GEOTECHNICAL ENGINEERING INVESTIGATION

PROPOSED 3 MWac SOLAR PROJECT
AES PETERSBURG GENERATING STATION
NORTH BLACKBURN ROAD AND NORTH FETTINGER LANE
PETERSBURG, INDIANA

ATLAS PROJECT NO. 170GC01330

MARCH 7, 2022

PREPARED FOR:

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March 7, 2022

Mr. Michael Harrell
AES Indiana
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Re: **Geotechnical Engineering Investigation**
Proposed 3 MWac Solar Project
AES Petersburg Generating Station
North Blackburn Road and North Fettinger Lane
Petersburg, Indiana
Atlas Project No. 170GC01330

Dear Mr. Harrell:

Submitted herewith is the report of the geotechnical engineering investigation performed by Atlas Technical Consultants, LLC (Atlas) for the referenced project. This study was authorized in accordance with Atlas Proposal No. 21-14421 dated September 30, 2021 and AES Order No. 4500608387 dated October 26, 2021.

This report contains the results of the field and laboratory testing program and an engineering interpretation of this data with respect to the available project characteristics. We wish to remind you that we will store the samples for 60 days after which time they will be discarded unless you request otherwise.

We appreciate the opportunity to be of service to you on this project. If we can be of any further assistance, or if you have any questions regarding this report, please do not hesitate to contact either of the undersigned.

Sincerely,

DANIEL A. HOMM
REGISTERED
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STATE OF
INDIANA
PROFESSIONAL ENGINEER

Daniel A. Homm, P.E.
Senior Project Engineer

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Principal Engineer

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1 PURPOSE AND SCOPE

The purpose of this study was to determine the general subsurface conditions at the project site by drilling twenty-two test borings and to evaluate this data with respect to foundation concept and design for the proposed solar project. Also included is an evaluation of the site with respect to potential construction problems and recommendations dealing with quality control during construction.

2 PROJECT CHARACTERISTICS

AES is planning the construction of a proposed 3 Mega-Watt (MW) solar facility on an approximately 30-acre site that is located northeast of the intersection of North Blackburn Road and North Fettinger Lane, near the existing AES Petersburg Generating Station on the northeast side of Petersburg, Indiana. The general location of the project site is shown on the Vicinity Map (Figure 1 in the Appendix), which is taken from a map made prior to the current level of development in the area surrounding the project site. The site is currently a vacant field that has previously been used for agricultural purposes and a previous baseball/softball field was located near the southwest corner of the project site near North Blackburn Road. The topography across the site generally slopes downward from south to north and west to east, with steeper slopes near the eastern edge of the project site. The site topography generally varies from approximately El 530 in the southern portion of the project site to approximately El 460 along the eastern project boundary.

Based on preliminary information, it is our understanding that a gravel access road will generally run north along the western project boundary and will lead to an inverter structure at the far northwest corner of the project site. Rows of solar panels will generally be arranged in an east to west orientation, generally evenly spaced across the majority of the western and central portions of the project site where the existing ground surface is more gently sloping. The eastern approximately 1/4 to 1/3 of the site will reportedly remain vacant without the installation of any solar panels. The proposed location of the site improvements are shown on the Boring Plan (Figure 2 in the Appendix).

Specific design information regarding the solar panels and supports is not available at this time. However, it is assumed that the proposed equipment pads, inverter structure, etc. will be supported on conventional shallow foundations (i.e., shallow spread footings or mat foundations) and the solar panels will be installed on ground-mounted racking systems and are typically constructed by installing small H-piles, steel wide-flange beam sections or steel channel sections driven into the ground to a prescribed depth.

3 GENERAL SUBSURFACE CONDITIONS

The general subsurface conditions were investigated by drilling twenty-two test borings to depths ranging from 8.6 ft to 20.0 ft below the existing ground surface. The test borings were performed at the approximate locations shown on the Boring Plan (Figure 2 in the Appendix). The subsurface conditions disclosed by the field investigation are summarized in a general fashion in the following paragraphs. Detailed descriptions of the subsurface conditions encountered in each test boring are presented on the "Test Boring Logs" in the Appendix. The letters in parentheses following the soil descriptions are the soil classifications in general accordance with the Unified Soil Classification System (ASTM D2488). It should be noted that the stratification lines shown on the test boring logs represent approximate transitions between material types. In-situ stratum changes could occur gradually or at different depths.

3.1 Subsurface Soil and Bedrock Conditions

The test borings encountered approximately 3 inches to 4 inches of topsoil at the existing ground surface. Underlying the surficial materials, Borings B-8, B-9, B-11, B-15, B-18 and B-20 encountered silty clay and sandy silty clay fill with varying amounts of gravel, weathered rock fragments, coal and roots to depths of about 3.5 ft to 11.0 ft below the existing ground surface. These soils were identified as fill material due to the unusual color, texture and stratification of the soil samples. Therefore, miscellaneous/uncontrolled/undocumented fill materials may be encountered throughout the project site and to various depths.

