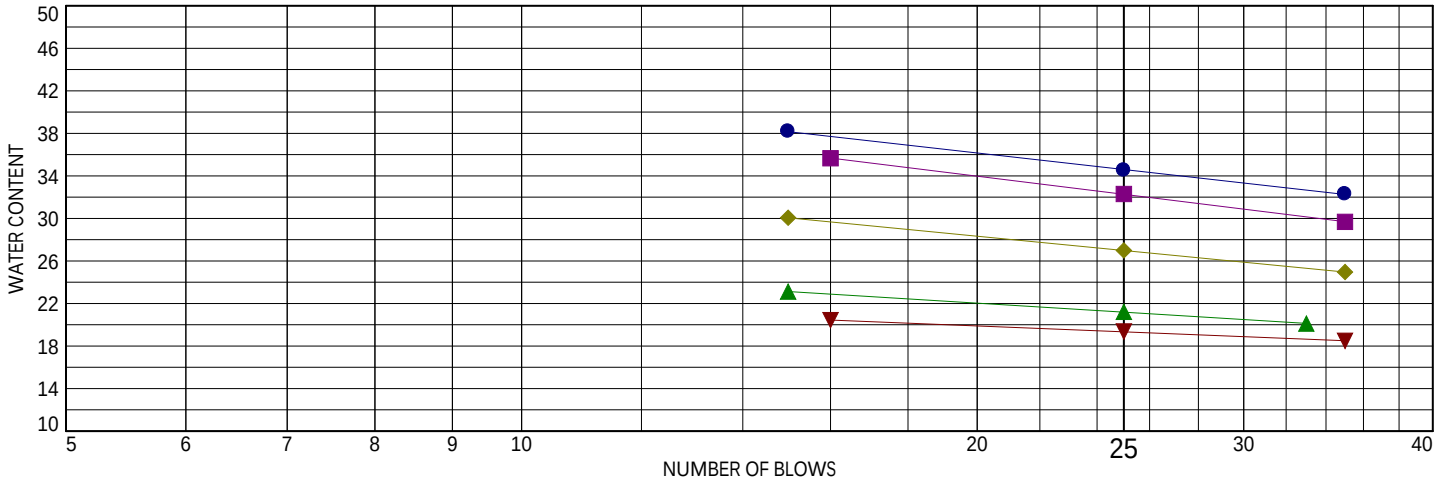
Project No: IRN 24-N-107 Figure

Tested By: RS Checked By: ANS

ATTERBERG LIMITS RESULTS

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Gray Clay & Silt, little cmf Sand (Visual)	35	21	14			
■	Gray Clay & Silt, little cmf Sand (Visual)	32	20	12			
▲	Brown Silt & Clay, some cmf Sand (Visual)	21	15	6			
◆	Gray Clay & Silt, some cmf Sand (Visual)	27	18	9			
▼	Light Brown Silt & Clay, some cmf Sand (Visual)	19	15	4			

Project No. IRN 24-N-108 Client: Bright Night, LLC

Project: Starfire Solar, Knott County, KY

●Depth: 18'-20' Sample Number: B-04, S-7

■Depth: 4'-6' Sample Number: B-05, S-3

▲Depth: 0'-2' Sample Number: B-10, S-1

◆Depth: 8'-10' Sample Number: B-11, S-5

▼Depth: 6'-8' Sample Number: B-13, S-4

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Remarks:

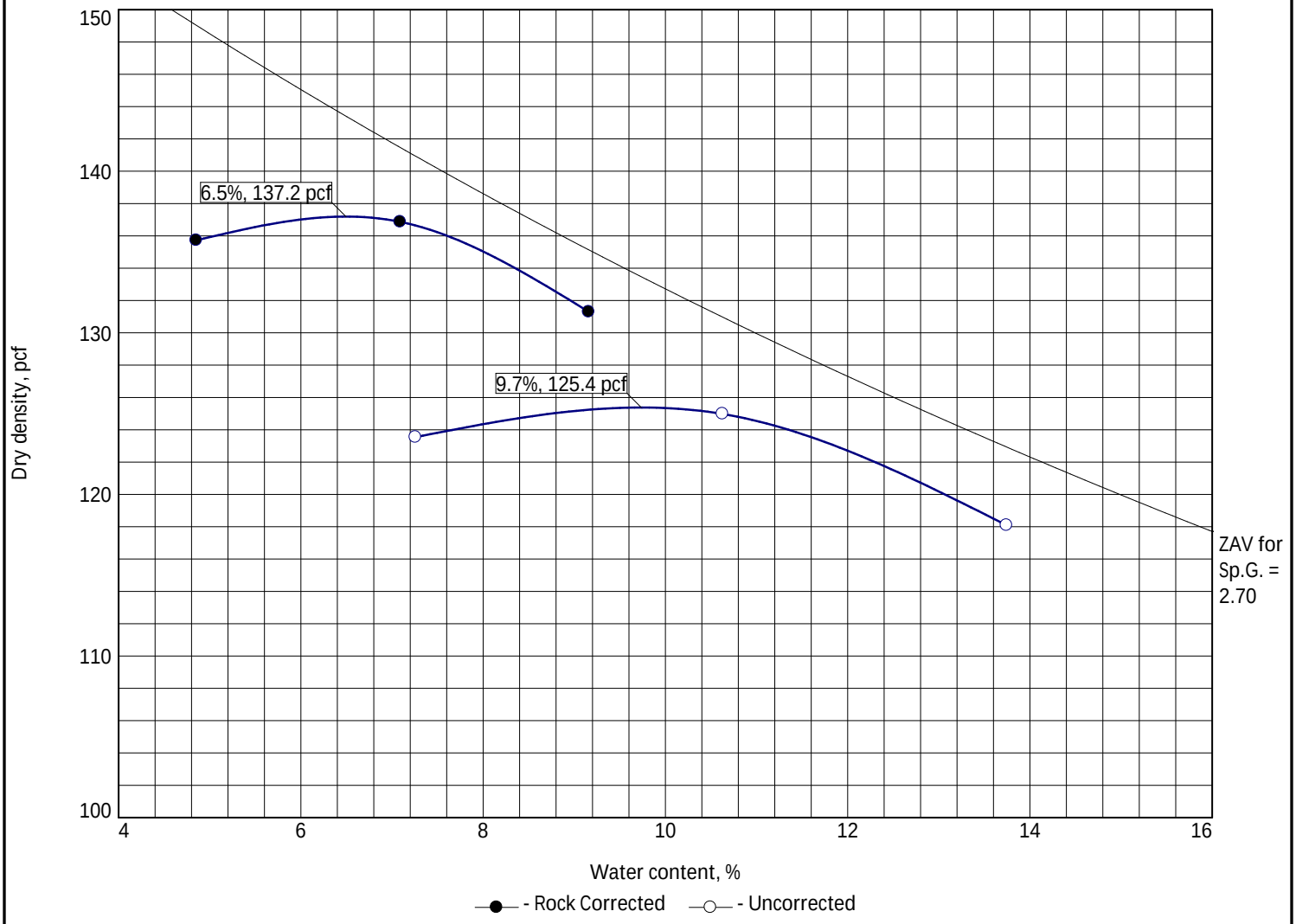
●ASTM D4318 - Sample Air-Dried, LL Device: Manual, PL Rolling Method: Hand-Rolled, Grooving Tool: Metal
3/20/2024

Figure

Tested By: AM Checked By: ANS

THERMAL RESISTIVITY RESULTS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			33.6	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 137.2 pcf	125.4 pcf	Dark Gray cmf Gravel, and cmf Sand, some Silt & Clay (Visual)
Optimum moisture = 6.5 %	9.7 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-01, TRT-1

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Remarks:
SG Assumed
Oversize material (>3/4") exceeds recommended ASTM guidelines (Max. 30% oversize allowed)

Figure

Tested By: MG Checked By: ANS

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: BrightNight, LLC
LAB IRN: 24-N-107
Project Name: Starfire Solar, Knott County, KY
Date: 3/28/2024

Sample ID: TP-01, TRT-1, 3'-5'
Description: Dark Gray cmf Gravel, and cmf Sand, some Silt & Clay (Visual)

Specimen type: Reconstituted Sample
Maximum Dry Density: 137.2 PCF
In-Situ Moisture: 11.4 %
Optimum Moisture: 6.5 %

S.No.	Moisture (%)		85% D698 (PCF): 116.6		95% D698 (PCF): 130.3	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.4756	210.3	0.5580	179.2
3	¼ OMC	1.6	0.6810	146.8	0.8516	117.4
4	½ OMC	3.3	1.3014	76.8	1.4368	69.6
5	¾ OMC	4.9	1.4467	69.1	1.5626	64.0
6	OMC	6.5	1.5179	65.9	1.6438	60.8
7	In-Situ	11.4	1.5942	62.7	1.7374	57.6

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: MG
Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Sample ID: TP-01, TRT-1, 3'-5'

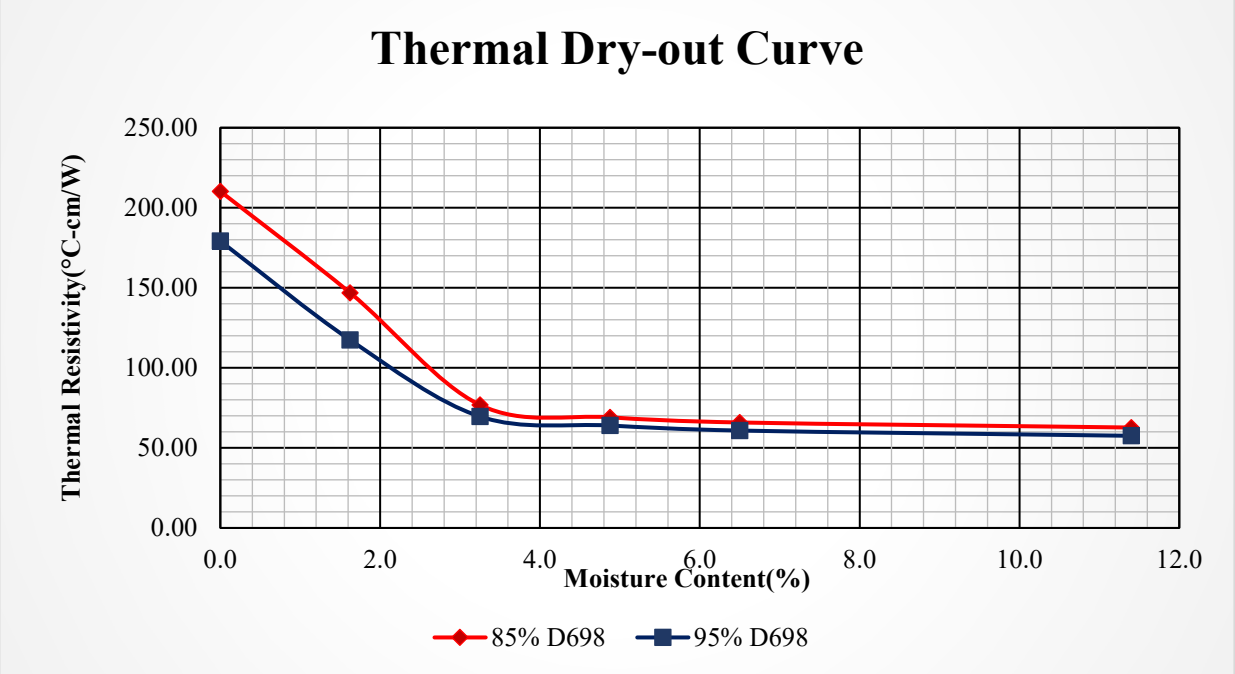
Description: Dark Gray cmf Gravel, and cmf Sand, some Silt & Clay (Visual)

Specimen type: Reconstituted Sample

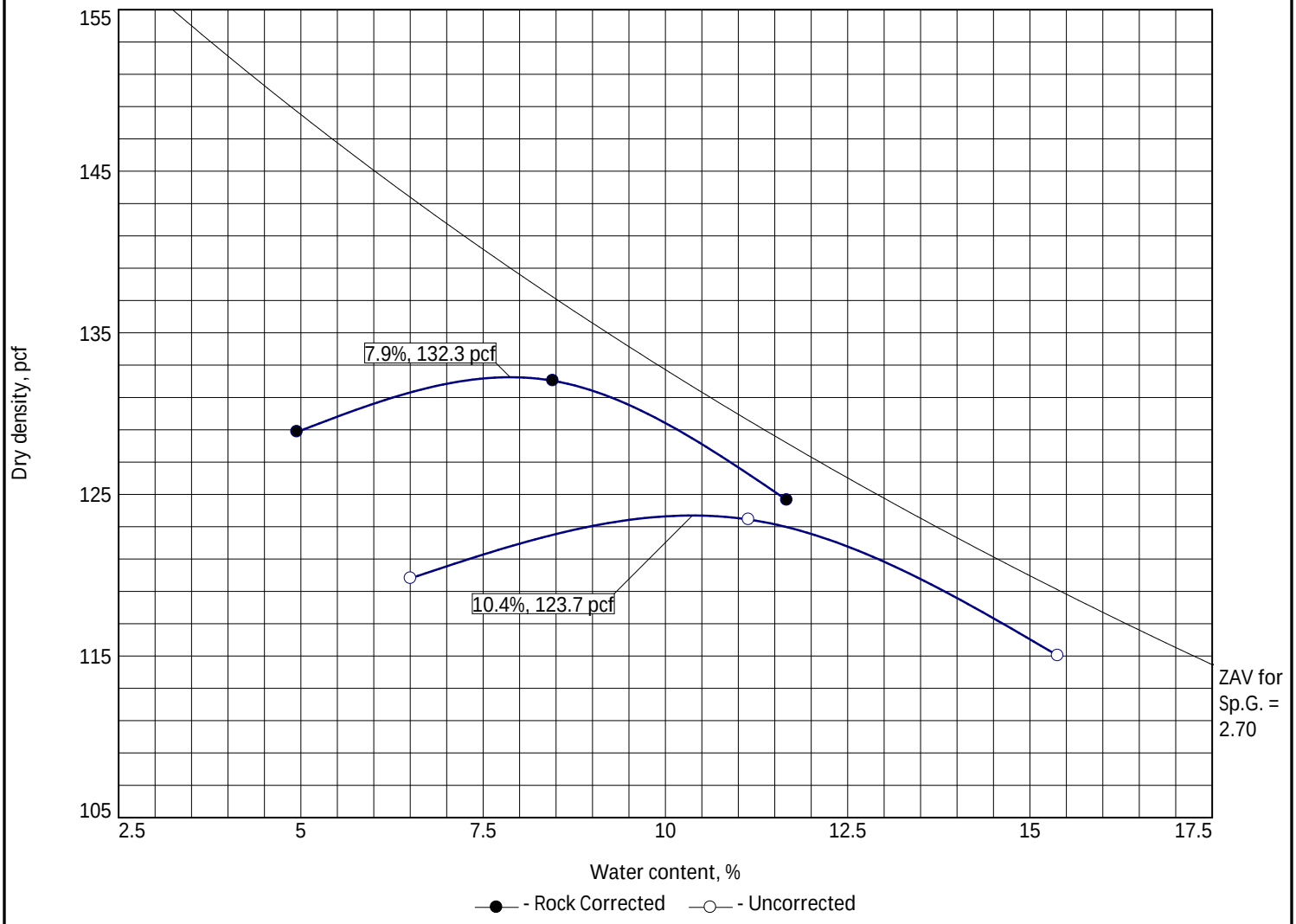
Maximum Dry Density: 137.2 PCF

In-Situ Moisture: 11.4 %

Optimum Moisture: 6.5 %



COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			24.3	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 132.3 pcf	123.7 pcf	Dark Gray cmf Sand, and Silt & Clay, some cmf Gravel (Visual)
Optimum moisture = 7.9 %	10.4 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-05, TRT-2

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Remarks:
SG Assumed

Figure

Tested By: MG Checked By: ANS

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: BrightNight, LLC
LAB IRN: 24-N-107
Project Name: Starfire Solar, Knott County, KY
Date: 3/28/2024

Sample ID: TP-05, TRT-2, 3'-5'
Description: Dark Gray cmf Sand, and Silt & Clay, some cmf Gravel (Visual)

Specimen type: Reconstituted Sample
Maximum Dry Density: 132.3 PCF
In-Situ Moisture: 9.5 %
Optimum Moisture: 7.9 %

S.No.	Moisture (%)		85% D698 (PCF): 112.5		95% D698 (PCF): 125.7	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.4938	202.5	0.5879	170.1
3	¼ OMC	2.0	0.7276	137.4	0.9243	108.2
4	½ OMC	4.0	1.4760	67.8	1.6319	61.3
5	¾ OMC	5.9	1.6478	60.7	1.7816	56.1
6	OMC	7.9	1.7299	57.8	1.8743	53.4
7	In-Situ	9.5	1.7518	57.1	1.9008	52.6

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: MG
Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Sample ID: TP-05, TRT-2, 3'-5'

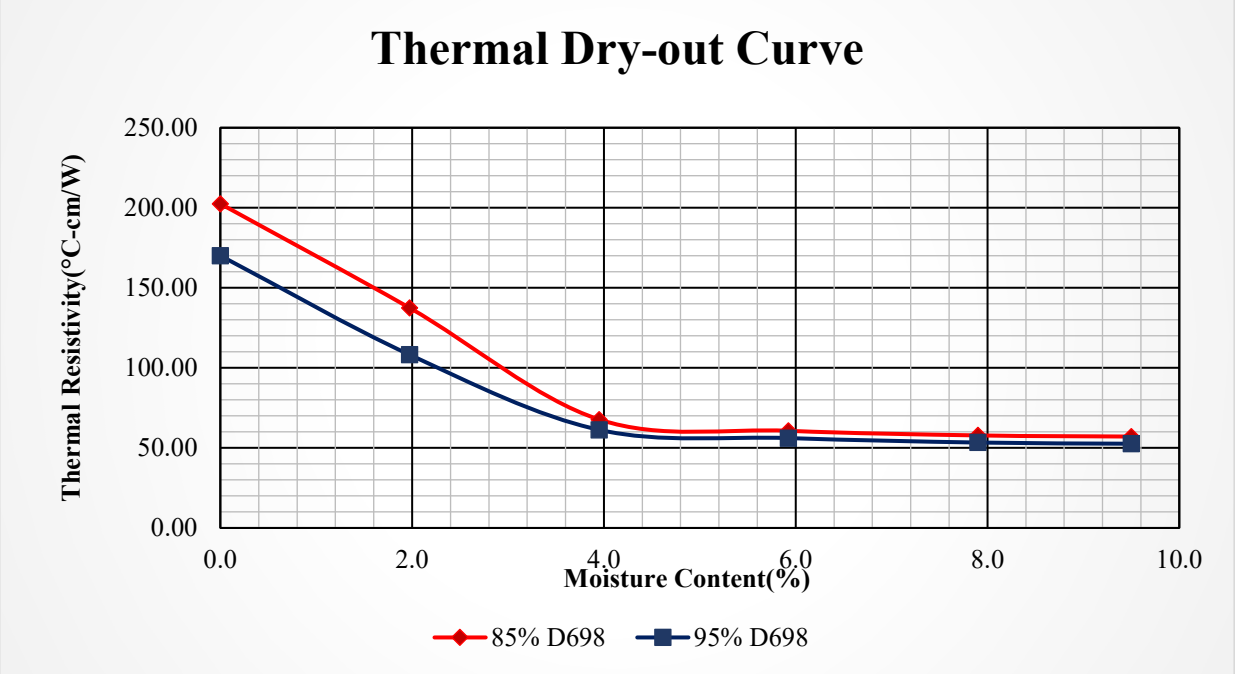
Description: Dark Gray cmf Sand, and Silt & Clay, some cmf Gravel (Visual)

