Ross County Solar

Exhibit C

Geotechnical Report

Case No. 20-1380-EL-BGN

Preliminary Geotechnical Engineering Report

Ross County Solar Facility
Ross County, Ohio
September 16, 2020
Terracon Project No. N4205268

Prepared for:
Ross County Solar, LLC
Bloomington, Minnesota

Prepared by:
Terracon Consultants, Inc.
Columbus, Ohio

September 16, 2020

Ross County Solar, LLC
8400 Normandale Lake Boulevard Suite 1200
Bloomington, Minnesota 55437

Attn: Mr. John Storm P.E.- Project Manager
P: (952) 300 9483

Re: Preliminary Geotechnical Engineering Report
Ross County Solar Facility
Ross County, Ohio
Terracon Project No. N4205268

Dear Mr. Storm:

We have completed the Preliminary Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PN4205268 dated July 7, 2020. This report presents the findings of the subsurface exploration and provides our preliminary geotechnical engineering recommendations for the proposed solar power facility and the associated site work for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

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STATE OF OHIO
YOGESH SURESH REGE
#E-65651
REGISTERED
PROFESSIONAL ENGINEER
10/14/2020

REPORT TOPICS

Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Preliminary Geotechnical Engineering Report
Ross County Solar Facility
Ross County, Ohio
Terracon Project No. N4205268
September 16, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and preliminary geotechnical engineering services performed for the proposed Ross County Solar Facility to be located in Ross County, Ohio.

The purpose of these services is to provide information and preliminary geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Site preparation and earthwork
- Thermal resistivity of trench/backfill
- Foundation design and construction
- Seismic site classification per IBC
- Electrical resistivity for grounding design
- Access roads

The preliminary phase of our geotechnical engineering services for this project included the advancement of 15 test borings to depths of approximately 14.5 to 15 feet below existing site grades. The field and laboratory testing of the preliminary geotechnical services are summarized in the table below:

Type of Exploration / Test	Number of Explorations / Tests
Borings	15
Electrical Resistivity Tests	3
Thermal Resistivity Tests	3
Corrosion Analysis Tests	15

Maps showing the site, boring locations, and electrical resistivity test locations are shown in the **SITE LOCATION AND EXPLORATION PLANS** section of this report. Logs of the borings, results of the field electrical resistivity tests, and laboratory testing performed on soil samples obtained from the site during the field exploration are included in the **EXPLORATION RESULTS** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The site proposed for development of the Ross County Solar Facility has a total area of approximately 1,400 acres. The site is located west of Thrifton Road in Ross County, Ohio. Approximate coordinates of the center of site: 39.319063, -83.358719. See **SITE LOCATION PLANS.**
Existing Improvements	The site is primarily being used for agricultural purposes; several residential structures are located within the site boundary.
Existing Topography	Finished grade elevations have not been provided at this time. Finished grade elevations are assumed to be close to the existing ground surface elevation. It is anticipated that the site work will involve a nominal amount of cut / fill to develop final grade for the solar facility. Based on the Google Earth and USGS topographic mapping, the project site appears to be rolling or gently sloping with ridges and drainages with ground surface elevations ranging from 860 to 995 feet above MSL.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Project Description	We understand that the project site will be developed as a photovoltaic (PV) solar power facility consisting of multiple PV modules mounted to a racking system. In addition, inverters, transformers, and other appurtenant equipment are anticipated. Trenches for electrical conductors for both direct current (DC), alternating current (AC), and communication systems will be proposed throughout the project site.
Proposed Structures	The steel pile foundations for the solar array are anticipated to consist of wide flange steel piles (W6x9 or similar). In addition, we understand the inverters may also be supported on wide flange steel piles, while transformers, and other appurtenant equipment is anticipated to be supported on shallow spread or mat foundations. Other various aspects of the project include overhead or underground electrical circuits and pads for electrical equipment such as switchgear, transformers, and inverters.

Item	Description
Maximum Loads	The actual loads for this project were not available at the issuance of this report. Therefore, loads from similar projects were used for the pile foundation analysis in this study. Single axis tracking rack systems: ■ Downward: 1.25 to 4 kips ■ Lateral Shear (Lateral): 1 kip to 3.5 kips ■ Uplift: 1.5 kips exclusive of frost heave loads Substation structures and equipment loads: To be determined.
Grading/Slopes	We understand that where possible, it is desirable to minimize grading, without extensive earthwork or treatment of in-situ soils. Therefore, we anticipate that the solar field final grades will generally follow the existing site grades with nominal grading (i.e. cut/fill up to 2 feet). Final slope angles neither steeper than 3H:1V (Horizontal: Vertical) nor taller than 5 feet are anticipated.
Access Roads	We understand that access road cross sections used for construction of the project will be the responsibility of the EPC, and that only post construction traffic with an allowable rut depth of 2 inches is what we are to design for in this report. We anticipate low-volume, aggregate-surfaced and native soil access roads will have a maximum vehicle load of 30,000 lbs. and will travel over the access roads only once per week.

GEOTECHNICAL CHARACTERIZATION

The project area is located within the glaciated area of Ohio, with the soils being formed in glacial till deposits. Glacial till is a heterogeneous mixture of clay, silt, sand, gravel and rock fragments, which was deposited by glacial ice advancing over bedrock or other glacial deposits. It is believed that glacial till in Ross County is a product of the Illinoian and late Wisconsinan Glaciation. Glacial till typically becomes more compact with depth within the soil profile. Based on the USGS Geologic map of Ohio, the overburden soils consist of silty loam till covered with loess and is generally described as flat, continuous ground moraine deposited in the Illinoian Age.

Terracon borings were not extended deeper to confirm the bedrock depths. According to the USGS mapping, bedrock of Mississippian and Devonian age varies across the site. Deeper lying bedrock in the project area consists of various sedimentary rock types (i.e. shale, siltstone, sandstone, limestone, and dolomite). The underlying bedrock is reported to be of the Devonian Age and known to consist of generally Richmond Shale and Limestone. Geological Map of Ohio can be found in the appendix of the report **GEOLOGICAL MAP OF OHIO**

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **EXPLORATION RESULTS** section of this report and the GeoModel can be found in the **FIGURES** section of the report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Topsoil** [1]	3" to 6" of topsoil (due to prior use of the site for agricultural purposes, tilled soils with high organic content should be anticipated to depths deeper than the topsoil depths noted on the logs)
2	**Lean Clay**	Soft to hard Sandy Lean Clay, Lean Clay with Sand, Sandy Silty Clay, Gravelly Lean Clay with Sand
3	**Fat Clay**	Stiff Sandy Fat Clay
4	**Sand**	Loose to Very Dense Clayey Sand, Clayey Sand with Gravel, Silty Sand with Gravel
5	**Gravel**	Very Dense Clayey Gravel with Sand

1. Topsoil thickness ranged from 3 to 6 inches in the borings, however due to prior usage of the site for agricultural purposes, it is possible that the previously tilled horizon would be comprised of highly organic soils to deeper depths.

Groundwater was encountered during, and at completion of drilling in some of our borings at depths ranging from about 4 to 15 feet and about 11.5 to 14.5 feet below existing surface, during and at completion respectively. The groundwater observations presented in the following table are considered to be an indication of the groundwater levels at the dates and times indicated. However, please note that water levels were taken subsequent to a significant rainfall event and may represent surface water that entered into the boreholes. The amount of water seepage into the borings is limited, and it is generally not possible to establish the location of the groundwater table through short term water level observations. Accordingly, the groundwater information presented herein should be used with caution. Also, fluctuations in groundwater levels should be expected with seasons of the year, construction activity, changes to surface grades, precipitation, or other similar factors. The water levels observed in borings can be found on the boring logs in **EXPLORATION RESULTS** and are summarized below.

Boring ID	Elevation[2]	Water Depth During Drilling (feet) [1]	Water Depth at Completion (feet) [1]
B-20-1	885.5	Water was not encountered	Water was not encountered
B-20-2	876.5	Water was not encountered	Water was not encountered
B-20-3	890.5	Water was not encountered	Water was not encountered

Boring ID	Elevation[2]	Water Depth During Drilling (feet) [1]	Water Depth at Completion (feet) [1]
B-20-4	559.0	Water was not encountered	Water was not encountered
B-20-5	903.5	Water was not encountered	Water was not encountered
B-20-6	903.5	Water was not encountered	Water was not encountered
B-20-7	928.0	6.0	Water was not encountered
B-20-8	909.5	14.0	Water was not encountered
B-20-9	944.0	4.0	Water was not encountered
B-20-10	896.5	Water was not encountered	Water was not encountered
B-20-11	876.0	11.5	11.5
B-20-12	929.5	15.0	Water was not encountered
B-20-13	990.5	10.5	Water was not encountered
B-20-14	940.5	Water was not encountered	Water was not encountered
B-20-15	904.5	9.5	14.5

1. Below ground surface
2. Elevation information was obtained from google earth.

GEOTECHNICAL OVERVIEW

Preliminary geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined in this report. The preliminary recommendations contained in this report are based upon the preliminary results of field and laboratory testing, engineering analyses, and our current understanding of the proposed project.

The subsurface conditions encountered in the borings generally appear to be suitable for development of the proposed site as a solar power facility. The PV arrays can be supported on wide channel driven piles bearing in the native overburden soils. The inverters could be similarly supported on driven piles or mat foundations.

The structures associated with the proposed substation can either be supported on shallow mat/slab type foundations or drilled shafts. Preliminary recommendations for mat/slab foundations and drilled shafts are presented in this report.

The **GENERAL COMMENTS** section provides an understanding of the report limitations.

CONTRIBUTORY RISK COMPONENTS

ITEM	DESCRIPTION
Suitability Statement	In our opinion, the site should be suitable for the proposed solar development. Additional soil test borings should be performed to adequately explore the site as part of a design-level study. Additionally, a full-scale pile load testing (PLT) program should be considered as the project design progresses. The results of a full scale PLT program in conjunction with soil test boring/test pit results are often successful in reducing the design embedment depth when compared to designs solely based on explorative results and analytical methods.
Soil Conditions	Topsoil thickness ranged from 3 to 6 inches in the borings; however, due to prior usage of the site for agricultural purposes, it is possible that the previously tilled horizon would comprise of highly organic soils to deeper depths. This depth should be determined during the design level study by performing various test pits across the site. Subsurface profile based on the preliminary borings consists of native cohesive as well as granular soils. Bedrock was not encountered in borings within the boring-completion depths of about 14.5 to 15 feet below existing ground surface; therefore, bedrock is not anticipated within the driving depth of the piles shallower than 14.5 feet supporting the PV arrays and inverters.
Access	Wet and loose/soft surface conditions and wet low-lying areas will create access issues for vehicles. The site will generally be more accessible in the summer and early fall due to the improved drying conditions.
Grading	We anticipate very little grading will be performed. On-site materials that are used as fill or backfill will likely require drying prior to re-compaction as engineered fill. Alternatively, these materials could be replaced with imported soils containing an appropriate moisture content. We expect localized areas of unsuitable conditions will be encountered prior to placing fill and within the subgrade for roadways and shallow foundations that are planned. Stabilization measures, such as over-excavation and replacement, should be expected.
Groundwater	Groundwater was encountered during and at completion of drilling at depths ranging between about 4 to 15 feet and 11.5 to 14.5 feet below existing surface, respectively. Based on our experience in the project area, groundwater levels could approach the surface at certain times during the year. Excavations, such as trenches for electrical cable and conduit, will likely encounter groundwater and require dewatering. Excavations for shallow foundations could also encounter groundwater, especially if construction is performed during periods of seasonally high groundwater. While precipitation is relatively constant throughout the year, groundwater levels are expected to be deepest during the late summer due to increased evaporation rates.
Site Drainage	The site is generally flat and appears to be poorly drained. Drainage tiles were likely installed to facilitate farming activities and site access. Filling the drainage ditches\ swales or destruction of other site drainage systems (e.g., drainage tiles) will result

ITEM	DESCRIPTION
	in increased groundwater levels, softer soils, and generally undesirable subsurface conditions.
Corrosion Hazard	Based on field resistivity data and laboratory testing for electrical resistivity and chemical properties, the site soils have low to moderate corrosion potential to buried metal per corrosion guidelines from U.S Department of Transportation Federal Highway Administration. The soils have a 'negligible' classification for sulfate exposure according to ACI Design Manual table 19.3.1.1- Exposure categories and classes. The results of our laboratory testing of soil chemical properties (provided in the attachment) are expected to assist a qualified engineer to design corrosion protection for the production piles and other project elements.
Excavation Hazards	Based on the results of the borings and our experience with the geology of the project site, we do not expect that difficult excavation conditions or widespread obstructions to pile driving operations will be encountered during construction. As previously noted, groundwater is expected to be encountered in excavations. We expect general instability in the form of caving, sloughing, and raveling to be encountered in excavations. Excavations will likely require bracing, sloping, and/or other means to create safe and stable working conditions.
Karst Hazard	Based on the publicly available geological information, carbonate rocks are anticipated to be buried under greater than 50 feet of glacially derived insoluble sediments at the proposed site. We did not encounter karst conditions during our geotechnical exploration. It should be noted that exploration for the PV Array field of a solar project does not typically extend below depths of 20 to 25 feet, as the stresses from the structures of a solar project typically do not extend below these depths. Additional studies could be undertaken as part of the design level investigation of the site.
Expansive Soil Hazards	Test borings encountered low plasticity clayey soil. Therefore, we do not anticipate that expansive soils will be an issue for the design and construction of the proposed site.
Slope Hazards	The site is relatively flat. Therefore, we do not anticipate slope stability issues.
Anticipated Pile Drivability	There is a very low likelihood of encountering difficulties during pile driving. We do not anticipate pre-drilling to be required based on encountered soil conditions, however, pre-drilling should be considered within the design frost depth.
General Construction Considerations	The near-surface soils are moderately moisture sensitive and subject to degradation with exposure to moisture. To the extent practical, earthwork should be performed during warmer and drier periods of weather to reduce the amount of necessary subgrade remedial measures for soft and unsuitable conditions beneath access roadways, equipment pads, etc.

Note: The soil properties that can significantly affect the aggressiveness of corrosion to buried metal structures include pH, oxidation-reduction potential, sulfates, sulfides, total dissolved salts, chlorides, resistivity, and moisture content. These properties were measured, and the results are reported in the attachment. These test results are provided to assist the designers of corrosion protection for the project.

SOLAR PANEL SUPPORT DESIGN RECOMMENDATIONS

Driven W-Section steel piles may be used for supporting solar panel arrays. The axial capacity of lightly-loaded piles is highly dependent upon near surface conditions and must take into consideration environmental and other factors such as frost heave and ground disturbance that would reduce the axial capacity of the near surface soils. Such an analysis is commonly termed a “depth of neglect” analysis, and it includes geotechnical and other factors.

Ground disturbance: The depth of disturbance will depend on near surface conditions during construction and the design life of the project. We recommend a value of 2 foot be applied to this site.

Frost: Lean clay, lean clay with sand, sandy lean clay and gravelly lean clay with sand with fines greater than 15 percent are present across the site. These soils are frost susceptible. If the anchorage/embedment of the foundations and the deadweight of the structure is not sufficient to resist these forces, it can cause uplift of structures. In colder climates, the design to resist frost heave forces exerted on foundations is a critical factor in the foundation design, especially for lightly-loaded structures such as solar panel arrays. Pile lengths will need to be long enough to counteract potential heave forces in the seasonal frost zone. Based on our review of soil samples and published soil maps of the area, we recommend that a frost heave adfreeze stress of 1,500 psf acting along the pile perimeter to an approximate depth of 2.0 feet below the ground surface be considered for calculating the potential frost heave force. The factor of safety against frost heave forces should be determined based on discussions between the owner/developer, contractor, and design engineer taking into consideration the acceptable level or risk, initial capital expenditure, and the long-term maintenance program. Thawing soils typically have significantly less strength than frozen or fully thawed soils. The design skin friction and lateral soil resistance should use lower strength parameters to account for the reduced capacity of the thawing soils within the frost zone. The values provided in the design tables below have already taken into account the reduction due to fully thawed soil conditions.

GEOTECHNICAL AXIAL CAPACITY

The following preliminary geotechnical parameters based on preliminary borings can be used to estimate the capacity of driven W-section pile foundations. These values should also be suitable to prepare a full-scale pile load testing program which is recommended as part of the overall project design. Final design values will vary from the preliminary estimates below. We recommend a factor of safety for the skin friction values of 2.0 and for end bearing values of 3.0.

Borings B-20-1 (Clay and Thick Sand)

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)		Ultimate End Bearing Pressure (psf)
0 – 2 [1]	Consider adfreeze uplift value in zone	Thawed values 0 to 1 ft: 0 1 to 2 ft: 100 psf	--
2 - 6	350		--
6 - 9	475		7,500
9 - 15	680		11,000

1. Depth to ignore frost heave.
2. No free water was encountered in this boring.

Borings B-20-2, B-20-3, B-20-6, B-20-10 (All Clay)

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)		Ultimate End Bearing Pressure (psf)
0 – 2 [1]	Consider adfreeze uplift value in zone	Thawed values 0 to 1 ft: 0 1 to 2 ft: 100 psf	--
2 - 6	300		--
6 - 9	450		5,300
9 –15	700		9,000

1. Depth to ignore frost heave.
2. No free water was encountered in this boring.

Borings B-20-4, B-20-8, B-20-14 (Clay and Sand)

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)		Ultimate End Bearing Pressure (psf)
0 – 2 [1]	Consider adfreeze uplift value in zone	Thawed values 0 to 1 ft: 0 1 to 2 ft: 100 psf	--
2 - 6	300		--
6 - 9	480		4,600
9 –14	700		9,000
14 - 15	800		14,000

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)	Ultimate End Bearing Pressure (psf)

1. Depth to ignore frost heave
2. Free water was encountered at a depth of about 14 feet in boring B-8. Hydrostatic pressure is considered below this depth in this calculation.

Boring B-20-5 (Sand and Clay)

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)		Ultimate End Bearing Pressure (psf)
0 – 2 [1]	Consider adfreeze uplift value in zone	Thawed values 0 to 1 ft: 0 1 to 2 ft: 100 psf	--
2 - 6	300		--
6 - 9	480		7,500
9 –15	720		10,000

1. Depth to ignore frost heave
2. No free water was encountered at this boring. Hydrostatic pressure has not been considered in this calculation.

Borings B-20-7 (All Clay; Relatively Soft Soil from 6 to 9 feet Depth)

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)		Ultimate End Bearing Pressure (psf)
0 – 2 [1]	Consider adfreeze uplift value in zone	Thawed values 0 to 1 ft: 0 1 to 2 ft: 100 psf	--
2 - 6	300		--
6 - 9	400		3,000
9 - 13	500		5,000
13 - 15	600		9,000

1. Depth to ignore frost heave
2. Groundwater encountered at a depth of about 6 feet. Hydrostatic pressure is considered below this depth in this calculation.

B-20-9 (All Sand; Higher Free Water Level)

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)		Ultimate End Bearing Pressure (psf)
0 – 2 [1]	Consider adfreeze uplift value in zone	Thawed values 0 to 1 ft: 0 1 to 2 ft: 100 psf	--
2 - 4	250		--
4 - 6	300		---
6 - 10	375		5,700
10 - 15	450		6,900

1. Depth to ignore frost heave.
2. Groundwater was encountered at a depth of about 4 feet. Hydrostatic pressure is considered below this depth in this calculation.

Borings B-20-11, B-20-12, B-20-13, B-20-15 (Relatively Soft Soil from 3 to 7.5 feet Depth)

Layer (feet) [2]	Ultimate Unit Skin Friction (psf)		Ultimate End Bearing Pressure (psf)
0 – 2 [1]	Consider adfreeze uplift value in zone	Thawed values 0 to 1 ft: 0 1 to 2 ft: 100 psf	--
2 - 6	250		--
6 – 7.5	400		--
7.5 – 9	450		6,500
9 - 15	525		11,000

1. Depth to ignore frost heave
2. Groundwater was encountered at depths of about 11.6 feet, 15 feet, 10.6 feet and 9.5 feet in borings B-20-11, B-20-12, B-20-13 and B-20-15 respectively. Hydrostatic pressure is considered below a depth of about 9 feet in this calculation.

The axial tensile (pull-out) capacity can be developed from skin friction while the axial compressive capacity can be developed from skin friction and end bearing. The above indicated allowable skin friction is appropriate for uplift and compressive loading. The skin friction perimeter can be calculated using the perimeter of the pile which equals twice the sum of the flange width and web depth. The end bearing is applicable for piles founded at depths greater than the depths indicated on the tables above.

Piles should have a minimum center-to-center spacing of at least 3 times their largest cross-sectional dimension to prevent reduction in the axial capacities due to group effects. If the piles are designed using the above parameters, settlements are not anticipated to exceed 1 inch.

GEOTECHNICAL LATERAL CAPACITY

The parameters in the following table can be used for a preliminary analysis of the lateral capacity of driven steel piles in support of solar panel arrays.

Boring B-20-1 (Clay and Thick Sand)

Depth (feet bgs)	p-y model	Effective Unit Weight γ, (pcf)	Friction Angle, Φ	Undrained Shear Strength (ksf)	Soil Modulus, k (pci)	ε_{50}	P-Multiplier
0 – 1.5	Stiff Clay (Reese)	110	--	0.5	75	0.020	0.7
2 - 6	Sand (Reese)	115	29	--	50	--	1.0
6 - 9	Sand (Reese)	115	31	--	100	--	1.0
9[1] - 15	Sand (Reese)	120	32	--	125	--	1.0

1. No free water was encountered in this boring. Hydrostatic pressure has not been considered in this calculation.

Note: Default values were used for spring constant and p-multiplier. Bgs: below ground surface

Borings B-20-2, B-20-3, B-20-6, B-20-10 (All Clay)

Depth (feet bgs)[1]	p-y model	Effective Unit Weight γ, (pcf)	Friction Angle, Φ	Undrained Shear Strength (ksf)	Soil Modulus, k (pci)	ε_{50}	P-Multiplier
0 - 2	Stiff Clay (Reese)	110	--	0.5	75	0.025	0.7
2 - 6	Stiff Clay (Reese)	105	--	0.5	75	0.020	1.0
6 - 9	Stiff Clay (Reese)	115	--	1.0	300	0.012	1.0
9 - 15	Stiff Clay (Reese)	120	--	2.0	650	0.008	1.0

1. No free water was encountered in these borings. Hydrostatic pressure has not been considered in this calculation.

Note: Default values were used for spring constant and p-multiplier.

Borings B-20-4, B-20-8, B-20-14 (Clay and Sand)

Depth (feet bgs)	p-y model	Effective Unit Weight γ, (pcf)	Friction Angle, Φ	Undrained Shear Strength (ksf)	Soil Modulus, k (pci)	ε_{50}	P-Multiplier
0 - 2	Stiff Clay (Reese)	110	--	0.5	75	0.025	0.7
2 - 6	Stiff Clay (Reese)	100	--	0.5	75	0.025	1.0
6 - 9	Sand (Reese)	105	29	--	50	--	1.0
9- 14	Sand (Reese)	115	30	--	80	--	1.0
14[1] - 15	Sand (Reese)	58	32	--	125	--	1.0

1. Free water was encountered at a depth of about 8 feet in boring B-8. Hydrostatic pressure is considered below this depth in this calculation.

Note: Default values were used for spring constant and p-multiplier.

Borings B-20-5 (Sand and Clay)

Depth (feet bgs)[1]	p-y model	Effective Unit Weight γ, (pcf)	Friction Angle, Φ	Undrained Shear Strength (ksf)	Soil Modulus, k (pci)	ε_{50}	P-Multiplier
0 - 2	Sand (Reese)	110	27	--	35	--	0.7
2 - 6	Sand (Reese)	115	29	--	50	--	1.0
6 - 9	Stiff Clay (Reese)	115	--	1.0	100	0.012	1.0
9 - 15	Stiff Clay (Reese)	120	--	2.0	650	0.008	1.0

1. No groundwater was encountered at this boring. Hydrostatic pressure has not been considered in this boring.

Note: Default values were used for spring constant and p-multiplier.

Borings B-20-7 (All Clay; Relatively Soft Soil From 6 to 9 feet Depth)

Depth (feet bgs)	p-y model	Effective Unit Weight γ, (pcf)	Friction Angle, Φ	Undrained Shear Strength (ksf)	Soil Modulus, k (pci)	ε50	P-Multiplier
0 - 2	Stiff Clay (Reese)	115	--	0.5	75	0.025	0.7
2 - 6	Stiff Clay (Reese)	115	--	0.5	75	0.025	1.0
6[1] – 9	Stiff Clay (Reese)	53	--	1.0	300	0.012	1.0
9 - 13	Stiff Clay (Reese)	53	--	1.75	500	0.008	1.0
13 - 15	Stiff Clay (Reese)	58	--	2.0	650	0.005	1.0

1. Free water was encountered at a depth of 6 feet. Hydrostatic pressure is considered this depth in this calculation.

Note: default values were used for spring constant and p-multiplier

Boring B-20-9 (All Sand; Higher Free Water Level)

Depth (feet bgs)	p-y model	Effective Unit Weight γ, (pcf)	Friction Angle, Φ	Undrained Shear Strength (ksf)	Soil Modulus, k (pci)	ε_{50}	P-Multiplier
0 – 2	Sand (Reese)	110	27	--	25	--	0.7
2 - 4	Sand (Reese)	110	28	--	40	--	1.0
4[1] - 10	Sand (Reese)	53	30	--	80	--	1.0
10 - 15	Sand (Reese)	53	31	--	100	--	1.0
14 - 15	Sand (Reese)	53	32	--	125	--	1.0

1. Free water was encountered at a depth of 4 feet at this boring. Hydrostatic pressure is considered below this depth in this calculation.

Note: default values were used for spring constant and p-multiplier

Borings B-20-11, B-20-12, B-20-13, B-20-15 (Relatively Soft/Loose Soil from 3 to 7.5 feet)

Depth (feet bgs)	p-y model	Effective Unit Weight γ, (pcf)	Friction Angle, Φ	Undrained Shear Strength (ksf)	Soil Modulus, k (pci)	ε50	P-Multiplier
0 - 2	Stiff Clay (Reese)	110	--	0.5	75	0.025	0.7
2 - 6	Stiff Clay (Reese)	100	--	0.75	100	0.020	1.0
6 – 9	Stiff Clay (Reese)	53	--	1.0	300	0.012	1.0
9[1] - 13	Stiff Clay (Reese)	58	--	2.0	650	0.008	1.0
13 - 15	Stiff Clay (Reese)	58	--	3.0	1,000	0.005	1.0

1. Groundwater was encountered at depths of about 11.6 feet, 15 feet, 10.6 feet and 9.5 feet in borings B-20-11, B-20-12, B-20-13 and B-2015 respectively. Hydrostatic pressure is considered below a depth of about 9 feet.

Note: default values were used for spring constant and p-multiplier

A P-multiplier of 0.7 should be applied to the upper 2 feet of loose and cultivated, near-surface soils to account for potential strength losses due to construction disturbance, seasonal effects, and other factors. These values should be considered approximate.

The above indicated effective unit weight, effective friction angle, strain factor and soil modulus have no factor of safety and may be used to analyze suitability of the proposed section and serviceability requirements. These parameters are based on correlations with SPT results, published values, and our experience with similar soil types. Existing p-y models typically under-predict the lateral capacity of shallow driven piles in sandy soils. Therefore, p-multiplier values for the design phase would likely be higher following completion of a pile load testing program.

As previously noted in this report, our analyses have been performed using preliminary information and are intended to assist the designer in roughly evaluating construction costs and viability for the proposed project. Ultimately, the design of foundations for the solar panel racking system will depend on a number of factors including the actual structural loading conditions, the structural serviceability requirements, anticipated corrosion losses, a detailed understanding of the site soil conditions, and other factors where complete and final information is not available at this time.