Underlying the topsoil and existing fill soils, the test borings typically encountered a layer of soft silty clay (CL) to a depth of approximately 3.5 ft below the existing ground surface. Underlying this typically soft cohesive stratum and/or old fill, the test borings typically encountered medium stiff to stiff silty clay (CL, CL-ML), clay (CH) and sandy silty clay (CL) with varying amounts of sand and gravel to depths ranging from approximately 8.5 ft to 13.0 ft below the existing ground surface. Underlying these soils, the test borings generally encountered very stiff to hard silty clay (CL, CL-ML), clay (CH) and sandy silty clay (CL) with varying amounts of sand, weathered rock fragments and coal to the boring termination depths of 8.6 ft to 20.0 ft below the existing ground surface. It should be noted that weathered siltstone and sandstone bedrock was encountered in Borings B-2, B-4, B-5, B-14 and B-22, with the top of the bedrock at depths varying from approximately 8.6 ft to 17.0 ft below the existing ground surface, and extended to the boring termination or auger refusal depths.

Borings B-5 and B-20 were drilled to auger refusal. Auger refusal is defined herein as the depth at which a conventional test drill rig cannot advance the hollow-stem-augers. It is important to understand that auger refusal is not necessarily coincident with the bedrock surface since the augers can penetrate the upper weathered or fractured bedrock in most cases, or the augers can encounter refusal on objects above the bedrock surface, such as boulders or floaters lying above the more in-tact bedrock surface, obstructions within fill, etc.

The qualitative strengths or consistencies of the cohesive soils as described above and on the test boring logs were estimated based on the results of the standard penetration test (ASTM D1586) and based on the definitions as described on the Field Classification System for Soil Exploration contained in the Appendix of this report.

3.2 Ground Water

Ground water level observations were made during the drilling operations by noting the depth of free ground water on the drilling tools (if any), in the open boreholes following withdrawal of the drilling augers (if any) and approximately 24 hours after completion of drilling in selected test borings (if any). No free ground water was noted in any of the test borings at the time or drilling or approximately 24 hours after completion of drilling activities.

It must be noted that short term ground water level observations made in cohesive soils are not necessarily a reliable indication of the actual ground water level nor represent future ground water trends and it is anticipated that ground water may be encountered at varying depths and locations across the site during the life of this facility.

Fluctuations in the level of the ground water should be expected due to variations in rainfall and other factors not evident at the time of the field investigation. It is also possible that “perched” ground water may be encountered at various depths and locations across the site due to water trapped within old miscellaneous fill materials, etc. and although the amount of such water is usually not significant, it is important to recognize that such ground water may be encountered at various depths and locations.

4 FINDINGS, CONCLUSIONS AND DESIGN RECOMMENDATIONS

The following findings, conclusions and design recommendations are based on the previously described project characteristics (Section 2) and subsurface conditions (Section 3). If there are any changes in the project criteria, including proposed locations of the project elements, foundation types, etc., a review should be made by this office.

The design recommendations presented herein are based upon the assumption that all earth related elements of the project will be carefully and continuously observed, tested and evaluated by a geotechnical engineer or qualified geotechnical technician working under the direction of a geotechnical engineer to confirm that the earth related elements of the project are compatible and consistent with the conditions upon which the design recommendations are based. The careful and thorough field testing and observations of the soil related aspects of the project are a critical and essential component of the design recommendations.

4.1 Underground Coal Mining

Based upon underground coal mine information available from the Indiana Geological Survey, it is evident that the project site is underlain by an abandoned underground coal mine. A comprehensive investigation into the potential for surface subsidence due to the collapse of abandoned mine workings is beyond the scope of this study. It is our understanding that subsidence of the abandoned underground coal mine that extends beneath this project site has occurred in the past and recently a portion of Blackburn Road was affected by surface subsidence due to collapse of the underground coal mine workings. Therefore, subsidence due to collapse of underground mine workings cannot be ruled out and the construction or installation of any facilities on this site may be affected by future subsidence, unless countermeasures are taken to prevent subsidence or mitigate the effects of subsidence (e.g., grouting of the mine openings, extending foundations through the mine openings, etc.).

It must be understood that there is risk of potential distress to the proposed facilities due to settlement resulting from subsidence caused by the collapse of abandoned mine openings unless countermeasures are taken to prevent subsidence or mitigate the effects of subsidence. The recommendations contained in the remainder of this report do not take into account the potential for settlement due to subsidence from underground mine collapse and assume that the owner understands and accepts these risks. If the owner desires to mitigate the risks and effects of potential future mine collapse, additional measures, such as grouting of the mine openings, will be required. The design of any mine subsidence mitigation measures is beyond the scope of this investigation and if performed should be based upon a detailed study and investigation of the abandoned mine openings.

4.2 Seismic Considerations

Based on geologic mapping, the results of the test borings and our experience, it is our opinion that the subsurface conditions at this site meet the criteria for Site Class C based on Chapter 20 of ASCE 7-16, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures". The recommended seismic design parameters are summarized in the following table:

Table No. 1 – Recommended Seismic Design Parameters

Seismic Design Parameter	Recommended Class/Value
Seismic Site Class*	C
Site Modified Peak Ground Acceleration, PGA_M	0.26g
Design Spectral Response Acceleration at Short Periods, S_{DS}**	0.34g
Design Spectral Response Acceleration at 1-Second Period, S_{D1}**	0.17g

*Based upon Chapter 20 of ASCE 7-16 "Minimum Design Loads and Associated Criteria for Buildings and Other Structures"

**Based upon Chapter 11 of ASCE 7-16 "Minimum Design Loads and Associated Criteria for Buildings and Other Structures"

Considering the types of soil encountered in the test borings, there is virtually no probability of “liquefaction” or cyclic softening (significant weakening of cohesive soils) of the soil at the project site under any reasonably anticipated earthquake event.