Specimen type: Reconstituted Sample

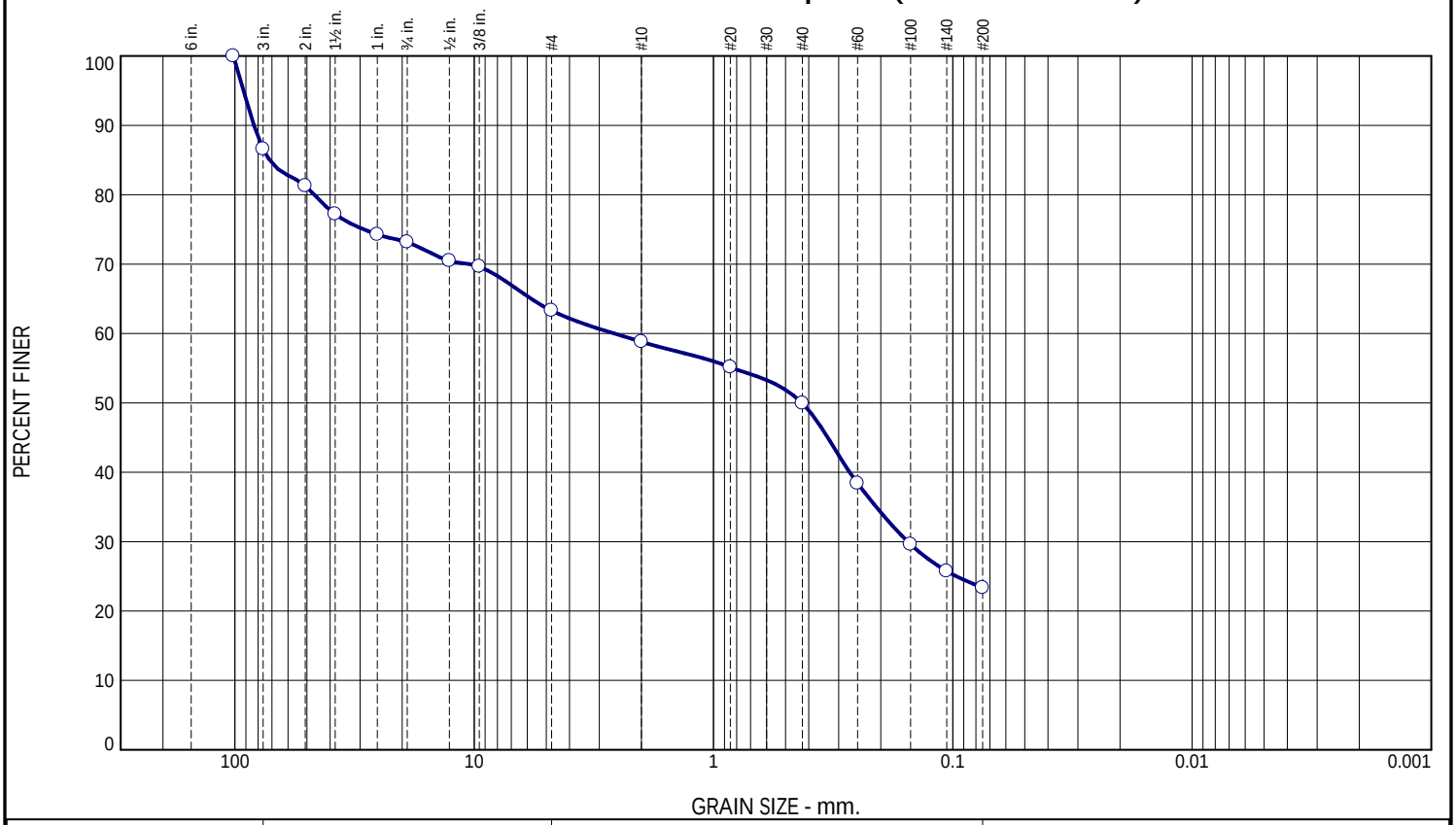
Maximum Dry Density: 132.3 PCF

In-Situ Moisture: 9.5 %

Optimum Moisture: 7.9 %



Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
13.4	13.4	9.9	4.5	8.9	26.6	23.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
4.0"	100.0		
3.0"	86.6		
2.0"	81.3		
1.5"	77.2		
1.0"	74.3		
0.75"	73.2		
0.5"	70.5		
0.375"	69.6		
#4	63.3		
#10	58.8		
#20	55.1		
#40	49.9		
#60	38.4		
#100	29.6		
#140	25.7		
#200	23.3		

* (no specification provided)

Soil Description

Pale Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 83.2787 D_{85}= 71.5784 D_{60}= 2.5973
D_{50}= 0.4267 D_{30}= 0.1542 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: TP-03, CBR-3 Depth: 1'-3'

Date: 3/28/2024

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Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY

Project No: IRN 24-N-107 Figure

Tested By: RS Checked By: ANS

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: BrightNight, LLC
LAB IRN: 24-N-107
Project Name: Starfire Solar, Knott County, KY
Date: 3/28/2024

Sample ID: TP-09, TRT-3, 3'-5'
Description: Dark Gray Silt & Clay, and cmf Gravel, little cmf Sand (Visual)

Specimen type: Reconstituted Sample
Maximum Dry Density: 131.0 PCF
In-Situ Moisture: 10.2 %
Optimum Moisture: 7.9 %

S.No.	Moisture (%)		85% D698 (PCF): 111.4		95% D698 (PCF): 124.5	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.5054	197.9	0.5987	167.0
3	¼ OMC	2.0	0.7411	134.9	0.9598	104.2
4	½ OMC	4.0	1.5270	65.5	1.7626	56.7
5	¾ OMC	5.9	1.7135	58.4	1.9235	52.0
6	OMC	7.9	1.7959	55.7	2.0163	49.6
7	In-Situ	10.2	1.8176	55.0	2.0424	49.0

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: MG
Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Sample ID: TP-09, TRT-3, 3'-5'

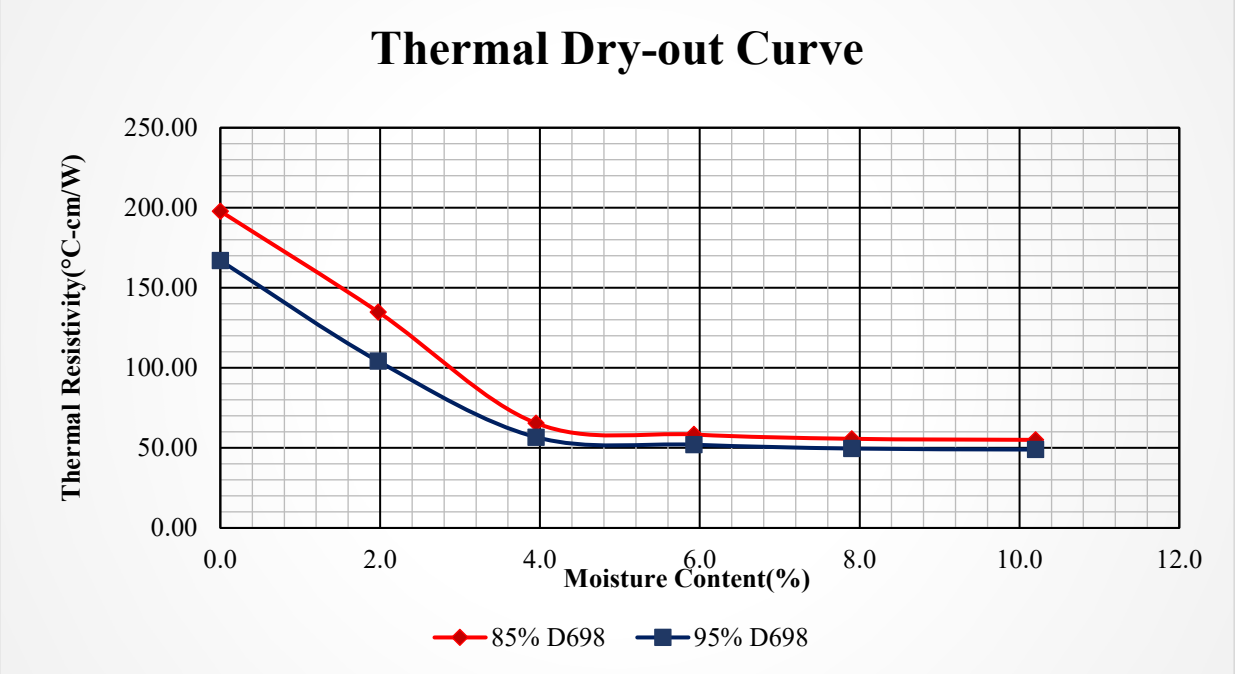
Description: Dark Gray Silt & Clay, and cmf Gravel, little cmf Sand (Visual)

Specimen type: Reconstituted Sample

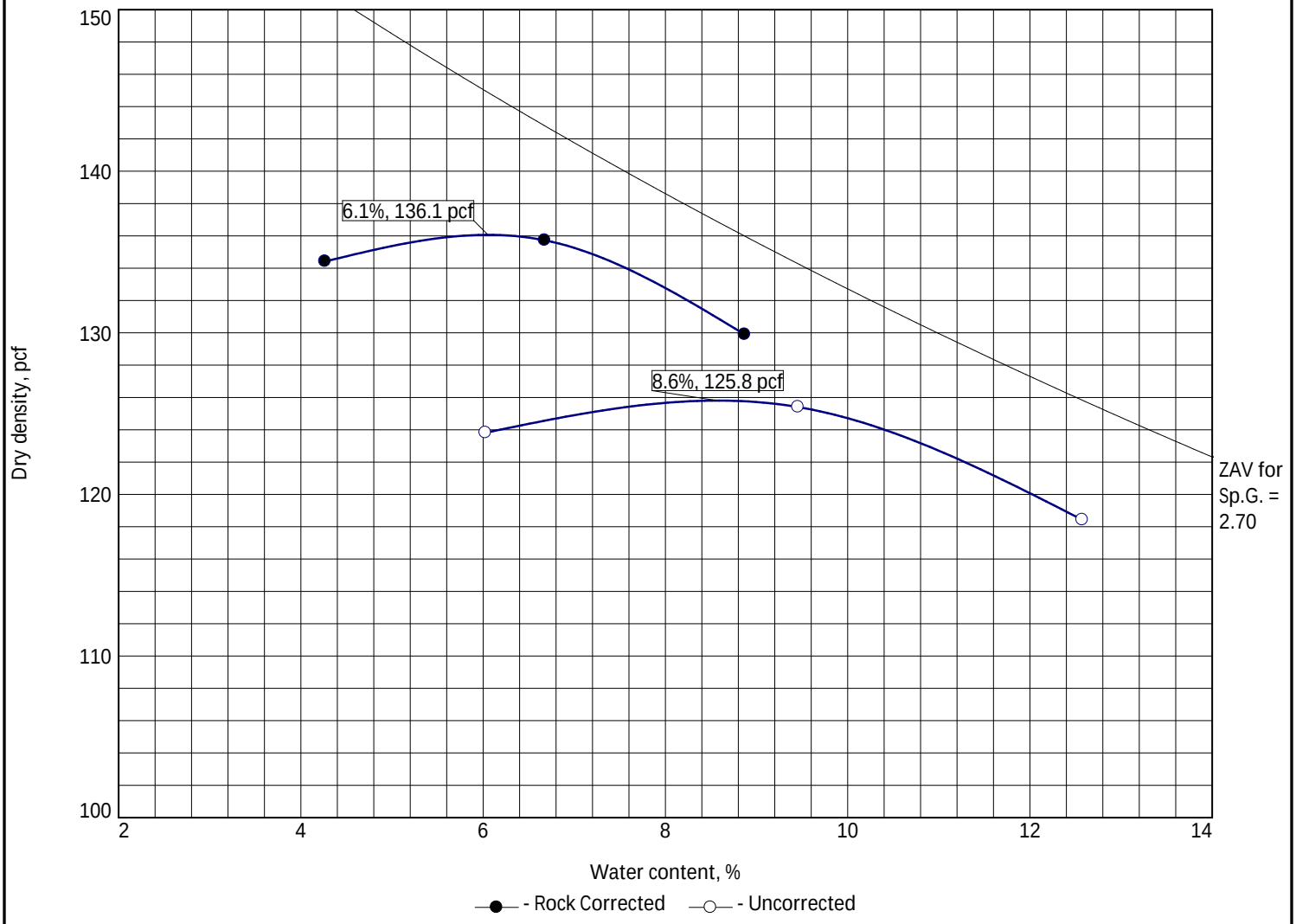
Maximum Dry Density: 131.0 PCF

In-Situ Moisture: 10.2 %

Optimum Moisture: 7.9 %



COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			29.7	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 136.1 pcf	125.8 pcf	Dark Gray cmf Sand, and cmf Gravel, some Silt & Clay (Visual)
Optimum moisture = 6.1 %	8.6 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-11, TRT-4

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Remarks:
SG Assumed

Figure

Tested By: MG Checked By: ANS

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: BrightNight, LLC
LAB IRN: 24-N-107
Project Name: Starfire Solar, Knott County, KY
Date: 3/28/2024

Sample ID: TP-11, TRT-4, 3'-5'
Description: Dark Gray cmf Sand, and cmf Gravel, some Silt & Clay (Visual)

Specimen type: Reconstituted Sample
Maximum Dry Density: 136.1 PCF
In-Situ Moisture: 10.0 %
Optimum Moisture: 6.1 %

S.No.	Moisture (%)		85% D698 (PCF): 115.7		95% D698 (PCF): 129.3	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.5150	194.2	0.6188	161.6
3	¼ OMC	1.5	0.6925	144.4	0.8761	114.1
4	½ OMC	3.1	1.3866	72.1	1.5535	64.4
5	¾ OMC	4.6	1.5625	64.0	1.7019	58.8
6	OMC	6.1	1.6459	60.8	1.7812	56.1
7	In-Situ	10.0	1.7191	58.2	1.8697	53.5

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: MG
Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Sample ID: TP-11, TRT-4, 3'-5'

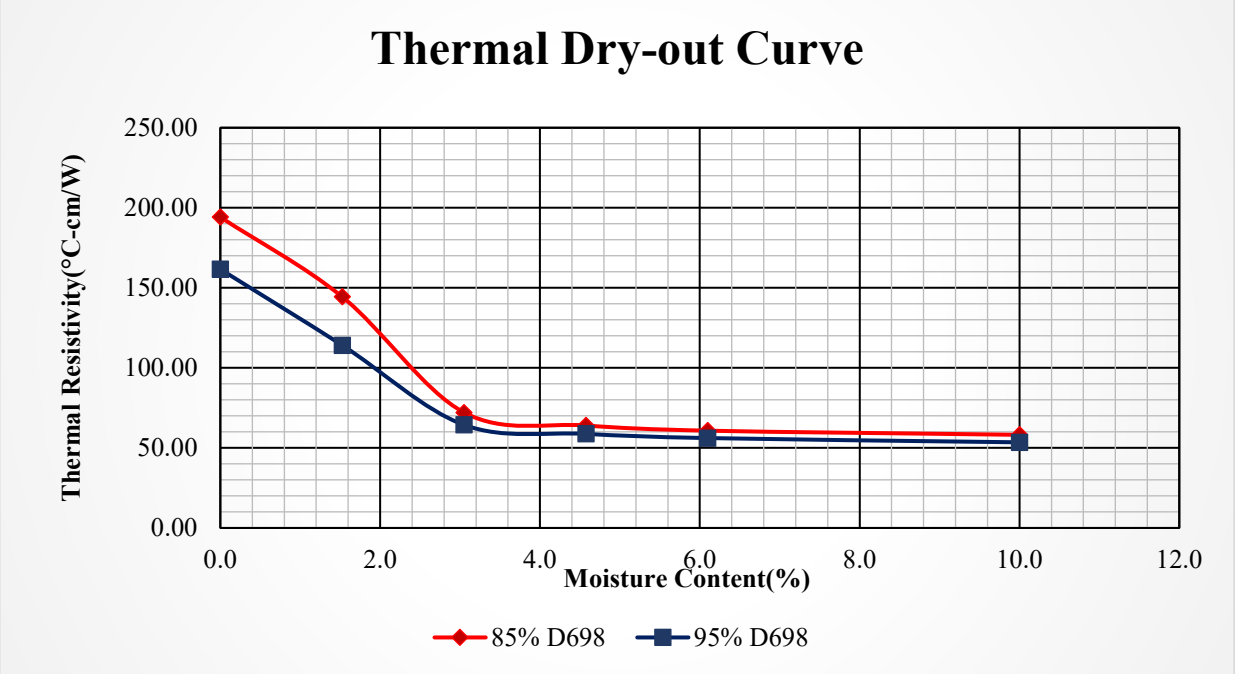
Description: Dark Gray cmf Sand, and cmf Gravel, some Silt & Clay (Visual)