SUBSTATION

DRILLED SHAFT DESIGN CONSIDERATIONS

It is anticipated that some of the substation structures/appurtenances and transmission towers will be supported on deep foundation systems such as drilled shaft foundation elements. It is recommended that each drilled shaft element be at least 1.5 feet in diameter. It is recommended that drilled shaft lengths should be at least 3 times the shaft diameter or 15 feet, whichever is more, and should be terminated within native stiff soils or granular soil of at least medium dense relative density. Additional deeper borings are recommended in the substation and transmission tower areas.

Recommended geotechnical parameters in tables in sections **GEOTECHNICAL AXIAL CAPACITY** and **GEOTECHNICAL LATERAL CAPACITY** above can be used for preliminary drilled shaft foundations design.

CONSTRUCTION CONSIDERATIONS

The following additional construction considerations, during the drilled shaft installations, should be followed:

- It is anticipated that drilled shafts will require to be constructed by using the slurry displacement method due to possibility of groundwater seepage, granular soils and caving conditions.
- The actual bearing elevation at each drilled shaft location should be determined in the field during construction through inspection by an authorized representative of the geotechnical engineer.
- If effective dewatering is not practical, concrete should be placed at the bottom of the excavation by pumping or by using a tremie pipe.
- To facilitate construction, concrete should be on-site and ready for placement as shaft excavations are completed.
- It is recommended that no completed drilled shaft holes be left open overnight without being filled with concrete.

MAT/SLAB DESIGN PARAMETERS

We understand that foundation components in the array area will include driven pile foundations for support of solar arrays; however, inverter structures are typically required across the site. In general, inverter structures may be supported on driven piles or isolated mat/slab foundation systems.

If the site has been prepared in accordance with the requirements noted in the **EARTHWORK** section of this report, the mat/slab foundations should be designed based on the criteria outlined below.

We recommend that mat/slab foundations supporting heavy equipment or structures that are sensitive to movements should be supported on a minimum 12-inch thick free draining granular base, such as relatively clean, well-graded crushed limestone.

The mat foundation can be designed using a theoretical allowable soil bearing capacity of 1,500 psf. A modulus of subgrade reaction design value should be based on anticipated soil contact pressure and theoretical vertical displacements. In this case, based on an assumed 1,000 psf contact stress and anticipated settlement up to 1 inch, a value of 7 pci is computed as the average subgrade modulus.

If exposed to the exterior grade, the sides of the mat foundation should be backfilled with compacted soil and consideration should also be made with regard to frost protection. A minimum 36 inches foundation embedment should be used for frost protection.

If lateral load resistance is required, an ultimate coefficient of friction between the bottom of the concrete mat and the underlying granular structural fill can be assumed to be 0.5. It is recommended that passive pressure resistance along the sides of the foundation be neglected.

MAT/SLAB CONSTRUCTION CONSIDERATIONS

The following recommendations apply heavily-loaded structural mat foundations planned at this project site. We recommend that after completion of the site grading program the area within and at least 3 feet beyond the mat/slab footprint should be undercut such that at least a 1-foot thick layer of dense graded aggregate exists beneath the bottom of mat/slab foundation level. If unsuitable soils with a soft or medium stiff consistency or loose density are encountered at the bottom of this foundation undercut area, further undercut may be required until competent native soils are exposed and/or stabilization measures would be required.

Once the undercut excavation is made, the exposed subgrade soils should be examined by Terracon geotechnical personnel to determine that suitable bearing materials have been encountered. Should the undercut excavation expose materials that require stabilization with #2 stone or durable dump-rock prior to fill placements, provisions should be made to “drain” these materials to a nearby storm sewer or other drainage outlet. Any #2 stone or dump rock should be suitably choked-off at the top so as to prevent overlying finer grained materials from migrating into this open-graded material.

The undercut areas should then be backfilled with granular structural fill (well graded granular as described below) in accordance with requirements provided in **EARTHWORK** sections.

FROST CONSIDERATIONS

The soils on this site are frost susceptible, and small amounts of water within the soil can affect the performance of the slabs on-grade, sidewalks, and roadways. Exterior slabs should be anticipated to heave during winter months. If frost action needs to be eliminated in critical areas, we recommend the use of non-frost susceptible (NFS) fill to the conventional frost protection depth of 3 feet below lowest exterior grade, or structural slabs (for instance, structural stoops in front of building doors). Placement of NFS material in large areas may not be feasible; however, the following recommendations are provided to help reduce potential frost heave:

- Provide surface drainage away from the building and slabs, and toward the site storm drainage system.
- Install drains around the perimeter of the building, stoops, below exterior slabs and access roadways, and connect them to the storm drainage system.
- Grade clayey subgrades, so groundwater potentially perched in overlying more permeable subgrades, such as sand or aggregate base, slope toward a site drainage system.
- Place NFS fill as backfill beneath slabs and access roadways critical to the project.
- Place a 3 horizontal to 1 vertical (3H:1V) transition zone between NFS fill and other soils.
- Place NFS materials in critical sidewalk areas.

As an alternative to extending NFS fill to the full frost depth, consideration can be made to placing extruded polystyrene or cellular concrete under a buffer of at least 2 feet of NFS material.

EARTHWORK

It is recommended that areas of proposed mat/slab foundation structures, any building areas, roadways and areas to receive fill, be stripped of any tilled soil, topsoil, or soft/loose overburden soils containing organic matter. In access roadway, solar array and new fill areas of the site, the tilled soils and topsoil will create difficult access issues, particularly when the soils possess high moisture content. These materials can be modified to increase their strength and any planned approaches to improve the strength of these soils should be tested. Please note, that any soil placed over topsoil will settle with time with the magnitude of the settlement being directly related to the thickness of proposed fill and thickness of the topsoil and tilled soils.

Any materials consisting of vegetation and organic matter should be stripped and wasted off site or could be re-spread in landscaped areas after completion of grading operations. Stripping depths between our boring locations and across the site could vary considerably. We recommend actual stripping depths be evaluated by a representative of Terracon during construction to aid in preventing removal of excess material.

After performing the site grading activities associated with cutting/filling the site to design grade; and prior to placing structural fill in areas to receive fill, the subgrade should be proof-rolled to aid in locating soft or loose areas. Proof-rolling of cohesive soils should be accomplished with a fully loaded, tandem axle dump truck or other suitable pneumatic tired equipment weighing at least 20-tons. Granular soils should be proof-rolled with several passes of a vibratory roller (minimum dead weight of 8 tons on the drum) to help densify those soils. Based on conditions encountered in the borings, subgrade stabilization should be anticipated especially in low-lying, poorly drained areas and during wet seasons.

Any soft or yielding areas encountered within the new fill areas, solar array bays, substation and access road areas during proof-rolling operations should be undercut to expose firm stable soils or re-worked in place to a suitable acceptable condition. Chemical modification of the subgrade in the access road locations may be an alternative to removal, though any planned chemical modification should be tested and approved by a geotechnical engineer prior to implementation. It should be noted that an undercut/stabilization depth somewhat greater than normal may be needed if the construction occurs during periods of inclement weather. The actual amount of undercut/stabilization would need to be determined in the field during construction and is dependent on the subsurface conditions encountered, weather conditions and equipment used in the construction. Chemical modification is generally considered to be more cost effective than undercut and replacement of large areas.

The rough soil subgrade elevation should be established with quality controlled cohesive or granular fill placed and compacted in accordance with requirements provided in section **FILL MATERIAL TYPES** and section **FILL COMPACTION REQUIREMENTS**.

FILL MATERIAL TYPES

Fill required to achieve design grade should be classified as structural fill. Structural fill is material used below, or within 10 feet of structures, roadways or constructed slopes. Earthen materials used for structural fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Lean Clay, Lean	CL (LL<40)	All Locations and Elevations
Fat Clay and moderate plasticity lean clays	CH (LL>50) and CL with 40<LL<50	>1.5 feet below the finished subgrade elevation
Well Graded Granular	GW[2]	All Locations and Elevations
Low Volume Change Material[3]	CL (LL<40 & PI<22) or GW[2]	All Locations and Elevations
On-site Soils	CL, ML, SM, SC, CL-ML	On-site native soils appear suitable for use as engineered fill after moisture conditioning. Use of on-site soils as structural fill should meet the requirements for "acceptable location for placement" indicated above.

1. New structural fill should consist of approved materials that are free of organic matter, muck, peat, debris and rock fragments larger than 3 inches in any dimension. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the geotechnical engineer for testing and evaluation.
2. Similar to ODOT aggregate base or crushed limestone aggregate or granular material such as sand, gravel, or crushed stone.
3. Low plasticity cohesive soil or granular soil.

FILL COMPACTION REQUIREMENTS

Structural fill should meet the following compaction requirements.

Item	Description
Fill Lift Thickness (Structural Areas)	8-inches or less in loose thickness if heavy self-propelled compaction equipment is used. 4 to 6 inches or less if hand compaction equipment is used.
Compaction Requirements [1] (Structural Areas)	Minimum 98% of the material's Standard Proctor maximum dry density (ASTM D698)
Moisture Content – Cohesive Soil (Low Plasticity) [3]	Within -2 to +3% of optimum moisture content (OMC) as determined by the Standard Proctor test at the time of placement and compaction

Item	Description
Moisture Content – Cohesive Soil (Moderate to High Plasticity) [3]	Within 0 to +3% of optimum moisture content (OMC) as determined by the Standard Proctor test at the time of placement and compaction
Moisture Content [2] **– Granular Material** [3]	Workable Moisture Levels

1. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proof-rolled.
3. All materials to be used as engineered fill should be tested in the laboratory to determine their suitability and compaction characteristics.

SEISMIC CONSIDERATIONS

The seismic design requirements for structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Classification is D**. Subsurface explorations at this site were extended to a maximum depth of 15 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

ACCESS ROADWAYS

On most project sites, the site grading is accomplished relatively early in the construction phase. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy construction traffic disturbs the subgrade and many surface irregularities are filled in with loose soils to improve trafficability temporarily. As a result, the roadways subgrades should be carefully evaluated as the time of construction.

We recommend the moisture content and density of the upper 12 inches of the subgrade be evaluated and the road subgrades be proof-rolled. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to anticipated high traffic areas and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills.

After proof-rolling and repairing subgrade deficiencies, the entire subgrade should be scarified and compacted as recommended in **EARTHWORK** section to provide a uniform subgrade for gravel road construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to application of the gravel surfacing. The subgrade should be in its finished form at the time of final review.

We understand that the proposed gravel access road will be primarily used by light duty maintenance vehicles. We recommend the proposed gravel access roads should have minimum 8” thick crushed stone or gravel, such as Ohio DOT Type A aggregate over the final prepared subgrade. We recommend a CBR value of 3 be used in preliminary design. CBR tests should be performed as part of the final design level study.

DRAINAGE

The proposed gravel access road should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the road could saturate the subgrade and contribute to premature road deterioration. In addition, the road subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

MAINTENANCE

Crushed stone surfaced roadways, regardless of the section thickness or subgrade preparation measures, will require on-going maintenance and repairs to keep them in a serviceable condition. It is not practical to design a gravel section of sufficient thickness that on-going maintenance will not be required. This is due to the porous nature of the gravel that will allow precipitation and surface water to infiltrate and soften the subgrade soils, and the limited near surface strength of unconfined gravel that makes it susceptible to rutting. When potholes, ruts, depressions or yielding subgrades develop, they must be addressed as soon as possible to avoid major repairs.

Typical repairs could consist of placing additional gravel in ruts or depressed areas. In some cases, complete removal of distressed portions of the existing section will be required along with replacement of the roadway section. Potholes and depressions should not be filled by blading adjacent ridges or high areas into the depressed areas. New material should be added to depressed areas as they develop. Failure to make timely repairs will result in more rapid deterioration of the roadways, making more extensive repairs necessary.

THERMAL RESISTIVITY

Thermal resistivity testing was performed by Geotherm USA on three soil samples (B-20-3, B-20-6, B-20-12) obtained from the site at a depth between 1 to 5 feet. The thermal resistivity testing was performed in general accordance with the Standard Test Method for Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure (ASTM D5334). Tests were performed on each sample remolded at 85 and 95 percent of the maximum dry density as determined by ASTM D698 and a test was performed on an intact specimen obtained from a thin-walled tube at each location.

The results of the thermal resistivity testing are presented in the **EXPLORATION RESULTS** section.

ELECTRICAL EARTH RESISTIVITY

The resistivity tests were performed using the “Wenner Four Electrode Method.” The test locations in the proposed panel array areas are designated as EER-20-1 through EER-20-3. The results of these tests are presented in this report. The approximate locations of the resistivity survey test lines are depicted on the attached **EER TEST LOCATION PLAN**, and the corresponding **ELECTRICAL EARTH RESISTIVITY TEST DATA** sheets are also attached to this report.

It should be noted that the resistivity values measured in the field may vary by material type, moisture content, surface temperature, groundwater depth, and other climatic conditions. During the site visit, our field representative indicated that the ground surface cover consisted of moist clayey soil at each test location. The weather conditions during the site visit are indicated on the field data sheets.

CORROSIVITY

Samples for corrosion testing were obtained from 15 bulk samples of soils from depths of approximately 1 to 4 feet below existing ground surface. The corresponding **RESULTS OF CORROSION ANALYSIS** sheets are attached to this report.

The degradation of steel, concrete, or cement grout can be caused by chemical agents in the soil that react with concrete to either dissolve the cement paste or precipitate larger compounds within the concrete, causing cracking and flaking. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete or cement grout. The American Concrete Institute (ACI) in their publication ACI Building Code Requirements for Structural Concrete (ACI 318-14) provides guidelines for this assessment.

Concrete and steel are at risk of corrosion when exposed to water-soluble chloride in the soil.

Chloride tests indicate that all eleven of the samples had a measurable concentration. The project structural engineer should review this data to determine if remedial measures are necessary for the steel. Ferrous metal and concrete elements in contact with soil, whether part of a foundation or part of the supported structure, are subject to degradation due to corrosion or chemical attack. Therefore, buried ferrous metal and concrete elements should be designed to resist corrosion and degradation.

These test results are provided to assist in determining the type and degree of corrosion protection that may be required. We recommend that a certified corrosion engineer be employed to determine the need for corrosion protection and to design appropriate protective measures, if required. As discussed in Section 10.7.5 of the AASHTO LRFD Bridge Manual, 8th Edition, 2017, the following soil or site conditions should be considered as indicative of potential deterioration or corrosion situation for steel piles:

- Soil electrical resistivity less than 2,000 ohm-cm
- pH less than 5.5
- pH between 5.5 and 8.5 with high organic content
- Sulfate concentration greater than 1,000 ppm (mg/kg)

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

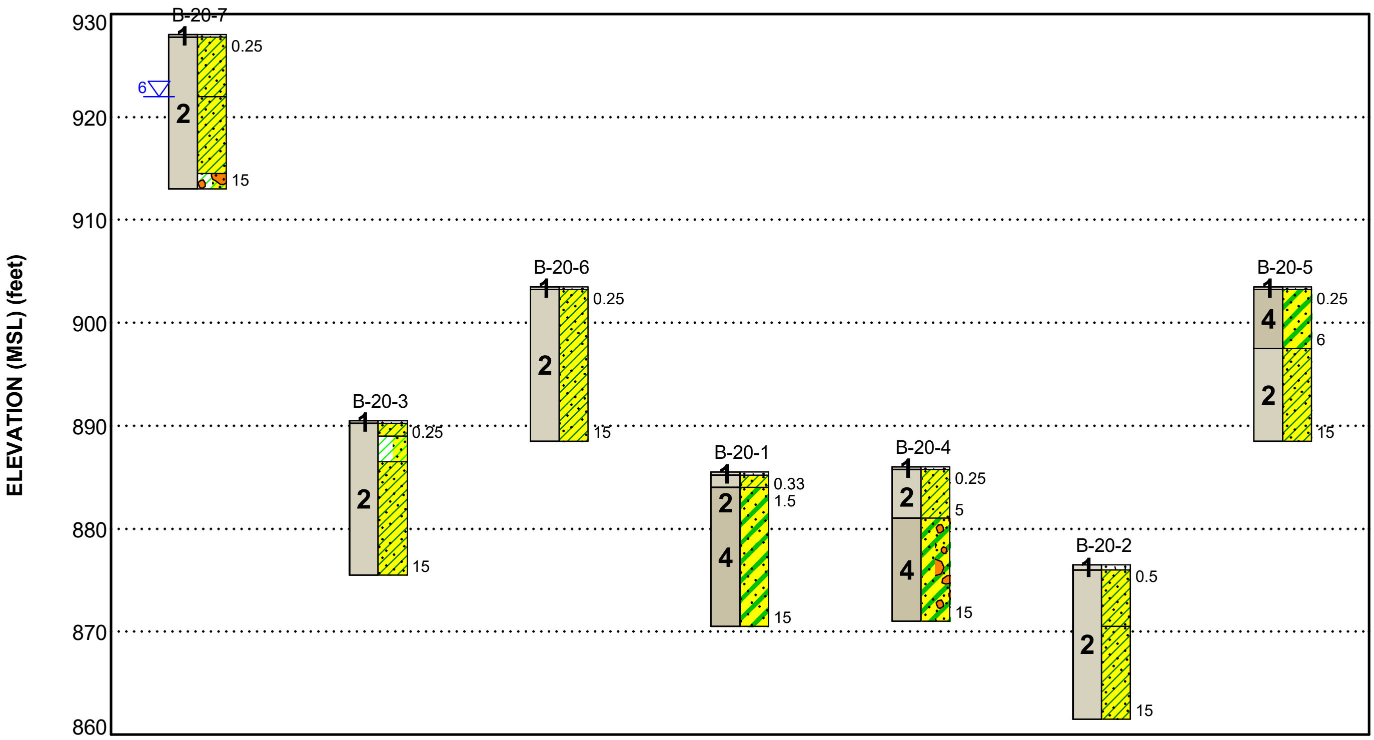
Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

FIGURES

Contents:

GEOMODEL

Ross County Solar Facility ■ Clarksburg, OH
Terracon Project No. N4205268



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil	3" to 6" of topsoil
2	Lean Clay	Soft to hard Sandy Lean Clay, Lean Clay with Sand, Sandy Silty Clay, Gravelly Lean Clay with Sand
3	Fat Clay	Stiff Sandy Fat clay
4	Sand	Loose to Very Dense Clayey Sand, Clayey Sand with Gravel, Silty Sand with Gravel
5	Gravel	Very dense Clayey Gravel with Sand

LEGEND

- Topsoil
- Sandy Lean Clay
- Clayey Sand
- Lean Clay with Sand
- Clayey Sand with Gravel
- Gravelly Lean Caly with Sand

First Water Observation
Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

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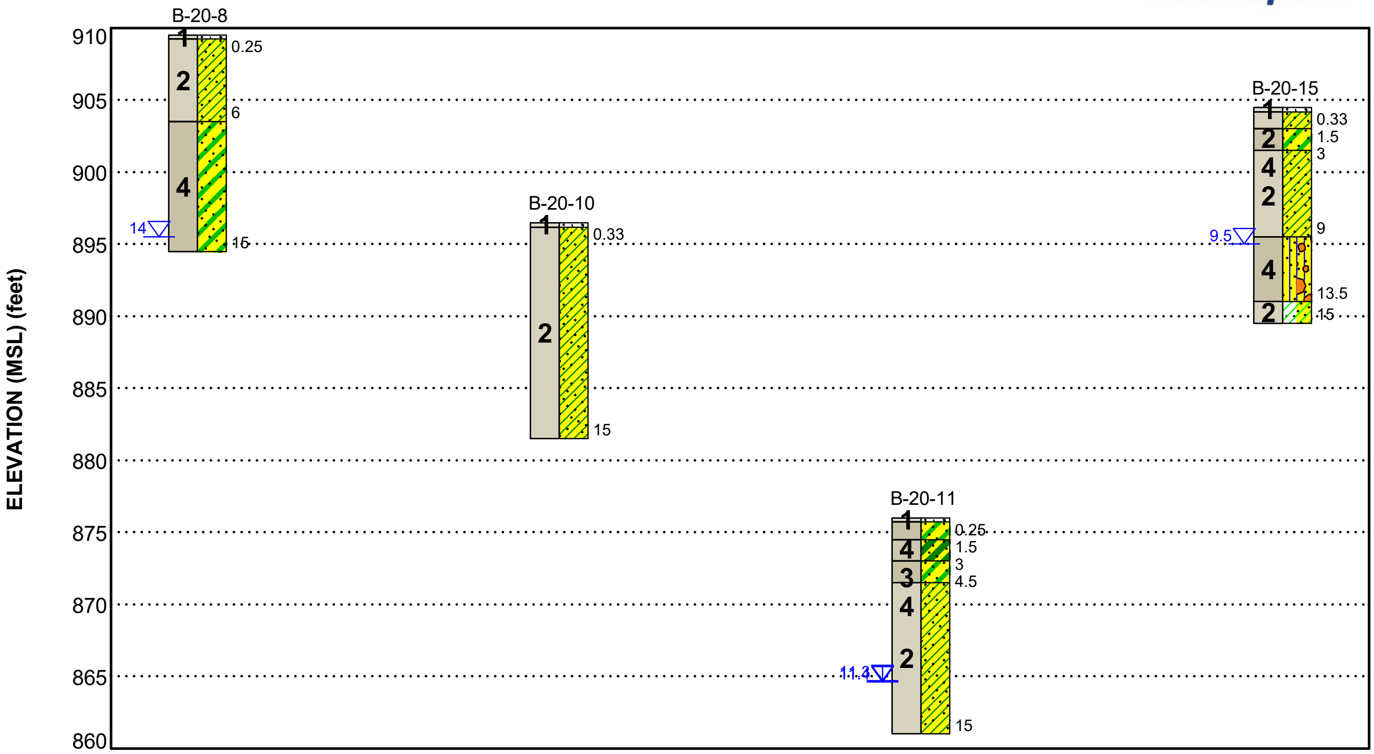

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LEGEND

Topsoil
Sandy Lean Clay
Clayey Sand
Sandy Fat Clay
Silty Sand with Gravel
Lean Clay with Sand

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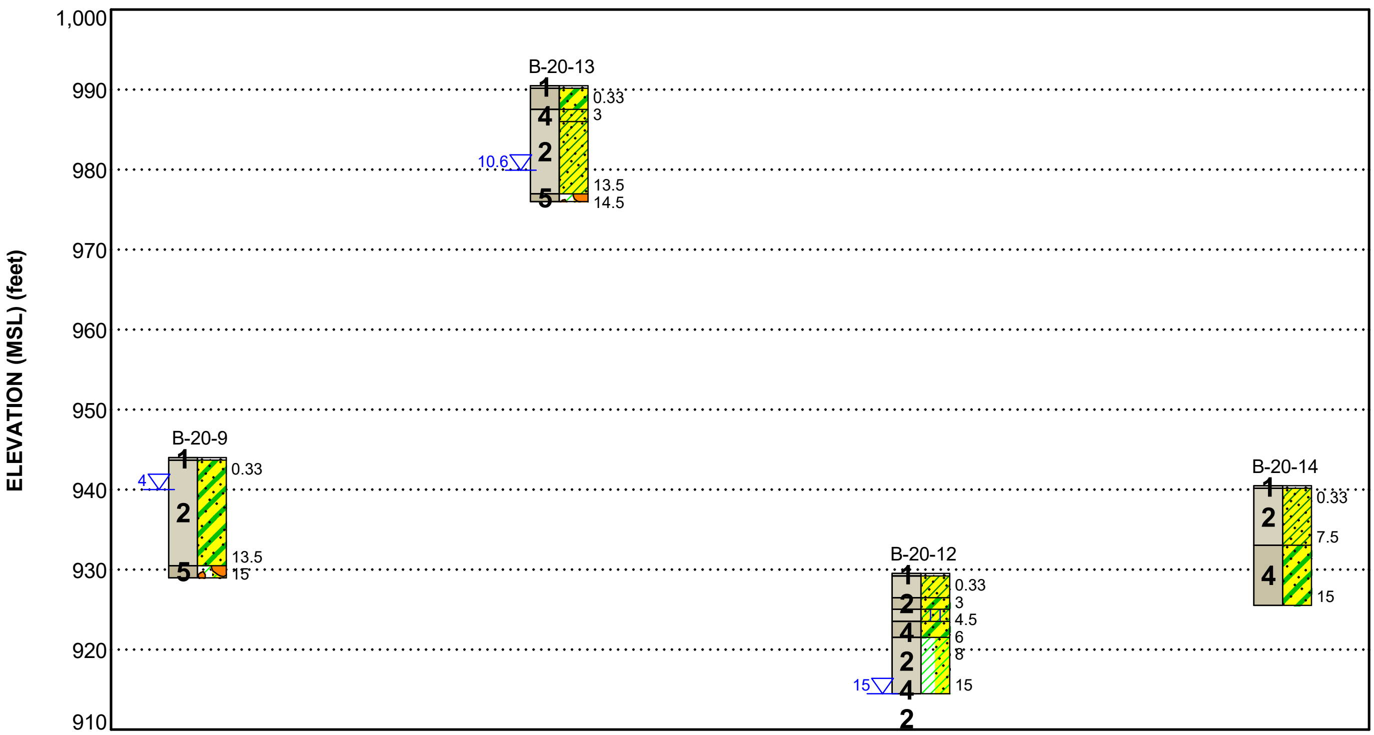

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LEGEND

- Topsoil
- Sandy Lean Clay
- Clayey Sand
- Sandy Silty Clay
- Clayey Gravel with Sand
- Lean Clay with Sand

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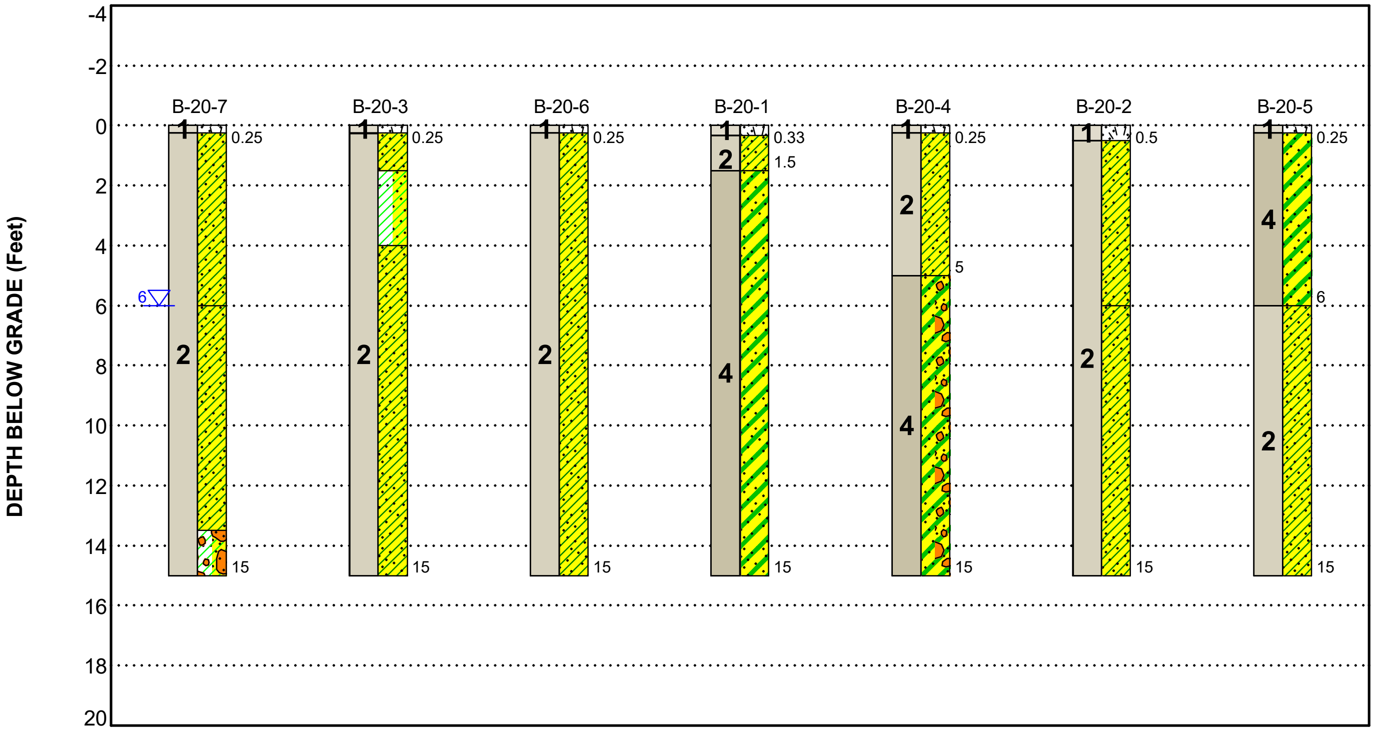
GEOMODEL