4.3 General Subsurface Considerations

The test borings typically encountered an upper layer of softer silty clay and clay to a depth of approximately 3 ft below the existing ground surface. For the purpose of foundation analyses, this upper cohesive soil layer should be ignored for skin friction or lateral resistance due to the potential for frost effects and other seasonal variations in this zone. Below the upper softer, cohesive stratum, the test borings typically encountered stiffer silty clay, sandy silty clay and clay soils, and in some cases hard soil, and/or weathered bedrock to the boring termination depths of 8.6 ft to 20.0 ft below the existing ground surface. The stiffer natural cohesive soils are suitable for support of the proposed equipment pads and other project elements at nominal depths provided that any pockets of old fill, softer natural soils or otherwise unsuitable materials are first removed at the foundation locations.

It is our understanding that the solar panels will be installed on ground-mounted racking systems that are typically constructed by installing steel H-piles, steel wide-flange beam sections or steel channel sections driven into the ground to a prescribed design embedment depth. It is important to note that the depth to hard soil and the bedrock surface at this site is variable and the quality, weathering and condition of the upper bedrock is also variable. If the desired driven foundation element design embedment depth cannot be achieved above the hard soil or bedrock depth, it will be necessary to predrill holes into the hard soil or bedrock to the design foundation element embedment depth and set the foundation elements into the holes and then fill the holes with concrete. Alternatively, the solar panel supports can be supported on shallow spread footings similar to the proposed equipment pads described below.

Other deep foundation options (i.e., drilled pier foundations) that extend to derive capacity in the hard silty clay soils or weathered bedrock may also be used to support the proposed ground-mounted solar panel racking systems. If an alternative deep foundation option such as drilled piers appears to be desirable, additional recommendations to support the proposed ground-mounted solar panel racking systems can be provided.

4.4 Spread Footings and Mat Foundations

The results of the subsurface investigation indicate that the proposed project elements (e.g., equipment pads such as required for the inverter and/or solar panel supports) can be supported on conventional shallow foundations, such as spread footings or mat foundations, provided any existing uncontrolled fill, softer natural soils and any other unsuitable materials are removed at the foundation locations. Foundations that bear on firm natural soil, or on well-compacted engineered fill that is placed over firm natural soil, can be designed for an allowable soil bearing pressure of 2,500 lbs/sq.ft. The allowable bearing capacity can be increased by a factor of 1.33 for transient loading conditions such as wind gusts and earthquake loads. A mat foundation can be designed using a modulus of subgrade reaction (k) value of 30 lbs/cu.in. It is important that the soil at the base of each foundation excavation be carefully observed and evaluated as described in Section 5.2 so that any unsuitable materials can be identified and removed and to verify that the foundations will bear on suitable materials. Based on the results of the test borings, it is likely that pockets of unsuitable soils may need to be undercut to depths of about 3 ft to 6 ft below the existing ground surface at some of the foundation locations.

In using the allowable bearing pressure recommended above, the weight of the spread footing or mat foundation need not be considered; hence, only loads applied at the top of the spread footing or mat foundation need to be used for dimensioning the foundation element. Foundations should have a minimum dimension of at least 2.5 ft wide for bearing capacity considerations. All foundations should be located at a depth of at least 2.5 ft below the final exterior grade for frost protection.

Provided that the foundations are designed as prescribed herein and the soils exposed at the base of the foundation excavations are inspected and evaluated as outlined in Section 5.2, it is estimated that the post-construction total and differential foundation settlements should not exceed about 1 in. and ¾ in., respectively. Careful field control will contribute substantially to minimizing the settlements.

Uplift forces on the spread footings and/or mat foundations can be resisted by the weight of the foundations and the backfill soil material that is placed over the foundations. It is recommended that the soil backfill weight considered to resist uplift loads be limited to that immediately above and within the perimeter of the foundations, unless a much higher factor of safety is used. A total soil unit weight of 110 lbs/cu.ft can be used for the backfill material placed above the foundations, provided it is compacted as recommended in Section 5.1. It is also recommended that a factor of safety of at least 1.3 be used for calculating uplift resistance from the foundations provided only the weight of the foundation and the soil immediately above it are used to resist uplift forces.

Lateral loads imparted upon spread footings and/or mat foundations can be resisted by the passive lateral earth pressure against the sides of the footings and by friction between the foundation soil and the bases of the foundations. If passive lateral earth pressure is to be used to resist lateral loads imparted on the foundations, it is essential that the soil that is relied upon to provide the passive lateral earth pressure resistance cannot be excavated or otherwise disturbed at any time in the future. If it is possible that disturbance or an excavation could be made in any portion of the passive zone, including not only soils immediately beside the foundations but also the soils that exist above the top of the foundation elevation since the passive resistance is dependent upon the overburden soils, then passive lateral earth pressure resistance should not be considered for resistance of lateral loads. Since significant displacement is required to mobilize passive resistance, a factor of safety of 3 has been used to determine the allowable equivalent fluid pressure for the passive condition in order to minimize the potential for excessive displacement. Based upon the soils encountered at this site, an allowable passive lateral earth pressure (allowable "equivalent fluid pressure") of 115 lbs/sq.ft per foot of depth below the ground surface can be used for that portion of the foundation that is below a depth of 2.5 ft below the final exterior grade (no portion of the foundation above this depth should be used for lateral resistance). An allowable coefficient of friction between the base of a foundation and the underlying foundation soil of 0.2 (based on a factor of safety of 1.5) can be used in conjunction with the minimum downward load on the base of a spread footing or mat foundation.