Specimen type: Reconstituted Sample

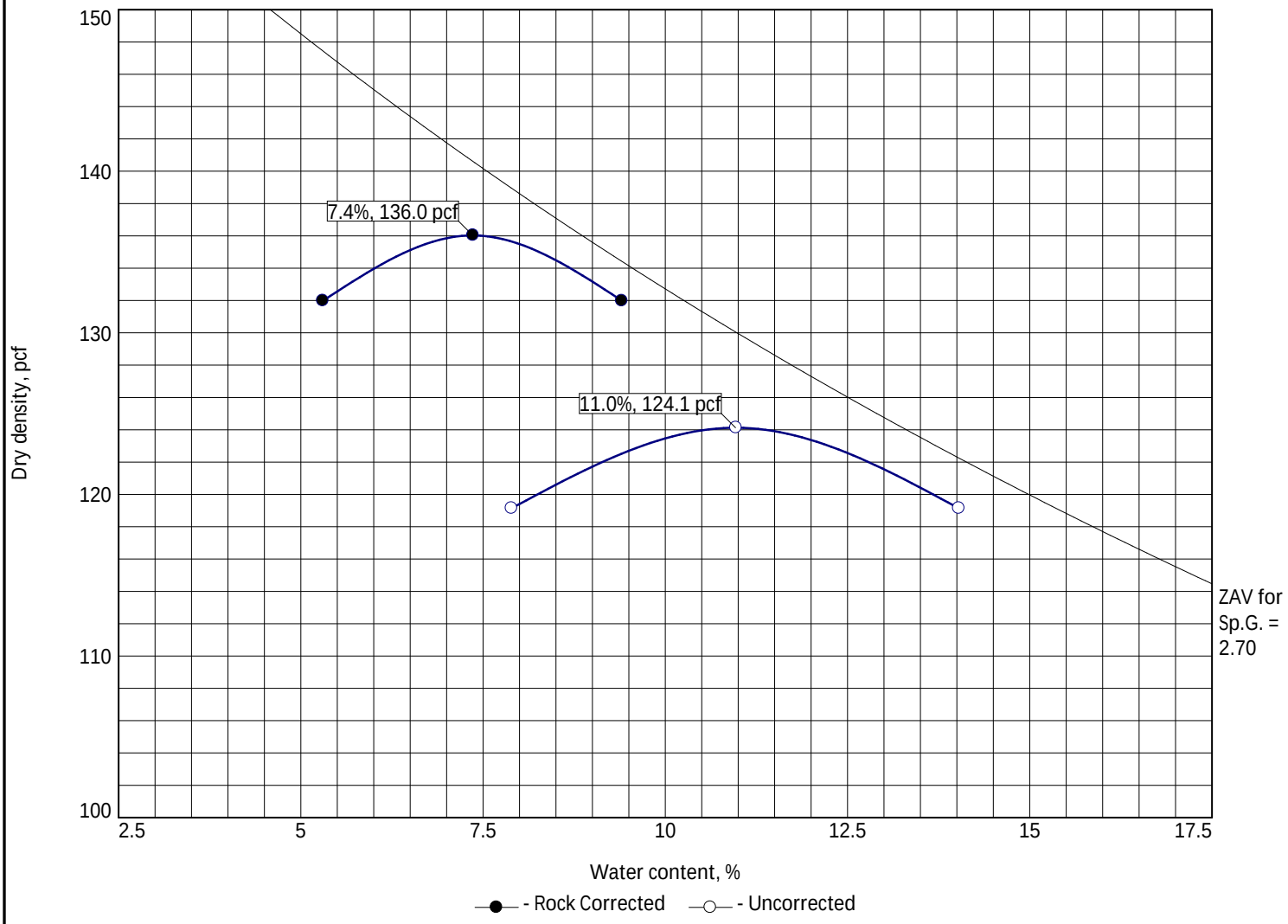
Maximum Dry Density: 136.1 PCF

In-Situ Moisture: 10.0 %

Optimum Moisture: 6.1 %



COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
3'-5'				2.7			33.2	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 136.0 pcf	124.1 pcf	Dark Grayish Brown cmf Gravel, and Silt & Clay, some cmf Sand (Visual)
Optimum moisture = 7.4 %	11.0 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-06, TRT-5

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Remarks:
SG Assumed
Oversize material (>3/4") exceeds recommended ASTM guidelines (Max. 30% oversize allowed)

Figure

Tested By: MG Checked By: ANS

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: BrightNight, LLC
LAB IRN: 24-N-107
Project Name: Starfire Solar, Knott County, KY
Date: 3/28/2024

Sample ID: TP-06, TRT-5, 3'-5'
Description: Dark Grayish Brown cmf Gravel, and Silt & Clay, some cmf Sand (Visual)

Specimen type: Reconstituted Sample
Maximum Dry Density: 136.0 PCF
In-Situ Moisture: 12.3 %
Optimum Moisture: 7.4 %

S.No.	Moisture (%)		85% D698 (PCF): 115.6		95% D698 (PCF): 129.2	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.4672	214.0	0.5480	182.5
3	¼ OMC	1.9	0.6488	154.1	0.8163	122.5
4	½ OMC	3.7	1.2644	79.1	1.4424	69.3
5	¾ OMC	5.6	1.4341	69.7	1.5913	62.8
6	OMC	7.4	1.5151	66.0	1.6834	59.4
7	In-Situ	12.3	1.5759	63.5	1.7574	56.9

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: MG
Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Sample ID: TP-06, TRT-5, 3'-5'

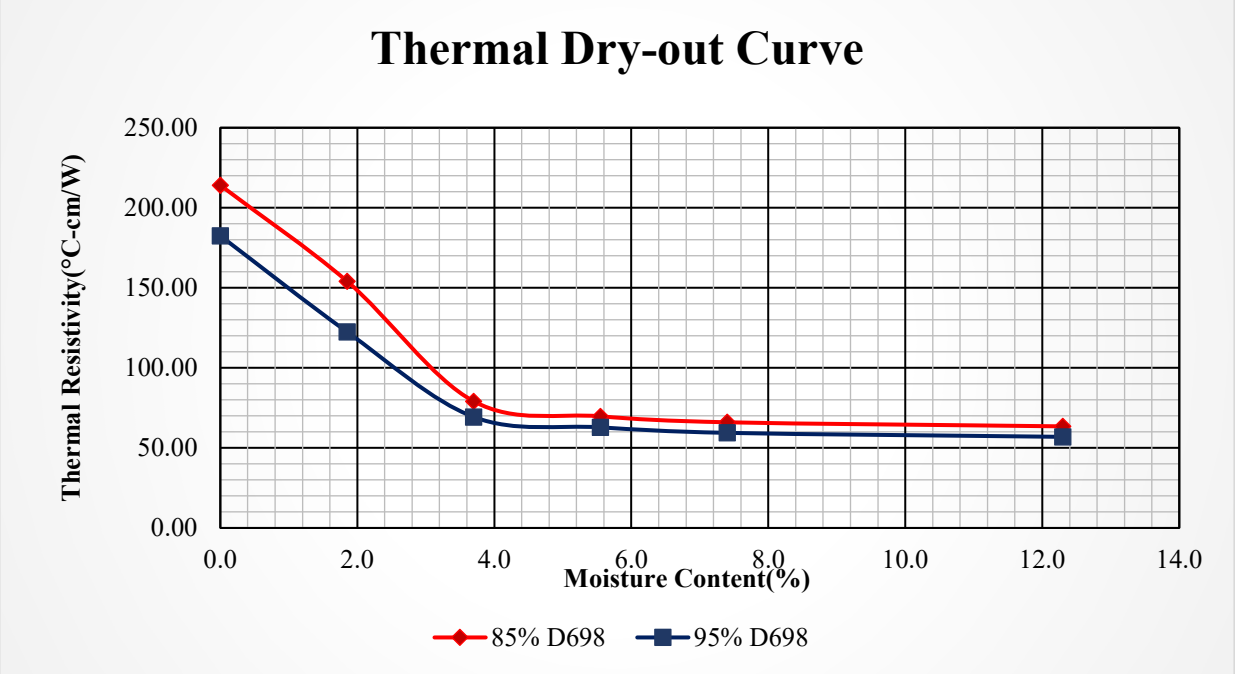
Description: Dark Grayish Brown cmf Gravel, and Silt & Clay, some cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 136.0 PCF

In-Situ Moisture: 12.3 %

Optimum Moisture: 7.4 %



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Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name: BrightNight, LLC
Project Name: Starfire Solar, Knott County, KY
LAB IRN: 24-N-107
Date: 3/28/2024

Sample ID	TP-01, TRT-1	TP-05, TRT-2	TP-09, TRT-3	TP-11, TRT-4	TP-06, TRT-5
Depth	3'-5'	3'-5'	3'-5'	3'-5'	3'-5'
Wet soil + Tare (g)	190.1	178.9	178.0	338.7	170.3
Dry soil + Tare (g)	172.1	164.6	162.7	309.3	153.0
Wt. of Tare (g)	14.0	13.7	13.3	14.2	12.9
Moisture Content	**11.4%**	**9.5%**	**10.2%**	**10.0%**	**12.3%**

Sample ID	TP-07, TRT-6	B-12, CORR-1	B-05, CORR-2	B-03, CORR-3	B-02, CORR-4
Depth	3'-5'	2'-4'	2'-4'	2'-4'	2'-4'
Wet soil + Tare (g)	198.6	235.8	239.7	243.0	234.9
Dry soil + Tare (g)	178.6	218.1	226.9	222.4	219.0
Wt. of Tare (g)	14.6	13.4	13.3	14.2	13.4
Moisture Content	**12.2%**	**8.6%**	**6.0%**	**9.9%**	**7.7%**

Tested By: RS
Checked By: ANS

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Determination of Thermal Conductivity of Soil and Rock by Thermal Needle Probe (ASTM D5334)

Client Name: BrightNight, LLC
LAB IRN: 24-N-107
Project Name: Starfire Solar, Knott County, KY
Date: 3/28/2024

Sample ID: TP-07, TRT-6, 3'-5'
Description: Dark Grayish Brown cmf Gravel, and Silt & Clay, little(+) cmf Sand (Visual)

Specimen type: Reconstituted Sample
Maximum Dry Density: 134.1 PCF
In-Situ Moisture: 12.2 %
Optimum Moisture: 6.8 %

S.No.	Moisture (%)		85% D698 (PCF): 114.0		95% D698 (PCF): 127.4	
			Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)	Thermal Cond. (W/mK)	Thermal Res. (°C-cm/W)
1	Dry	0.0	0.4754	210.3	0.5608	178.3
3	¼ OMC	1.7	0.6401	156.2	0.7994	125.1
4	½ OMC	3.4	1.2772	78.3	1.4339	69.7
5	¾ OMC	5.1	1.4615	68.4	1.5853	63.1
6	OMC	6.8	1.5387	65.0	1.6700	59.9
7	In-Situ	12.2	1.6204	61.7	1.7691	56.5

Remarks:

1. Needle size: 2.4 mm diameter × 100 mm length
2. Thermal grease used: High-density polysynthetics silver thermal compound
3. Tested under controlled room temperature conditions (20°C to 22°C)

Tested By: MG
Checked By: ANS

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Thermal Dryout Curve (ASTM D5334)

Sample ID: TP-07, TRT-6, 3'-5'

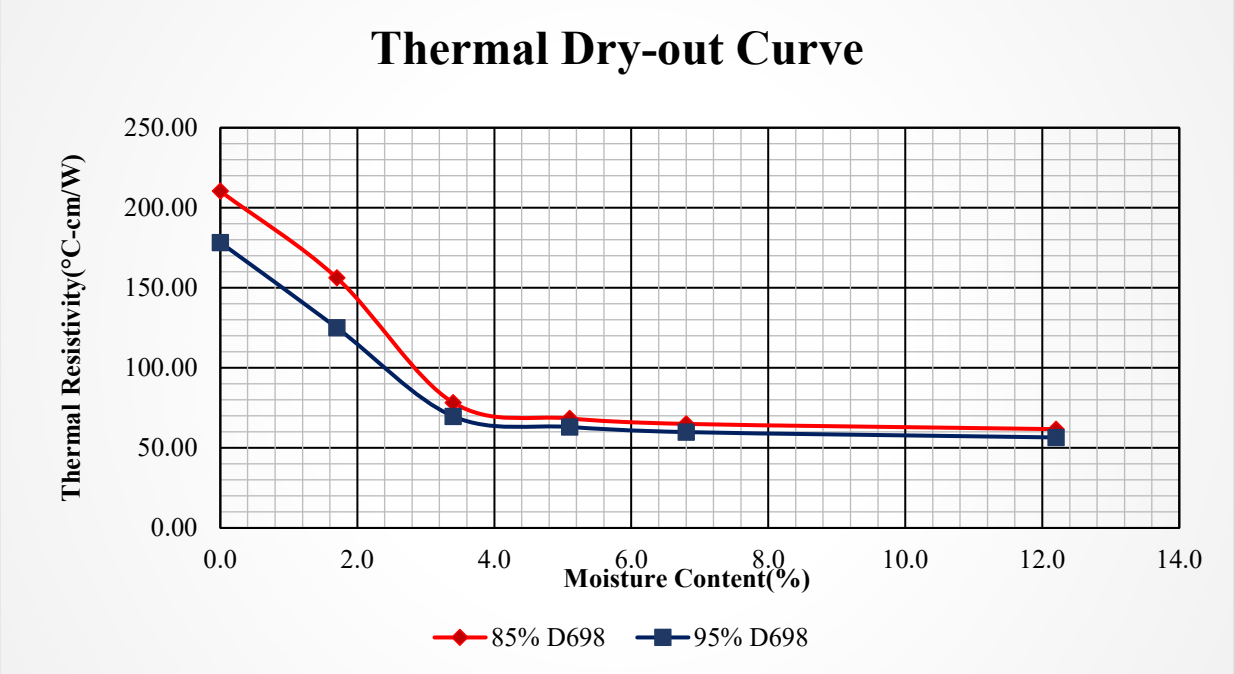
Description: Dark Grayish Brown cmf Gravel, and Silt & Clay, little(+) cmf Sand (Visual)

Specimen type: Reconstituted Sample

Maximum Dry Density: 134.1 PCF

In-Situ Moisture: 12.2 %

Optimum Moisture: 6.8 %



CORROSIVITY SUITE RESULTS

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Corrosivity Testing of Soil

Client Name: Bright Night, LLC
LAB IRN: 24-N-124
Project Name: Starfire Solar, Knott County, KY
Date: 3/25/2024

S.No.	Sample	Depth	Soil Resistivity (ohm-cm)	pH of Soil	Sulfate Content (mg/kg)	Chloride Content (mg/kg)	Oxidation-Reduction Pot. (mV)
		Natural Moisture	ASTM G187	ASTM G51	ASTM C1580	AASHTO T291	ASTM G200
1	B-18 Corr-5	2'-4'	28,200	7.4	30	147	289
		4.8%		Gray cmf Sand, some S&C, little mf Gravel (Vis.)			
2	B-22/23 Corr-6	2'-4'	26,600	5.2	<15	69	360
		8.4%		Gray cmf Sand, some S&C, little mf Gravel (Vis.)			
3	B-07 Corr-7	2'-4'	36,700	6.4	150	27	322
		7.2%		Gray cmf Sand, some S&C, little mf Gravel (Vis.)			
4	B-09/25 Corr-8	2'-4'	24,300	5.8	30	105	292
		11.7%		Brown S&C, some cmf Sand, little mf Gravel (Vis.)			

Remarks:

1. Turbidimetric procedure used for ASTM C1580.
2. Mohr's procedure with Silver Nitrate used for AASHTO T291.
3. Miller 400D Resistance Meter used for Resistivity testing, Multiplication factor = 1.
4. Tests conducted under standard laboratory conditions of temperature (72°F) and humidity.

Tested By: NK
Checked By: ANS

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Corrosivity Testing of Soil

Client Name: BrightNight, LLC
LAB IRN: 24-N-107
Project Name: Starfire Solar, Knott County, KY
Date: 3/28/2024

S.No.	Sample	Depth	Soil Resistivity (ohm-cm)	pH of Soil	Sulfate Content (mg/kg)	Chloride Content (mg/kg)	Oxidation-Reduction Pot. (mV)
		Natural Moisture	ASTM G187	ASTM G51	ASTM C1580	AASHTO T291	ASTM G200
1	B-12 CORR-1	2'-4'	11,000	7.4	30	126	309
		8.6%		Dark Gray S&C, little mf Gravel, little cmf Sand (Vis.)			
2	B-05 CORR-2	2'-4'	12,500	7.0	750	63	342
		6.0%		Light Gray S&C, little mf Gravel, little cmf Sand (Vis.)			
3	B-03 CORR-3	2'-4'	8,470	6.9	780	30	353
		9.9%		Grayish Brown S&C, some cmf Sand, little mf Gravel (Vis.)			
4	B-02 CORR-4	2'-4'	11,700	7.5	<15	354	332
		7.7%		Dark Gray S&C, some cmf Sand, little mf Gravel (Vis.)			

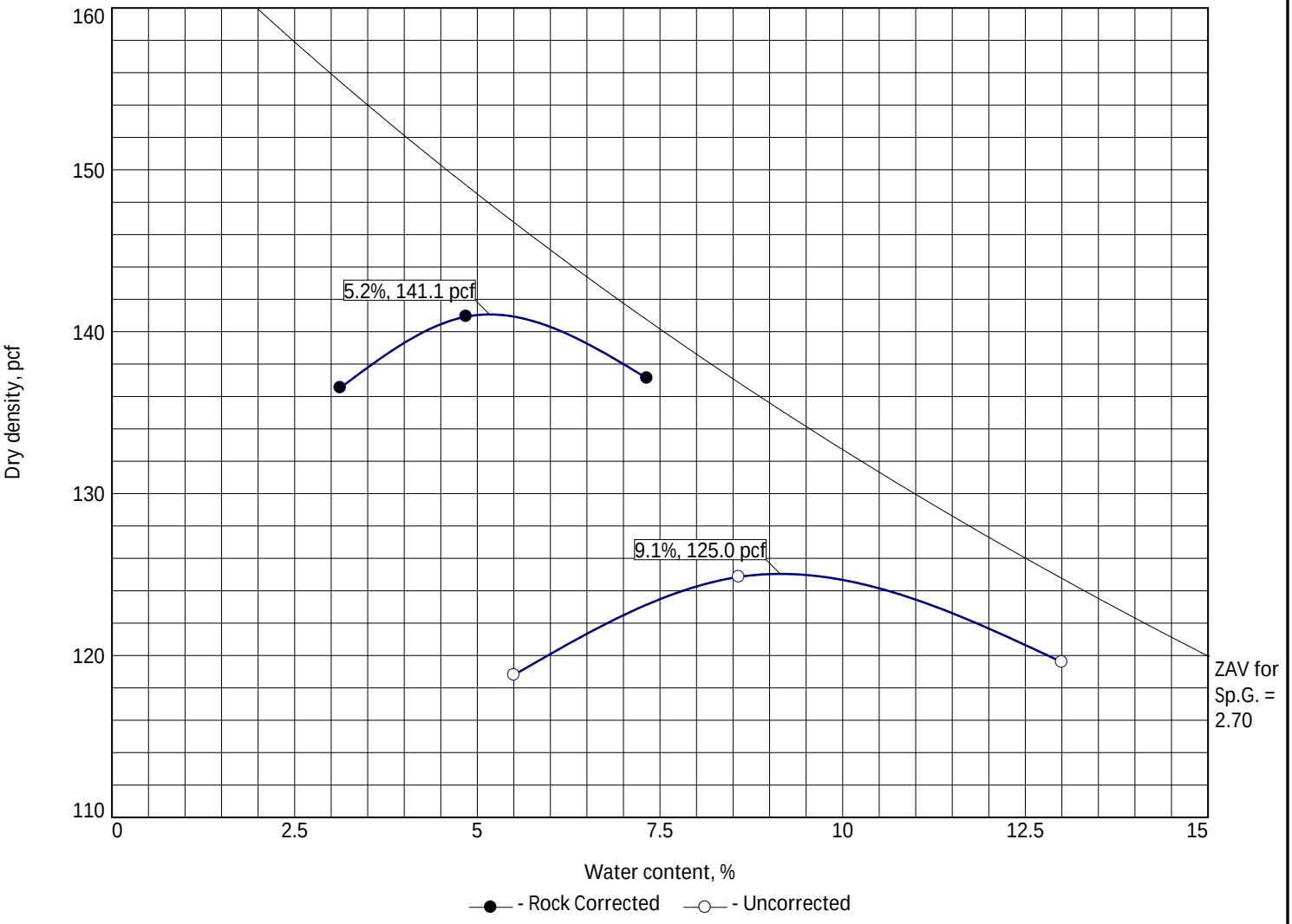
Remarks:

1. Turbidimetric procedure used for ASTM C1580.
2. Mohr's procedure with Silver Nitrate used for AASHTO T291.
3. Miller 400D Resistance Meter used for Resistivity testing, Multiplication factor = 1.
4. Tests conducted under standard laboratory conditions of temperature (72°F) and humidity.