Ross County Solar Facility ■ Clarksburg, OH
Terracon Project No. N4205268

Terracon GeoReport



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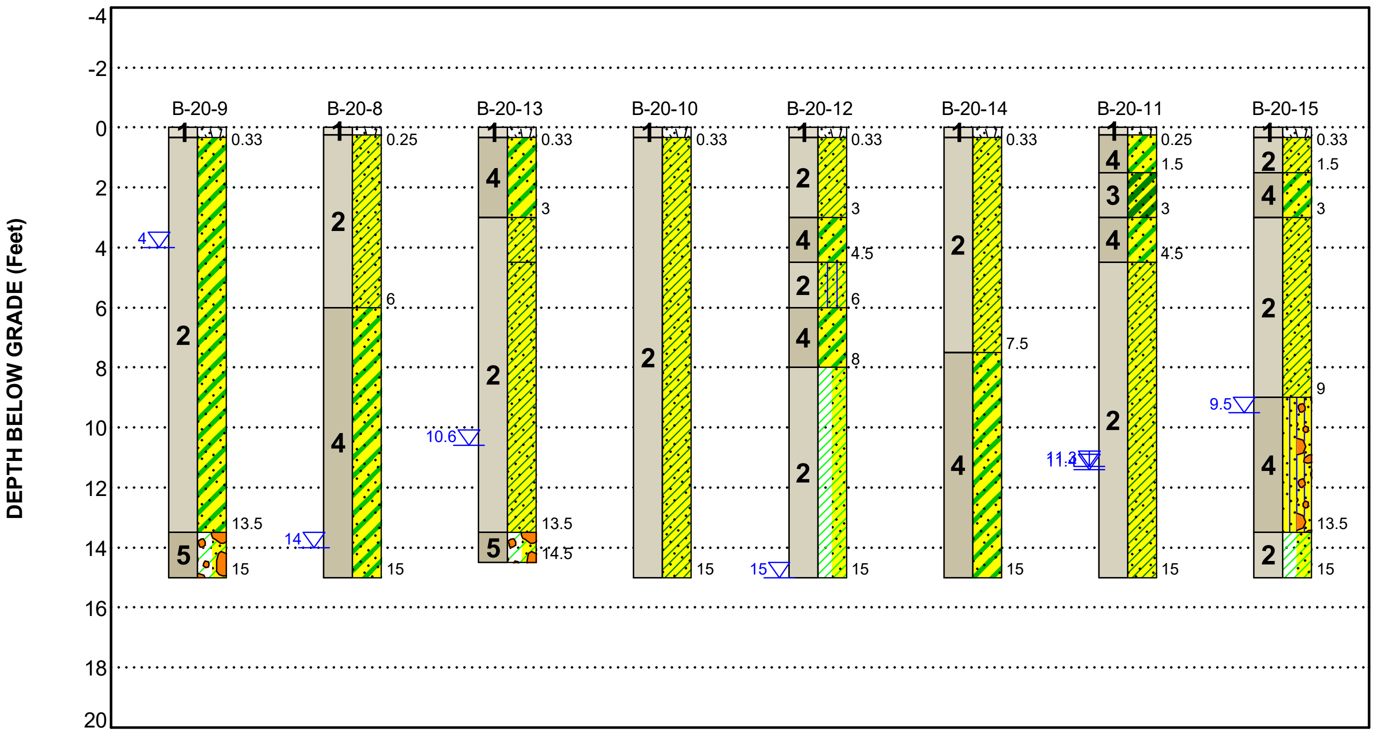
Terracon Project No. N4205268



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LEGEND

Topsoil
Clayey Gravel with Sand
Lean Clay with Sand
Sandy Lean Clay
Sandy Fat Clay
Silty Sand with Gravel
Clayey Sand
Sandy Silty Clay

First Water Observation
Second Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
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ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

FIELD EXPLORATION

Number of Borings	Boring Depth (feet)	Planned Location
15	15	Roadways, PV Array area

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by our handheld GPS. All elevations were recorded on the field boring logs. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted, track-mounted, ATV-mounted rotary drill rig using continuous flight augers (solid stem and/or hollow stem, as necessary, depending on soil conditions). Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the **thin-walled tube sampling** procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Field Electrical Resistivity Testing: Field measurements of soil electrical resistivity were performed were performed using the “Wenner Four Electrode Method.”. The soil resistivity testing was performed at the locations identified in the Attachments (section of this report). The Wenner arrangement (equal electrode spacing) was used with “a” spacings of 1, 2, 4, 8, 15, 25, 50, 75, 100, 150, and 200 feet, at three (3) locations within the planned solar array area. The “a” spacing is generally considered to be the depth of influence of the test. The testing was performed in both a north-south and an east-west orientation at each location. Results of the soil resistivity measurements are presented in **Electrical Earth Resistivity Test Results** section of this report.

LABORATORY TESTING

The project's engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

Our laboratory testing program also included examination of soil samples by an engineer. Based on observation and test data, the engineer classified the soil samples in accordance with the Unified Soil Classification System (ASTM D2487).

Thermal Resistivity Testing: Laboratory thermal resistivity testing was performed by Terracon on three bulk soil samples obtained during our field exploration from a depth of approximately 1 to 4 feet below the existing ground surface (bgs). Each bulk sample was tested for a standard Proctor test, and all thermal resistivity tests were performed on samples remolded to 85 percent and 95 percent of the material's maximum dry density as determined by test method ASTM D698 (standard Proctor) and at the material's natural water content. At each location, one additional thermal resistivity test was performed on a thin-wall tube sample obtained between depths of 1 and 5 feet. The thermal resistivity testing was performed in general accordance with the IEEE standard. The dry-out curves were developed from soil specimens compacted to 85% and 95% of the standard Proctor criteria (ASTM D698) at the optimum moisture content and dried to 0% moisture.

Corrosion Testing: Bulk soil samples were collected from 1 to 4 feet bgs at six locations at the project site and sent to Terracon's office for corrosivity testing. The testing included water-soluble sulfate ion content in soil in accordance with ASTM C1580 presented in percent by weight, water-soluble chloride ion content in accordance with ASTM D512 presented in percent by weight, pH in accordance with ASTM D4972, Sulfides in accordance with ASTM D4658, Oxidation Reduction Potential in accordance with ASTM G200, and electrical resistivity using the "soil box" method in accordance with ASTM G187.

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)[1]	Planned Location
15	14.5 to 15	Roadways, PV Array area

1. Below ground surface

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by our handheld GPS. All elevations were recorded on the field boring logs. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted, track-mounted, ATV-mounted rotary drill rig using continuous flight augers (solid stem and/or hollow stem, as necessary, depending on soil conditions). Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the **thin-walled tube sampling** procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Electrical Earth Resistivity Testing: Field measurements of soil electrical resistivity were performed were performed using the “Wenner Four Electrode Method.”. The soil resistivity testing was performed at the locations identified in the Attachments (section of this report). The Wenner arrangement (equal electrode spacing) was used with “a” spacings of 1, 2, 4, 8, 15, 25, 50, 75, 100, 150, and 200 feet, at three (3) locations within the planned solar array area. The “a” spacing is generally considered to be the depth of influence of the test. The testing was performed in both a north-south and an east-west orientation at each location.

The depth of interpreted resistivity values from the test is a function of the spacing between electrodes. Electrical current is transmitted to the two outer electrodes where a theoretical equal potential line of electrical activity is induced around each electrode. For this EER survey, the electrodes consisted of ½-inch diameter, copper-coated steel electrodes. The electrodes were inserted into the ground to a depth of 6 inches at electrode spacings of less than 10 feet and 12 inches for electrode spacings of 10 feet and greater. An electrical bridge, calibrated to read resistance, is used to measure the variation in potential between the two inner electrodes (receiving or potential electrodes).

Results of the soil resistivity measurements are presented in Electrical Earth Resistivity Test Results section of this report.

Laboratory Testing

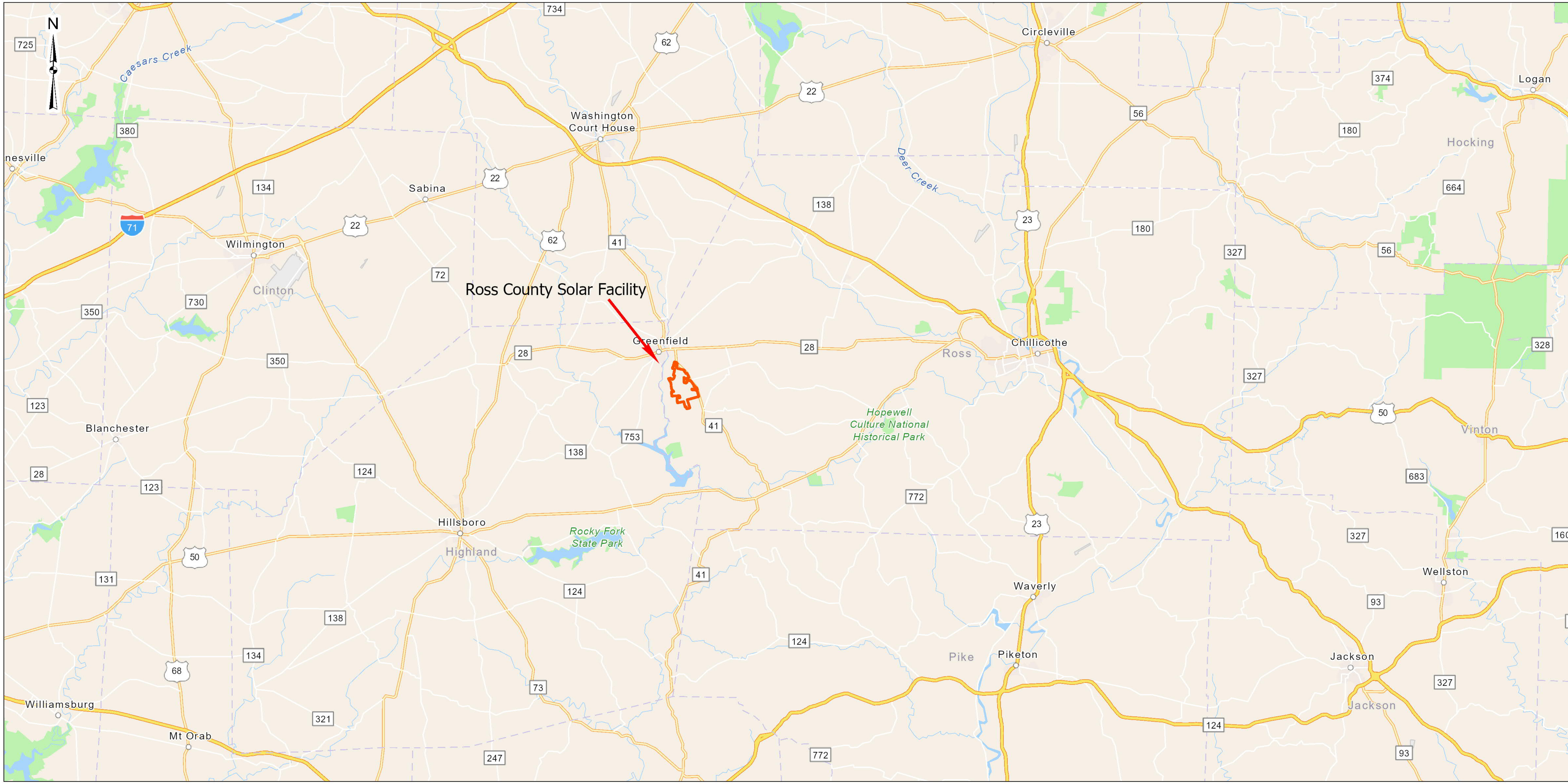
The project's engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- ASTM D4972 pH, Chloride, Sulfate, and Sulfide Content
- ASTM G57, G187 Electrical Resistivity Testing using the "soil box" method
- ASTM 5334 Thermal Resistivity Testing

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Contents:

Note: All attachments are one page unless noted above.



Site_Boundary

DATA SOURCES:
ESRI WMS - World Topographic, Streets

Miles
0 3.5 7 14

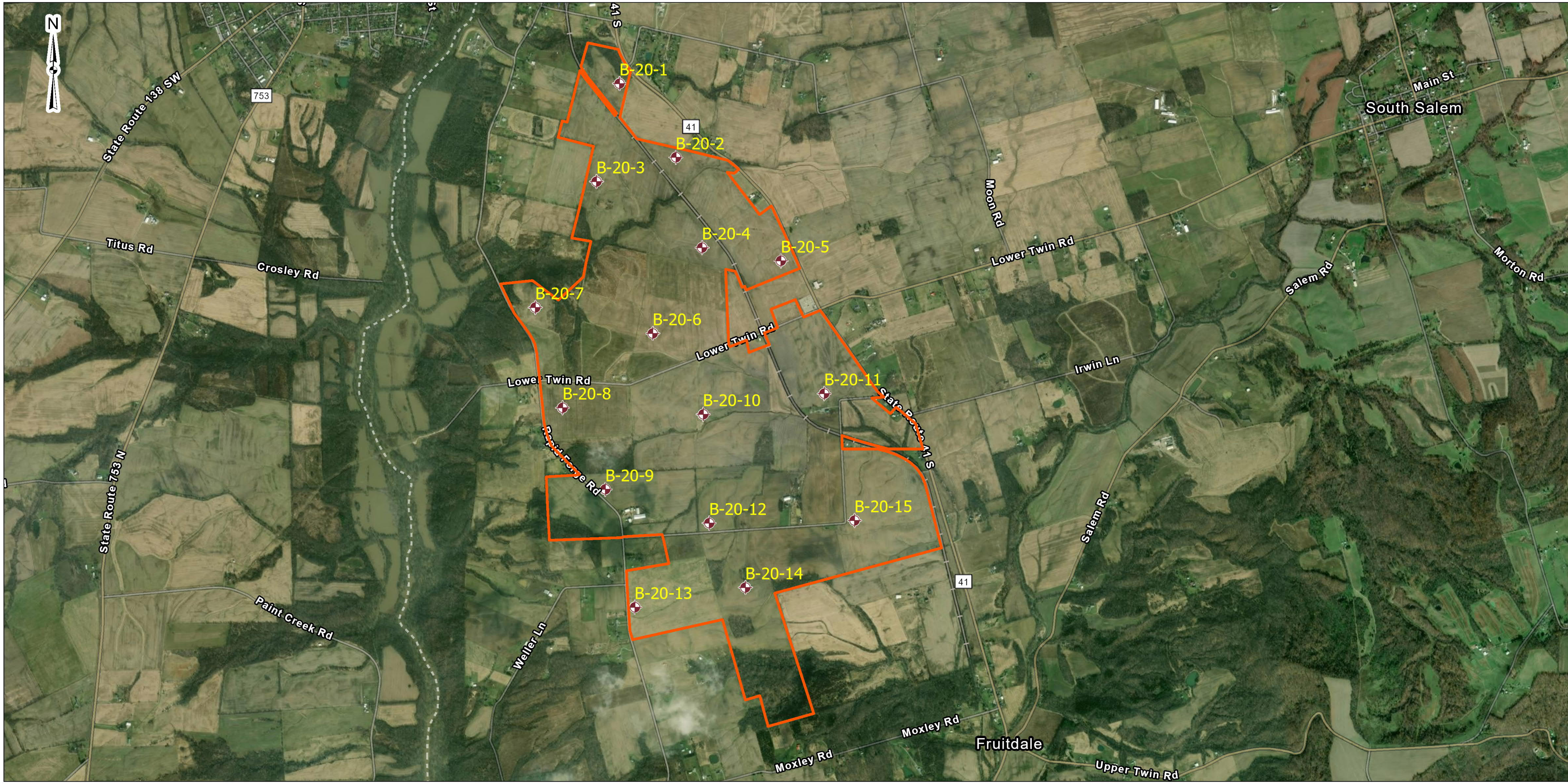
Project No.:	N4205268
Date:	September, 2020
Drawn By:	JNT
Reviewed By:	YSR

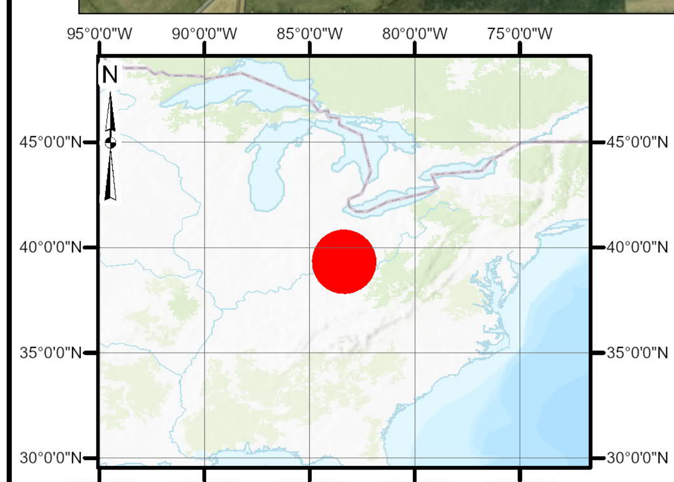
Terracon
800 Morrison Road Gahanna , Ohio 43230
PH. (614) 328-5150 terracon.com

SITE LOCATION PLAN

ROSS COUNTY SOLAR FACILITY

ROSS COUNTY SOLAR, LLC
8400 NORMANDALE LAKE BOULEVARD
BLOOMINGTON, MINNESOTA 55437





Site_Boundary

BORING LOCATION

DATA SOURCES:
ESRI WMS - World Topographic, Streets

Miles
0 0.23 0.45 0.9

Project No.:	N4205268
Date:	September, 2020
Drawn By:	JNT
Reviewed By:	YSR

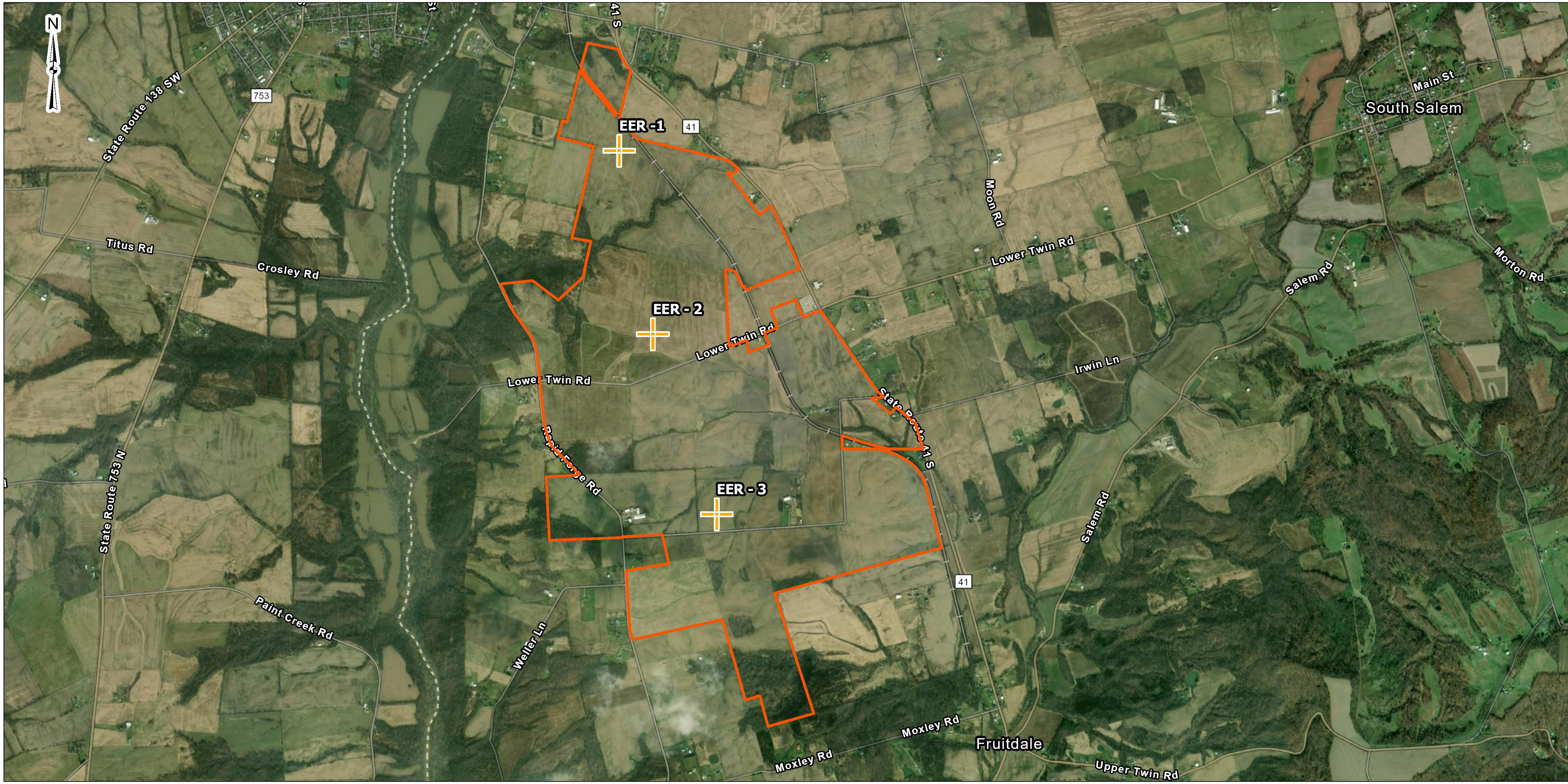
Terracon

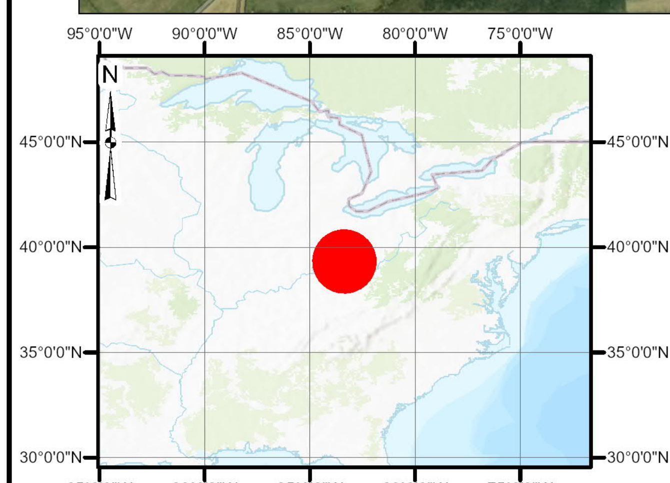
800 Morrison Road Gahanna , Ohio 43230
PH. (614) 328-5150 terracon.com

EXPLORATION PLAN

ROSS COUNTY SOLAR FACILITY

ROSS COUNTY SOLAR, LLC
8400 NORMANDALE LAKE BOULEVARD
BLOOMINGTON, MINNESOTA 55437





Earth Electrical Resistivity Location

Site_Boundary

DATA SOURCES:
ESRI WMS - World Topographic, Streets

Miles
0 0.23 0.45 0.9

Project No.:	N4205268
Date:	September, 2020
Drawn By:	JNT
Reviewed By:	YSR

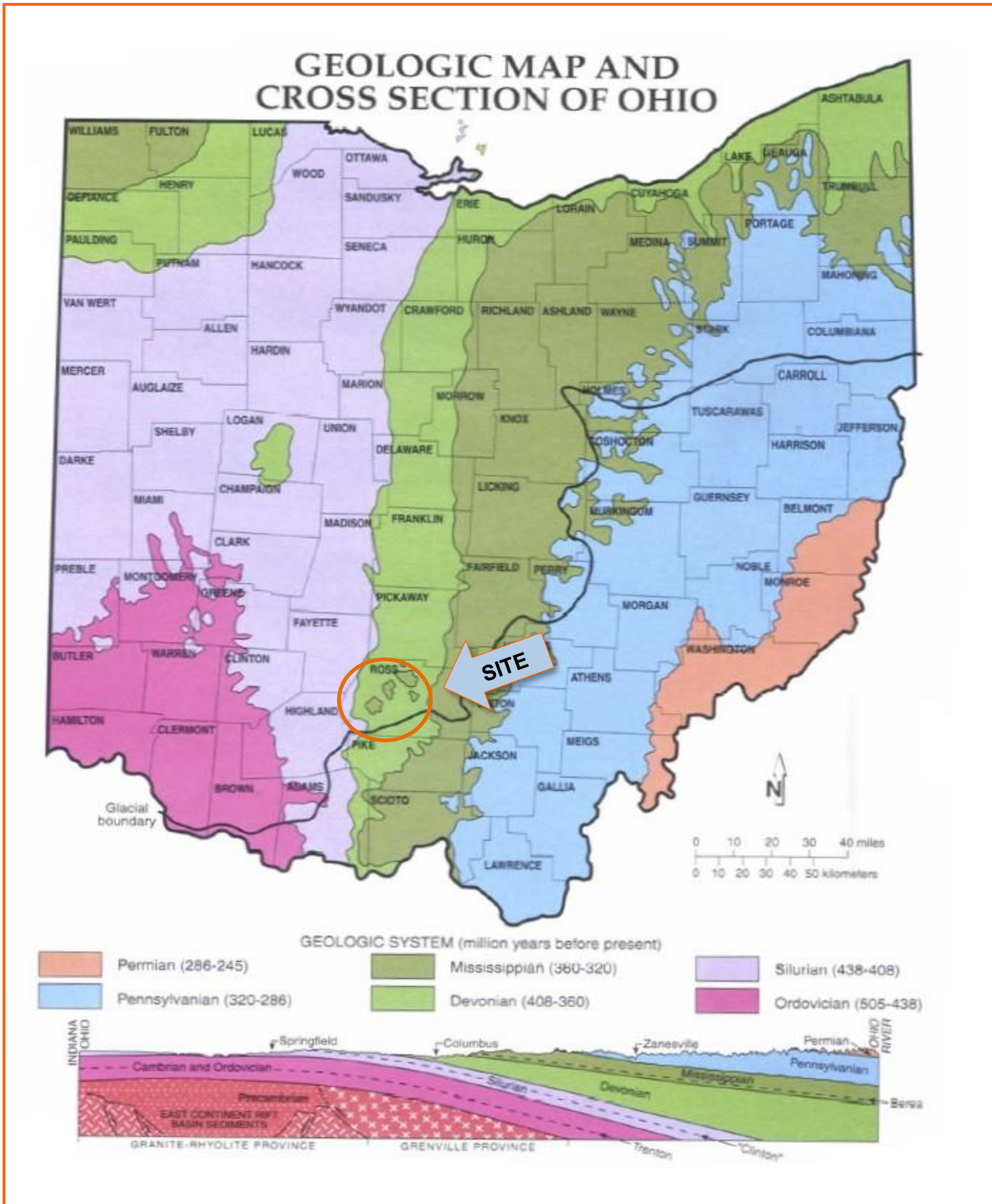
Terracon
800 Morrison Road Gahanna , Ohio 43230
PH. (614) 328-5150 terracon.com

EARTH ELECTRICAL RESISTIVITY LOCATION PLAN

ROSS COUNTY SOLAR FACILITY

ROSS COUNTY SOLAR, LLC
8400 NORMANDALE LAKE BOULEVARD
BLOOMINGTON, MINNESOTA 55437

MAP 1 PORTRAIT



EXPLORATION RESULTS

Contents:

Note: All attachments are one page unless noted above.