4.5 Solar Panel Foundations

It is our understanding that the solar panels will be installed on ground-mounted racking systems that are typically constructed by installing steel H-piles, steel wide-flange beam sections or steel channel sections driven into the ground to prescribed design embedment depths in order to achieve the design loads. It is important to note that the depth to hard soil and the bedrock surface at this site is variable and the quality, weathering and condition of the upper bedrock is also variable. If the driven foundation element design embedment depth cannot be achieved above the hard soil or bedrock depth, it will be necessary to predrill holes into the hard soil or bedrock to the design foundation element embedment depth and set the foundation elements into the drilled holes and then fill the drilled holes with concrete. Alternatively, the solar panel supports can be supported on shallow spread footings similar to the proposed equipment pads described above.

The following table (Table No. 2) provides estimated soil parameters for use in analyses of axial and lateral resistance of the driven steel solar panel foundation elements based on the general soil conditions encountered in the test borings drilled for this project. It is important to note that these values are estimated based upon the standard penetration test results (ASTM D1586) and soil type and are not directly measured. It should also be noted that the values provided for undrained shear strength (cohesion), angle of internal friction (φ), and total soil unit weight are ultimate (nominal or unfactored) values and appropriate factors of safety, or resistance factors, should be used in conjunction with these values based upon compatibility with all factors associated with the design of these structures.

Please note that the soil and bedrock conditions revealed by the test borings varied across the site. Since it is not practical to drill a test boring at each foundation location and design each foundation for the specific conditions at that location, the values in the table represent the predominate conditions in these zones and should provide a reasonable estimate of the conditions encountered in the test borings within each zone summarized. However, it is important to understand that variations in subsurface conditions will occur and these conditions should not be considered as existing at all locations. The factors of safety, or the load and resistance factors, selected for design should take into account the expected variability in subsurface conditions across the site and the construction methods should also account for such variability. The selection of appropriate soil parameters that are compatible with the analyses methodology utilized as well as factors of safety, or load and resistance factors, is the responsibility of the design engineer. The actual parameters used should be compatible with the reliability of the specific method of analysis selected along with any associated load and/or resistance factors used.

Since it is not possible to determine the depth to bedrock and the quality of the bedrock at each foundation location, it is not prudent nor recommended to design the foundations based upon bedrock properties, unless test borings are drilled at each foundation location to determine beforehand the depth to competent bedrock and quality of the bedrock at each foundation location, which is not practical in this case. It is also important to understand that it will likely not be possible to drive foundation elements into the bedrock or hard soils, unless a large pile section and pile hammer are used with sizes and capacities compatible with penetrating bedrock. Therefore, it is recommended that the soil parameters provided below for silty clay soils be used for design of the foundations that may penetrate the upper hard soils or weathered bedrock. If the desired pile foundation capacity cannot be achieved above the bedrock depth, it will be necessary to predrill holes into the bedrock and set the foundation elements into the holes and then fill the drilled holes with concrete.

Table No. 2 – Estimated Soil Parameters for Design of Solar Panel Foundations

Soil Type	Medium Stiff Silty Clay and Clay	Stiff to Very Stiff Silty Clay and Clay	Hard Silty Clay and Weathered Bedrock
Depth Below Existing Ground Surface, ft	2.5 to 8	8 to 20	*
Allowable Soil Bearing Capacity, lbs/sq.ft.	2,500	4,000	6,000
Minimum Foundation Bearing Elevation Below Final Grade, ft	2.5	8	8
Soil Description Based upon LPILE Definitions	Soft Clay	Stiff Clay Without Free Water	Stiff Clay Without Free Water
Ultimate (Nominal) Angle of Internal Friction of Foundation Soils, φ, degrees	0	0	0
Ultimate (Nominal) Cohesion of Foundation Soils (c), lbs/sq.ft.	1,000	2,500	5,000
Total Soil Unit Weight, (γ_T), lbs/cu.ft.	125	130	135
Submerged Soil Unit Weight (γ'), lbs/cu.ft**	63	67	73
Static Soil Modulus Parameter (k) [(1)] lbs./cu.in.	200	500	1,000
Cyclic Soil Modulus Parameter (k) [(1)] lbs./cu.in.	100	200	400
Strain at 50 percent of the maximum stress, (ε_{50})[(1)]	0.01	0.005	0.004
Ultimate Pile Skin Friction, lbs/sq.ft***	500	1,000	1,500

* Weathered bedrock encountered in Borings B-2, B-4, B-5, B-14 and B-22 at depths of approximately 8.6 ft to 17.0 ft below the existing ground surface.
** Submerged soil unit weights should be used below the ground water level.
*** Skin friction should be neglected in the upper 2.5 ft due to variability in soil conditions in the freeze/thaw zone.
[(1)]Soil Descriptions, Soil Modulus (k) values and Strain Parameter (ε_{50}) values based upon the definitions of these parameters in the LPILE program.

The soil parameters presented in Table No. 2 can be used for lateral analyses of the foundation elements using a soil-structure interaction type of analyses such as the computer program LPILE. All of the values presented in the table are nominal or ultimate values and have not been reduced by a resistance factor or a factor of safety, nor increased (depending upon the specific parameter) by a load factor. Appropriate load and resistance factors, or factors of safety, should be selected based upon the specific analyses performed in conjunction with the specific parameters used.