Tested By: AG
Checked By: ANS

CALIFORNIA BEARING RATIO RESULTS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			44	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 141.1 pcf	125.0 pcf	Gray cmf Gravel, and Silt & Clay, little cmf Sand (Visual)
Optimum moisture = 5.2 %	9.1 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-01, CBR-1

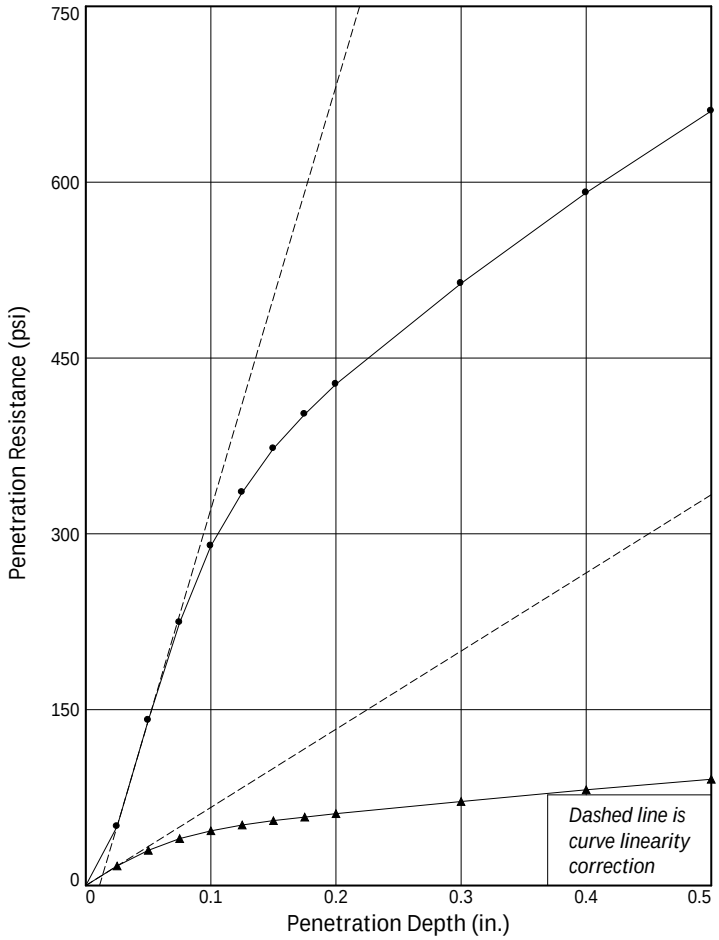
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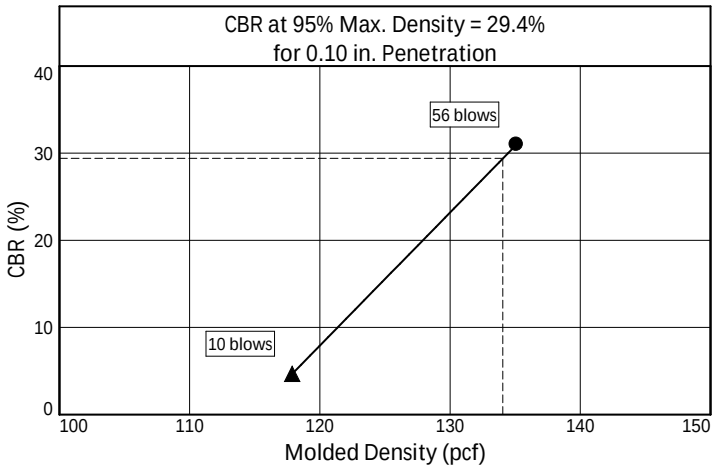
Remarks:
SG Assumed
Oversize material (>3/4") exceeds recommended ASTM guidelines (Max. 30% oversize allowed)

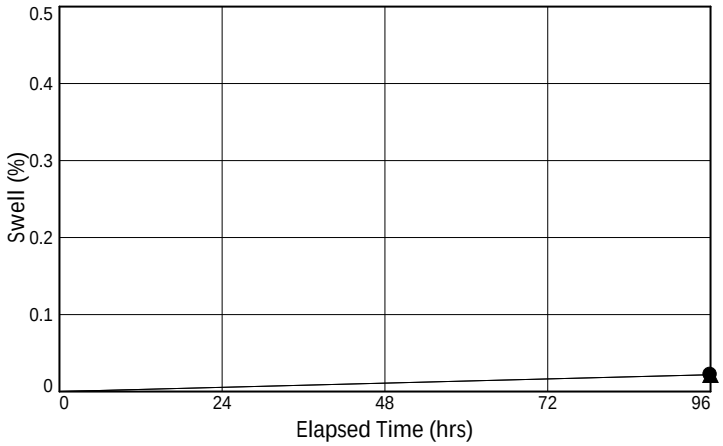
Figure

Tested By: RS Checked By: ANS

BEARING RATIO TEST REPORT
ASTM D1883-21







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	135.1	95.7	5.2	135.1	95.7	9.7	31.0	29.1	0.011	10	0
2 ▲	117.9	83.6	5.2	117.8	83.5	12.8	4.7	4.1	0.000	10	0
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Gray cmf Gravel, and Silt & Clay, little cmf Sand (Visual)		141.1	5.2		

Project No: IRN 24-N-107

Project: Starfire Solar, Knott County, KY

Sample Number: TP-01, CBR-1 Depth: 1'-3'

Date: 3/28/2024

BEARING RATIO TEST REPORT

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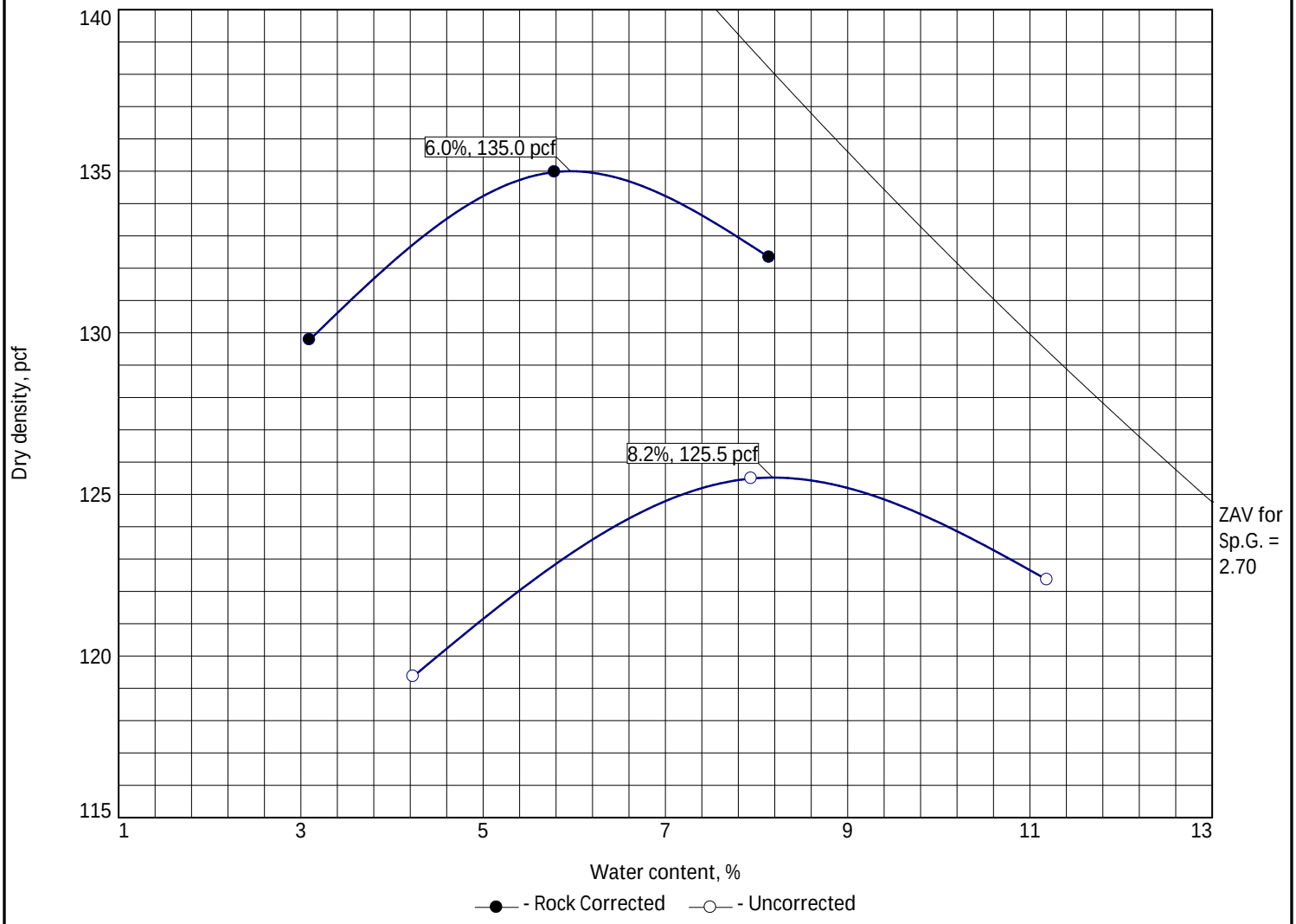
Test Remarks:

Saturation Period: 96 Hours

Figure _____

Tested By: MG Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			27.5	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 135.0 pcf	125.5 pcf	Pale Brown cmf Sand, and cmf Gravel, some Silt & Clay (Visual)
Optimum moisture = 6.0 %	8.2 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-12, CBR-2

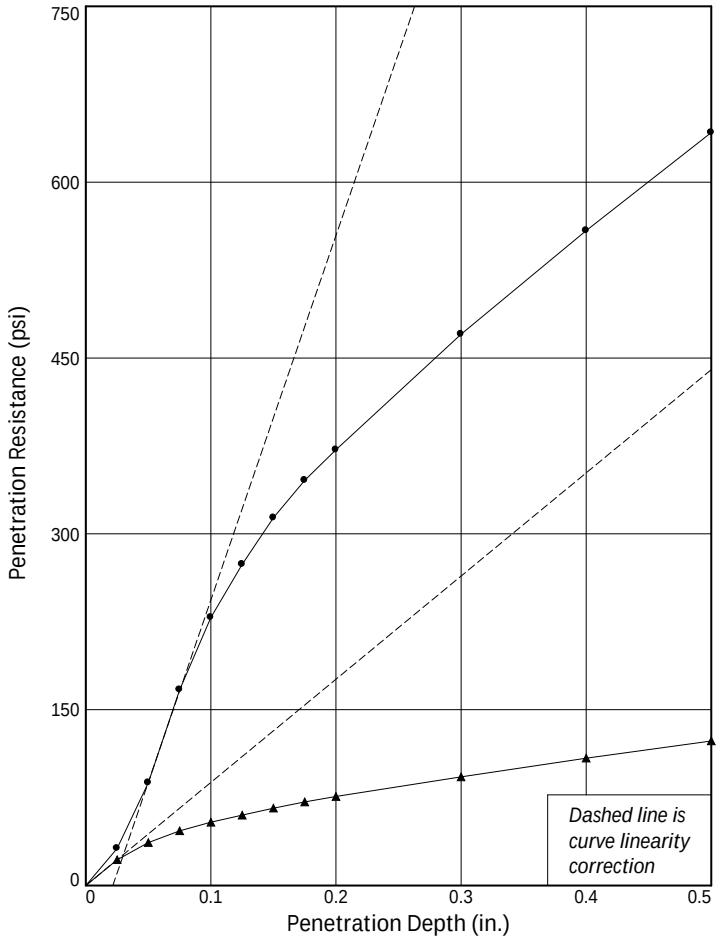
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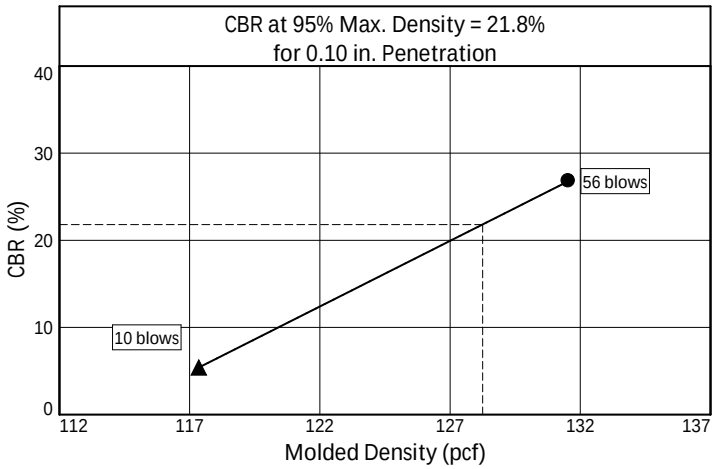
Remarks:
SG Assumed

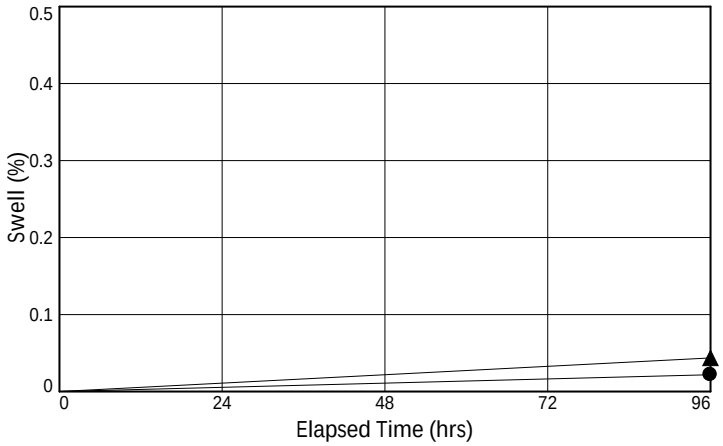
Figure

Tested By: RS Checked By: ANS

BEARING RATIO TEST REPORT
ASTM D1883-21







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	131.5	97.4	6.0	131.5	97.4	10.3	26.8	26.2	0.022	10	0
2 ▲	117.4	87	6.0	117.3	86.9	13.7	5.4	5.1	0.000	10	0
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Pale Brown cmf Sand, and cmf Gravel, some Silt & Clay (Visual)		135.0	6.0		

Project No: IRN 24-N-107

Project: Starfire Solar, Knott County, KY

Sample Number: TP-12, CBR-2 Depth: 1'-3'

Date: 3/28/2024

BEARING RATIO TEST REPORT

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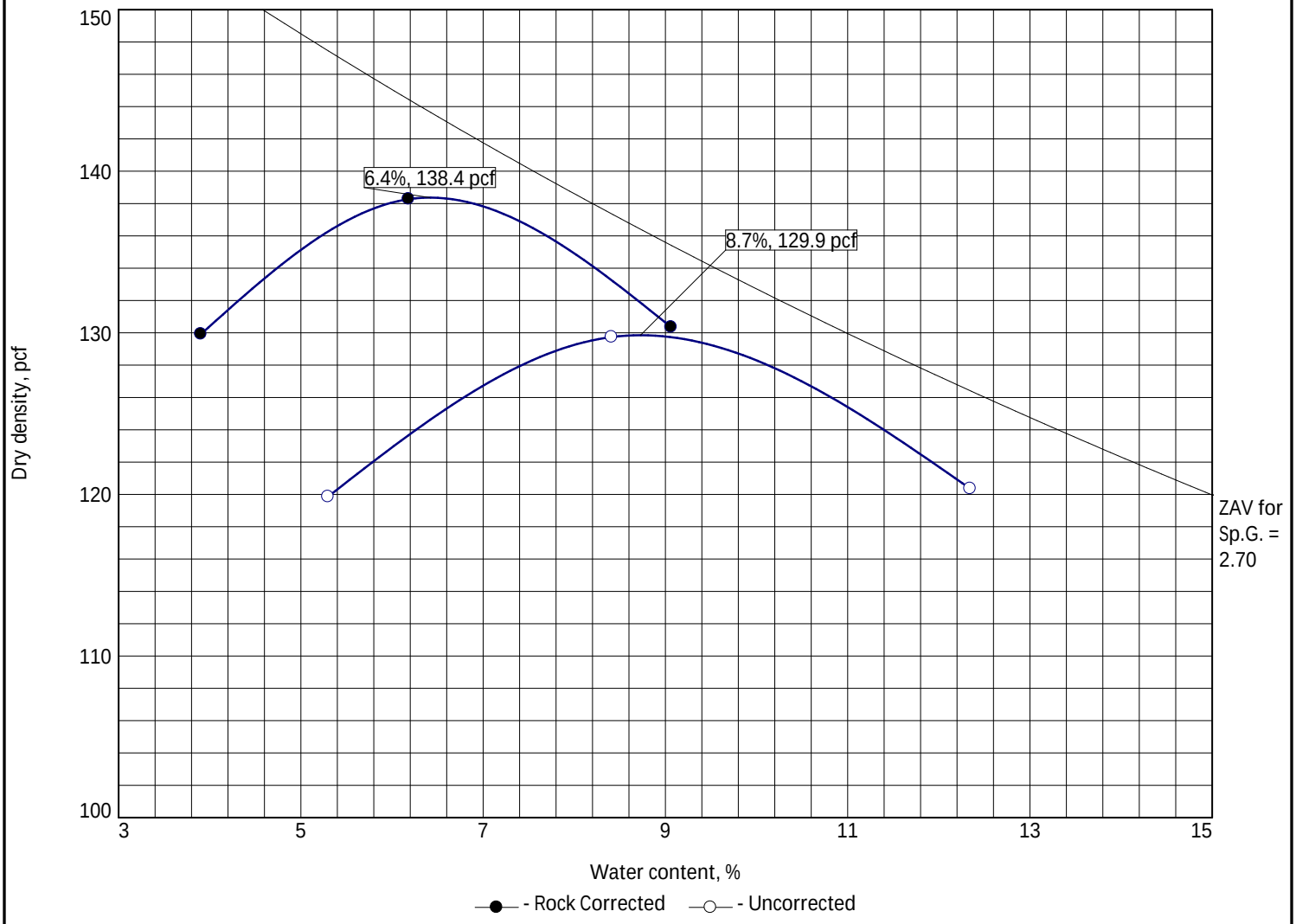
Test Remarks:

Saturation Period: 96 Hours

Figure _____

Tested By: MG Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			26.8	23.3

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 138.4 pcf	129.9 pcf	Pale Brown cmf Sand, and cmf Gravel, some(-) Silt & Clay (Visual)
Optimum moisture = 6.4 %	8.7 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-03, CBR-3

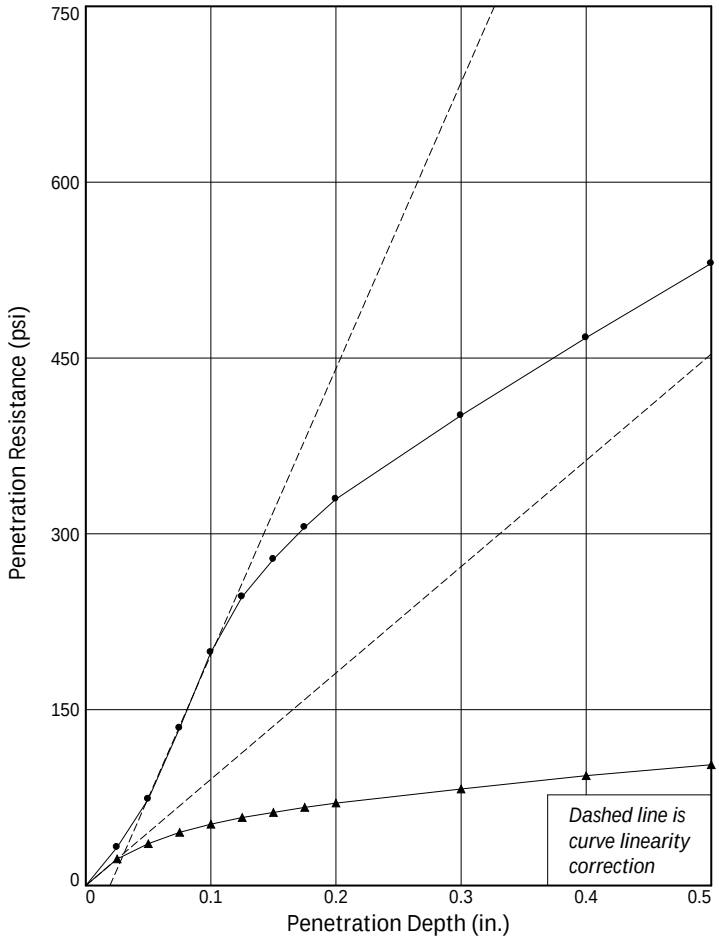
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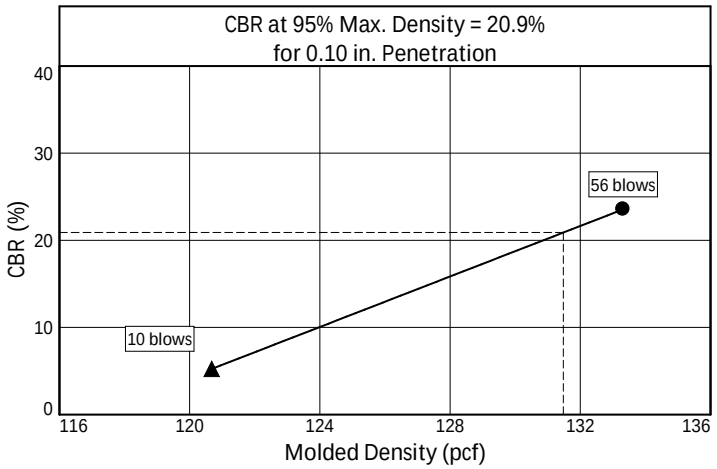
Remarks:
SG Assumed

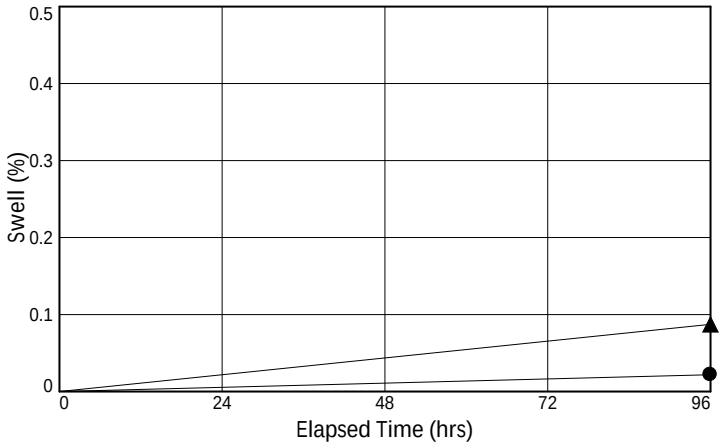
Figure

Tested By: RS Checked By: ANS

BEARING RATIO TEST REPORT
ASTM D1883-21







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	133.3	96.3	6.4	133.3	96.3	10.9	23.6	22.9	0.019	10	0
2 ▲	120.7	87.2	6.4	120.6	87.1	13.7	5.2	4.7	0.000	10	0.1
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Pale Brown cmf Sand, and cmf Gravel, some(-) Silt & Clay (Visual)		138.4	6.4		

Project No: IRN 24-N-107

Project: Starfire Solar, Knott County, KY

Sample Number: TP-03, CBR-3 Depth: 1'-3'

Date: 3/28/2024

BEARING RATIO TEST REPORT

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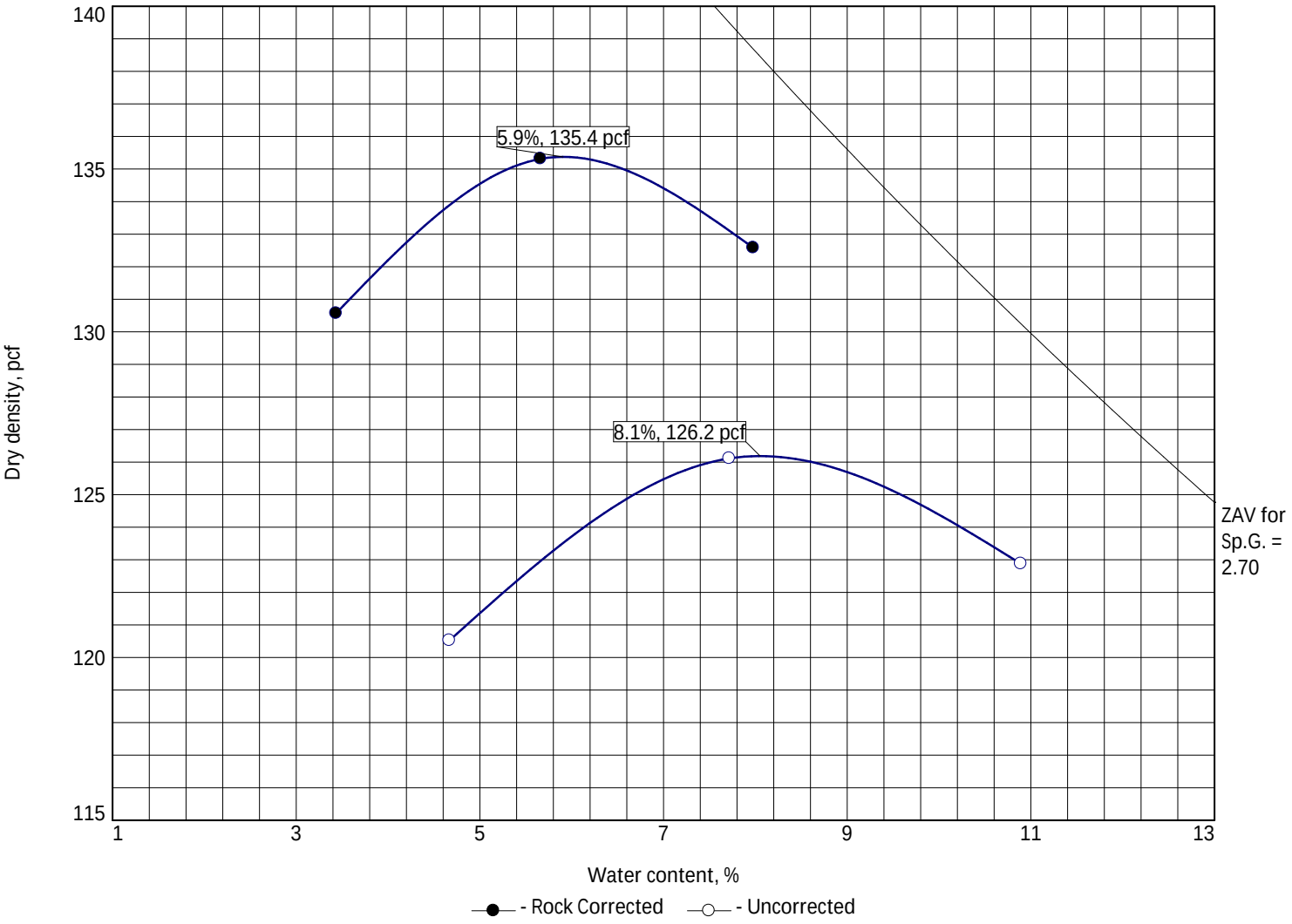
Test Remarks:

Saturation Period: 96 Hours

Figure _____

Tested By: MG Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			27	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 135.4 pcf	126.2 pcf	Light Gray cmf Sand, and cmf Gravel, some(-) Silt & Clay (Visual)
Optimum moisture = 5.9 %	8.1 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-08, CBR-4

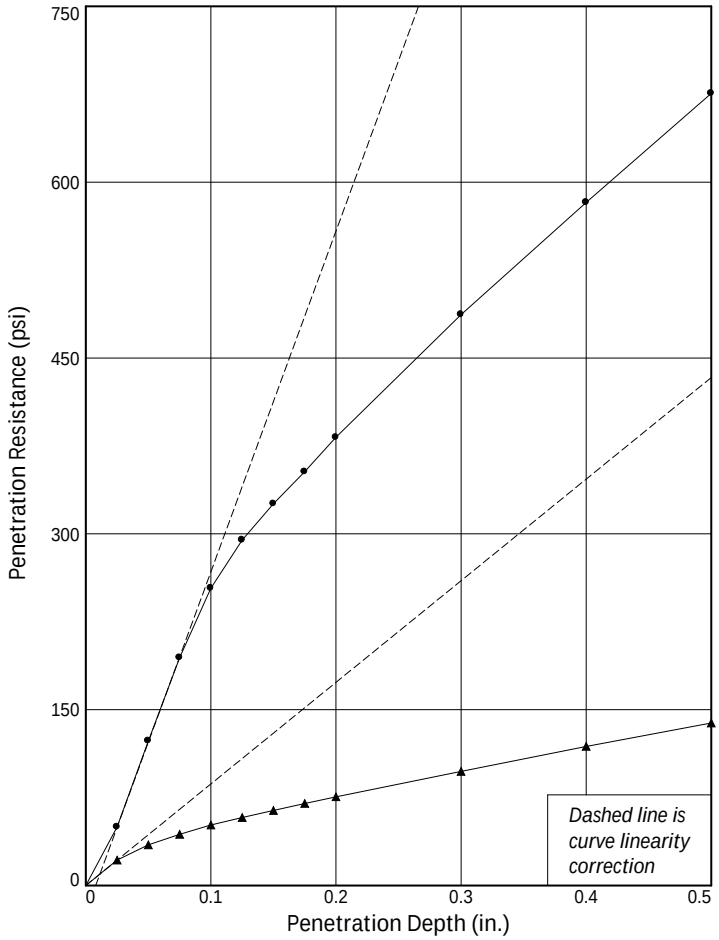
Remarks:
SG Assumed

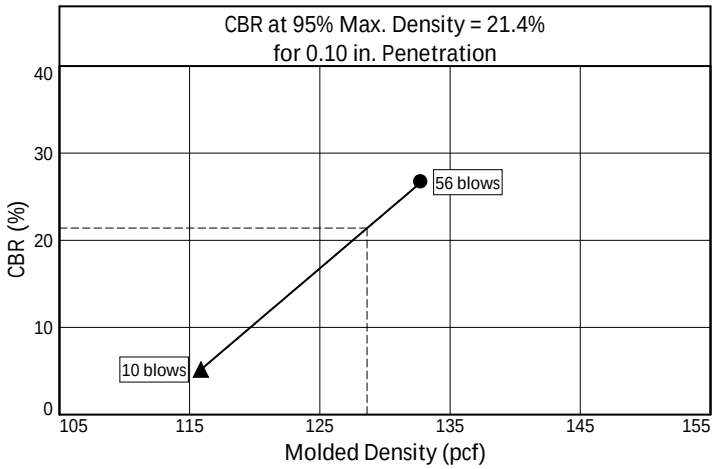
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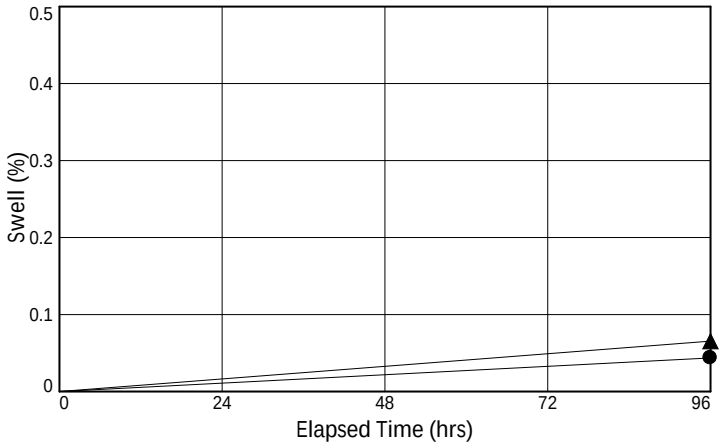
Figure

Tested By: RS Checked By: ANS

BEARING RATIO TEST REPORT
ASTM D1883-21







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	132.8	98.1	5.9	132.7	98	9.9	26.7	26.0	0.008	10	0
2 ▲	115.9	85.6	5.9	115.8	85.5	13.7	5.2	5.0	0.000	10	0.1
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Light Gray cmf Sand, and cmf Gravel, some(-) Silt & Clay (Visual)		135.4	5.9		

Project No: IRN 24-N-107

Project: Starfire Solar, Knott County, KY

Sample Number: TP-08, CBR-4 Depth: 1'-3'

Date: 3/28/2024

BEARING RATIO TEST REPORT

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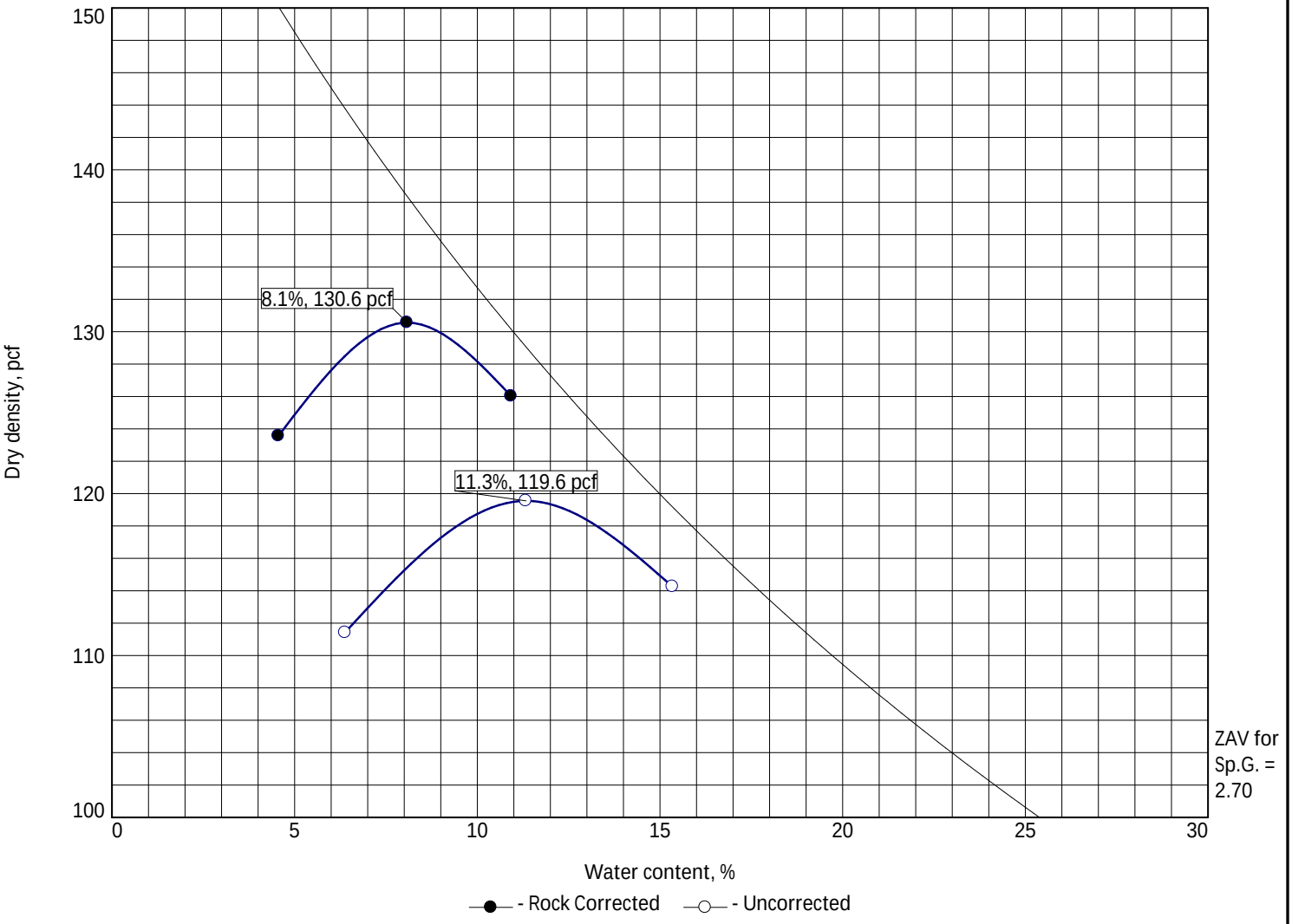
Test Remarks:

Saturation Period: 96 Hours

Figure _____

Tested By: MG Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1'-3'				2.7			29	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 130.6 pcf	119.6 pcf	Grayish Brown Silt & Clay, and cmf Gravel, some cmf Sand (Visual)
Optimum moisture = 8.1 %	11.3 %	

Project No. IRN 24-N-107 Client: BrightNight, LLC
Project: Starfire Solar, Knott County, KY
Date: 3/28/2024
○ Sample Number: TP-05, CBR-5

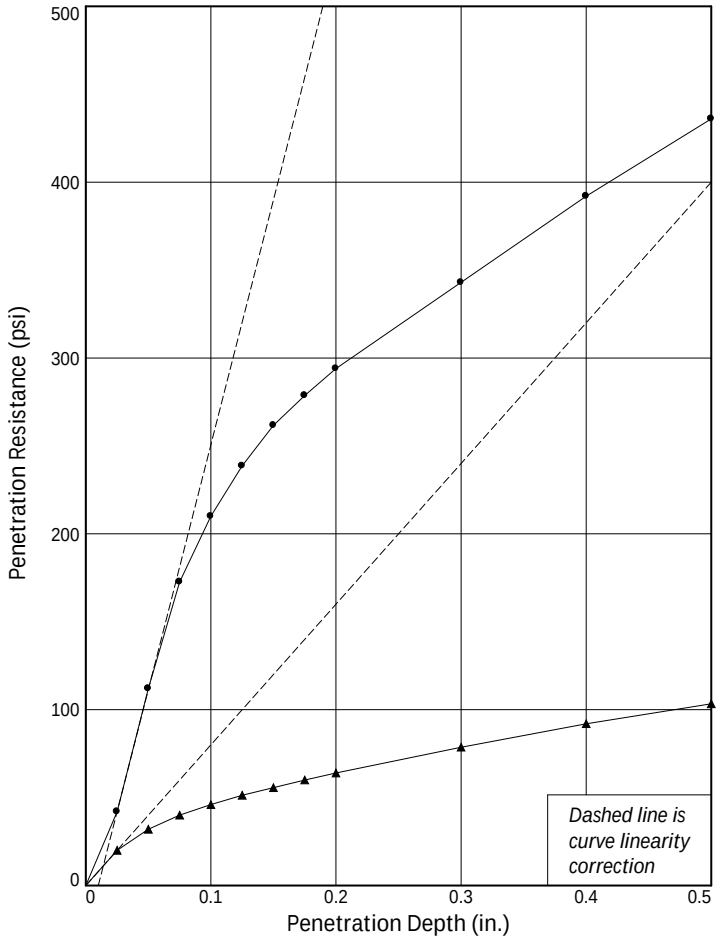
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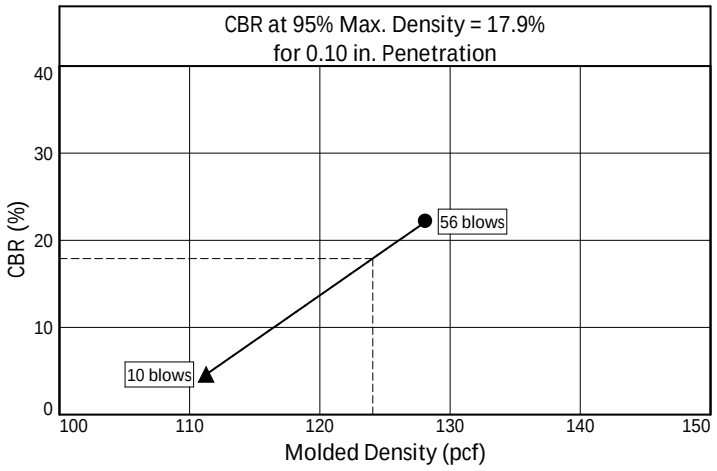
Remarks:
SG Assumed

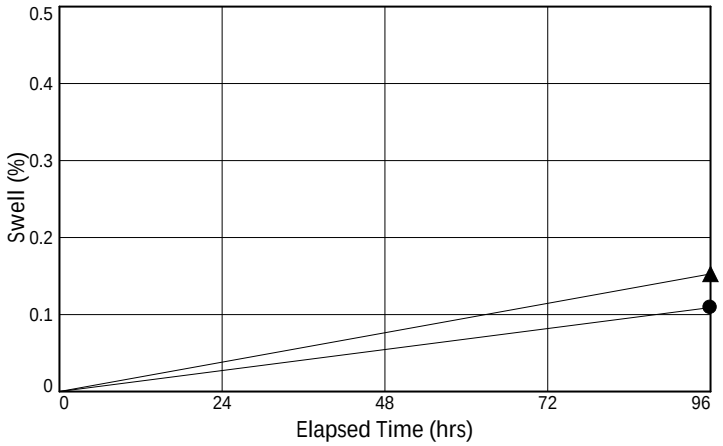
Figure

Tested By: MG Checked By: ANS

BEARING RATIO TEST REPORT
ASTM D1883-21







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ●	128.1	98.1	8.1	128.0	98	12.0	22.1	19.9	0.010	10	0.1
2 ▲	111.3	85.2	8.1	111.1	85.1	15.2	4.6	4.3	0.000	10	0.2
3 ■											

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Grayish Brown Silt & Clay, and cmf Gravel, some cmf Sand (Visual)		130.6	8.1		

Project No: IRN 24-N-107

Project: Starfire Solar, Knott County, KY

Sample Number: TP-05, CBR-5 Depth: 1'-3'

Date: 3/28/2024

BEARING RATIO TEST REPORT

ANS CONSULTANTS, INC.

Test Remarks:

Saturation Period: 96 Hours

Figure _____

Tested By: MG Checked By: ANS

MOISTURE CONTENT ANALYSIS RESULTS

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Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name: Bright Night, LLC
LAB IRN: 24-N-108
Project Name: Starfire Solar, Knott County, KY
Date: 3/20/2024

Sample ID	B-01, S-3	B-02, S-1	B-03, S-7	B-04, S-7	B-05, S-3
Depth	4'-6'	0'-2'	18'-20'	18'-20'	4'-6'
Wet soil + Tare (g)	668.7	741.7	907.5	387.8	508.5
Dry soil + Tare (g)	641.4	702.7	854.1	350.1	475.4
Wt. of Tare (g)	197.2	197.6	202.9	13.5	15.1
Moisture Content	**6.1%**	**7.7%**	**8.2%**	**11.2%**	**7.2%**

Sample ID	B-10, S-1	B-11, S-5	B-12, S-3	B-13, S-4
Depth	0'-2'	8'-10'	4'-6'	6'-8'
Wet soil + Tare (g)	333.0	353.9	895.4	412.0
Dry soil + Tare (g)	304.1	336.5	857.1	371.7
Wt. of Tare (g)	13.3	14.1	195.2	13.9
Moisture Content	**9.9%**	**5.4%**	**5.8%**	**11.3%**

Tested By: AG
Checked By: ANS

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Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name:	Bright Night, LLC	LAB IRN:	24-N-124
Project Name:	Starfire Solar, Knott County, KY	Date:	3/25/2024

Sample ID	B-08, S-3	B-25, S-5	B-09, S-1	B-24, S-7	B-16, S-5
Depth	4'-6'	8'-10'	0'-2'	18'-20'	8'-10'
Wet soil + Tare (g)	680.4	700.4	690.5	693.4	669.3
Dry soil + Tare (g)	649.2	636.1	660.8	658.6	644.0
Wt. of Tare (g)	188.8	194.0	204.8	195.6	197.5
Moisture Content	**6.8%**	**14.5%**	**6.5%**	**7.5%**	**5.7%**

Sample ID	B-17, S-2	B-15, S-6	B-06, S-2	B-07, S-3	B-14, S-4
Depth	2'-4'	13'-15'	2'-4'	4'-6'	6'-8'
Wet soil + Tare (g)	584.5	778.3	831.7	598.1	954.7
Dry soil + Tare (g)	559.3	741.3	811.2	569.3	901.0
Wt. of Tare (g)	195.3	197.3	193.9	194.6	202.9
Moisture Content	**6.9%**	**6.8%**	**3.3%**	**7.7%**	**7.7%**

Sample ID	B-22, S-7	B-23, S-5	B-18, S-2	B-20, S-3	B-21, S-4
Depth	18'-20'	8'-10'	2'-4'	2'-4'	6'-8'
Wet soil + Tare (g)	680.9	848.2	608.7	605.0	804.8
Dry soil + Tare (g)	651.0	819.9	577.4	583.6	766.5
Wt. of Tare (g)	196.3	197.2	195.7	190.8	197.2
Moisture Content	**6.6%**	**4.6%**	**8.2%**	**5.4%**	**6.7%**

Tested By: MM

Checked By: ANS

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Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name: Bright Night, LLC
LAB IRN: 24-N-124
Project Name: Starfire Solar, Knott County, KY
Date: 3/25/2024

Sample ID	B-19, S-7	B-19, CORR-5	B-22/23, CORR-6	B-07, CORR-7	B-09/25, CORR-8
Depth	18'-20'	2'-4'	2'-4'	2'-4'	2'-4'
Wet soil + Tare (g)	625.7	388.4	582.4	395.3	412.8
Dry soil + Tare (g)	583.8	371.0	538.4	369.5	371.1
Wt. of Tare (g)	191.7	12.8	14.1	13.2	14.4
Moisture Content	**10.7%**	**4.8%**	**8.4%**	**7.2%**	**11.7%**

Tested By: MM
Checked By: ANS

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Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

Client Name: BrightNight, LLC
Project Name: Starfire Solar, Knott County, KY
LAB IRN: 24-N-107
Date: 3/28/2024

Sample ID	TP-01, TRT-1	TP-05, TRT-2	TP-09, TRT-3	TP-11, TRT-4	TP-06, TRT-5
Depth	3'-5'	3'-5'	3'-5'	3'-5'	3'-5'
Wet soil + Tare (g)	190.1	178.9	178.0	338.7	170.3
Dry soil + Tare (g)	172.1	164.6	162.7	309.3	153.0
Wt. of Tare (g)	14.0	13.7	13.3	14.2	12.9
Moisture Content	**11.4%**	**9.5%**	**10.2%**	**10.0%**	**12.3%**

Sample ID	TP-07, TRT-6	B-12, CORR-1	B-05, CORR-2	B-03, CORR-3	B-02, CORR-4
Depth	3'-5'	2'-4'	2'-4'	2'-4'	2'-4'
Wet soil + Tare (g)	198.6	235.8	239.7	243.0	234.9
Dry soil + Tare (g)	178.6	218.1	226.9	222.4	219.0
Wt. of Tare (g)	14.6	13.4	13.3	14.2	13.4
Moisture Content	**12.2%**	**8.6%**	**6.0%**	**9.9%**	**7.7%**

Tested By: RS
Checked By: ANS

Attachment I

Seismic Site Class Data

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	37.406395
Risk Category:	II	**Longitude:**	-83.112148
Soil Class:	D - Stiff Soil	**Elevation:**	1362.602698006172 ft (NAVD 88)





Seismic

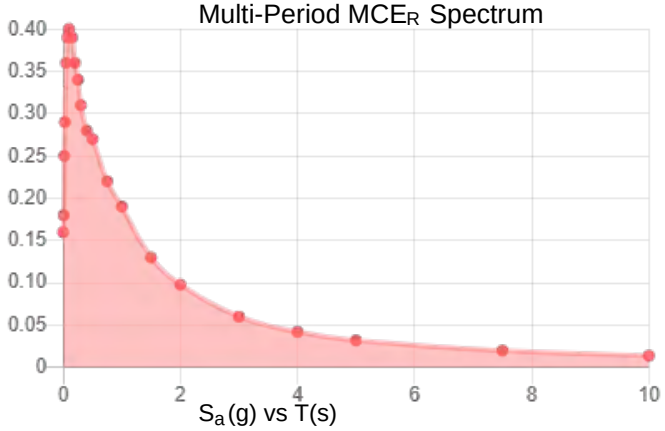
Site Soil Class: D - Stiff Soil

Results:

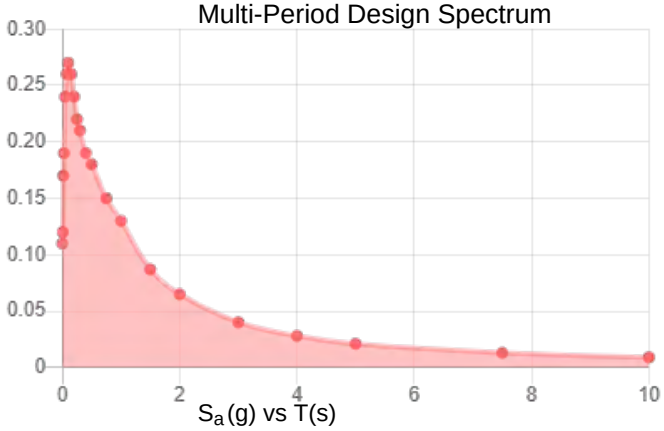
PGA_M :	0.15	T_L :	12
S_{MS} :	0.32	S_S :	0.27
S_{M1} :	0.19	S_1 :	0.09
S_{DS} :	0.22	V_{S30} :	260
S_{D1} :	0.13		

Seismic Design Category: B

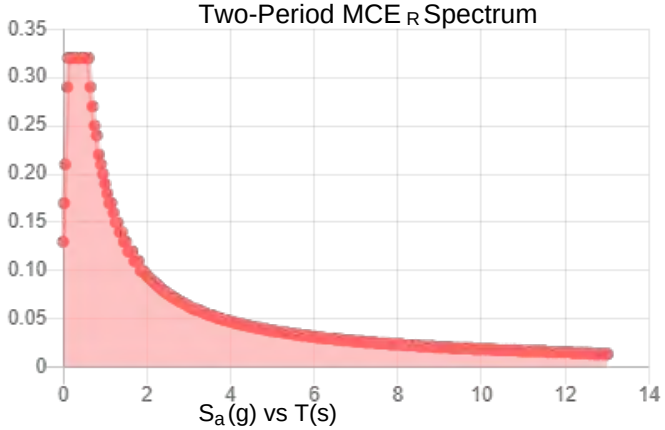
Multi-Period MCE_R Spectrum



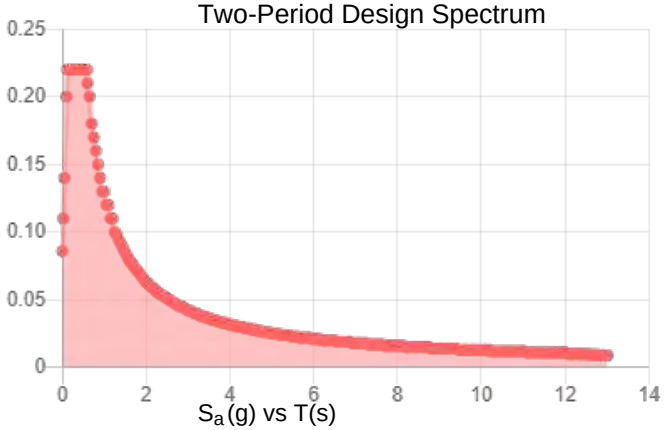
Multi-Period Design Spectrum



Two-Period MCE_R Spectrum



Two-Period Design Spectrum



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Wed Mar 27 2024**

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

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Attachment J

NRCS Mapping

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Breathitt County, Kentucky, Knott and Letcher Counties, Kentucky, and Leslie and Perry Counties, Kentucky



December 21, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

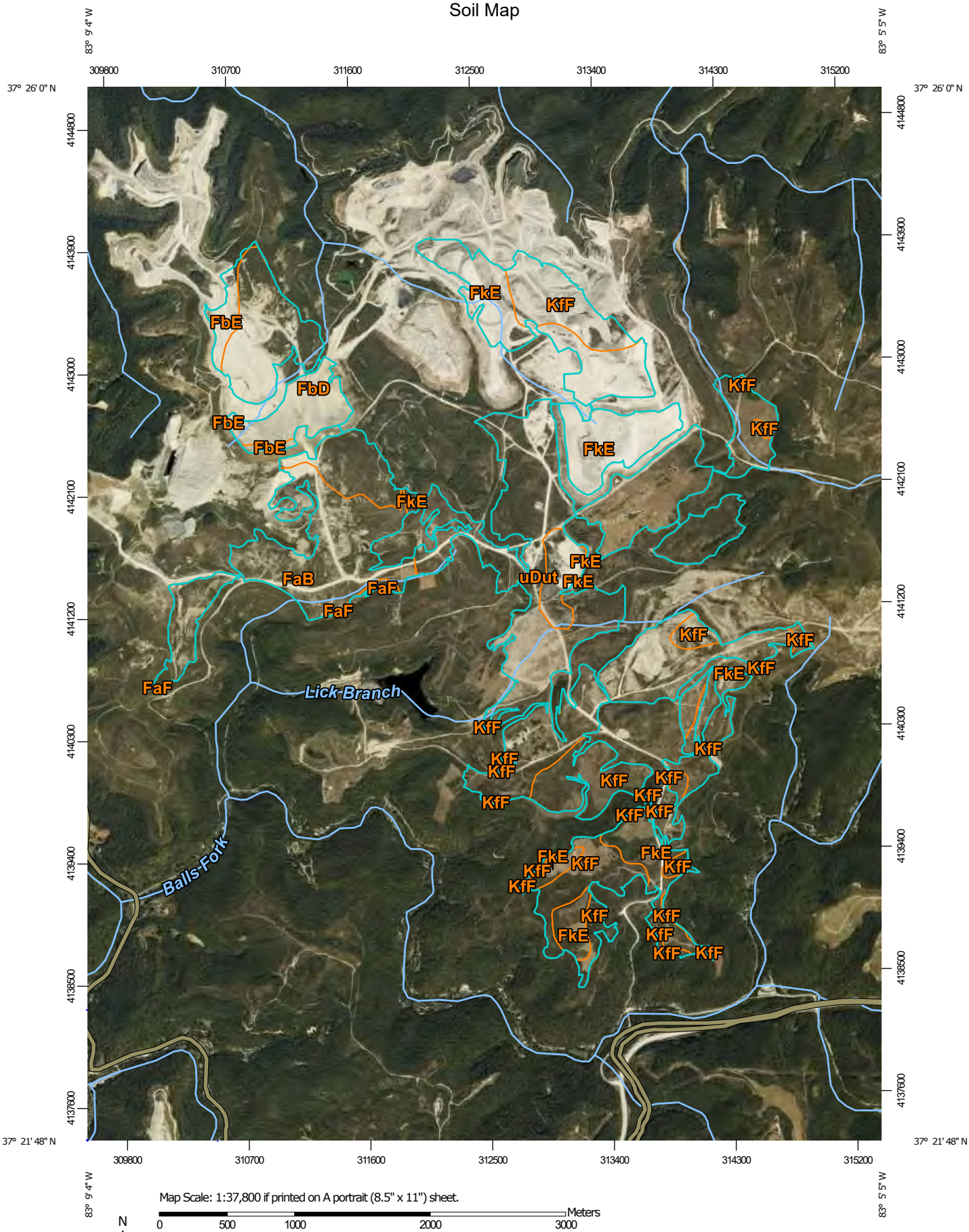
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