BORING LOG NO. B-20-1

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3385° Longitude: -83.3667°

Approximate Surface Elev.: 885.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (4.0")**	885+/-									
2	1.5	**SANDY LEAN CLAY (CL)**, trace gravel, brown and gray, moist, stiff	884+/-				10	6-5-5 N=10	4.5 (HP)	19.6	35-16-19	62
4		**CLAYEY SAND (SC)**, trace gravel, brown and gray, moist, medium dense					12	3-4-7 N=11		12.8	34-14-20	47
							16	5-6-7 N=13		13.0		
				5			14	3-6-6 N=12				
							16	4-6-6 N=12		14.0	22-12-10	44
							16	4-7-9 N=16				
				10			16	5-9-7 N=16				
	15.0		870.5+/-	15			16	4-5-7 N=12				

Boring Terminated at 15 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiancy: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-27-2020	Boring Completed: 07-27-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-2

PROJECT: Ross County Solar Facility

**CLIENT: Geronimo Energy
Bloomington, MN**

**SITE: Williamsport Pike
Clarksburg, OH**

LOCATION See Exploration Plan

Latitude: 39.3345° Longitude: -83.3604°

Approximate Surface Elev.: 876.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.5	**TOPSOIL (6.0")**	876+/-									
2		**SANDY LEAN CLAY (CL)**, trace sand, trace gravel, trace organics, dark brown to brown, moist, medium stiff					14	5-4-5 N=9	3.0 (HP)			
							12	4-3-4 N=7	1.5 (HP)	13.8	30-15-15	55
		possible boulder and cobble between 3' to 6'					6	4-4-4 N=8	3.0 (HP)	12.7		
	6.0		870.5+/-	5			4	3-3-3 N=6	-			
		SANDY LEAN CLAY (CL), trace gravel, brown, moist, stiff to very stiff					16	4-6-8 N=14	4.5 (HP)	12.6	23-11-12	52
		turning gray below 7.5'					16	4-8-8 N=16	3.5 (HP)			
				10			16	4-7-8 N=15	4.0 (HP)			
	15.0		861.5+/-	15			16	4-6-7 N=13	4.5 (HP)			
		Boring Terminated at 15 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-27-2020	Boring Completed: 07-27-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-3

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3324° Longitude: -83.369°

Approximate Surface Elev.: 890.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (3.0")**	890.5+/-									
2		**SANDY LEAN CLAY (CL)**, trace sand, trace gravel, brown, moist, stiff					16	5-5-5 N=10	4.5 (HP)			
	1.5		889+/-									
		LEAN CLAY WITH SAND (CL), trace gravel, brown to gray, moist, stiff					10	4-4-6 N=10	1.0 (HP)	17.4	33-16-17	72
							16	4-4-8 N=12	1.5 (HP)		27-13-14	61
	4.0		886.5+/-									
		SANDY LEAN CLAY (CL), trace gravel, brown to gray, moist, stiff		5			12				22-12-10	59
		turning to medium stiff at 6'					16	3-4-5 N=9	1.5 (HP)			
		turning to very stiff below 7.5'					14	4-8-10 N=18	2.5 (HP)			
		turning to gray below 9.5'		10			12	6-13-15 N=28	4.5 (HP)			
							16	7-10-10 N=20	20 (HP)			
	15.0		875.5+/-	15								
		Boring Terminated at 15 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiancy: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

800 Morrison Rd
Gahanna, OH

Boring Started: 07-27-2020	Boring Completed: 07-27-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-4

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3295° Longitude: -83.3607°

Approximate Surface Elev.: 886 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		0.3	**TOPSOIL (3.0")**	886+/-									
2			**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, stiff					14	5-5-5 N=10	4.5 (HP)			
								16	3-6-7 N=13	3.5 (HP)	12.7	25-13-12	56
								14	5-7-7 N=14	4.5 (HP)	10.4	31-14-17	63
		5.0		881+/-	5								
4			**CLAYEY SAND WITH GRAVEL (SC)**, brown, moist, medium dense					16	4-5-6 N=11				
								18	3-4-6 N=10				
								18	3-6-7 N=13		12.9	23-12-11	50
			turning to gray below 9'		10			16	3-5-5 N=10				
								18	3-5-5 N=10				
		15.0		871+/-	15								
			Boring Terminated at 15 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-28-2020	Boring Completed: 07-28-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-5

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3286° Longitude: -83.3547°

Approximate Surface Elev.: 903.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (3.0")**	903.5+/-									
4		**CLAYEY SAND (SC)**, trace gravel, brown, moist, loose to medium dense					16	5-5-4 N=9				
							10	3-5-5 N=10		23.9		
										15.2	35-16-19	43
							6	4-5-5 N=10				
				5			12	2-4-5 N=9				
	6.0		897.5+/-									
2		**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, stiff to very stiff					16	2-4-6 N=10	2.75 (HP)	14.3	24-13-11	59
							16	2-6-7 N=13	2.0 (HP)			
				10			16	6-10-12 N=22	4.5 (HP)			
		turning to gray below 13.5'					16	4-6-11 N=17	4.5 (HP)			
	15.0		888.5+/-	15								
		Boring Terminated at 15 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-27-2020	Boring Completed: 07-27-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-6

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3246° Longitude: -83.3647°

Approximate Surface Elev.: 903.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (3.0")**	903.5+/-									
2		**SANDY LEAN CLAY (CL)**, trace gravel, brown to gray, moist, medium stiff to very stiff					14	5-4-4 N=8	4.5 (HP)			
							16	4-4-5 N=9	1.75 (HP)	10.0	29-14-15	65
							16	2-4-7 N=11	3.0 (HP)	12.3	24-14-10	56
				5			12				23-12-11	59
							18	4-5-8 N=13	4.5 (HP)			
		turning to gray below 7.5'					14	6-10-10 N=20	4.5 (HP)			
				10			18	6-8-8 N=16	2.0 (HP)			
							16	3-4-6 N=10	4.5 (HP)			
	15.0		888.5+/-	15								

Boring Terminated at 15 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-28-2020	Boring Completed: 07-28-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-7

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy
Bloomington, MN

SITE: Williamsport Pike
Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3228° Longitude: -83.3727°

Approximate Surface Elev.: 928 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1	0.3	**TOPSOIL (3.0")**	928+/-
2	6.0	**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff to stiff	922+/-
2	13.5	**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff wet sand seams encountered between 6.0' to 7.5' turning to soft at 7.5' turning to very stiff below 9 feet	914.5+/-
2	15.0	**GRAVELLY LEAN CLAY WITH SAND (CL)**, brownish gray, moist, very stiff	913+/-
		Boring Terminated at 15 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0–1.5			16	4-4-5 N=9	3.0 (HP)	17.7		
1.5–3			14	3-4-5 N=9	2.5 (HP)	15.0	31-15-16	66
3–4.5			14	4-4-4 N=8	2.25 (HP)			
4.5–6			12	7-6-6 N=12	2.0 (HP)	13.7	23-11-12	51
6–7.5	▽ (6.0)		12	4-3-4 N=7	1.75 (HP)			
7.5–9			6	1-1-1 N=2	0.5 (HP)			
9–11			24					
13.5–15			16	6-9-13 N=22	4.5 (HP)			

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiancy: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 6.0' while sampling*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-28-2020	Boring Completed: 07-28-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-8

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy
Bloomington, MN

SITE: Williamsport Pike
Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3196° Longitude: -83.3672°

Approximate Surface Elev.: 909.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (3.0")**	909.5+/-								
2		**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff to stiff				12	3-4-4 N=8	4.5 (HP)			
						10	3-3-3 N=6	3.0 (HP)	21.9	31-15-16	55
						16	3-5-5 N=10	3.0 (HP)	9.0		
	6.0		903.5+/-	5		14	3-5-7 N=12	2.75 (HP)			
4		**CLAYEY SAND (SC)**, trace gravel, brown, moist, medium dense				14	4-7-8 N=15		11.1	20-11-9	47
						16	5-7-12 N=19				
				10		14	21-8-11 N=19				
	15.0	turning to gray below 13.5'	894.5+/-	15	▽	14	5-13-10 N=23				
		Boring Terminated at 15 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Classification by: M. Evener

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 14.0' while sampling*

800 Morrison Rd
Gahanna, OH

Boring Started: 07-28-2020	Boring Completed: 07-28-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-9

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3156° Longitude: -83.3688°

Approximate Surface Elev.: 944 (Ft.) +/-

MODEL LAYER	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)
1	0.3	**TOPSOIL (4.0")**	943.5+/-
2	13.5	**CLAYEY SAND (SC)**, trace gravel, brown, moist, medium dense, trace organic material	930.5+/-
5	15.0	**CLAYEY GRAVEL WITH SAND (GC)**, gray to brown, moist, dense	929+/-
		Boring Terminated at 15 Feet	

RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
14	7-6-7 N=13				
10	5-7-9 N=16		16.8	33-15-18	36
12	6-6-8 N=14		12.2		
16	5-6-8 N=14				
16	4-5-9 N=14				
16	5-8-9 N=17				
16	4-9-12 N=21				
14	7-20-27 N=47	-			

Stratification lines are approximate. In-situ, the transition may be gradual.

Classification by: J. Bitting

Hammer Type: Automatic (Hammer Efficiancy: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water observed at 4.0' while sampling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-28-2020

Boring Completed: 07-28-2020

Drill Rig: ATV (#651)

Driller: L. Reiser

Project No.: N4205268

BORING LOG NO. B-20-10

PROJECT: Ross County Solar Facility

**CLIENT: Geronimo Energy
Bloomington, MN**

**SITE: Williamsport Pike
Clarksburg, OH**

LOCATION See Exploration Plan

Latitude: 39.3194° Longitude: -83.3613°

Approximate Surface Elev.: 896.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		0.3	**TOPSOIL (4.0")**	896+/-									
2			**SANDY LEAN CLAY (CL)**, trace gravel, brown to gray, moist, stiff to very stiff, contains trace organic material				X	15	4-5-6 N=11	4.5 (HP)			
			wood chips noted between 1.5' to 3.0'				X	6	7-9-10 N=19	2.25 (HP)	14.0	29-16-13	64
							X	16	6-6-8 N=14	3.25 (HP)	11.6	30-13-17	62
					5		X	16	6-6-7 N=13	2.0 (HP)			
							X	14	4-5-6 N=11	1.75 (HP)			
							X	18	5-6-6 N=12	4.5 (HP)			
					10		X	16	3-4-8 N=12	2.25 (HP)			
			wet silt seams encountered below 13.5'				X	18	4-5-5 N=10	2.75 (HP)			
		15.0		881.5+/-	15								
			Boring Terminated at 15 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: J. Bitting

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-29-2020	Boring Completed: 07-29-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-11

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3198° Longitude: -83.3502°

Approximate Surface Elev.: 876.0 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (3.0")**	876+/-									
4	1.5	**CLAYEY SAND (SC)**, trace gravel, brown to gray, moist, loose, trace organic material encountered below 0.3'	874.5+/-				14	6-4-5 N=9				
3	3.0	**SANDY FAT CLAY (CH)**, trace gravel, brown to gray, moist, stiff	873+/-				14	4-5-6 N=11	4.5 (HP)	22.2	55-16-39	67
4	4.5	**CLAYEY SAND (SC)**, brown to gray, moist, medium dense	871.5+/-				12	4-5-5 N=10		14.6	35-15-20	42
2		**SANDY LEAN CLAY (CL)**, trace gravel, brown to gray, moist, stiff		5			18	4-5-5 N=10	2.75 (HP)	11.9	25-13-12	58
							18	2-4-6 N=10	3.25 (HP)			
		trace organic material encountered below 7.5'					6	5-5-7 N=12	1.75 (HP)			
		turning medium stiff below 9.5 feet		10			14	2-4-5 N=9	4.5 (HP)			
					▽							
	15.0	turning dark gray below 13.5'	861+/-	15			16	3-3-3 N=6	-			
		Boring Terminated at 15 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: J. Bitting

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:
Additional water observed at 13.5' - 15.0'.

WATER LEVEL OBSERVATIONS

▽ *Water observed at 11.4' while sampling*

▽ *Water was observed at 11.3' at the completion of drilling*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-29-2020	Boring Completed: 07-29-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-12

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy
Bloomington, MN

SITE: Williamsport Pike
Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3133° Longitude: -83.361°

Approximate Surface Elev.: 929.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1	0.3	**TOPSOIL (4.0")**	929+/-
2	3.0	**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff, contains trace organic material	926.5+/-
4	4.5	**CLAYEY SAND (SC)**, trace gravel, brown, moist, loose	925+/-
2	6.0	**SANDY SILTY CLAY (CL-ML)**, trace gravel, brown, moist	923.5+/-
4	8.0	**CLAYEY SAND (SC)**, trace gravel, brown to gray, moist, loose	921.5+/-
2	15.0	**LEAN CLAY WITH SAND (CL)**, trace gravel, brown to gray, moist, stiff turning hard at 9 feet turning stiff below 13.5 feet	914.5+/-
		Boring Terminated at 15 Feet	

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
0–1.5		14	5-4-5 N=9	2.5 (HP)	16.4		
1.5–3		16	3-4-4 N=8	1.5 (HP)			
3					14.9	33-16-17	58
3–4.5		6	2-3-3 N=6		24.9	39-14-25	38
4.5–6.5		24				21-15-6	53
6.5–8		14	1-4-1 N=5		10.4	19-11-8	39
8–9.5		16	3-5-7 N=12	2.75 (HP)			
9.5–11		18	7-14-27 N=41	4.5 (HP)			
13.5–15	▽ (15.0)	14	4-4-10 N=14	2.0 (HP)			

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: J. Bitting

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 15.0' while sampling*

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-29-2020	Boring Completed: 07-29-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-13

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy
Bloomington, MN

SITE: Williamsport Pike
Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3086° Longitude: -83.3669°

Approximate Surface Elev.: 990.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1	0.3	**TOPSOIL (4.0")**	990+/-
4	3.0	**CLAYEY SAND (SC)**, brown, moist, medium dense, trace organic material encountered below 0.33'	987.5+/-
2	4.5	**SANDY LEAN CLAY (CL)**, stiff	986+/-
2	13.5	**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff to very stiff	977+/-
5	14.5	**CLAYEY GRAVEL WITH SAND (GC)**, brown, very dense, drove shale boulder	976+/-
		Boring Terminated at 14.5 Feet	

RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
14	4-6-7 N=13		11.1		
12	5-7-6 N=13		12.0	27-12-15	47
6	4-4-8 N=12	4.5 (HP)	16.1	43-17-26	61
11	1-3-4 N=7	1.25 (HP)			
12	3-4-4 N=8	2.75 (HP)			
12	2-4-10 N=14	0.5 (HP)			
16	4-8-13 N=21	4.5 (HP)			
6	50/6"	-			

DEPTH (Ft.): 5, 10

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: J. Bitting

Hammer Type: Automatic (Hammer Efficiency: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water observed at 10.6' while sampling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-29-2020	Boring Completed: 07-29-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-14

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy Bloomington, MN

SITE: Williamsport Pike Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3094° Longitude: -83.3584°

Approximate Surface Elev.: 940.5 (Ft.) +/-

MODEL LAYER	DEPTH	MATERIAL DESCRIPTION	ELEVATION (Ft.)	SAMPLE DEPTH	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (4.0")**	940+/-							
2		**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff to stiff, trace organic material encountered below 0.33'		0-1.5	16	6-4-5 N=9	4.5 (HP)			
				1.5-3	16	7-7-5 N=12	4.5 (HP)	16.2	38-15-23	62
				3-4.5	10	2-3-3 N=6	4.5 (HP)	14.4	25-13-12	53
				4.5-6	16	8-3-2 N=5	1.25 (HP)			
	7.5		933+/-	6-7.5	18	3-5-6 N=11	2.75 (HP)			
4		**CLAYEY SAND (SC)**, trace gravel, brown to gray, moist, dense		7.5-9	16	4-10-21 N=31		8.8	20-10-10	47
		turning to medium dense and gray at 9'		9-10.5	16	14-13-13 N=26				
	15.0		925.5+/-	13.5-15	16	13-11-20 N=31				

Boring Terminated at 15 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Classification by: J. Bitting

Hammer Type: Automatic (Hammer Efficiancy: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

Water was not observed during drilling

Water was not observed at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-29-2020	Boring Completed: 07-29-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

BORING LOG NO. B-20-15

PROJECT: Ross County Solar Facility

CLIENT: Geronimo Energy
Bloomington, MN

SITE: Williamsport Pike
Clarksburg, OH

LOCATION See Exploration Plan

Latitude: 39.3131° Longitude: -83.35°

Approximate Surface Elev.: 904.5 (Ft.) +/-

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1	0.3	**TOPSOIL (4.0")**	904+/-									
2	1.5	**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, medium stiff, contains trace organic material	903+/-				14	4-3-3 N=6	2.75 (HP)			
4	3.0	**CLAYEY SAND (SC)**, trace gravel, brown, moist, loose	901.5+/-				16	2-3-5 N=8		24.4	45-14-31	45
2	9.0	**SANDY LEAN CLAY (CL)**, trace gravel, brown, moist, very stiff					14	4-9-10 N=19	4.5 (HP)	8.7	29-12-17	61
		turning stiff between 4.5' and 7.5 feet		5			14	4-5-5 N=10	-			
							16	3-5-9 N=14	2.75 (HP)			
		turning hard below 7.5'	895.5+/-				16	13-15-16 N=31	3.5 (HP)	8.4	22-11-11	52
4	13.5	**SILTY SAND WITH GRAVEL (SM)**, brown, wet, medium dense	891+/-	10	▽		14	9-10-9 N=19	-			
2	15.0	**LEAN CLAY WITH SAND (CL)**, trace gravel, gray, moist, hard	889.5+/-	15			14	9-17-15 N=32	4.5 (HP)			
		Boring Terminated at 15 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification by: J. Bitting

Hammer Type: Automatic (Hammer Efficiancy: 86.2%)

Advancement Method:
3.25" HSA

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

Notes:

WATER LEVEL OBSERVATIONS

▽ *Water observed at 9.5' while sampling*

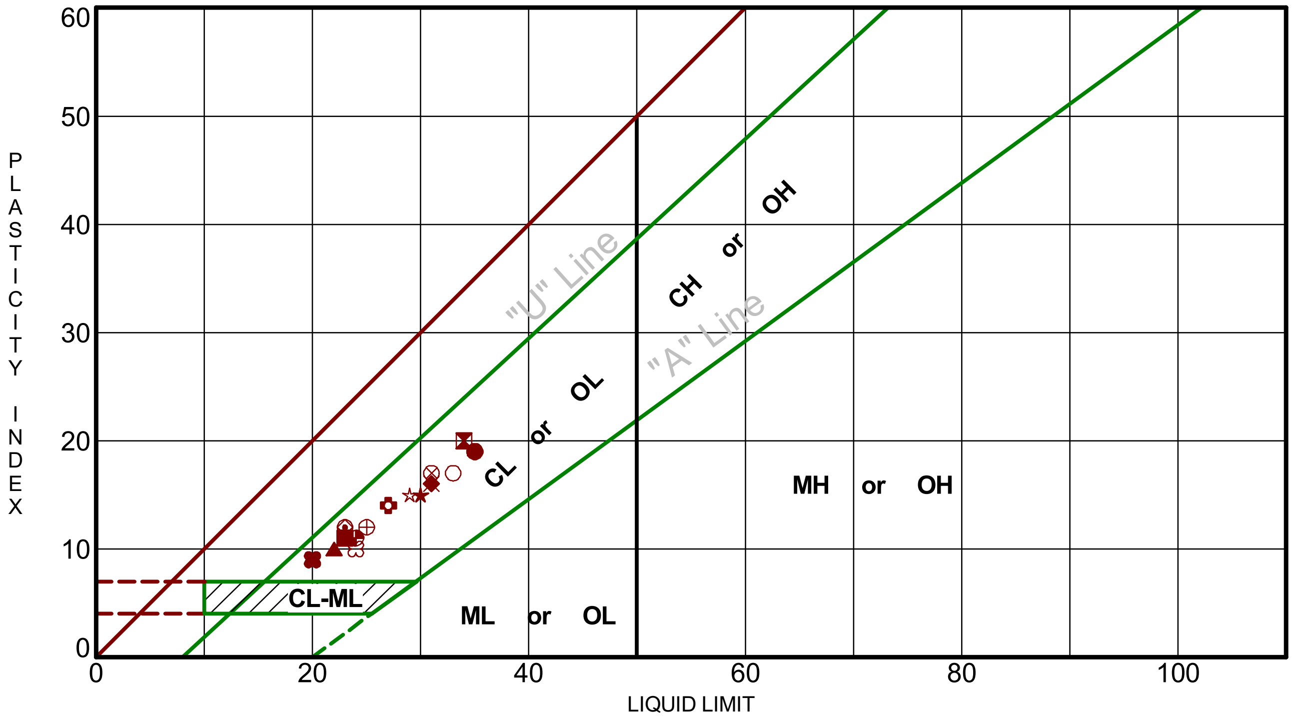
Water was observed at 14.4' at the completion of drilling

Terracon
800 Morrison Rd
Gahanna, OH

Boring Started: 07-29-2020	Boring Completed: 07-29-2020
Drill Rig: ATV (#651)	Driller: L. Reiser
Project No.: N4205268	

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
● B-20-1	0 - 1.5	35	16	19	61.6	CL	SANDY LEAN CLAY
⊠ B-20-1	1 - 5	34	14	20	46.8	SC	CLAYEY SAND
▲ B-20-1	6 - 7.5	22	12	10	43.6	SC	CLAYEY SAND
★ B-20-2	1 - 5	30	15	15	55.4	CL	SANDY LEAN CLAY
⊙ B-20-2	6 - 7.5	23	11	12	52.5	CL	SANDY LEAN CLAY
✿ B-20-3	1 - 5	27	13	14	61.0	CL	SANDY LEAN CLAY
○ B-20-3	1.5 - 3	33	16	17	72.2	CL	LEAN CLAY with SAND
△ B-20-3	4 - 6	22	12	10	58.9	CL	SANDY LEAN CLAY
⊗ B-20-4	1 - 5	31	14	17	63.2	CL	SANDY LEAN CLAY
⊕ B-20-4	1.5 - 3	25	13	12	56.5	CL	SANDY LEAN CLAY
□ B-20-4	7.5 - 9	23	12	11	49.8	SC	CLAYEY SAND with GRAVEL
B-20-5	1 - 5	35	16	19	42.9	SC	CLAYEY SAND
B-20-5	6 - 7.5	24	13	11	59.4	CL	SANDY LEAN CLAY
☆ B-20-6	1 - 5	29	14	15	65.5	CL	SANDY LEAN CLAY
B-20-6	3 - 4.5	24	14	10	56.3	CL	SANDY LEAN CLAY
■ B-20-6	4.5 - 6.5	23	12	11	58.8	CL	SANDY LEAN CLAY
◆ B-20-7	1 - 5	31	15	16	66.2	CL	SANDY LEAN CLAY
◇ B-20-7	4.5 - 6	23	11	12	51.5	CL	SANDY LEAN CLAY
× B-20-8	1 - 5	31	15	16	54.6	CL	SANDY LEAN CLAY
B-20-8	6 - 7.5	20	11	9	47.0	SC	CLAYEY SAND

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

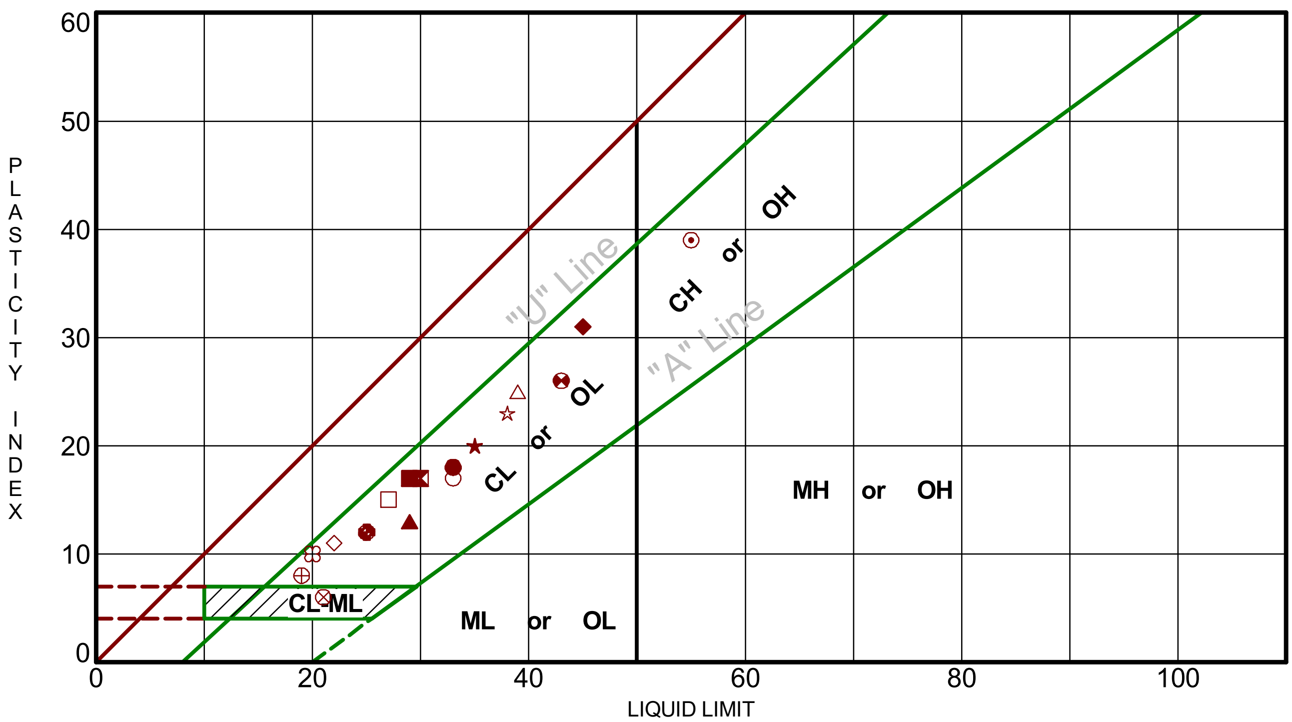
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
●	B-20-9	1 - 5	33	15	18	36.3	SC	CLAYEY SAND
⊠	B-20-10	1 - 5	30	13	17	61.7	CL	SANDY LEAN CLAY
▲	B-20-10	1.5 - 3	29	16	13	64.4	CL	SANDY LEAN CLAY
★	B-20-11	1 - 5	35	15	20	42.2	SC	CLAYEY SAND
⊙	B-20-11	1.5 - 3	55	16	39	67.5	CH	SANDY FAT CLAY
✿	B-20-11	4.5 - 6	25	13	12	58.3	CL	SANDY LEAN CLAY
○	B-20-12	1 - 5	33	16	17	57.5	CL	SANDY LEAN CLAY
△	B-20-12	3 - 4.5	39	14	25	37.6	SC	CLAYEY SAND
⊗	B-20-12	4.5 - 6.5	21	15	6	52.8	CL-ML	SANDY SILTY CLAY
⊕	B-20-12	6 - 7.5	19	11	8	39.4	SC	CLAYEY SAND
□	B-20-13	1 - 5	27	12	15	47.1	SC	CLAYEY SAND
⊗	B-20-13	3 - 4.5	43	17	26	61.4	CL	SANDY LEAN CLAY
◕	B-20-14	1 - 5	25	13	12	52.8	CL	SANDY LEAN CLAY
☆	B-20-14	1.5 - 3	38	15	23	62.5	CL	SANDY LEAN CLAY
✿	B-20-14	7.5 - 9	20	10	10	46.6	SC	CLAYEY SAND
■	B-20-15	1 - 5	29	12	17	61.2	CL	SANDY LEAN CLAY
◆	B-20-15	1.5 - 3	45	14	31	45.2	SC	CLAYEY SAND
◇	B-20-15	7.5 - 9	22	11	11	51.9	CL	SANDY LEAN CLAY