4.6 Site Grading and Drainage

Proper surface drainage should be provided at the site to minimize increase in moisture content of the foundation soils. The exterior grade should be sloped away from the structure foundations to prevent flow of surface water toward the structures and prevent ponding of water around the structures.

It is recommended that final cut and fill slopes be no steeper than about 3 (horizontal) to 1 (vertical). Where new fill will be placed against slopes that are steeper than 6 (horizontal) to 1 (vertical), it will be necessary to "bench" the new fill into the existing slope in order to ensure a good bond between the existing soil and the new fill and to prevent the development of a zone of weak soil at the interface.

5 GENERAL CONSTRUCTION PROCEDURES AND RECOMMENDATIONS

Since this investigation identified actual subsurface conditions only at the test boring locations, it was necessary for our geotechnical engineers to extrapolate these conditions in order to characterize the entire project site. Even under the best of circumstances, the conditions encountered during construction can be expected to vary somewhat from the test boring results and may, in the extreme case, differ to the extent that modifications to the foundation recommendations become necessary. Therefore, we recommend that Atlas be retained as geotechnical consultant through the earth-related phases of this project to correlate actual soil conditions with test boring data, identify variations, conduct additional tests that may be needed and recommend solutions to earth-related problems that may develop.

5.1 Fill Placement and Compaction

All engineered fill should be compacted to a dry density of at least 98 percent of the standard Proctor maximum dry density (ASTM D698). The compaction should be accomplished by placing the fill in about 8 in. thick (or less) loose lifts and mechanically compacting each lift to at least the specified minimum dry density. The moisture content of the fill materials should be within a range of approximately 2 percent below the optimum moisture content to 1 percent above the optimum moisture content. Field density tests should be performed on each lift as necessary to determine whether proper moisture conditioning and compaction is being achieved.

The need for aeration or chemical modification of the cohesive soils should be expected before they can be placed and compacted to the specified density. The in-place moisture contents of the existing cohesive soils are well above the associated optimum moisture contents of these soils. It may be necessary to use lime modification of the fill soils for moisture conditioning in order to be able to properly place and compact the fill soils. It is also recommended that only well-graded granular material, such as “pit-run” sand and gravel or INDOT No. 53 crushed limestone, should be used to fill undercut excavations beneath spread footings and mat foundations and other excavations of limited lateral dimensions where proper compaction of cohesive soils is difficult and compaction can only be accomplished with small vibratory equipment.

All soils encountered in the test borings made at this site are considered suitable as general grade-raise fill material with the exception of topsoil. The need for some aeration of the fill soils should be expected before they can be placed and compacted to the specified density. High plasticity clays may require chemical modification prior to placement.

Any imported fill materials required should consist of natural soil, sand and gravel or crushed limestone with the following characteristics:

- Organic content less than 4 percent by dry weight of soil;
- Liquid Limit less than 50 and Plasticity Index less than 25 and greater than 4;
- Free of large rock fragments, with no particles larger than 3 inches in diameter, no debris, rubble, wood or any other deleterious materials;
- The amount retained on the 1 inch sieve should be less than 30 percent;
- The standard Proctor maximum dry density (ASTM D698) should be at least 105 lbs/cu.ft;
- The soils should meet the requirements of the Unified Soil Classification System (USCS) ASTM D2487 for CL, CL-ML, SM, SC, SP, SW, SP-SM, SC-SM, SP-SC, SW-SM, SW-SC;
- The use of an essentially one-size material (e.g., “pea gravel”, etc.) should not be permitted.

5.2 Foundation Excavations

The soil at the base of each foundation (mat foundations and/or spread footings) excavation should be observed and evaluated by a geotechnical engineer, or a qualified geotechnical technician working under the direction of the geotechnical engineer. All old uncontrolled fill and any soft natural soil or otherwise undesirable material must be removed from beneath the mat foundation and spread footing locations of the proposed structures and replaced with compacted fill as described in Section 5.1, or with lean concrete, so that the foundations will bear on satisfactory material. At the time of such inspection, it will be necessary to make hand auger borings or use a hand penetration device in the base of the foundation excavation to determine whether the soils below the base are satisfactory for foundation support. The necessary depth of penetration will be established during inspection.

Where undercutting is required to remove unsuitable materials, the proposed footing elevation may be re-established by backfilling after all undesirable materials have been removed. The undercut excavation beneath each footing should extend to suitable bearing soils and the dimensions of the excavation base should be determined by imaginary planes extending outward and downward on a 2 (vertical) to 1 (horizontal) slope from the base perimeter of the footing (see Figure 3 in the Appendix). The entire excavation should then be refilled with engineered fill. The engineered fill should be limited to well-graded sand and gravel or crushed stone (e.g., INDOT coarse aggregate size No. 53 crushed stone) compacted to the minimum dry density recommended in Section 5.1. In cases where lean concrete will be used to fill an undercut excavation (rather than enlarging the base of the undercut excavation as recommended above and placing compacted granular fill materials in 8 in. thick lifts), the dimensions of the base of the undercut excavation can be made the same dimensions as the footings. Special care should be exercised to remove any sloughed, loose or soft materials near the base of the excavation slopes. This is to ensure that no pockets of loose or soft materials will be left in place along the excavation slopes below the foundation bearing level.

Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition such as from disturbance, rain and freezing. Surface run-off water should be drained away from the excavation and not allowed to pond. If possible, all footing concrete should be placed the same day the excavation is made. If this is not practical, the footing excavations should be adequately protected.

5.3 Construction Dewatering

At the time of the field investigation, the ground water level appeared to be below the anticipated excavation depths. However, depending on the seasonal conditions, some seepage into excavations may be experienced. It is anticipated that such seepage can be handled by conventional dewatering methods such as by pumping from sumps. However, in cases where a saturated sand or silt layer is encountered in the base of the excavation, it will not be possible to pump water directly from the base of the excavation without causing deterioration of the subgrade soil. In this case, it will be necessary to pump from a sump located adjacent to the excavation or to depress the ground water using wells or well points. The best dewatering system for each case must be determined at the time of construction based upon actual field conditions.

6 FIELD INVESTIGATION

Twenty-two test borings were drilled at the approximate locations shown on the Boring Plan (Figure 2 in the Appendix). The test borings were extended to depths of 8.6 ft to 20.0 ft below the existing grade. Split-barrel samples were obtained by the Standard Penetration Test procedures (ASTM D1586) at 2.5 and 5.0 ft intervals.

Logs of all test borings, which show visual descriptions of all soil strata encountered using the Unified Soil Classification System (ASTM D2488), have been included in numerical order in the Appendix. Ground water observations, sampling information and other pertinent field data and observations are also included. In addition, a "Field Classification System for Soil Exploration" document defining the terms and symbols used on the boring logs and explaining the Standard Penetration Test procedure is provided immediately following the Test Boring Logs.

7 LABORATORY INVESTIGATION

The soil samples obtained from the test borings were inspected in the laboratory by a geotechnical engineer. The soil was classified in general accordance with the Unified Soil Classification System (ASTM D2488) and the test boring logs were edited as necessary based upon the visual inspection and laboratory test results. The laboratory tests performed on the selected soil samples are summarized in the following table.

Table No. 3 - Laboratory Testing Program

Laboratory Test Description	Test Method Designation
Classification of Soils for Engineering Purposes	ASTM D2488
Moisture Content Test of Soils	ASTM D2216
Atterberg Limits Tests	ASTM D4318
Unconfined Compressive Strength of Soil	ASTM D2166
Grain Size Analyses	ASTM D422, ASTM D1140
Hydrometer Analysis	ASTM D7928
pH tests	USDA Handbook 60
Water-Soluble Sulfate Content Tests	USDA Handbook 60
Water-Soluble Sulfide Content Tests	SM4500
Water-Soluble Chloride Content Tests	USDA Handbook 60
Natural Dry Density Tests	ASTM D7263
Modified Proctor Moisture-Density Relationship Tests	ASTM D1557
Thermal Conductivity Tests	ASTM D5334
Resistivity	USDA Handbook 60
Oxidation-Reduction Potential	ASTM D1498
Calibrated Hand Penetrometer Test (“Pocket Penetrometer Test”)	NA

NA – Not applicable, no standardized test method available

The results of the laboratory tests are included on the Test Boring Logs and test result sheets in the Appendix and selected test results are presented in Sections 7.1 and 7.2 of this report.

7.1 Corrosion Potential of Tested Soil

Corrosion potential indicator tests were performed on bulk samples obtained in Borings B-7 and B-18 at depths of approximately 0 ft to 5 ft below the existing ground. The corrosion indicator tests include, pH, chloride ion content, water soluble sulfate content, electrical conductivity, electrical resistivity and redox potential. The laboratory test results are presented in the table below.

Table No. 4 - Corrosion Potential Indicator of Tested Soil

Test Boring ID	Sample Depth Range, ft	Water-Soluble Sulfate Content, ppm	Water-Soluble Sulfide Content, ppb	Water-Soluble Chloride Content, ppm	pH	Conductivity, mmho/cm	Resistivity, ohms/cm	Oxidation-Reduction Potential
B-7	0 – 5	1050	60	26	7.7	1.73	600	310.5 @ 21.5 °C
B-18	0 – 5	11	160	6	6.9	0.10	10,000	279.7 @ 21.6 °C

7.2 Thermal Conductivity Tests

Bulk samples were obtained in Borings B-7 and B-18 at depths of 0 ft to 5 ft below the existing ground surface for the purpose of performing remolded thermal conductivity tests of soil. In order to facilitate the remolded thermal conductivity tests, moisture-density relationship (modified Proctor) tests were performed on the collected bulk samples. The modified proctor test results and thermal conductivity test results are included in the Appendix and summarized in the tables below.

Table No. 5 – Summary of Modified Proctor Tests

Test Boring ID	Sample Depth, ft	USCS Soil Classification	In-situ Moisture Content, %	Maximum Dry Density, pcf*	Optimum Moisture Content, %*
B-7	0 – 5	CL	26.3	119.1	11.2
B-18	0 – 5	CL	25.6	113.5	15.2

* Modified Proctor Moisture-Density Relationship Test - ASTM D1557

Table No. 6 – Summary of Thermal Conductivity Tests

Test Boring ID	Sample Depth, ft	Percent Compaction of Maximum Dry Density	Dry Density at Start of Thermal Conductivity Test, pcf*	Moisture Content, %*	Thermal Conductivity (W/m˚K**)	Thermal Resistivity (˚Kcm/W***)
B-7	0 – 5	80%	94.7	9.4	1.12	90
B-7	0 – 5	85%	101.2	13.4	1.52	66
B-7	0 – 5	90%	107.2	10.7	1.45	69
B-18	0 – 5	80%	91.0	13.1	0.88	114
B-18	0 – 5	85%	96.4	17.6	1.59	63
B-18	0 – 5	90%	102.1	15.6	1.54	65