Map Scale: 1:37,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Breathitt County, Kentucky
Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Knott and Letcher Counties, Kentucky
Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Leslie and Perry Counties, Kentucky
Survey Area Data: Version 20, Sep 10, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 9, 2016—Sep 15, 2019

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FbD	Fairpoint and Bethesda soils, 0 to 20 percent slopes	244.1	13.0%
FbE	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	28.6	1.5%
Subtotals for Soil Survey Area		**272.7**	**14.5%**
Totals for Area of Interest		**1,881.4**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FkE	Fiveblock and Kaymine soils, 0 to 30 percent slopes, stony	1,024.1	54.4%
KfF	Kaymine, Fairpoint, and Fiveblock soils, benched, 2 to 70 percent slopes, very stony	308.8	16.4%
uDut	Dumps, mine and tailings	40.2	2.1%
Subtotals for Soil Survey Area		**1,373.1**	**73.0%**
Totals for Area of Interest		**1,881.4**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FaB	Fairpoint soils, undulating	230.0	12.2%
FaF	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	5.6	0.3%
Subtotals for Soil Survey Area		**235.6**	**12.5%**
Totals for Area of Interest		**1,881.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made

up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Breathitt County, Kentucky

FbD—Fairpoint and Bethesda soils, 0 to 20 percent slopes

Map Unit Setting

National map unit symbol: lgny
Elevation: 700 to 1,800 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 42 to 68 degrees F
Frost-free period: 175 to 222 days
Farmland classification: Not prime farmland

Map Unit Composition

Fairpoint, unstable fill, and similar soils: 50 percent
Bethesda, unstable fill, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fairpoint, Unstable Fill

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy-skeletal mine spoil or earthy fill derived from sedimentary rock

Typical profile

H1 - 0 to 5 inches: channery loam
H2 - 5 to 60 inches: very channery loam

Properties and qualities

Slope: 0 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Bethesda, Unstable Fill

Setting

Landform: Ridges
Landform position (two-dimensional): Summit

Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy-skeletal mine spoil or earthy fill derived from sedimentary rock

Typical profile

H1 - 0 to 4 inches: channery loam
H2 - 4 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 20 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Dekalb

Percent of map unit: 2 percent
Hydric soil rating: No

Gilpin

Percent of map unit: 2 percent
Hydric soil rating: No

Marrowbone

Percent of map unit: 2 percent
Hydric soil rating: No

Cloverlick

Percent of map unit: 2 percent
Hydric soil rating: No

Hazleton

Percent of map unit: 2 percent
Hydric soil rating: No

Kimper

Percent of map unit: 2 percent
Hydric soil rating: No

Shelocta

Percent of map unit: 2 percent
Hydric soil rating: No

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

FbE—Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony

Map Unit Setting

National map unit symbol: 2tqhd
Elevation: 720 to 1,510 feet
Mean annual precipitation: 45 to 57 inches
Mean annual air temperature: 43 to 68 degrees F
Frost-free period: 169 to 203 days
Farmland classification: Not prime farmland

Map Unit Composition

Fairpoint, unstable fill, and similar soils: 55 percent
Bethesda, unstable fill, and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fairpoint, Unstable Fill

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy-skeletal coal extraction mine spoil derived from sandstone and shale

Typical profile

Ap - 0 to 11 inches: channery loam
C1 - 11 to 32 inches: very channery loam
C2 - 32 to 41 inches: extremely channery loam
C3 - 41 to 51 inches: extremely flaggy loam
C4 - 51 to 58 inches: extremely flaggy silt loam
C5 - 58 to 72 inches: extremely flaggy loam

Properties and qualities

Slope: 2 to 70 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Bethesda, Unstable Fill

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy-skeletal coal extraction mine spoil derived from sandstone and shale

Typical profile

Ap - 0 to 12 inches: channery silt loam
C1 - 12 to 36 inches: very channery loam
C2 - 36 to 58 inches: very channery loam
C3 - 58 to 72 inches: very channery loam

Properties and qualities

Slope: 2 to 70 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Udorthents, unstable fill

Percent of map unit: 5 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Shelocta, very stony

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Matewan, very stony

Percent of map unit: 3 percent
Landform: Ridges
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Urban land

Percent of map unit: 2 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Dumps, mine (tailings & tipples)

Percent of map unit: 2 percent
Landform: Ridges
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Knott and Letcher Counties, Kentucky

FkE—Fiveblock and Kaymine soils, 0 to 30 percent slopes, stony

Map Unit Setting

National map unit symbol: lh2j
Elevation: 800 to 3,000 feet
Mean annual precipitation: 28 to 47 inches
Mean annual air temperature: 42 to 67 degrees F
Frost-free period: 159 to 199 days
Farmland classification: Not prime farmland

Map Unit Composition

Fiveblock, unstable fill, and similar soils: 41 percent
Kaymine, unstable fill, and similar soils: 39 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fiveblock, Unstable Fill

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy skeletal coal extraction mine spoil derived from interbedded sedimentary rock

Typical profile

H1 - 0 to 14 inches: channery sandy loam
H2 - 14 to 65 inches: very channery sandy loam

Properties and qualities

Slope: 0 to 30 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Kaymine, Unstable Fill

Setting

Landform: Ridges

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy skeletal coal extraction mine spoil derived from interbedded sedimentary rock

Typical profile

H1 - 0 to 14 inches: channery silt loam
H2 - 14 to 80 inches: very channery silt loam

Properties and qualities

Slope: 0 to 30 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Cedarcreek, unstable fill

Percent of map unit: 5 percent
Hydric soil rating: No

Sewell, unstable fill

Percent of map unit: 5 percent
Hydric soil rating: No

Fairpoint, unstable fill

Percent of map unit: 5 percent
Hydric soil rating: No

Itmann, unstable fill

Percent of map unit: 3 percent
Hydric soil rating: No

Bethesda, unstable fill

Percent of map unit: 2 percent
Hydric soil rating: No

KfF—Kaymine, Fairpoint, and Fiveblock soils, benched, 2 to 70 percent slopes, very stony

Map Unit Setting

National map unit symbol: lh2w
Elevation: 800 to 3,800 feet
Mean annual precipitation: 28 to 47 inches
Mean annual air temperature: 42 to 67 degrees F
Frost-free period: 159 to 199 days
Farmland classification: Not prime farmland

Map Unit Composition

Kaymine, unstable fill, and similar soils: 40 percent
Fairpoint, unstable fill, and similar soils: 20 percent
Fiveblock, unstable fill, and similar soils: 15 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kaymine, Unstable Fill

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy coal extraction mine spoil derived from interbedded sedimentary rock

Typical profile

H1 - 0 to 14 inches: channery silt loam
H2 - 14 to 80 inches: very channery silt loam

Properties and qualities

Slope: 2 to 70 percent
Surface area covered with cobbles, stones or boulders: 1.5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Fairpoint, Unstable Fill

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy coal extraction mine spoil derived from interbedded sedimentary rock

Typical profile

H1 - 0 to 4 inches: channery silty clay loam
H2 - 4 to 72 inches: very channery silty clay loam

Properties and qualities

Slope: 2 to 70 percent
Surface area covered with cobbles, stones or boulders: 1.5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Fiveblock, Unstable Fill

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy coal extraction mine spoil derived from interbedded sedimentary rock

Typical profile

H1 - 0 to 14 inches: channery sandy loam
H2 - 14 to 65 inches: very channery sandy loam

Properties and qualities

Slope: 2 to 70 percent
Surface area covered with cobbles, stones or boulders: 1.5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Cedarcreek, unstable fill
Percent of map unit: 8 percent
Hydric soil rating: No

Bethesda, unstable fill
Percent of map unit: 7 percent
Hydric soil rating: No

Shelocta
Percent of map unit: 3 percent
Hydric soil rating: No

Sewell, unstable fill
Percent of map unit: 3 percent
Hydric soil rating: No

Udorthents, unstable fill
Percent of map unit: 2 percent
Hydric soil rating: No

Itmann, unstable fill
Percent of map unit: 2 percent
Hydric soil rating: No

uDut—Dumps, mine and tailings

Map Unit Setting
National map unit symbol: 2mtj7
Elevation: 720 to 1,510 feet
Mean annual precipitation: 45 to 57 inches
Mean annual air temperature: 43 to 68 degrees F
Frost-free period: 169 to 203 days
Farmland classification: Not prime farmland

Map Unit Composition

Dumps, mine (tailings & tipples): 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dumps, Mine (tailings & Tipples)

Setting

Landform: Hillslopes
Landform position (three-dimensional): Base slope

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Minor Components

Fairpoint, unstable fill

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Urban land

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (three-dimensional): Base slope
Hydric soil rating: No

Udorthents, unstable fill

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, concave
Across-slope shape: Linear
Hydric soil rating: No

Leslie and Perry Counties, Kentucky

FaB—Fairpoint soils, undulating

Map Unit Setting

National map unit symbol: ljk2
Elevation: 820 to 2,460 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 42 to 67 degrees F
Frost-free period: 156 to 196 days
Farmland classification: Not prime farmland

Map Unit Composition

Fairpoint, unstable fill, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fairpoint, Unstable Fill

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy skeletal coal extraction mine spoil derived from interbedded sedimentary rock

Typical profile

H1 - 0 to 6 inches: very channery silt loam
H2 - 6 to 62 inches: very channery silt loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Shelocta

Percent of map unit: 4 percent
Hydric soil rating: No

Cutshin

Percent of map unit: 4 percent
Hydric soil rating: No

Dekalb

Percent of map unit: 4 percent
Hydric soil rating: No

Gilpin

Percent of map unit: 3 percent
Hydric soil rating: No

FaF—Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony

Map Unit Setting

National map unit symbol: 2tqhd
Elevation: 720 to 1,510 feet
Mean annual precipitation: 45 to 57 inches
Mean annual air temperature: 43 to 68 degrees F
Frost-free period: 169 to 203 days
Farmland classification: Not prime farmland

Map Unit Composition

Fairpoint, unstable fill, and similar soils: 55 percent
Bethesda, unstable fill, and similar soils: 30 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fairpoint, Unstable Fill

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy-skeletal coal extraction mine spoil derived from sandstone and shale

Typical profile

Ap - 0 to 11 inches: channery loam
C1 - 11 to 32 inches: very channery loam
C2 - 32 to 41 inches: extremely channery loam
C3 - 41 to 51 inches: extremely flaggy loam
C4 - 51 to 58 inches: extremely flaggy silt loam
C5 - 58 to 72 inches: extremely flaggy loam

Properties and qualities

Slope: 2 to 70 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Bethesda, Unstable Fill

Setting

Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy-skeletal coal extraction mine spoil derived from sandstone and shale

Typical profile

Ap - 0 to 12 inches: channery silt loam
C1 - 12 to 36 inches: very channery loam
C2 - 36 to 58 inches: very channery loam
C3 - 58 to 72 inches: very channery loam

Properties and qualities

Slope: 2 to 70 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Udorthents, unstable fill

Percent of map unit: 5 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Shelocta, very stony

Percent of map unit: 3 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Matewan, very stony

Percent of map unit: 3 percent
Landform: Ridges
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Urban land

Percent of map unit: 2 percent
Landform: Mountain slopes
Landform position (three-dimensional): Mountainflank
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Dumps, mine (tailings & tipples)

Percent of map unit: 2 percent
Landform: Ridges
Landform position (three-dimensional): Mountaintop
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete

ENG

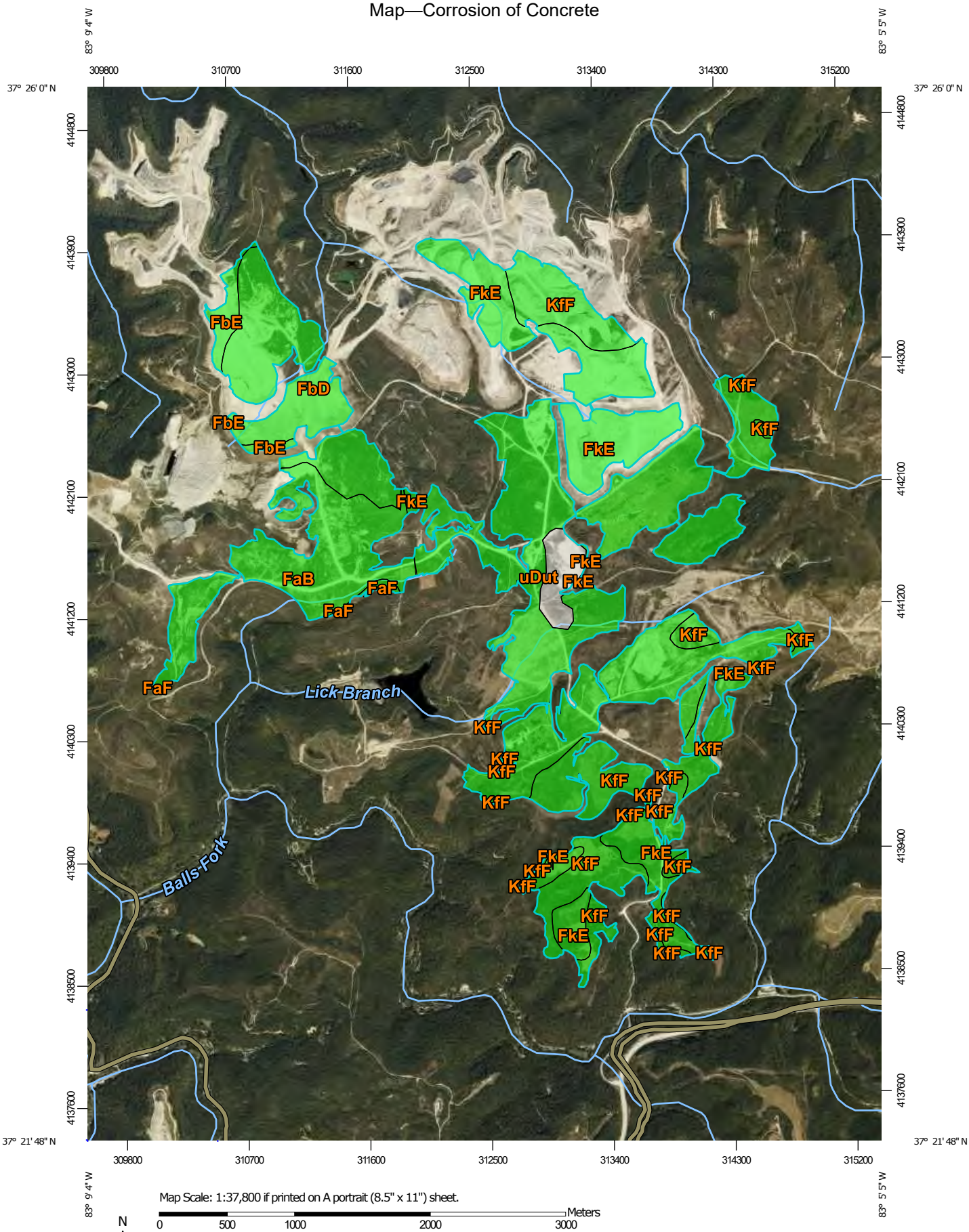
Engineering

AGR

Agronomy

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."


83° 9' 4" W
83° 5' 5" W
37° 26' 0" N
37° 21' 48" N
309800
310700
311600
312500
313400
314300
315200
4144800
4143900
4143000
4142100
4141200
4140300
4139400
4138500
4137600
FbE
FbD
FkE
KfF
FaB
FaF
uDut
Lick Branch
Balls Fork
Map Scale: 1:37,800 if printed on A portrait (8.5" x 11") sheet.
N
0 500 1000 2000 3000 Meters
0 1500 3000 6000 9000 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- High
- Moderate
- Low
- Not rated or not available

Soil Rating Lines
- High
- Moderate
- Low
- Not rated or not available

Soil Rating Points
- High
- Moderate
- Low
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Breathitt County, Kentucky
Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Knott and Letcher Counties, Kentucky
Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Leslie and Perry Counties, Kentucky
Survey Area Data: Version 20, Sep 10, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 9, 2016—Sep 15, 2019

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Concrete

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FbD	Fairpoint and Bethesda soils, 0 to 20 percent slopes	Low	244.1	13.0%
FbE	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Low	28.6	1.5%
Subtotals for Soil Survey Area			**272.7**	**14.5%**
Totals for Area of Interest			**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FkE	Fiveblock and Kaymine soils, 0 to 30 percent slopes, stony	Low	1,024.1	54.4%
KfF	Kaymine, Fairpoint, and Fiveblock soils, benched, 2 to 70 percent slopes, very stony	Low	308.8	16.4%
uDut	Dumps, mine and tailings		40.2	2.1%
Subtotals for Soil Survey Area			**1,373.1**	**73.0%**
Totals for Area of Interest			**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FaB	Fairpoint soils, undulating	Low	230.0	12.2%
FaF	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Low	5.6	0.3%
Subtotals for Soil Survey Area			**235.6**	**12.5%**
Totals for Area of Interest			**1,881.4**	**100.0%**

Rating Options—Corrosion of Concrete

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Corrosion of Steel

ENG

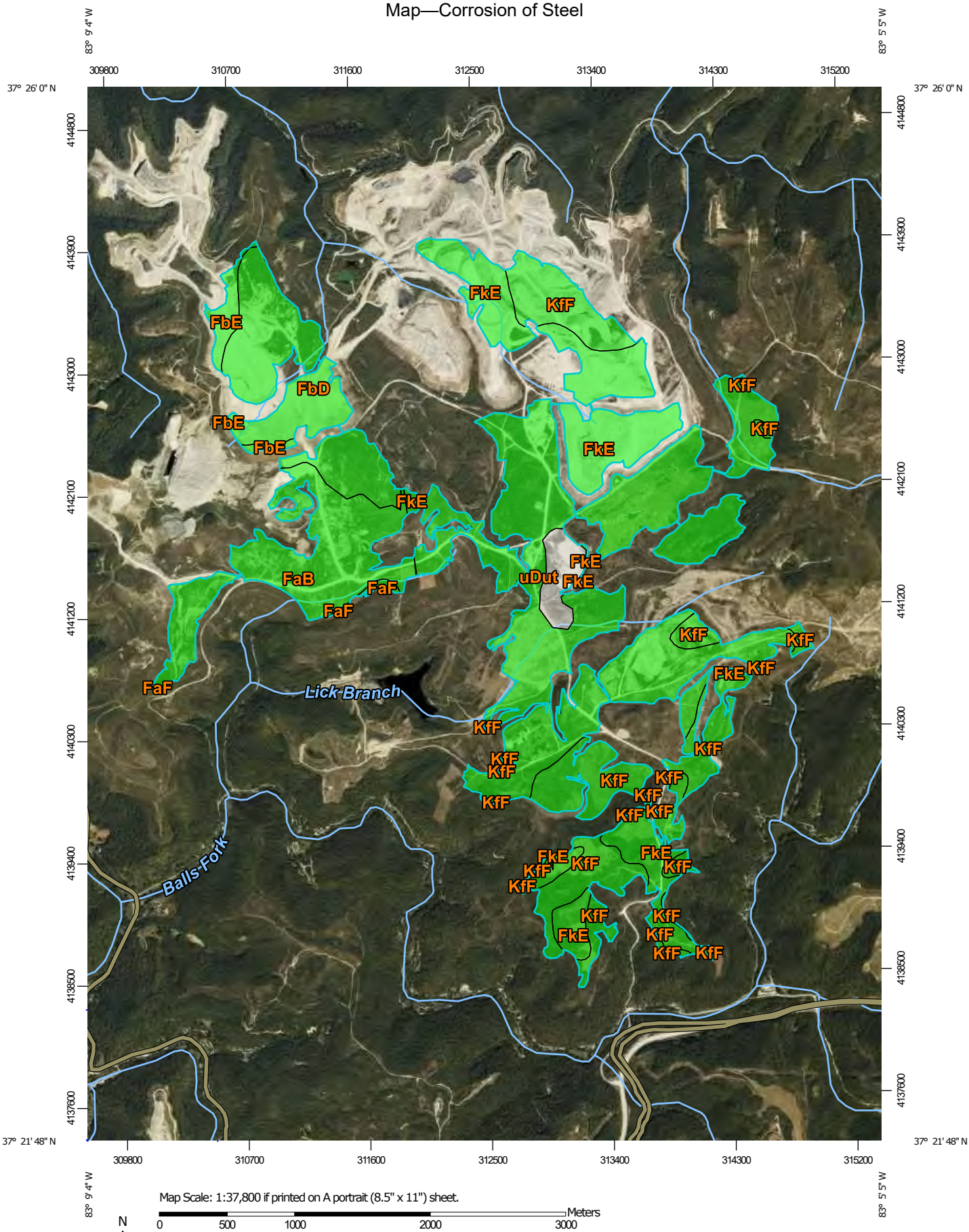
Engineering

AGR

Agronomy

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."