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

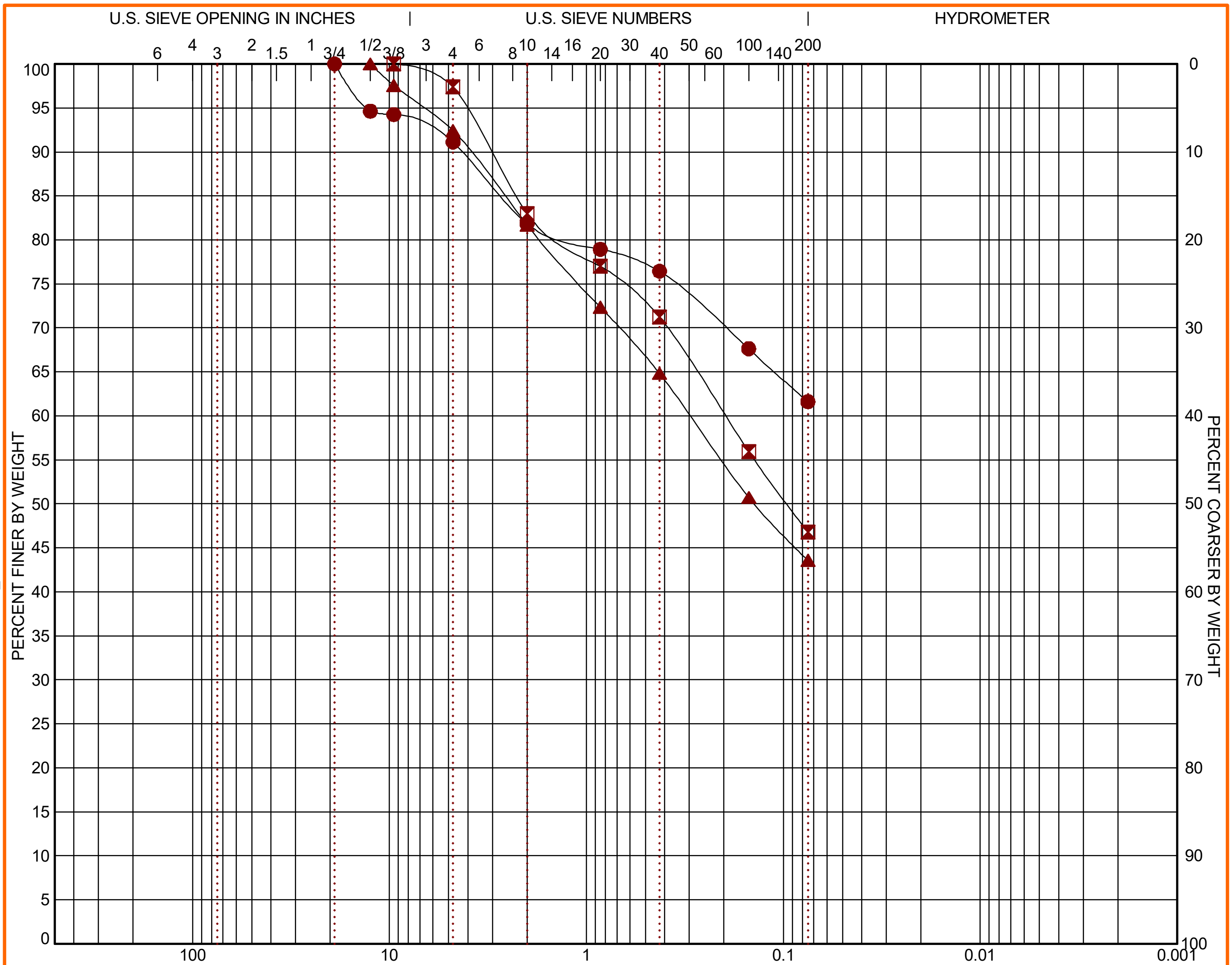
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-1**	**39.33853 / -83.36673**	**0 - 1.5**	**0.0**	**8.9**	**29.5**		**61.6**	
⊠	**B-20-1**	**39.33853 / -83.36673**	**1 - 5**	**0.0**	**2.6**	**50.6**		**46.8**	
▲	**B-20-1**	**39.33853 / -83.36673**	**6 - 7.5**	**0.0**	**7.6**	**48.8**		**43.6**	

GRAIN SIZE

	●	⊠	▲
D_{60}		0.198	0.298
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/4"	100.0	3/8"	100.0	1/2"	100.0
1/2"	94.63	#4	97.43	3/8"	97.58
3/8"	94.25	#10	83.0	#4	92.42
#4	91.13	#20	76.99	#10	81.69
#10	81.82	#40	71.23	#20	72.35
#20	78.93	#100	55.94	#40	64.83
#40	76.44	#200	46.82	#100	50.73
#100	67.63			#200	43.58
#200	61.62				

SOIL DESCRIPTION

- ● SANDY LEAN CLAY (CL)
- ⊠ CLAYEY SAND (SC)
- ▲ CLAYEY SAND (SC)

REMARKS

- ● Location: N E
  Elevation: 885.4
- ⊠ Location: N E
  Elevation: 885.4
- ▲ Location: N E
  Elevation: 885.4

PROJECT: Ross County Solar Facility

PROJECT NUMBER: N4205268

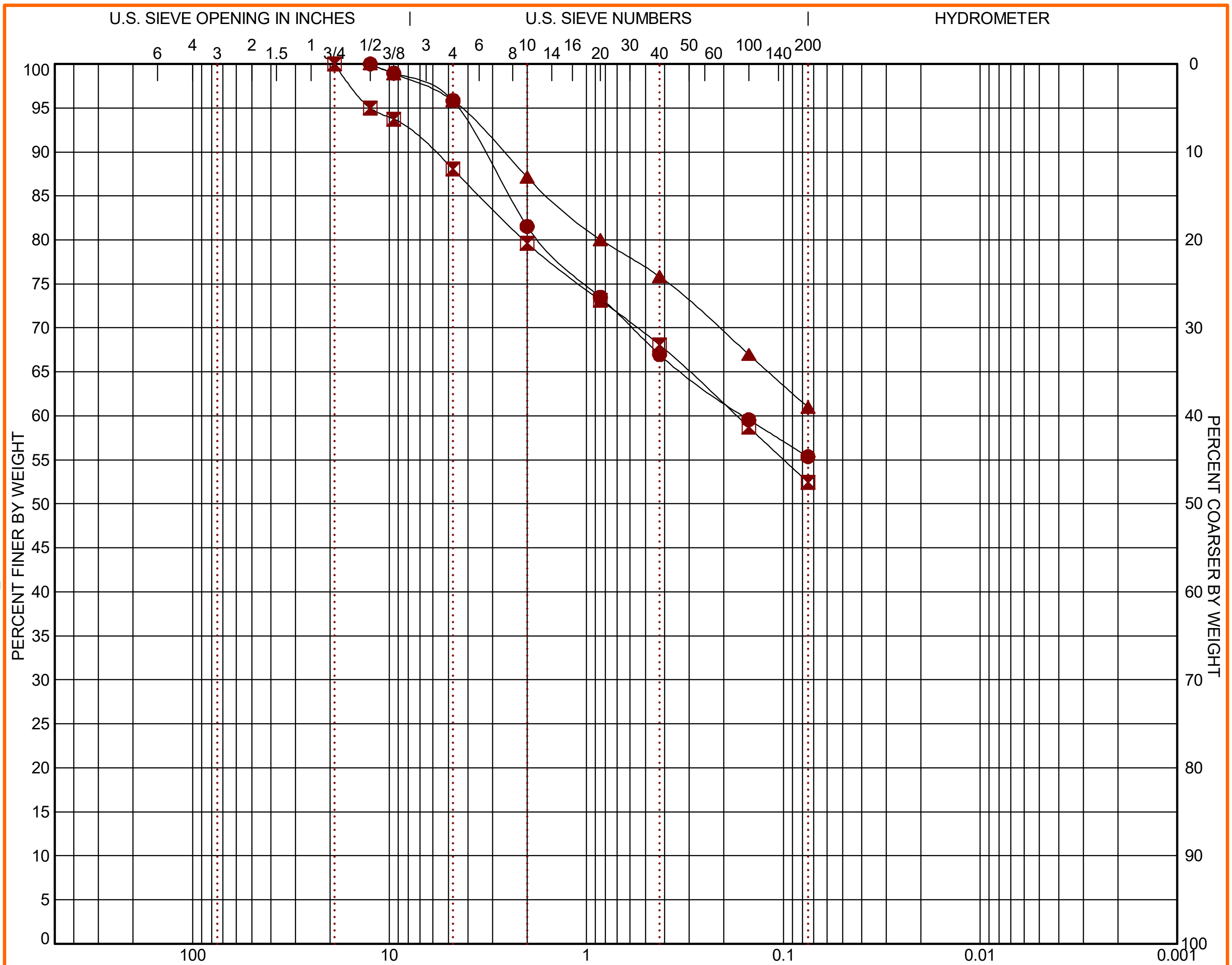
SITE: Williamsport Pike
Clarksburg, OH

Terracon
800 Morrison Rd
Gahanna, OH

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-2**	**39.33455 / -83.36035**	**1 - 5**	**0.0**	**4.2**	**40.5**		**55.4**	
⊠	**B-20-2**	**39.33455 / -83.36035**	**6 - 7.5**	**0.0**	**11.9**	**35.6**		**52.5**	
▲	**B-20-3**	**39.33236 / -83.36896**	**1 - 5**	**0.0**	**4.2**	**34.8**		**61.0**	

GRAIN SIZE

	●	⊠	▲
D_{60}	0.16	0.173	
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
1/2"	100.0	3/4"	100.0	1/2"	100.0
3/8"	98.95	1/2"	94.97	3/8"	98.88
#4	95.83	3/8"	93.73	#4	95.84
#10	81.53	#4	88.05	#10	87.13
#20	73.47	#10	79.64	#20	80.04
#40	66.97	#20	73.14	#40	75.85
#100	59.56	#40	68.07	#100	66.99
#200	55.37	#100	58.74	#200	61.0
		#200	52.47		

SOIL DESCRIPTION

- ● SANDY LEAN CLAY (CL)
- ⊠ SANDY LEAN CLAY (CL)
- ▲ SANDY LEAN CLAY (CL)

REMARKS

- ● Location: N E Elevation: 876.3
- ⊠ Location: N E Elevation: 876.3
- ▲ Location: N E Elevation: 890.5

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

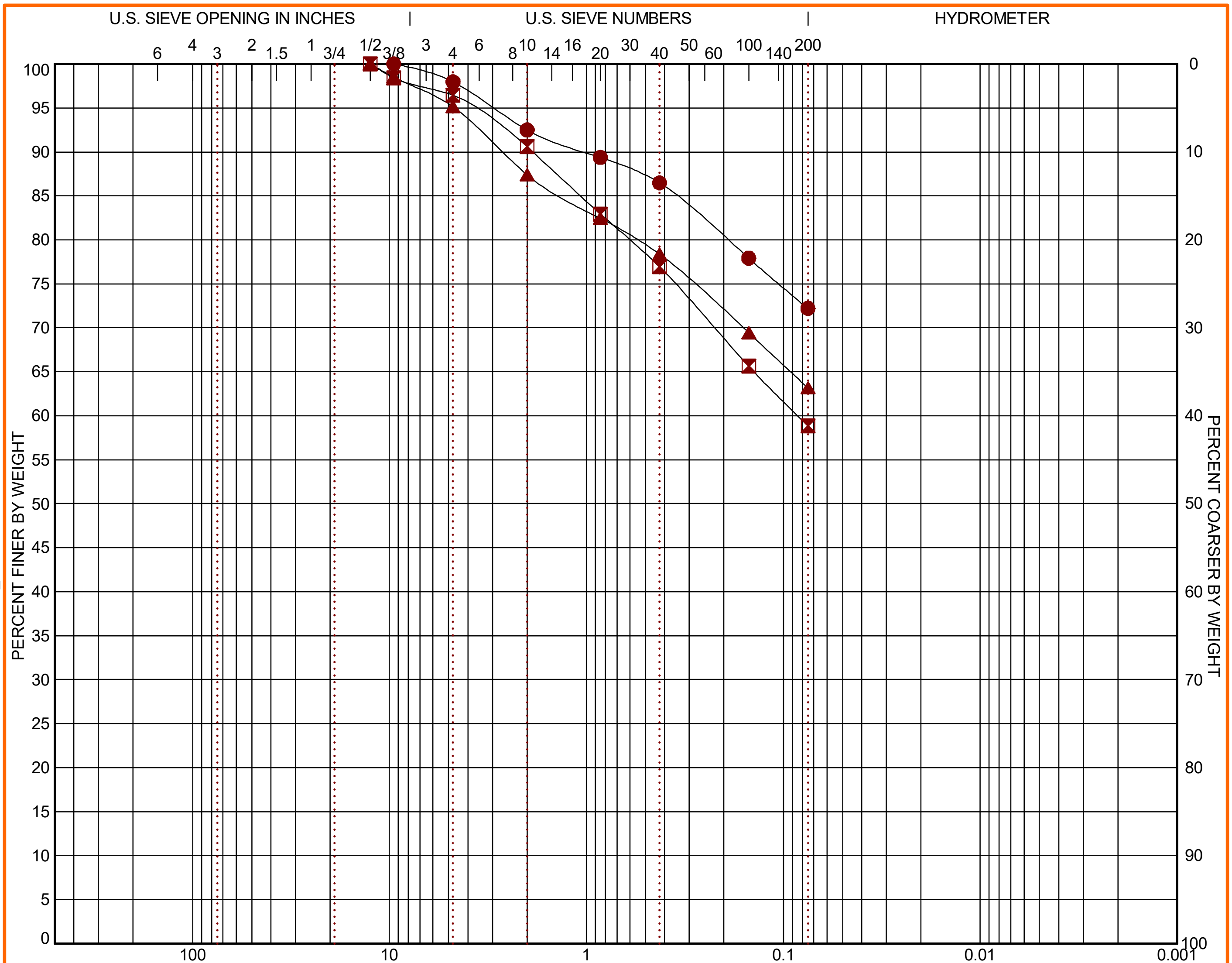
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-3**	**39.33236 / -83.36896**	**1.5 - 3**	**0.0**	**2.0**	**25.7**		**72.2**	
⊠	**B-20-3**	**39.33236 / -83.36896**	**4 - 6**	**0.0**	**3.6**	**37.6**		**58.9**	
▲	**B-20-4**	**39.32954 / -83.36066**	**1 - 5**	**0.0**	**4.9**	**31.9**		**63.2**	

GRAIN SIZE

	●	⊠	▲
D_{60}		0.084	
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/8"	100.0	1/2"	100.0	1/2"	100.0
#4	97.96	3/8"	98.42	3/8"	98.49
#10	92.49	#4	96.44	#4	95.12
#20	89.37	#10	90.58	#10	87.39
#40	86.47	#20	82.95	#20	82.44
#100	77.92	#40	76.93	#40	78.38
#200	72.21	#100	65.63	#100	69.45
		#200	58.87	#200	63.18

SOIL DESCRIPTION

● LEAN CLAY with SAND (CL)

⊠ SANDY LEAN CLAY (CL)

▲ SANDY LEAN CLAY (CL)

REMARKS

● Location: N E
Elevation: 890.5

⊠ Location: N E
Elevation: 890.5

▲ Location: N E
Elevation: 559.2

PROJECT: Ross County Solar Facility

PROJECT NUMBER: N4205268

SITE: Williamsport Pike
Clarksburg, OH

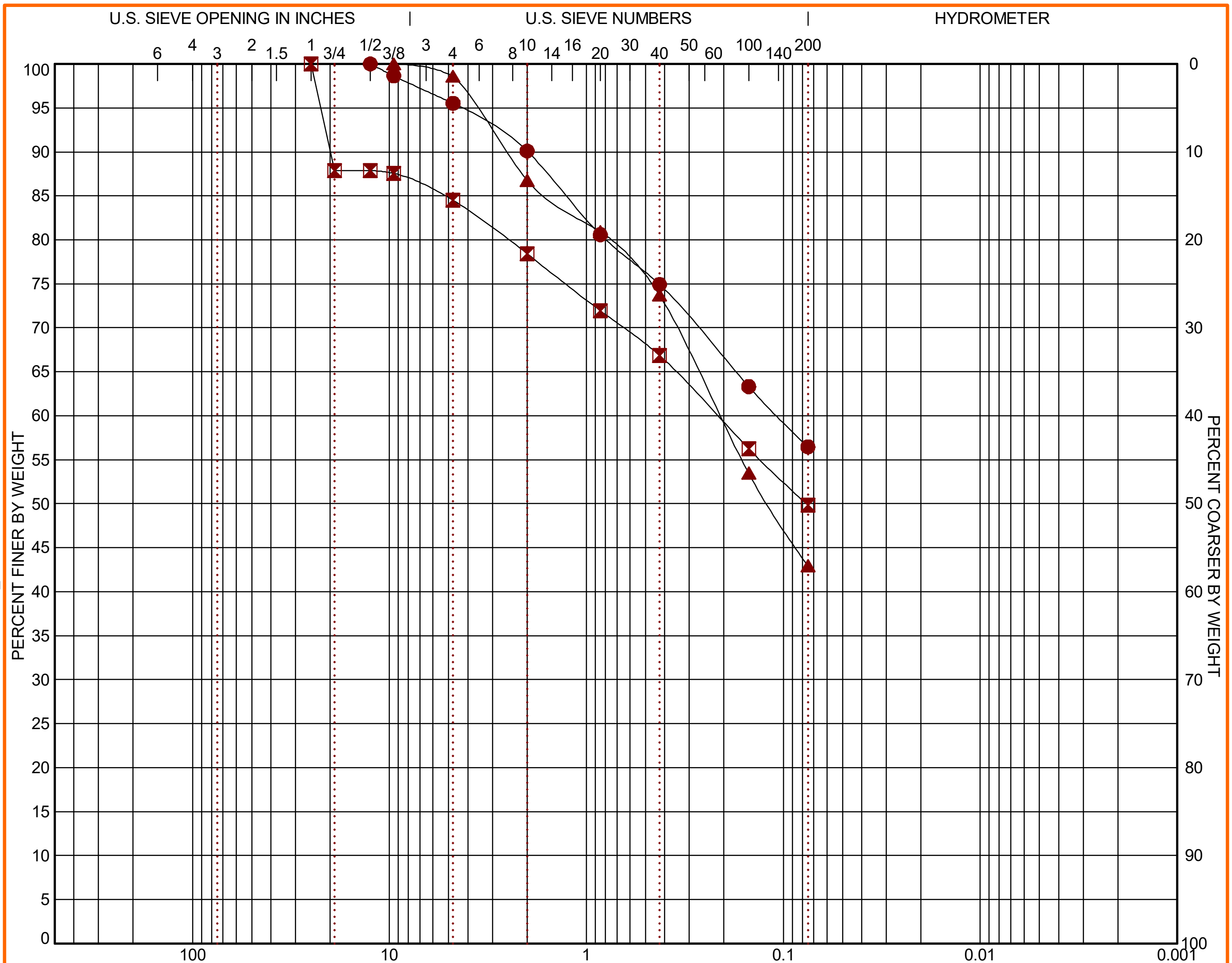
Terracon
800 Morrison Rd
Gahanna, OH

CLIENT: Ross County Solar, LLC
Bloomington, MN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. 73191029-GRAIN SIZE-USCS 1 N4205268 ROSS COUNTY SOLAR.GPJ TERRACON_DATATEMPLATE.GDT 9/17/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL coarse	GRAVEL fine	SAND coarse	SAND medium	SAND fine	SILT OR CLAY

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	B-20-4	39.32954 / -83.36066	1.5 - 3	0.0	4.5	39.1		56.5	
⊠	B-20-4	39.32954 / -83.36066	7.5 - 9	0.0	15.5	34.7		49.8	
▲	B-20-5	39.32857 / -83.35473	1 - 5	0.0	1.4	55.7		42.9	

GRAIN SIZE

	●	⊠	▲
D_{60}	0.107	0.217	0.21
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/8"	98.64	1"	100.0	3/8"	100.0
#4	95.52	3/4"	87.89	#4	98.6
#10	90.1	1/2"	87.89	#10	86.77
#20	80.59	3/8"	87.54	#20	80.93
#40	74.93	#4	84.51	#40	73.72
#100	63.32	#10	78.43	#100	53.47
#200	56.47	#20	71.97	#200	42.93
1/2"	100.0	#40	66.85		
		#100	56.25		
		#200	49.83		

SOIL DESCRIPTION

●	SANDY LEAN CLAY (CL)
⊠	CLAYEY SAND with GRAVEL (SC)
▲	CLAYEY SAND (SC)

REMARKS

●	Location: N E Elevation: 559.2
⊠	Location: N E Elevation: 559.2
▲	Location: N E Elevation: 903.5

PROJECT: Ross County Solar Facility

PROJECT NUMBER: N4205268

SITE: Williamsport Pike
Clarksburg, OH

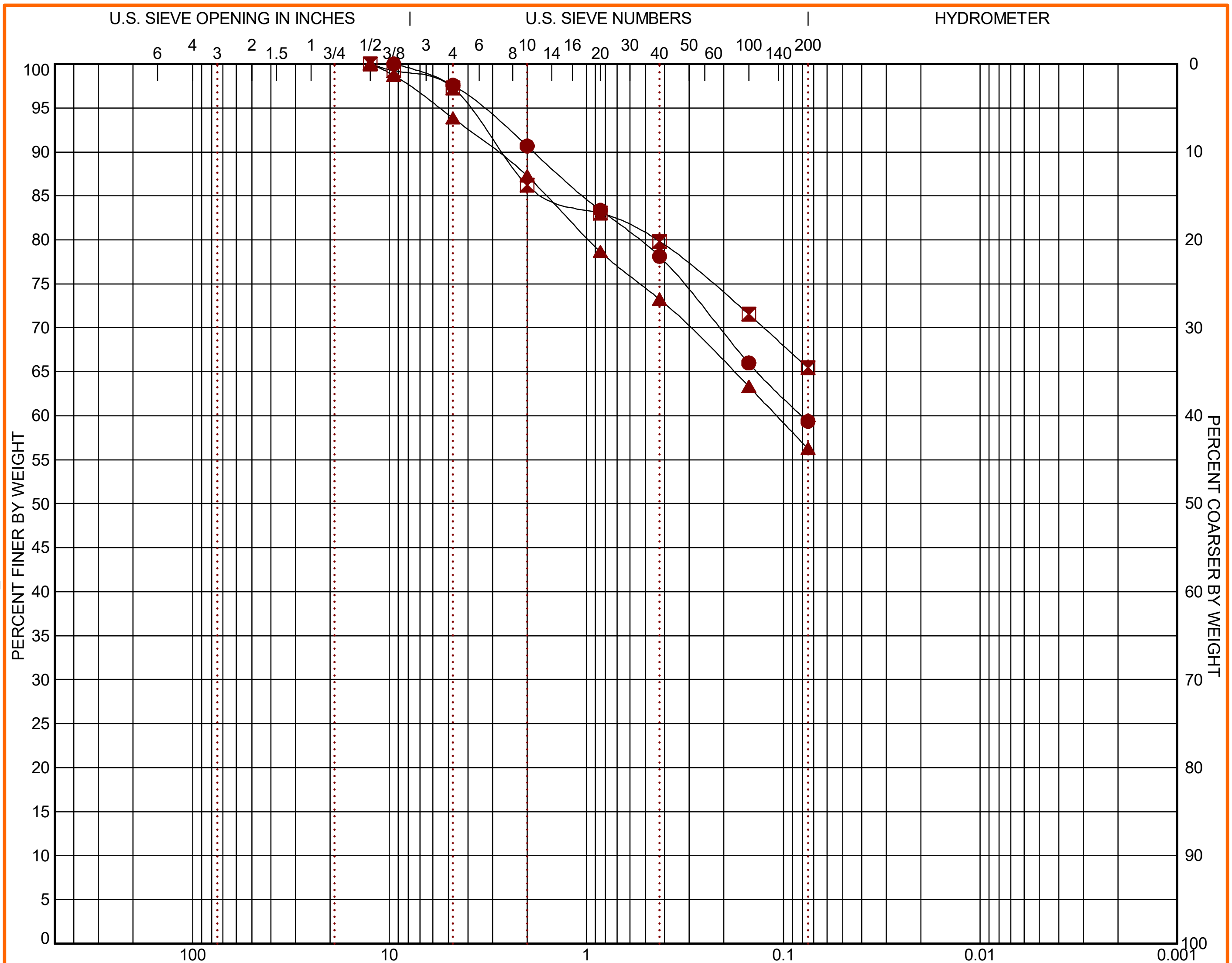
Terracon
800 Morrison Rd
Gahanna, OH

CLIENT: Ross County Solar, LLC
Bloomington, MN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. 73191029-GRAIN SIZE-USCS 1 N4205268 ROSS COUNTY SOLAR.GPJ TERRACON_DATATEMPLATE.GDT 9/17/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-5**	**39.32857 / -83.35473**	**6 - 7.5**	**0.0**	**2.4**	**38.2**		**59.4**	
⊠	**B-20-6**	**39.32462 / -83.36467**	**1 - 5**	**0.0**	**2.7**	**31.8**		**65.5**	
▲	**B-20-6**	**39.32462 / -83.36467**	**3 - 4.5**	**0.0**	**6.2**	**37.6**		**56.3**	

GRAIN SIZE

	●	⊠	▲
D_{60}	0.08		0.108
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/8"	100.0	1/2"	100.0	1/2"	100.0
#4	97.57	3/8"	99.21	3/8"	98.7
#10	90.67	#4	97.3	#4	93.84
#20	83.37	#10	86.21	#10	87.29
#40	78.12	#20	83.04	#20	78.67
#100	66.0	#40	79.84	#40	73.25
#200	59.36	#100	71.55	#100	63.35
		#200	65.46	#200	56.27

SOIL DESCRIPTION

●	SANDY LEAN CLAY (CL)
⊠	SANDY LEAN CLAY (CL)
▲	SANDY LEAN CLAY (CL)

REMARKS

●	Location: N E Elevation: 903.5
⊠	Location: N E Elevation: 903.4
▲	Location: N E Elevation: 903.4