* Modified Proctor Moisture-Density Relationship Test - ASTM D1557
** W/m˚K = Watts per Meter ˚Kelvin
*** ˚Kcm/W = ˚Kelvin Centimeter per Watt

8 LIMITATIONS OF STUDY

An inherent limitation of any geotechnical engineering study is that conclusions must be drawn on the basis of data collected at a limited number of discrete locations. The recommendations provided in this report were developed from the information obtained from the test borings that depict subsurface conditions only at these specific locations and at the particular times designated on the boring logs. Soil and bedrock conditions at other locations may differ from conditions occurring at these boring locations and ground water conditions will vary through time. The nature and extent of variations between the borings may not become evident until the course of construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report after performing on-site observations during the excavation or construction period and noting the characteristics of any variation.

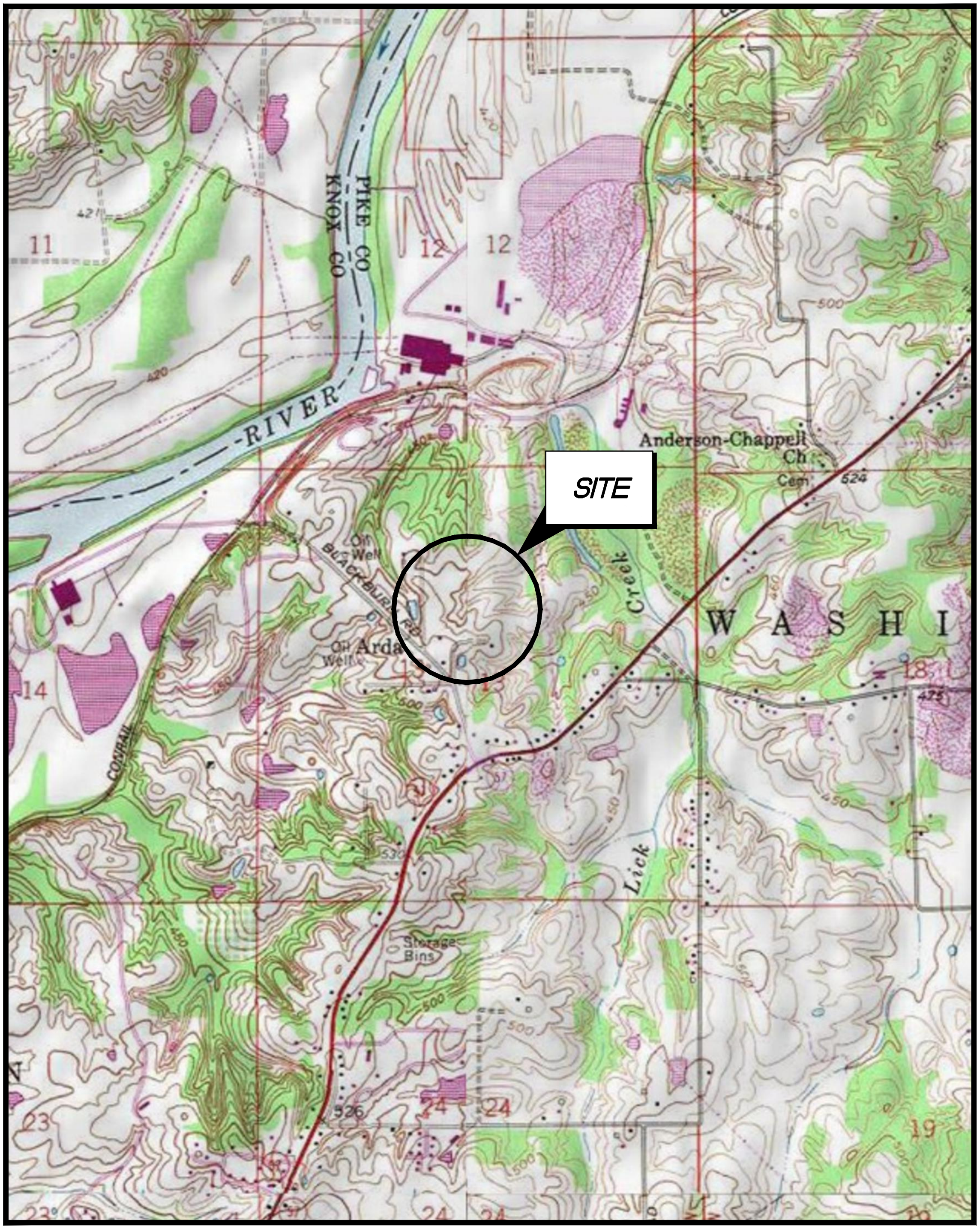
Any comments or recommendations made herein regarding construction related issues are solely for the purpose of planning the design of the proposed facilities. The scope of this investigation is not sufficient to identify all potential construction related issues, variations, anomalies, etc. or all factors that may affect construction means, methods and costs.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with customary principles and practices in the field of geotechnical engineering at the time when the services were performed and at the location where the services were performed. This warranty is in lieu of all other warranties either express or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, ground water or surface water within or beyond the site studied.