Map Scale: 1:37,800 if printed on A portrait (8.5" x 11") sheet.

N

0 500 1000 2000 3000 Meters

0 1500 3000 6000 9000 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- High
- Moderate
- Low
- Not rated or not available

Soil Rating Lines
- High
- Moderate
- Low
- Not rated or not available

Soil Rating Points
- High
- Moderate
- Low
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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Soil Survey Area: Knott and Letcher Counties, Kentucky
Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Leslie and Perry Counties, Kentucky
Survey Area Data: Version 20, Sep 10, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 9, 2016—Sep 15, 2019

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Steel

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FbD	Fairpoint and Bethesda soils, 0 to 20 percent slopes	Low	244.1	13.0%
FbE	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Low	28.6	1.5%
Subtotals for Soil Survey Area			**272.7**	**14.5%**
Totals for Area of Interest			**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FkE	Fiveblock and Kaymine soils, 0 to 30 percent slopes, stony	Low	1,024.1	54.4%
KfF	Kaymine, Fairpoint, and Fiveblock soils, benched, 2 to 70 percent slopes, very stony	Low	308.8	16.4%
uDut	Dumps, mine and tailings		40.2	2.1%
Subtotals for Soil Survey Area			**1,373.1**	**73.0%**
Totals for Area of Interest			**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FaB	Fairpoint soils, undulating	Low	230.0	12.2%
FaF	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Low	5.6	0.3%
Subtotals for Soil Survey Area			**235.6**	**12.5%**
Totals for Area of Interest			**1,881.4**	**100.0%**

Rating Options—Corrosion of Steel

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Land Management

Land management interpretations are tools designed to guide the user in evaluating existing conditions in planning and predicting the soil response to various land

management practices, for a variety of land uses, including cropland, forestland, hayland, pastureland, horticulture, and rangeland. Example interpretations include suitability for a variety of irrigation practices, log landings, haul roads and major skid trails, equipment operability, site preparation, suitability for hand and mechanical planting, potential erosion hazard associated with various practices, and ratings for fencing and waterline installation.

Erosion Hazard (Off-Road, Off-Trail)

FOR - Forestry

As of 9/30/2022, this rating is not working as intended. All components appear as not rated. This rating will be fixed on 10/01/2023.

The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope, soil erosion factor K, and an index of rainfall erosivity (R). The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance.

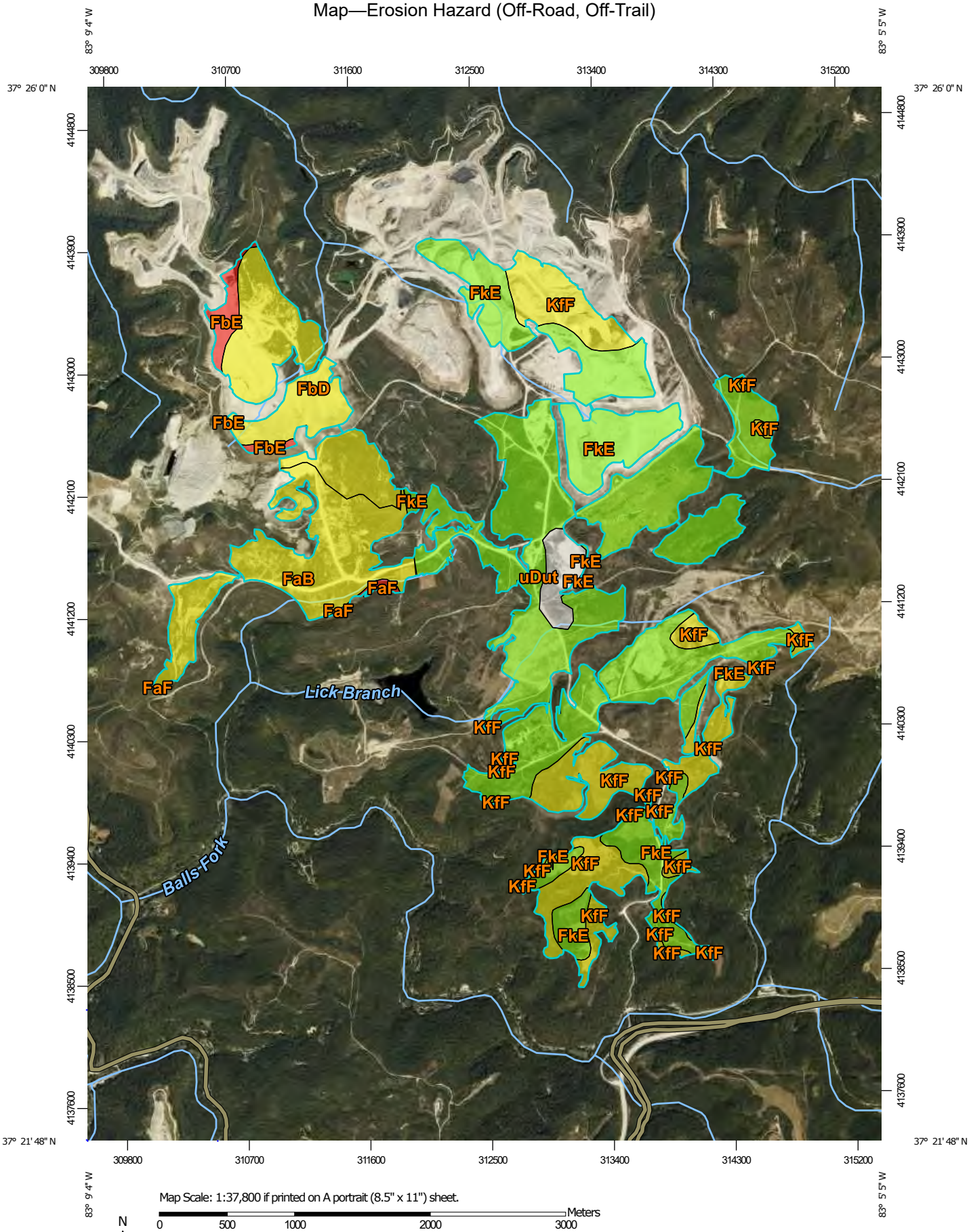
The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," "severe," or "very severe." A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures may be needed; "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and "very severe" indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Erosion Hazard (Off-Road, Off-Trail)



Map Scale: 1:37,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Lines
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Points
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Leslie and Perry Counties, Kentucky
Survey Area Data: Version 20, Sep 10, 2023

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Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 9, 2016—Sep 15, 2019

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Erosion Hazard (Off-Road, Off-Trail)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
FbD	Fairpoint and Bethesda soils, 0 to 20 percent slopes	Moderate	Fairpoint, unstable fill (50%)	Surface kw times slope times R index (0.59)	244.1	13.0%
			Bethesda, unstable fill (35%)	Surface kw times slope times R index (0.65)		
FbE	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Very Severe	Fairpoint, unstable fill (55%)	Surface kw times slope times R index (1.00)	28.6	1.5%
			Bethesda, unstable fill (30%)	Surface kw times slope times R index (1.00)		
			Udorthents, unstable fill (5%)	Surface kw times slope times R index (1.00)		
			Shelocta, very stony (3%)	Surface kw times slope times R index (1.00)		
Subtotals for Soil Survey Area					**272.7**	**14.5%**
Totals for Area of Interest					**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
FkE	Fiveblock and Kaymine soils, 0 to 30 percent slopes, stony	Slight	Fiveblock, unstable fill (41%)		1,024.1	54.4%
KfF	Kaymine, Fairpoint, and Fiveblock soils, benched, 2 to 70 percent slopes, very stony	Moderate	Kaymine, unstable fill (40%)	Surface kw times slope times R index (0.75)	308.8	16.4%
			Fiveblock, unstable fill (15%)	Surface kw times slope times R index (0.42)		
uDut	Dumps, mine and tailings	Not rated	Dumps, mine (tailings & tipples) (85%)		40.2	2.1%
			Urban land (5%)			
Subtotals for Soil Survey Area					**1,373.1**	**73.0%**
Totals for Area of Interest					**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
FaB	Fairpoint soils, undulating	Moderate	Fairpoint, unstable fill (85%)	Surface kw times slope times R index (0.14)	230.0	12.2%
FaF	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Very Severe	Fairpoint, unstable fill (55%)	Surface kw times slope times R index (1.00)	5.6	0.3%
			Bethesda, unstable fill (30%)	Surface kw times slope times R index (1.00)		
			Udorthents, unstable fill (5%)	Surface kw times slope times R index (1.00)		
			Shelocta, very stony (3%)	Surface kw times slope times R index (1.00)		
Subtotals for Soil Survey Area					**235.6**	**12.5%**
Totals for Area of Interest					**1,881.4**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Slight	1,024.1	54.4%
Moderate	782.9	41.6%
Very Severe	34.2	1.8%
Null or Not Rated	40.2	2.1%
Totals for Area of Interest	**1,881.4**	**100.0%**

Rating Options—Erosion Hazard (Off-Road, Off-Trail)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Erosion Hazard (Road, Trail)

FOR - Forestry

The ratings in this interpretation indicate the hazard of soil loss from unsurfaced roads and trails. The ratings are based on soil erosion factor K, slope, and content of rock fragments.

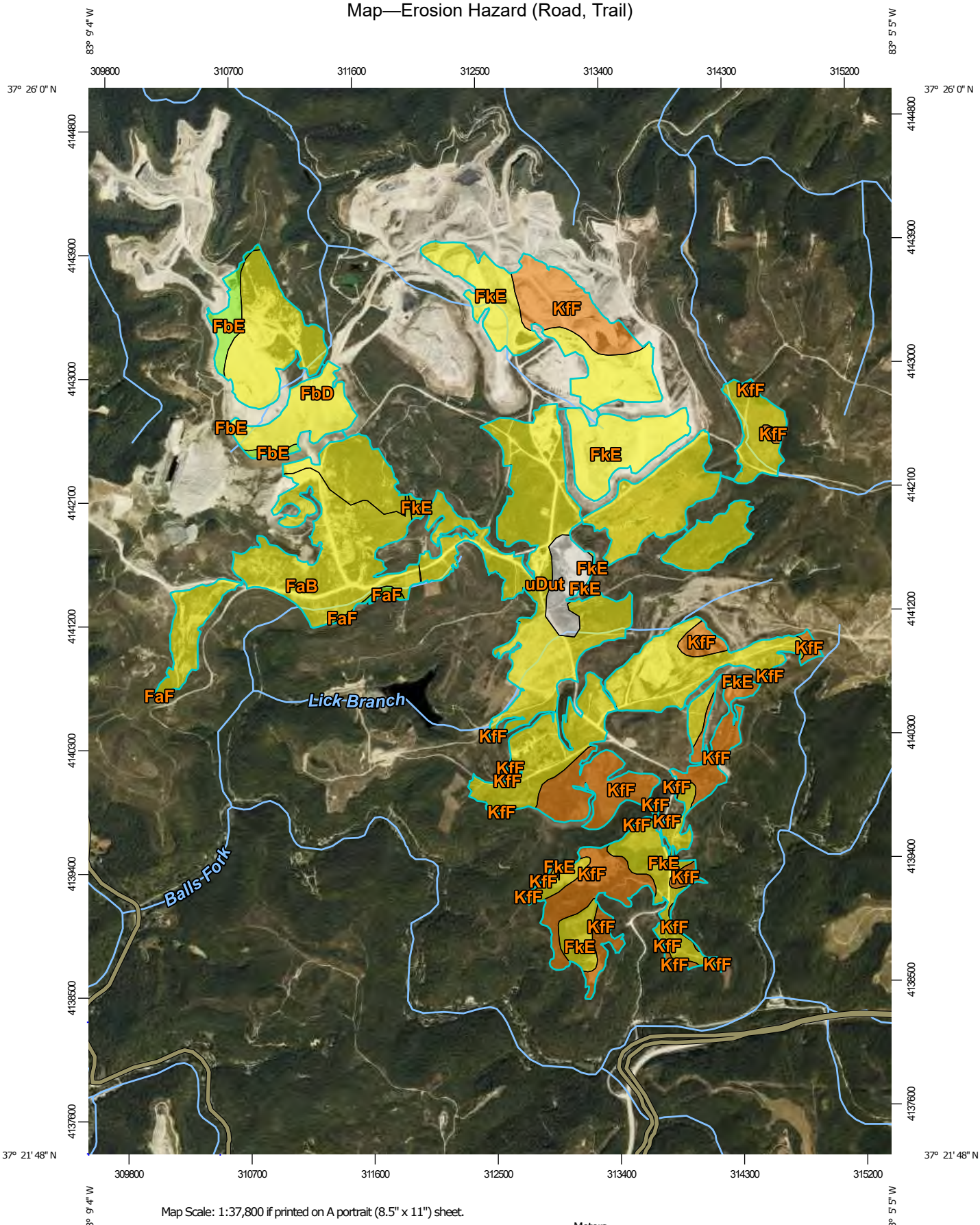
The ratings are both verbal and numerical. The hazard is described as "slight," "moderate," or "severe." A rating of "slight" indicates that little or no erosion is likely; "moderate" indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and

"severe" indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified aspect of forestland management (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.


83° 9' 4" W
83° 5' 5" W
37° 26' 0" N
37° 21' 48" N
309800
310700
311600
312500
313400
314300
315200
4144800
4143900
4143000
4142100
4141200
4140300
4139400
4138500
4137600
FbE
FbD
FkE
KfF
FaB
FaF
uDut
Lick Branch
Balls Fork
Map Scale: 1:37,800 if printed on A portrait (8.5" x 11") sheet.
N
0 500 1000 2000 3000 Meters
0 1500 3000 6000 9000 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Lines
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Soil Rating Points
- Very severe
- Severe
- Moderate
- Slight
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Breathitt County, Kentucky
Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Knott and Letcher Counties, Kentucky
Survey Area Data: Version 19, Sep 10, 2023

Soil Survey Area: Leslie and Perry Counties, Kentucky
Survey Area Data: Version 20, Sep 10, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 9, 2016—Sep 15, 2019

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Erosion Hazard (Road, Trail)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
FbD	Fairpoint and Bethesda soils, 0 to 20 percent slopes	Moderate	Fairpoint, unstable fill (50%)	Slope/erodibility (0.50)	244.1	13.0%
FbE	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Slight	Fairpoint, unstable fill (55%)		28.6	1.5%
Subtotals for Soil Survey Area					**272.7**	**14.5%**
Totals for Area of Interest					**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
FkE	Fiveblock and Kaymine soils, 0 to 30 percent slopes, stony	Moderate	Fiveblock, unstable fill (41%)	Slope/erodibility (0.50)	1,024.1	54.4%
			Kaymine, unstable fill (39%)	Slope/erodibility (0.50)		
KfF	Kaymine, Fairpoint, and Fiveblock soils, benched, 2 to 70 percent slopes, very stony	Severe	Kaymine, unstable fill (40%)	Slope/erodibility (0.95)	308.8	16.4%
			Fairpoint, unstable fill (20%)	Slope/erodibility (0.95)		
				Slope/erodibility (0.95)		
			Fiveblock, unstable fill (15%)	Slope/erodibility (0.95)		
uDut	Dumps, mine and tailings	Not rated	Dumps, mine (tailings & tipples) (85%)		40.2	2.1%
			Urban land (5%)			
Subtotals for Soil Survey Area					**1,373.1**	**73.0%**
Totals for Area of Interest					**1,881.4**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
FaB	Fairpoint soils, undulating	Moderate	Fairpoint, unstable fill (85%)	Slope/erodibility (0.50)	230.0	12.2%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
FaF	Fairpoint and Bethesda soils, 2 to 70 percent slopes, benched, stony	Slight	Fairpoint, unstable fill (55%)		5.6	0.3%
Subtotals for Soil Survey Area					**235.6**	**12.5%**
Totals for Area of Interest					**1,881.4**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Moderate	1,498.2	79.6%
Severe	308.8	16.4%
Slight	34.2	1.8%
Null or Not Rated	40.2	2.1%
Totals for Area of Interest	**1,881.4**	**100.0%**

Rating Options—Erosion Hazard (Road, Trail)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf


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