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

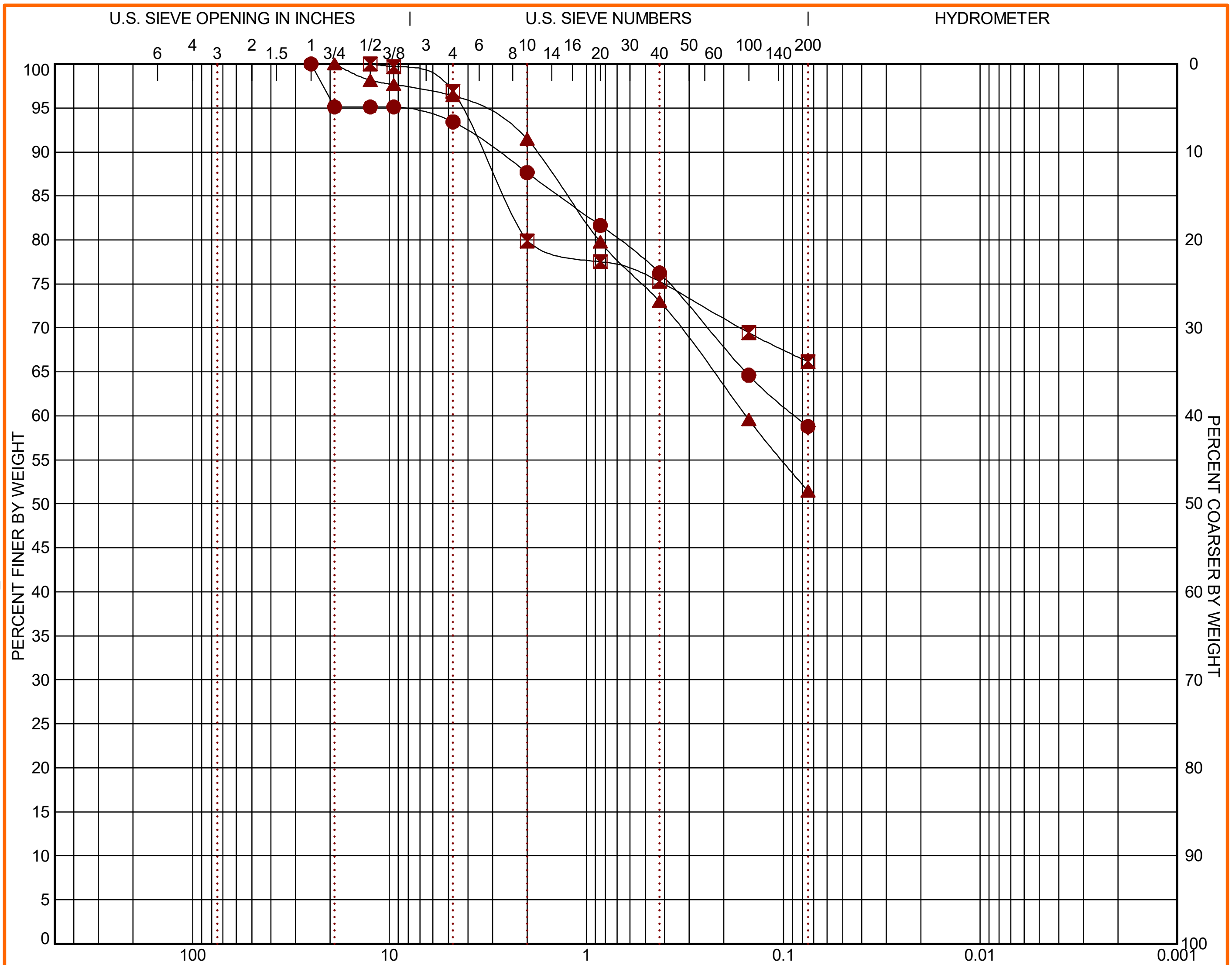
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-6**	**39.32462 / -83.36467**	**4.5 - 6.5**	**0.0**	**6.6**	**34.6**		**58.8**	
⊠	**B-20-7**	**39.32280 / -83.37266**	**1 - 5**	**0.0**	**3.1**	**30.7**		**66.2**	
▲	**B-20-7**	**39.32280 / -83.37266**	**4.5 - 6**	**0.0**	**3.6**	**44.9**		**51.5**	

GRAIN SIZE

	●	⊠	▲
D_{60}	0.087		0.155
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
1"	100.0	1/2"	100.0	3/4"	100.0
3/4"	95.11	3/8"	99.7	1/2"	98.14
1/2"	95.11	#4	96.9	3/8"	97.65
3/8"	95.11	#10	79.88	#4	96.39
#4	93.42	#20	77.5	#10	91.45
#10	87.66	#40	75.28	#20	79.78
#20	81.64	#100	69.46	#40	73.02
#40	76.25	#200	66.16	#100	59.59
#100	64.62			#200	51.47
#200	58.8				

SOIL DESCRIPTION

●	SANDY LEAN CLAY (CL)
⊠	SANDY LEAN CLAY (CL)
▲	SANDY LEAN CLAY (CL)

REMARKS

●	Location: N E Elevation: 903.4
⊠	Location: N E Elevation: 927.8
▲	Location: N E Elevation: 927.8

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

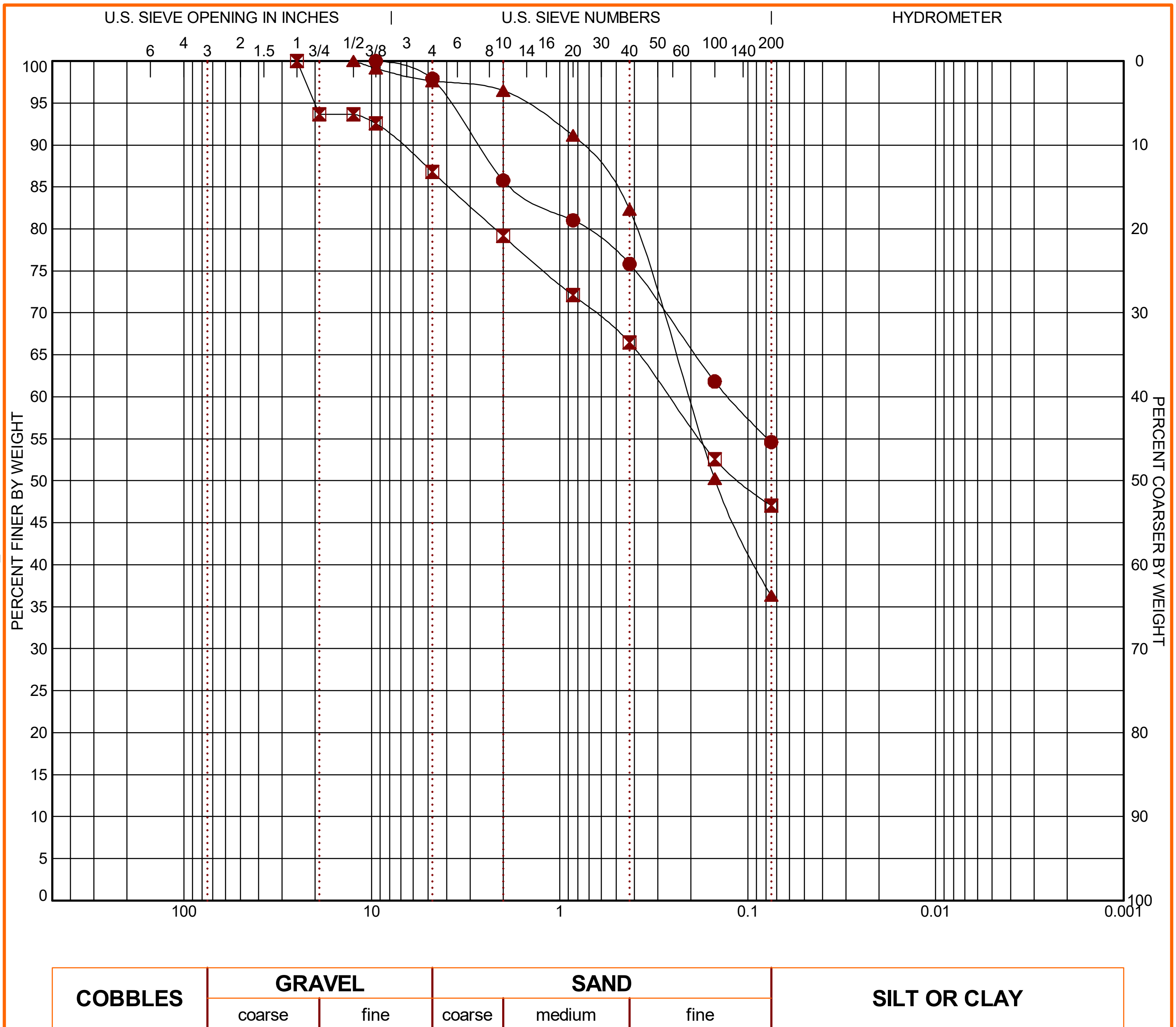
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
● **B-20-8**	**39.31957 / -83.36723**	**1 - 5**	**0.0**	**2.1**	**43.3**		**54.6**	
⊠ **B-20-8**	**39.31957 / -83.36723**	**6 - 7.5**	**0.0**	**13.2**	**39.7**		**47.0**	
▲ **B-20-9**	**39.31556 / -83.36875**	**1 - 5**	**0.0**	**2.4**	**61.3**		**36.3**	

GRAIN SIZE

	●	⊠	▲
D_{60}	0.126	0.261	0.206
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/8"	100.0	1"	100.0	1/2"	100.0
#4	97.89	3/4"	93.67	3/8"	99.13
#10	85.78	1/2"	93.67	#4	97.62
#20	81.03	3/8"	92.57	#10	96.49
#40	75.83	#4	86.78	#20	91.12
#100	61.83	#10	79.15	#40	82.33
#200	54.62	#20	72.1	#100	50.24
		#40	66.47	#200	36.32
		#100	52.6		
		#200	47.04		

SOIL DESCRIPTION

● SANDY LEAN CLAY (CL)

⊠ CLAYEY SAND (SC)

▲ CLAYEY SAND (SC)

REMARKS

● Location: N E
Elevation: 909.5

⊠ Location: N E
Elevation: 909.5

▲ Location: N E
Elevation: 943.7

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

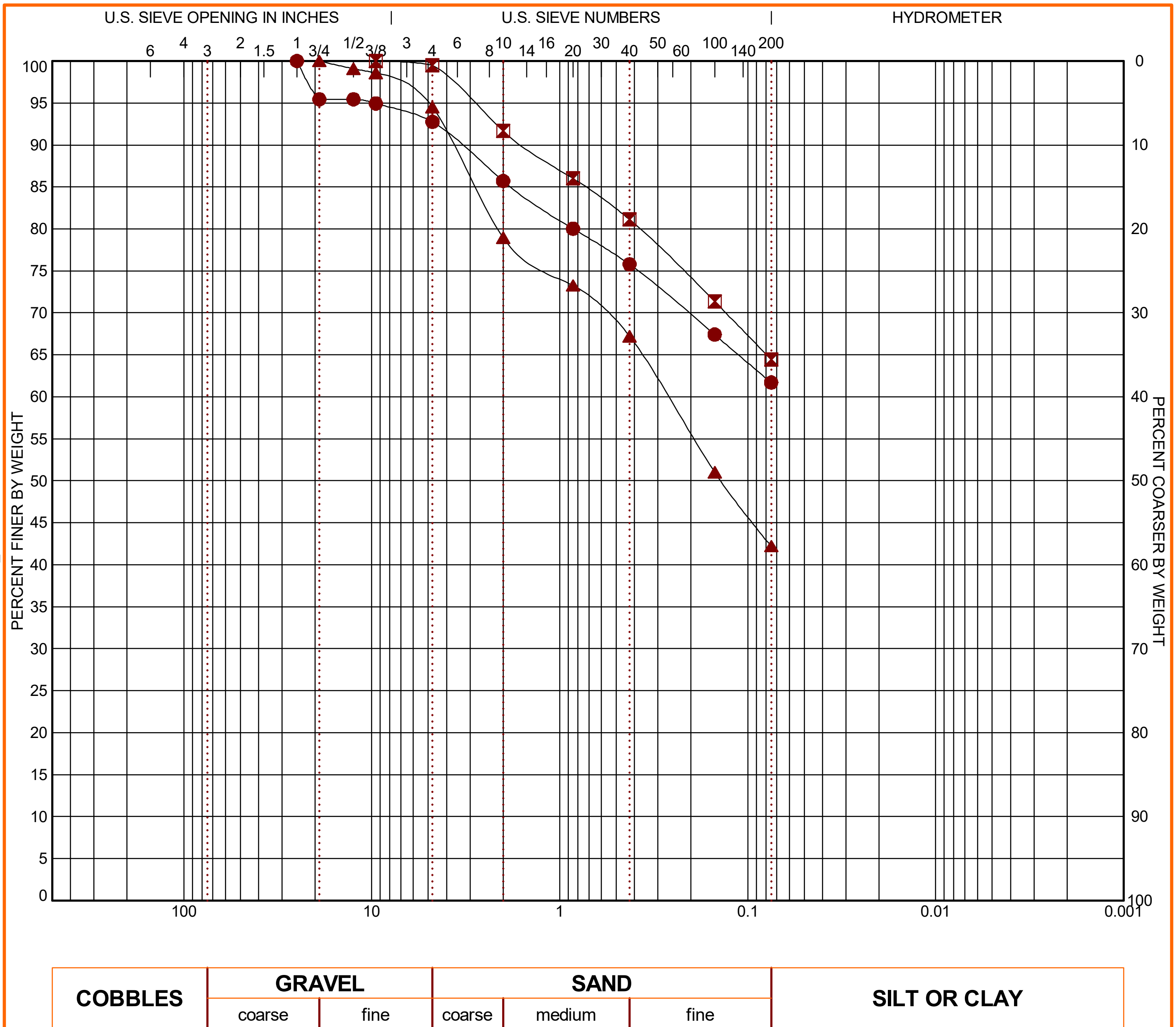
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



BORING ID		LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	B-20-10	39.31937 / -83.36127	1 - 5	0.0	7.3	31.0		61.7	
⊠	B-20-10	39.31937 / -83.36127	1.5 - 3	0.0	0.5	35.1		64.4	
▲	B-20-11	39.31980 / -83.35023	1 - 5	0.0	5.5	52.3		42.2	

GRAIN SIZE

	●	⊠	▲
D_{60}			0.267
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
1"	100.0	3/8"	100.0	3/4"	100.0
3/4"	95.44	#4	99.51	1/2"	99.08
1/2"	95.44	#10	91.66	3/8"	98.58
3/8"	94.94	#20	86.02	#4	94.52
#4	92.75	#40	81.12	#10	78.93
#10	85.7	#100	71.37	#20	73.27
#20	80.03	#200	64.45	#40	67.22
#40	75.78			#100	51.04
#100	67.42			#200	42.22
#200	61.7				

SOIL DESCRIPTION

● SANDY LEAN CLAY (CL)

⊠ SANDY LEAN CLAY (CL)

▲ CLAYEY SAND (SC)

REMARKS

● Location: N E
Elevation: 896.4

⊠ Location: N E
Elevation: 896.4

▲ Location: N E
Elevation: 876.2

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

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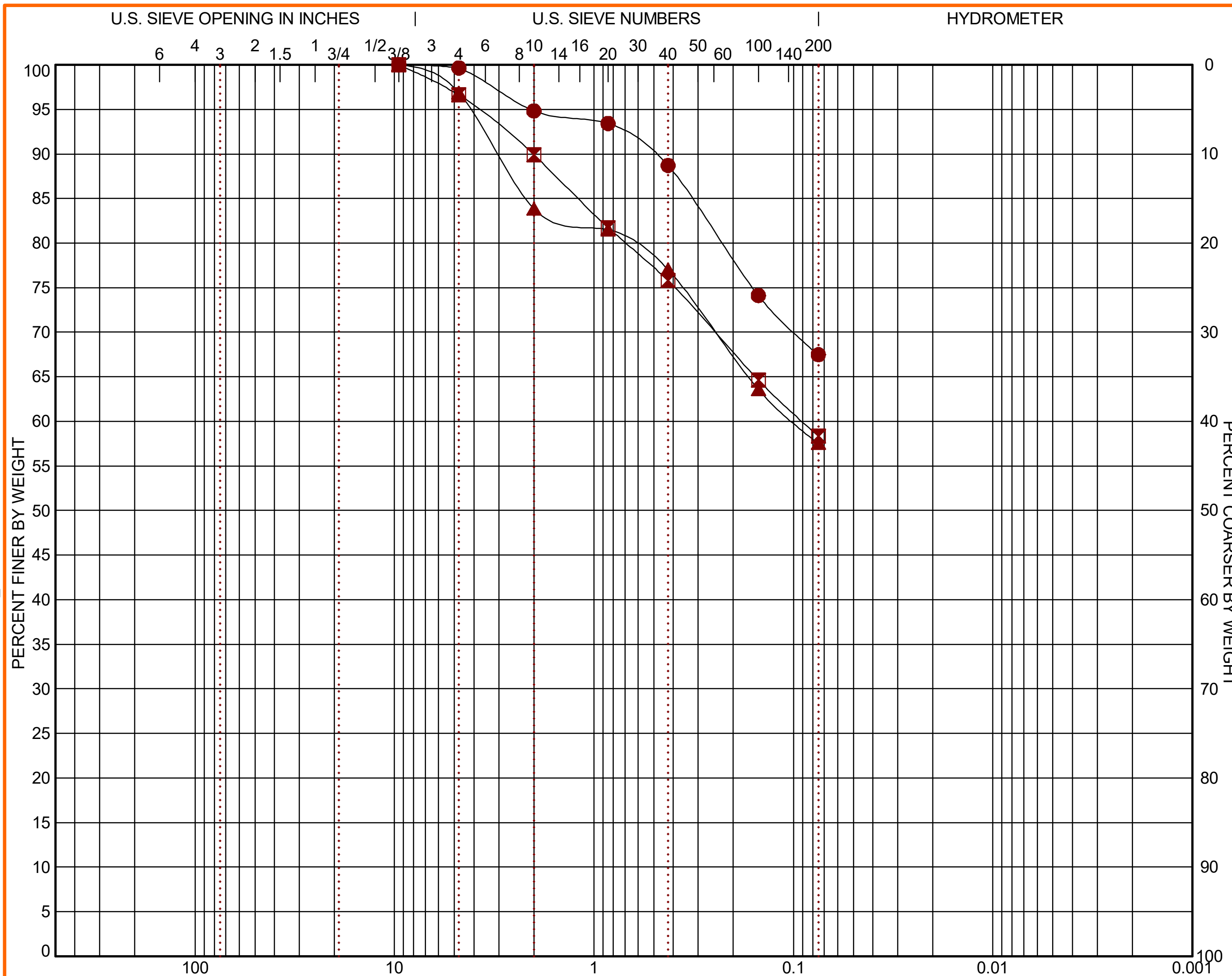
GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-11**	**39.31980 / -83.35023**	**1.5 - 3**	**0.0**	**0.4**	**32.2**		**67.5**	
⊠	**B-20-11**	**39.31980 / -83.35023**	**4.5 - 6**	**0.0**	**3.4**	**38.3**		**58.3**	
▲	**B-20-12**	**39.31332 / -83.36099**	**1 - 5**	**0.0**	**3.1**	**39.4**		**57.5**	

GRAIN SIZE

	●	⊠	▲
D_{60}		0.09	0.1
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

●		⊠		▲	
Sieve	% Finer	Sieve	% Finer	Sieve	% Finer
3/8"	100.0	3/8"	100.0	3/8"	100.0
#4	99.64	#4	96.61	#4	96.87
#10	94.82	#10	89.91	#10	83.86
#20	93.41	#20	81.75	#20	81.5
#40	88.71	#40	75.79	#40	77.04
#100	74.12	#100	64.64	#100	63.59
#200	67.48	#200	58.33	#200	57.52

SOIL DESCRIPTION

● SANDY FAT CLAY (CH)
⊠ SANDY LEAN CLAY (CL)
▲ SANDY LEAN CLAY (CL)

REMARKS

● Location: N E
Elevation: 876.2
⊠ Location: N E
Elevation: 876.2
▲ Location: N E
Elevation: 929.3

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

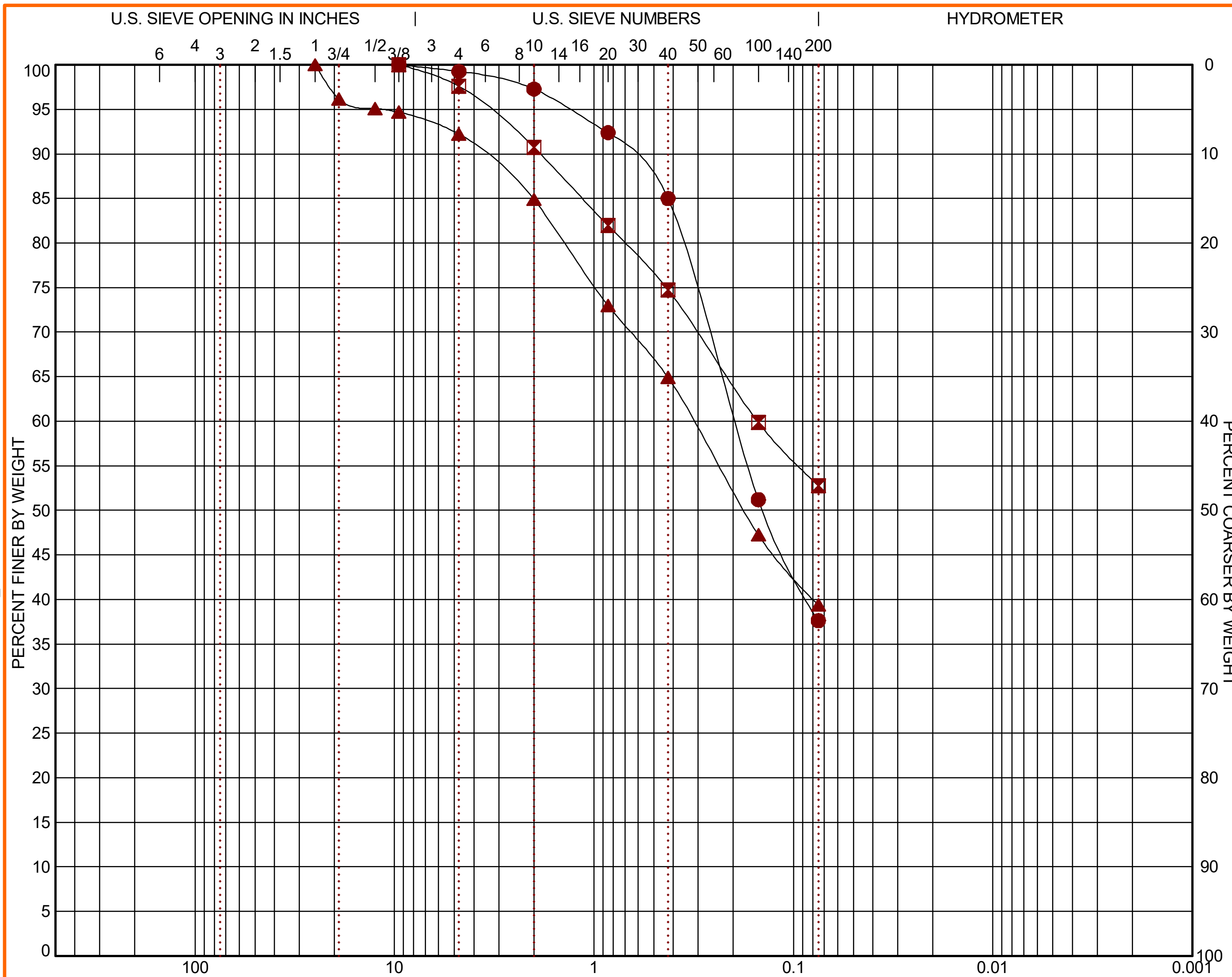
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	B-20-12	39.31332 / -83.36099	3 - 4.5	0.0	0.7	61.6		37.6	
⊠	B-20-12	39.31332 / -83.36099	4.5 - 6.5	0.0	2.4	44.8		52.8	
▲	B-20-12	39.31332 / -83.36099	6 - 7.5	0.0	7.8	52.9		39.4	

GRAIN SIZE

	●	⊠	▲
D_{60}	0.197	0.151	0.318
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/8"	100.0	3/8"	100.0	1"	100.0
#4	99.25	#4	97.6	3/4"	96.18
#10	97.28	#10	90.76	1/2"	95.08
#20	92.38	#20	81.97	3/8"	94.68
#40	84.99	#40	74.75	#4	92.23
#100	51.2	#100	59.87	#10	84.89
#200	37.62	#200	52.78	#20	72.99
				#40	64.93
				#100	47.26
				#200	39.38

SOIL DESCRIPTION

●	CLAYEY SAND (SC)
⊠	SANDY SILTY CLAY (CL-ML)
▲	CLAYEY SAND (SC)

REMARKS

●	Location: N E Elevation: 929.3
⊠	Location: N E Elevation: 929.3
▲	Location: N E Elevation: 929.3

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

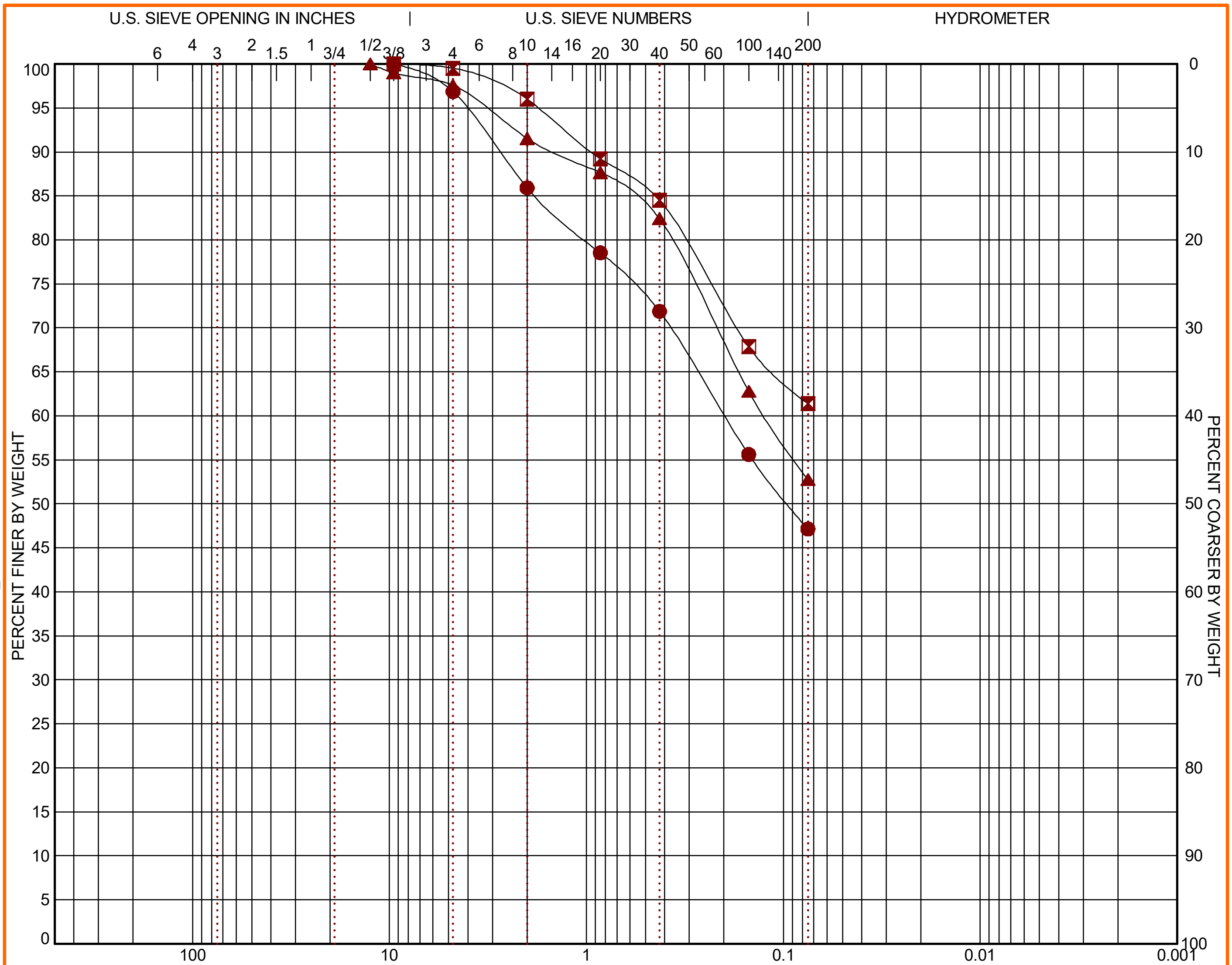
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-13**	**39.30855 / -83.36688**	**1 - 5**	**0.0**	**3.1**	**49.7**		**47.1**	
⊠	**B-20-13**	**39.30855 / -83.36688**	**3 - 4.5**	**0.0**	**0.5**	**38.1**		**61.4**	
▲	**B-20-14**	**39.30944 / -83.35845**	**1 - 5**	**0.0**	**2.4**	**44.8**		**52.8**	

GRAIN SIZE	●	⊠	▲
D_{60}	0.199		0.124
D_{30}			
D_{10}			

COEFFICIENTS	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/8"	100.0	3/8"	100.0	1/2"	100.0
#4	96.86	#4	99.52	3/8"	98.98
#10	85.91	#10	96.0	#4	97.56
#20	78.53	#20	89.22	#10	91.54
#40	71.88	#40	84.54	#20	87.67
#100	55.61	#100	67.89	#40	82.42
#200	47.14	#200	61.39	#100	62.8
				#200	52.77

	SOIL DESCRIPTION
●	CLAYEY SAND (SC)
⊠	SANDY LEAN CLAY (CL)
▲	SANDY LEAN CLAY (CL)

	REMARKS
●	Location: N E Elevation: 990.6
⊠	Location: N E Elevation: 990.6
▲	Location: N E Elevation: 940.6

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

Terracon
800 Morrison Rd
Gahanna, OH

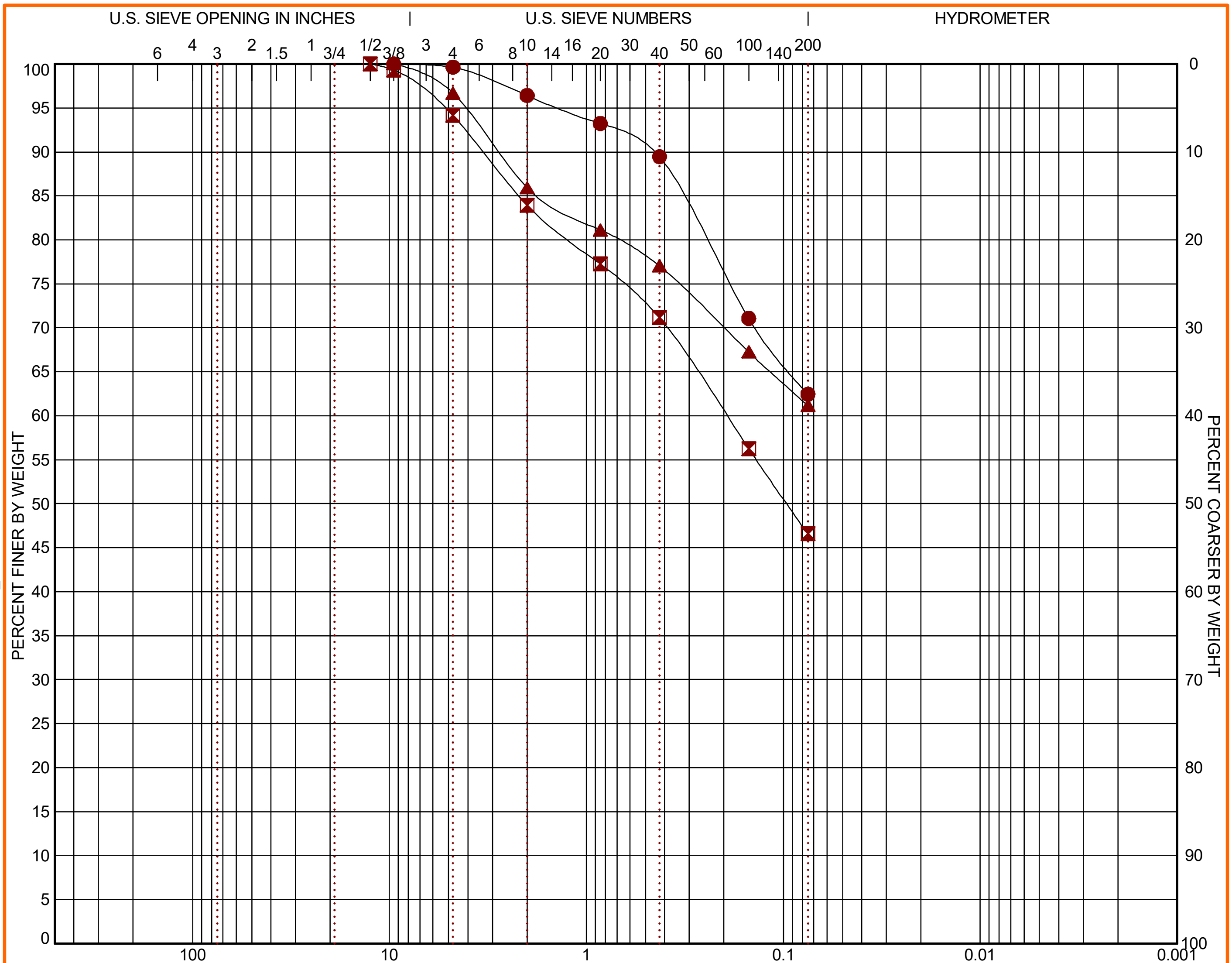
PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. 73191029-GRAIN SIZE-USCS 1 N4205268 ROSS COUNTY SOLAR.GPJ TERRACON_DATATEMPLATE.GDT 9/17/20

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-14**	**39.30944 / -83.35845**	**1.5 - 3**	**0.0**	**0.4**	**37.2**		**62.5**	
⊠	**B-20-14**	**39.30944 / -83.35845**	**7.5 - 9**	**0.0**	**5.9**	**47.6**		**46.6**	
▲	**B-20-15**	**39.31312 / -83.34997**	**1 - 5**	**0.0**	**3.3**	**35.5**		**61.2**	

GRAIN SIZE

	●	⊠	▲
D_{60}		0.195	
D_{30}			
D_{10}			

COEFFICIENTS

	●	⊠	▲
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	▲ Sieve	▲ % Finer
3/8"	100.0	1/2"	100.0	3/8"	100.0
#4	99.63	3/8"	99.3	#4	96.69
#10	96.41	#4	94.15	#10	85.9
#20	93.22	#10	83.95	#20	81.14
#40	89.45	#20	77.25	#40	77.03
#100	71.07	#40	71.15	#100	67.26
#200	62.45	#100	56.28	#200	61.16
		#200	46.59		

SOIL DESCRIPTION

●	SANDY LEAN CLAY (CL)
⊠	CLAYEY SAND (SC)
▲	SANDY LEAN CLAY (CL)

REMARKS

●	Location: N E Elevation: 940.6
⊠	Location: N E Elevation: 940.6
▲	Location: N E Elevation: 904.4

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

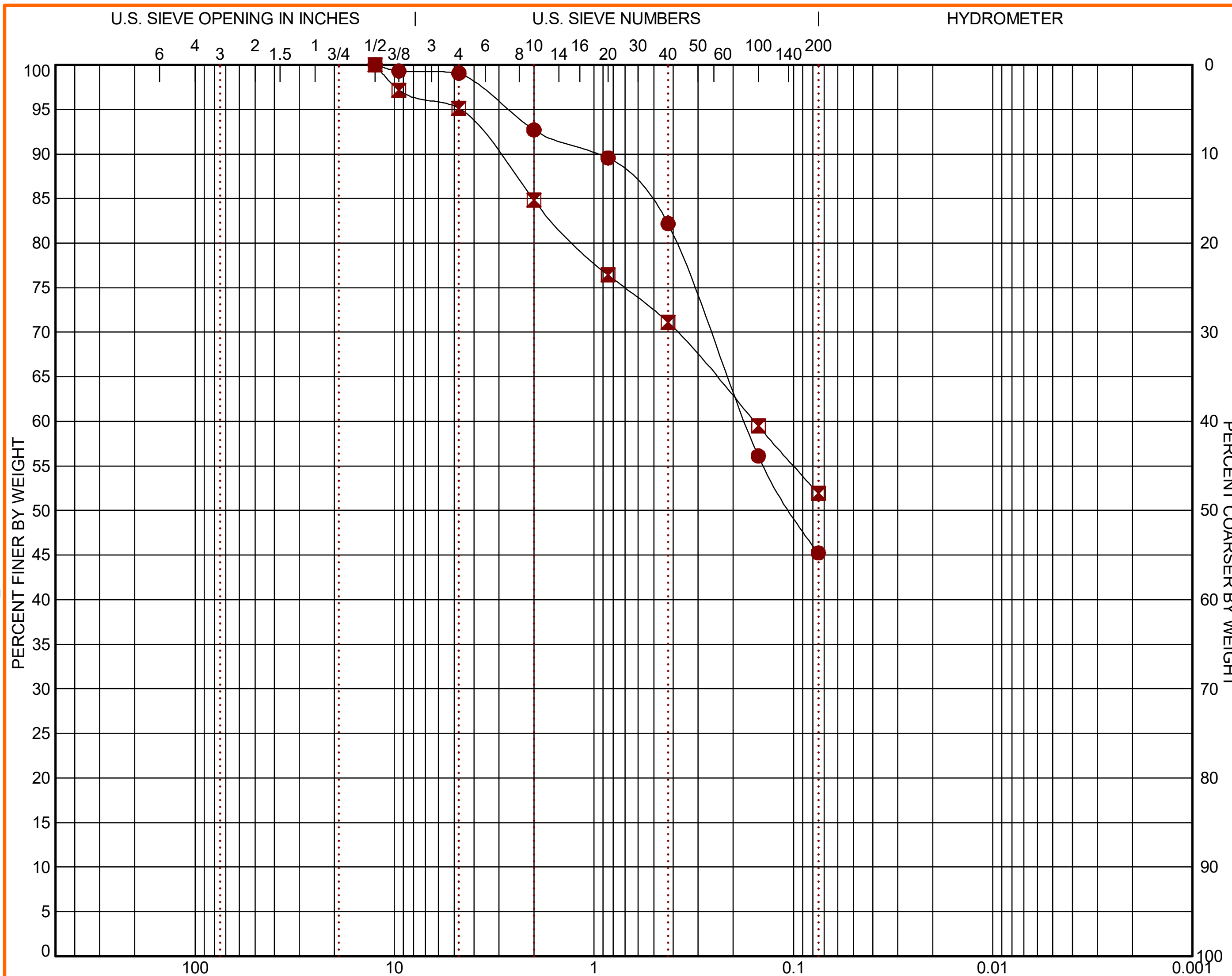
Terracon
800 Morrison Rd
Gahanna, OH

PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	LATITUDE/LONGITUDE	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY
●	**B-20-15**	**39.31312 / -83.34997**	**1.5 - 3**	**0.0**	**0.9**	**53.8**		**45.2**	
⊠	**B-20-15**	**39.31312 / -83.34997**	**7.5 - 9**	**0.0**	**4.9**	**43.2**		**51.9**	

GRAIN SIZE	●	⊠	
D_{60}	0.175	0.157	
D_{30}			
D_{10}			

COEFFICIENTS	●	⊠	
C_C			
C_U			

● Sieve	● % Finer	⊠ Sieve	⊠ % Finer	Sieve	% Finer
1/2"	100.0	1/2"	100.0		
3/8"	99.3	3/8"	97.17		
#4	99.06	#4	95.13		
#10	92.69	#10	84.8		
#20	89.55	#20	76.41		
#40	82.18	#40	71.12		
#100	56.11	#100	59.47		
#200	45.25	#200	51.94		

SOIL DESCRIPTION

● CLAYEY SAND (SC)

⊠ SANDY LEAN CLAY (CL)

REMARKS

● Location: N E
Elevation: 904.4

⊠ Location: N E
Elevation: 904.4

PROJECT: Ross County Solar Facility

SITE: Williamsport Pike
Clarksburg, OH

Terracon
800 Morrison Rd
Gahanna, OH

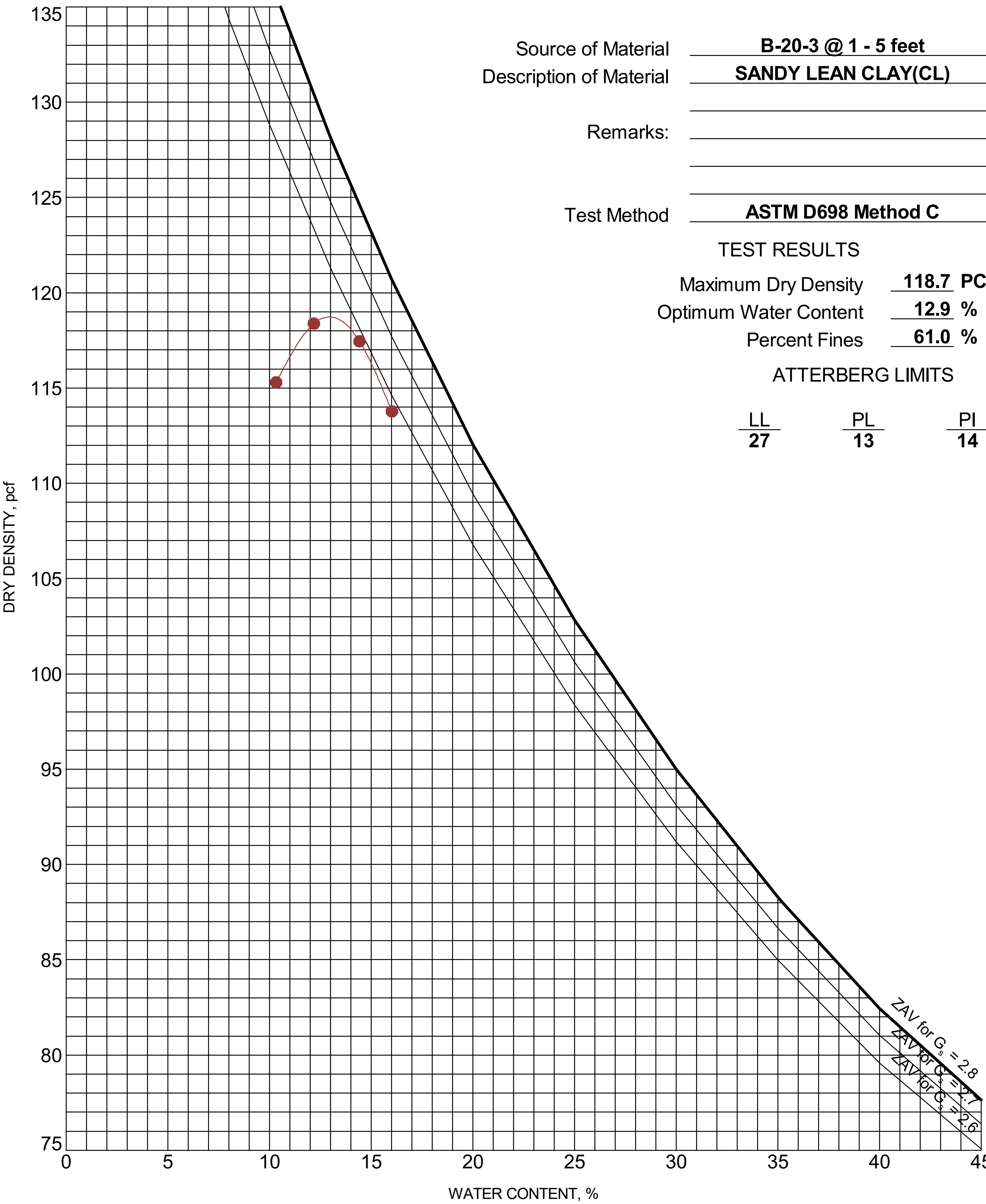
PROJECT NUMBER: N4205268

CLIENT: Ross County Solar, LLC
Bloomington, MN

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. 73191029-GRAIN SIZE-USCS 1 N4205268 ROSS COUNTY SOLAR.GPJ TERRACON_DATATEMPLATE.GDT 9/17/20

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material **B-20-3 @ 1 - 5 feet**

Description of Material **SANDY LEAN CLAY(CL)**

Remarks:

Test Method **ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density **118.7 PCF**

Optimum Water Content **12.9 %**

Percent Fines **61.0 %**

ATTERBERG LIMITS

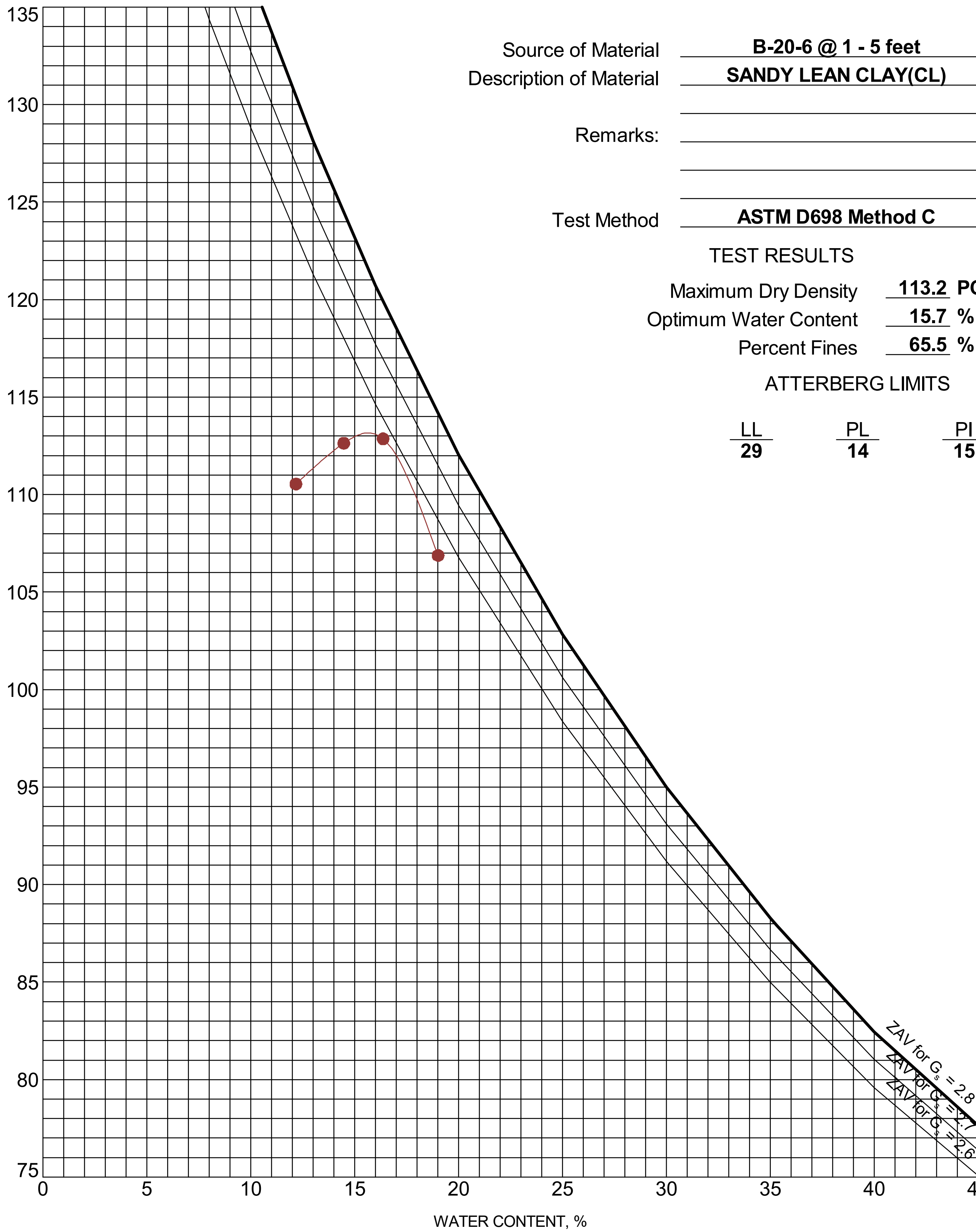
LL	PL	PI
27	**13**	**14**

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. COMPACTION - V2 N4205268 ROSS COUNTY SOLAR.GPJ TERRACON_DATATEMPLATE.GDT 9/17/20

PROJECT: Ross County Solar Facility	Terracon 800 Morrison Rd Gahanna, OH	PROJECT NUMBER: N4205268
SITE: Williamsport Pike Clarksburg, OH		CLIENT: Ross County Solar, LLC Bloomington, MN

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**B-20-6 @ 1 - 5 feet**
Description of Material	**SANDY LEAN CLAY(CL)**
Remarks:	
Test Method	**ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density	**113.2**	**PCF**
Optimum Water Content	**15.7**	**%**
Percent Fines	**65.5**	**%**

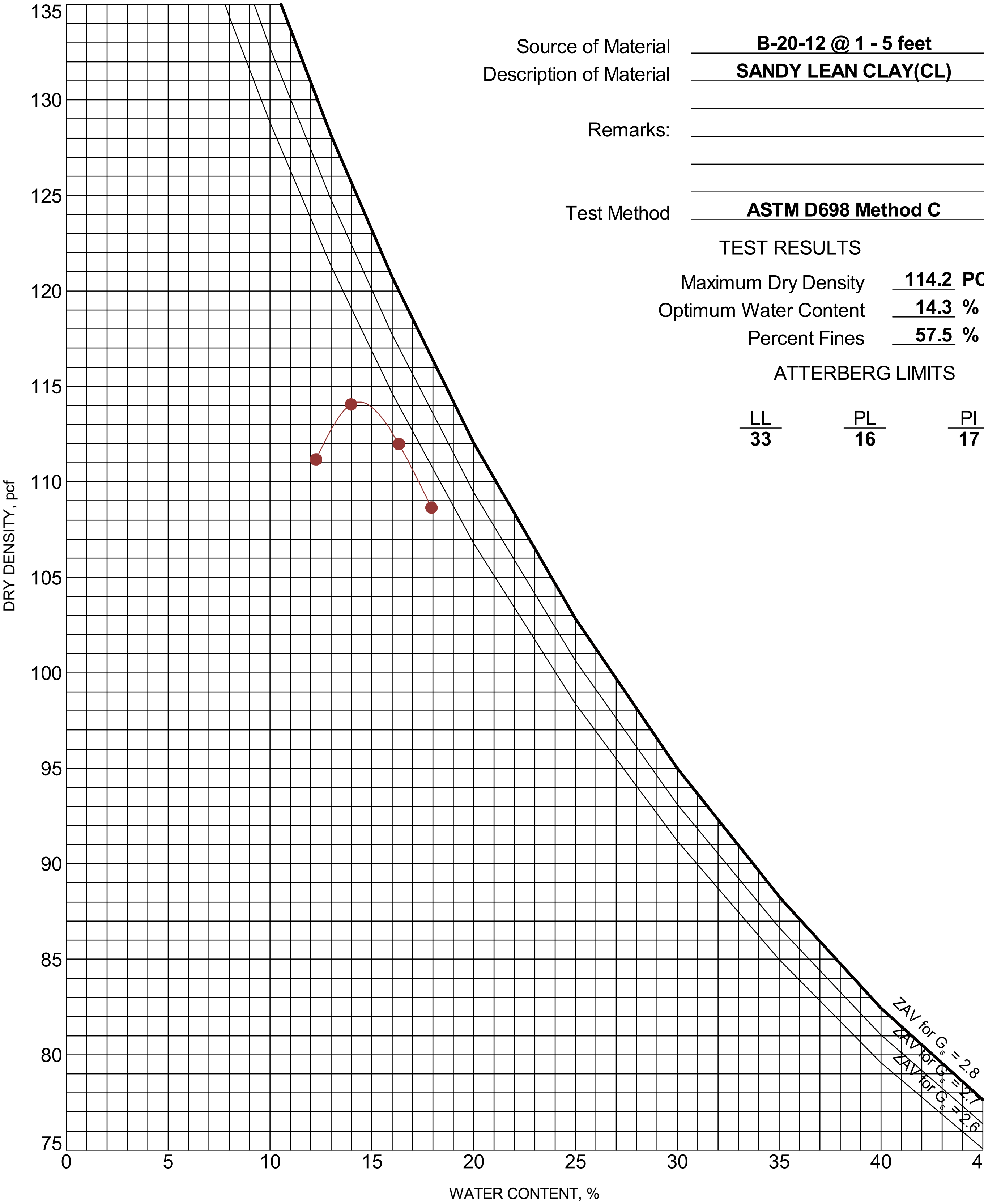
ATTERBERG LIMITS

LL	PL	PI
29	**14**	**15**

PROJECT: Ross County Solar Facility	Terracon 800 Morrison Rd Gahanna, OH	PROJECT NUMBER: N4205268
SITE: Williamsport Pike Clarksburg, OH		CLIENT: Ross County Solar, LLC Bloomington, MN

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material	**B-20-12 @ 1 - 5 feet**
Description of Material	**SANDY LEAN CLAY(CL)**
Remarks:	
Test Method	**ASTM D698 Method C**

TEST RESULTS

Maximum Dry Density	**114.2 PCF**
Optimum Water Content	**14.3 %**
Percent Fines	**57.5 %**

ATTERBERG LIMITS

LL	PL	PI
33	**16**	**17**

PROJECT: Ross County Solar Facility	Terracon 800 Morrison Rd Gahanna, OH	PROJECT NUMBER: N4205268
SITE: Williamsport Pike Clarksburg, OH		CLIENT: Ross County Solar, LLC Bloomington, MN

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Terracon GeoReport

Client

Ross County Solar, LLC
Bloomington, MN

Project

Ross County Solar Facility

Sample Submitted By: Terracon (N4) **Date Received:** 8/14/2020 **Lab No.: 20-0940**

Results of Corrosion Analysis

Sample Number	--	--	--	--
Sample Location	B-20-1	B-20-2	B-20-3	B-20-4
Sample Depth (ft.)	1.0-5.0	1.0-5.0	1.0-5.0	1.0-5.0
pH Analysis, ASTM G 51	8.00	8.22	8.04	8.08
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	47	15	56	21
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil	Nil	Nil
Chlorides, ASTM D 512, (ppm)	50	53	38	65
Red-Ox, ASTM G 200, (mV)	+687	+690	+689	+690
Total Salts, AWWA 2540, (mg/kg)	941	670	941	986
Resistivity (Saturated), ASTM G 187, (ohm-cm)	3484	3551	3082	3417

Analyzed By: Trisha Campo

Trisha Campo
Chemist

The tests were performed in general accordance with applicable ASTM and AWWA test methods. This report is exclusively for the use of the client indicated above and shall not be reproduced except in full without the written consent of our company. Test results transmitted herein are only applicable to the actual samples tested at the location(s) referenced and are not necessarily indicative of the properties of other apparently similar or identical materials.

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Terracon GeoReport

Client

Ross County Solar, LLC
Bloomington, MN

Project

Ross County Solar Facility

Sample Submitted By: Terracon (N4) **Date Received:** 8/14/2020 **Lab No.: 20-0940**

Results of Corrosion Analysis

Sample Number	--	--	--	--
Sample Location	B-20-5	B-20-6	B-20-7	B-20-8
Sample Depth (ft.)	1.0-5.0	1.0-5.0	1.0-5.0	1.0-5.0
pH Analysis, ASTM G 51	7.84	8.00	7.91	8.04
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	145	49	131	47
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil	Nil	Nil
Chlorides, ASTM D 512, (ppm)	53	33	48	28
Red-Ox, ASTM G 200, (mV)	+686	+688	+687	+690
Total Salts, AWWA 2540, (mg/kg)	1366	1176	1428	1159
Resistivity (Saturated), ASTM G 187, (ohm-cm)	2680	2278	2546	2814

Analyzed By: Trisha Campo

Trisha Campo
Chemist

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Terracon GeoReport

Client

Ross County Solar, LLC
Bloomington, MN

Project

Ross County Solar Facility

Sample Submitted By: Terracon (N4) **Date Received:** 8/14/2020 **Lab No.: 20-0940**

Results of Corrosion Analysis

Sample Number	--	--	--	--
Sample Location	B-20-9	B-20-10	B-20-11	B-20-12
Sample Depth (ft.)	1.0-5.0	1.0-5.0	1.0-5.0	1.0-5.0
pH Analysis, ASTM G 51	7.93	8.12	7.94	8.14
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	111	123	56	66
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil	Nil	Nil
Chlorides, ASTM D 512, (ppm)	30	50	48	48
Red-Ox, ASTM G 200, (mV)	+689	+690	+688	+691
Total Salts, AWWA 2540, (mg/kg)	1176	1182	1338	918
Resistivity (Saturated), ASTM G 187, (ohm-cm)	2144	2881	2680	2412

Analyzed By: Trisha Campo

Trisha Campo
Chemist

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Terracon GeoReport

Client

Ross County Solar, LLC
Bloomington, MN

Project

Ross County Solar Facility

Sample Submitted By: Terracon (N4) **Date Received:** 8/14/2020 **Lab No.: 20-0940**

Results of Corrosion Analysis

Sample Number	--	--	--
Sample Location	B-20-13	B-20-14	B-20-15
Sample Depth (ft.)	1.0-5.0	1.0-5.0	1.0-5.0
pH Analysis, ASTM G 51	8.30	7.99	8.28
Water Soluble Sulfate (SO4), ASTM C 1580 (ppm)	85	61	85
Sulfides, AWWA 4500-S D, (mg/kg)	Nil	Nil	Nil
Chlorides, ASTM D 512, (ppm)	53	43	58
Red-Ox, ASTM G 200, (mV)	+693	+691	+691
Total Salts, AWWA 2540, (mg/kg)	647	872	809
Resistivity (Saturated), ASTM G 187, (ohm-cm)	2881	2948	2546

Analyzed By: Trisha Campo

Trisha Campo
Chemist

21239 FM529 Rd., Bldg. F
Cypress, TX 77433
Tel: 281-985-9344
Fax: 832-427-1752
info@geothermusa.com
http://www.geothermusa.com

August 25, 2020

Terracon Consultants, Inc.
800 Morrison Road
Columbus, Ohio 43230
Attn: Jamal N. Tahat, MSc.

Re: Thermal Analysis of Native Soil Samples
Ross County Solar – Ross County, Ohio (Project No. N4205268)

The following is the report of thermal dryout characterization tests conducted on three bulk samples and three tube samples of native soil from the referenced project received at our laboratory.

Thermal Resistivity Tests: The tube samples were tested 'as-received' and the bulk samples were tested at the 'optimum' moisture content and at 85% and 95% of the density ***provided by Terracon.*** The tests were conducted in accordance with the **IEEE Standard 442-2017.** The results are tabulated below and the thermal dryout curves are presented in **Figures 1 to 3.**

Sample ID, Description, Thermal Resistivity, Moisture Content and Density

Sample ID	Depth (ft)	Density (%)	Description (Terracon)	Thermal Resistivity (°C-cm/W)		Moisture Content (%)	Dry Density (lb/ft³)
				Wet	Dry		
B-20-3	1'-5'	85	Lean clay	87	199	13	101
	1'-5'	95		74	162		113
	4'-6'	tube		61	128	12	121
B-20-6	1'-5'	85	Lean clay	94	231	16	96
	1'-5'	95		74	162		108
	4.5'-6.5'	tube		66	133	14	120
B-20-12	1'-5'	85	Lean clay	97	214	14	97
	1'-5'	95		83	180		108
	4'-6'	tube		61	138	12	120

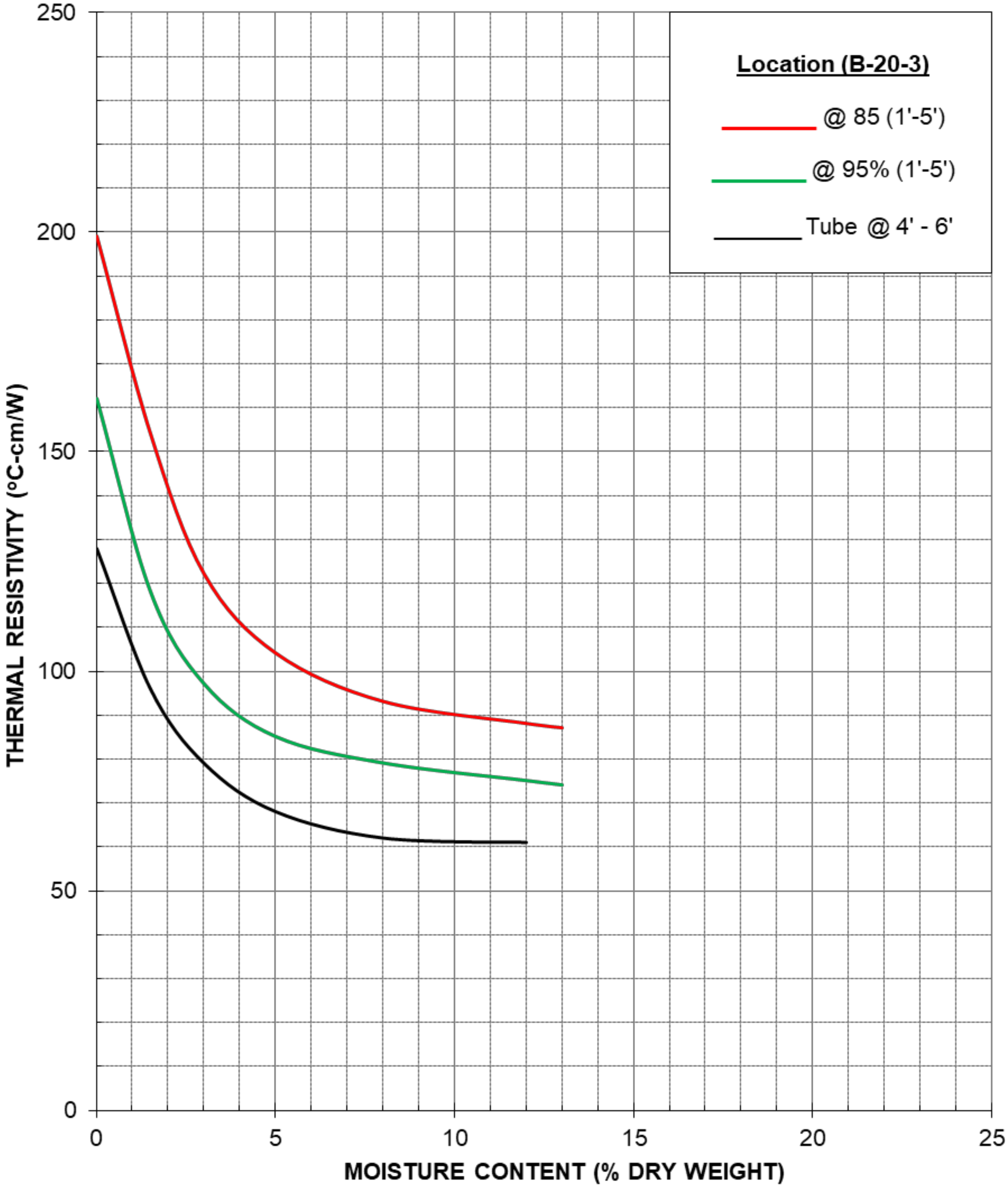
Comments: The thermal characteristic depicted in the dryout curves apply for the soil at the respective test dry density.

Please contact us if you have any questions or if we can be of further assistance.

Geotherm USA

Nimesh Patel

THERMAL DRYOUT CURVES



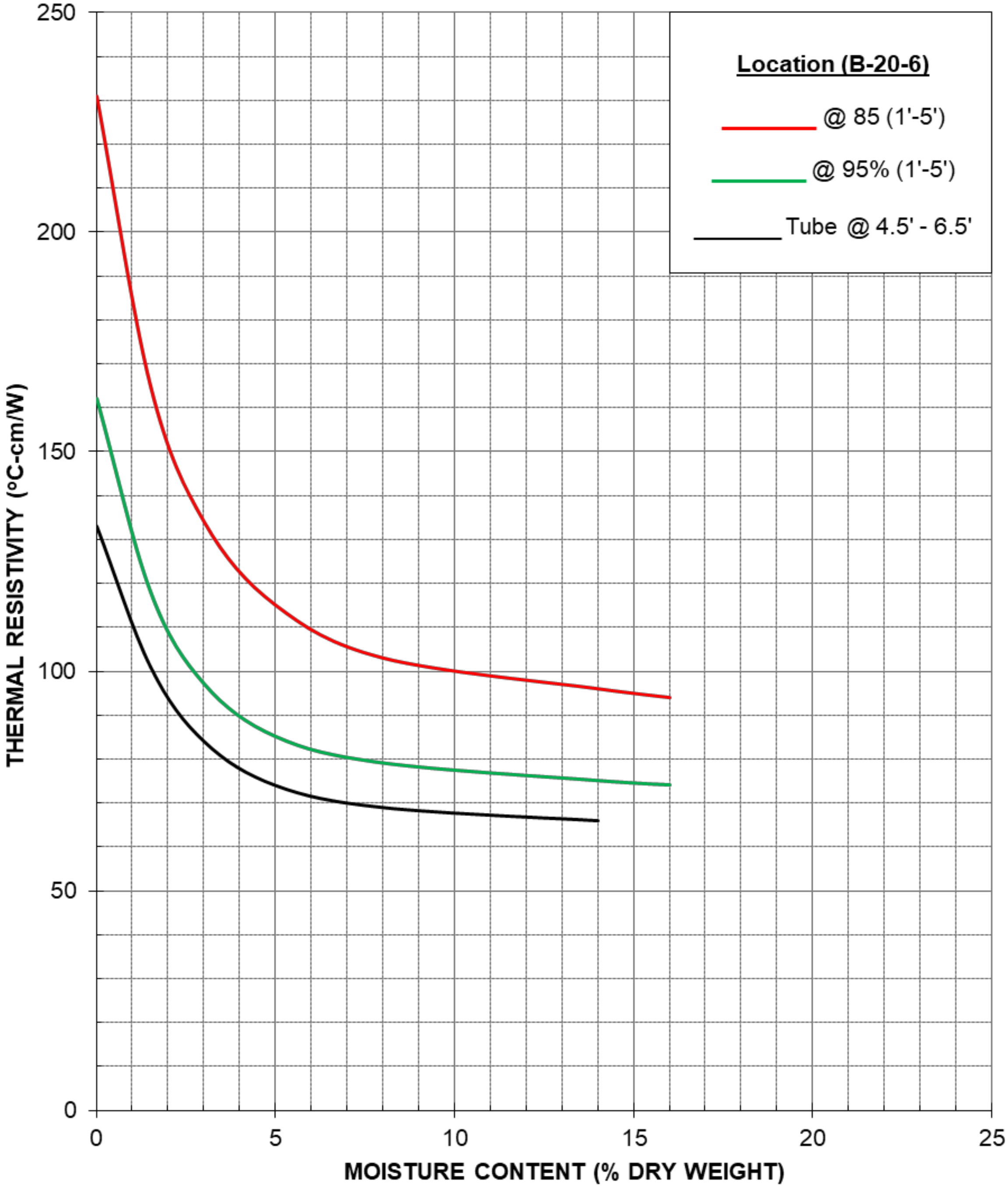
Terracon Consultants, Inc. (Project No. N4205268)

Thermal Analysis of Native Soil

Ross County Solar – Ross County, Ohio

August 2020 **Figure 1**

THERMAL DRYOUT CURVES

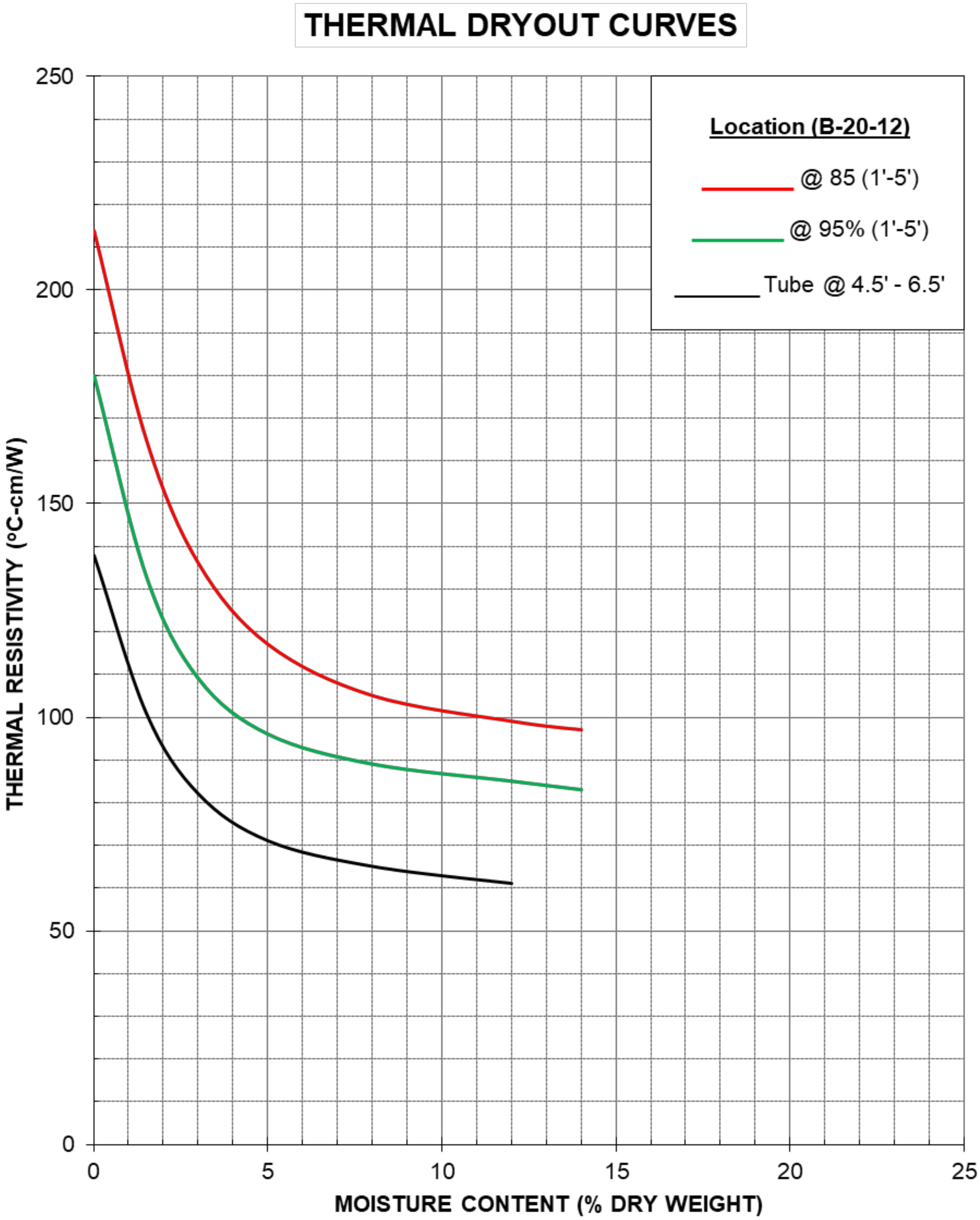


Terracon Consultants, Inc. (Project No. N4205268)

Thermal Analysis of Native Soil

Ross County Solar – Ross County, Ohio

August 2020 **Figure 2**



Terracon Consultants, Inc. (Project No. N4205268)

Thermal Analysis of Native Soil
Ross County Solar – Ross County, Ohio

August 2020 **Figure 3**

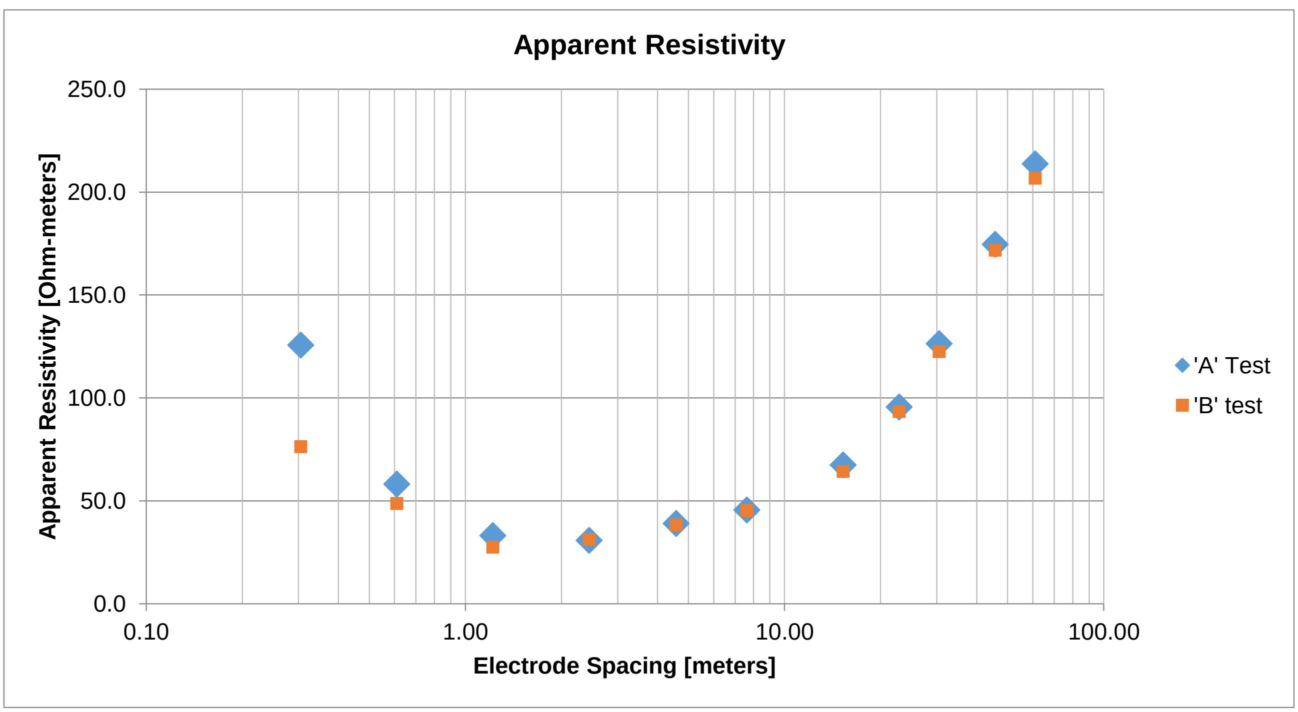
ELECTRICAL EARTH RESISTIVITY TEST DATA

Test Line EER-20-1

Project	Ross County Solar Project	**Weather**	71° and Partly Cloudy
Location	Greenfield, OH	**Surface Soil**	Silty Sand
Project #	N4205268	**Instrument**	Megger DET2/2
Test Date	July 24, 2020	**Tested By**	I. McGougan, M. Bishop

Electrode Spacing "a"		**Electrode Depth "b"**		**"A" Test (Extended N-S)**		**"B" Test (Extended E-W)**	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
1	0.30	0.5	0.15	49.90	125.8	30.30	76.4
2	0.61	0.5	0.15	13.80	58.1	11.59	48.8
4	1.22	0.5	0.15	4.21	33.1	3.50	27.5
8	2.44	0.5	0.15	2.00	30.9	2.03	31.3
15	4.57	1	0.30	1.348	39.0	1.324	38.3
25	7.62	1	0.30	0.950	45.6	0.944	45.3
50	15.24	1	0.30	0.704	67.5	0.672	64.4
75	22.86	1	0.30	0.666	95.7	0.650	93.4
100	30.48	1	0.30	0.660	126.4	0.640	122.6
150	45.72	1	0.30	0.608	174.7	0.598	171.8
200	60.96	1	0.30	0.558	213.7	0.540	206.8

Apparent resistivity p is calculated as : $$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



ELECTRICAL EARTH RESISTIVITY TEST DATA

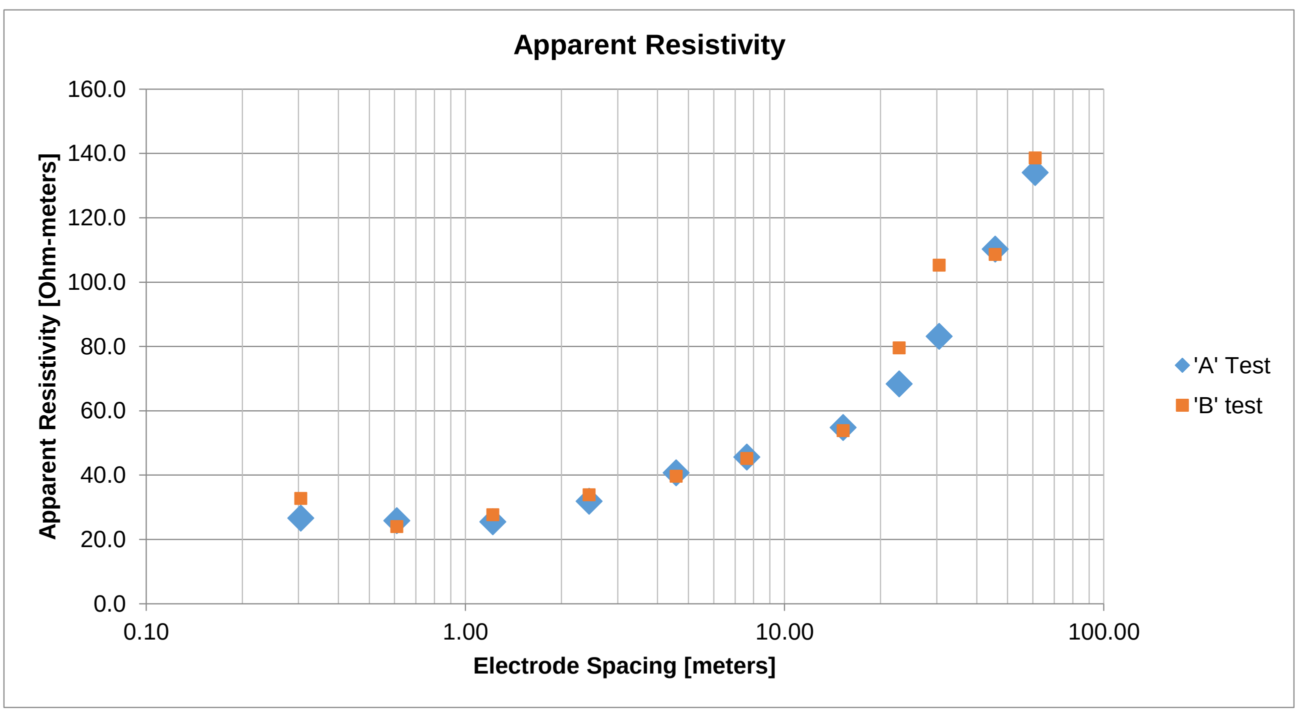
Test Line EER-20-2

Project	Ross County Solar Project	**Weather**	71° and Partly Cloudy
Location	Greenfield, OH	**Surface Soil**	Silty Sand
Project #	N4205268	**Instrument**	Megger DET2/2
Test Date	July 24, 2020	**Tested By**	I. McGougan, M. Bishop

Electrode Spacing "a"		Electrode Depth "b"		"A" Test (Extended N-S)		"B" Test (Extended E-W)	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
1	0.30	0.5	0.15	10.59	26.7	13.01	32.8
2	0.61	0.5	0.15	6.15	25.9	5.71	24.1
4	1.22	0.5	0.15	3.24	25.5	3.52	27.7
8	2.44	0.5	0.15	2.070	31.9	2.200	33.9
15	4.57	1	0.30	1.408	40.8	1.370	39.7
25	7.62	1	0.30	0.950	45.6	0.942	45.2
50	15.24	1	0.30	0.572	54.8	0.562	53.9
75	22.86	1	0.30	0.476	68.4	0.554	79.6
100	30.48	1	0.30	0.434	83.1	0.550	105.3
150	45.72	1	0.30	0.384	110.3	0.378	108.6
200	60.96	1	0.30	0.350	134.1	0.362	138.7

Apparent resistivity p is calculated as :

$$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$



ELECTRICAL EARTH RESISTIVITY TEST DATA

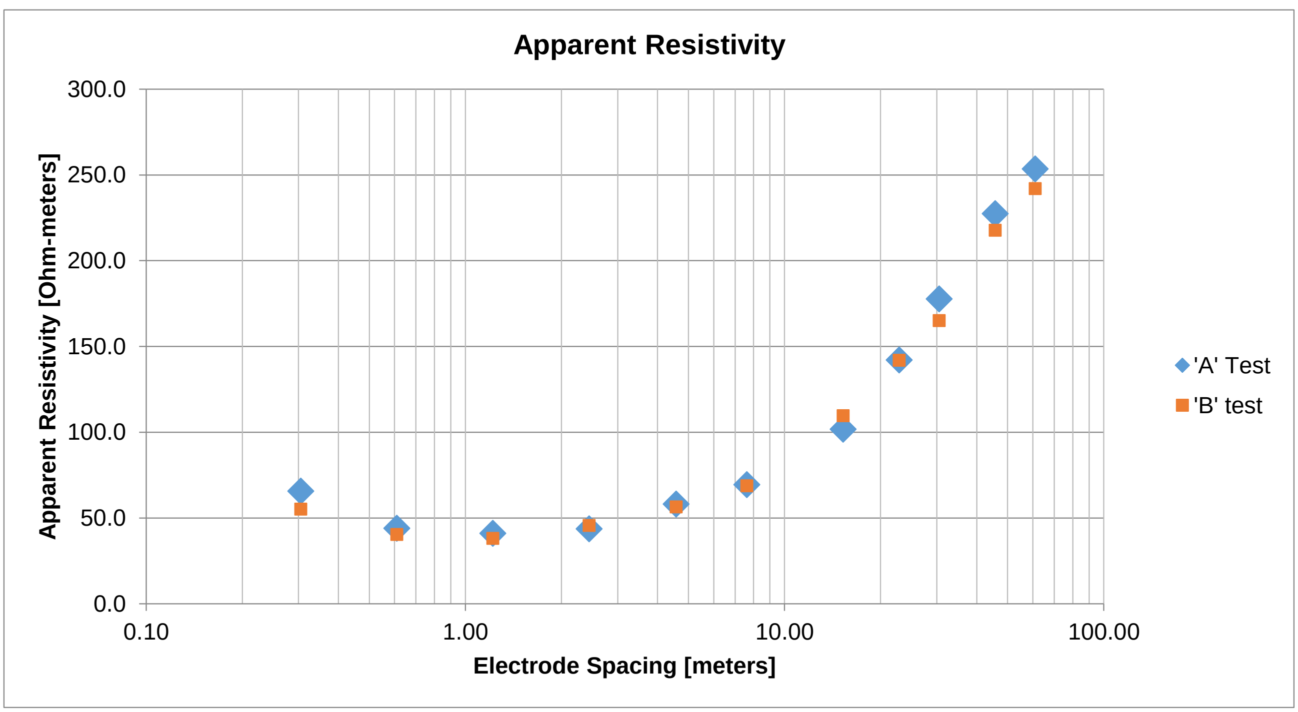
Test Line EER-20-3

Project	Ross County Solar Project	**Weather**	71° and Partly Cloudy
Location	Greenfield, OH	**Surface Soil**	Silty Sand
Project #	N4205268	**Instrument**	Megger DET2/2
Test Date	July 24, 2020	**Tested By**	I. McGougan, M. Bishop

Electrode Spacing "a"		**Electrode Depth "b"**		**"A" Test (Extended E-W)**		**"B" Test (Extended N-S)**	
[feet]	[meters]	[feet]	[meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]	Measured Resistance "R" [Ohms]	Apparent Resistivity "ρ" [Ohm-meters]
1	0.30	0.5	0.15	26.10	65.8	21.90	55.2
2	0.61	0.5	0.15	10.45	44.0	9.60	40.4
4	1.22	0.5	0.15	5.23	41.1	4.86	38.2
8	2.44	0.5	0.15	2.84	43.8	2.96	45.7
15	4.57	1	0.30	2.010	58.2	1.950	56.4
25	7.62	1	0.30	1.448	69.5	1.434	68.8
50	15.24	1	0.30	1.062	101.8	1.144	109.6
75	22.86	1	0.30	0.990	142.2	0.988	142.0
100	30.48	1	0.30	0.928	177.8	0.862	165.1
150	45.72	1	0.30	0.792	227.5	0.758	217.8
200	60.96	1	0.30	0.662	253.6	0.632	242.1

Apparent resistivity p is calculated as :

$$\rho = \frac{4\pi a R}{1+\frac{2a}{\sqrt{a^2+4b^2}}-\frac{a}{\sqrt{a^2+b^2}}}$$



GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

Ross County Solar Facility ■ Clarksburg, OH

Terracon Project No. N4205268

SAMPLING	WATER LEVEL	FIELD TESTS
Grab Sample Shelby Tube Standard Penetration Test	**Water Initially Encountered** **Water Level After a Specified Period of Time** **Water Level After a Specified Period of Time** **Cave In Encountered** Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	**N** **Standard Penetration Test Resistance (Blows/Ft.)** **(HP)** **Hand Penetrometer** **(T)** **Torvane** **(DCP)** **Dynamic Cone Penetrometer** **UC** **Unconfined Compressive Strength** **(PID)** **Photo-Ionization Detector** **(OVA)** **Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.