Atlas assumes no responsibility for any construction procedures, temporary excavations (including utility trenches), temporary dewatering or site safety during or after construction. The contractor shall be solely responsible for all construction procedures, construction means and methods, construction sequencing and for safety measures during construction as well as the protection and preservation of all existing facilities. All applicable federal, state and local laws and regulations regarding construction safety must be followed, including current Occupational Safety and Health Administration (OSHA) Regulations including OSHA 29 CFR Part 1926 “Safety and Health Regulations for Construction”, Subpart P “Excavations”, and/or successor regulations. The Contractor shall be solely responsible for designing and constructing stable, temporary excavations and should brace, shore, slope, or bench the sides of the excavations as necessary to maintain stability of the excavation sides and bottom and to protect the integrity of all existing facilities (i.e., utilities, etc.).

Appendix



VICINITY MAP

PROPOSED 3 MW SOLAR PROJECT
AES PETERSBURG GENERATING STATION
NORTH BLACKBURN ROAD AND FETTINGER LANE
PETERSBURG, INDIANA

Project Number: 170GC01330		Drn. By: AK
Date: 02/25/2022	Scale: 1":2,000'	Ckd. By: DH
ATLAS		1

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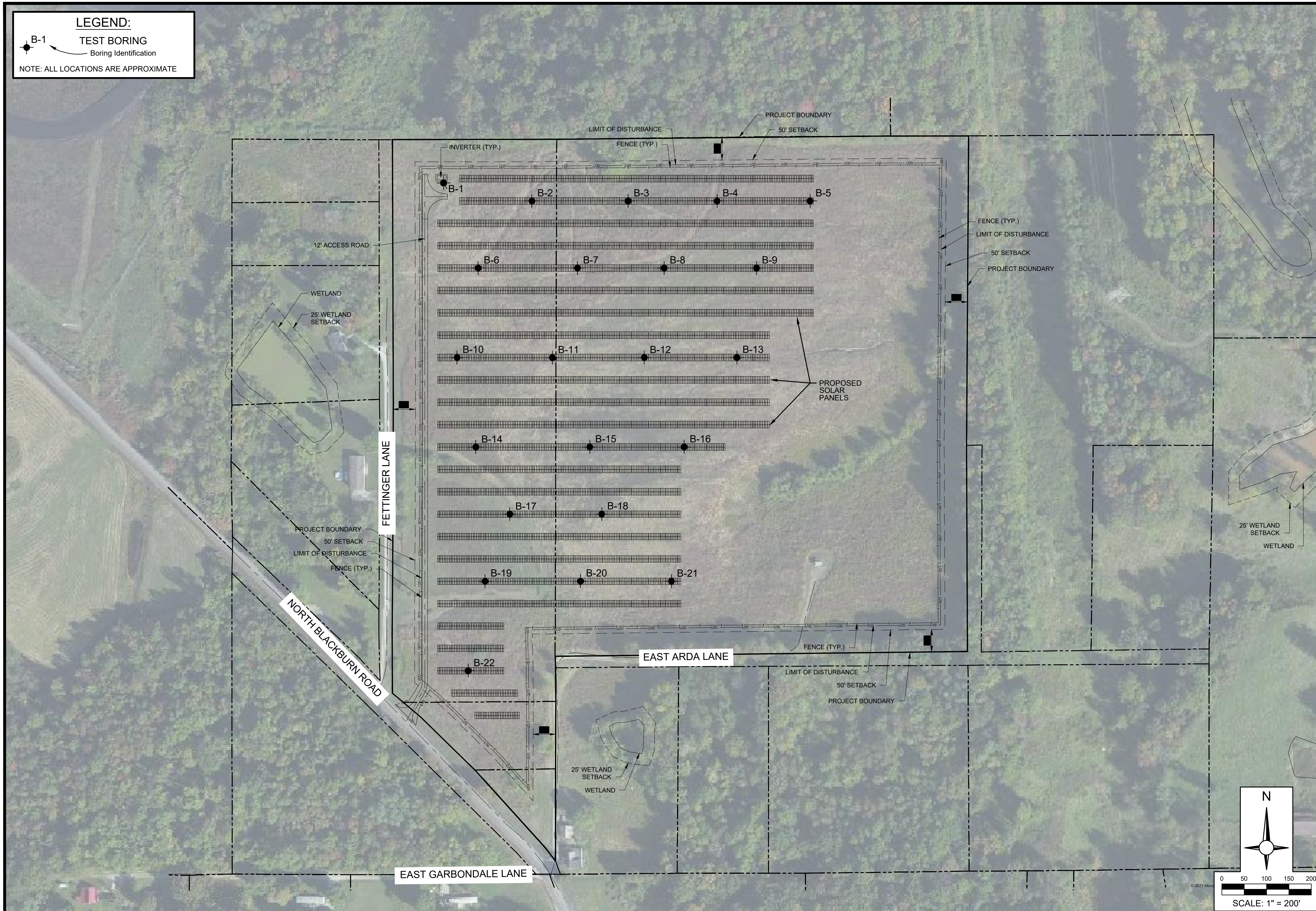

ATLAS

BORING PLAN

PROPOSED 3 MW SOLAR PROJECT
AES PETERSBURG GENERATING STATION
NORTH BLACKBURN ROAD AND FETTINGER LANE
PETERSBURG, INDIANA

Project Number: 170GC01330

Date: 02/25/2022

Drn. By: AK

Ckd. By: DH

Scale: AS SHOWN

Figure: 2

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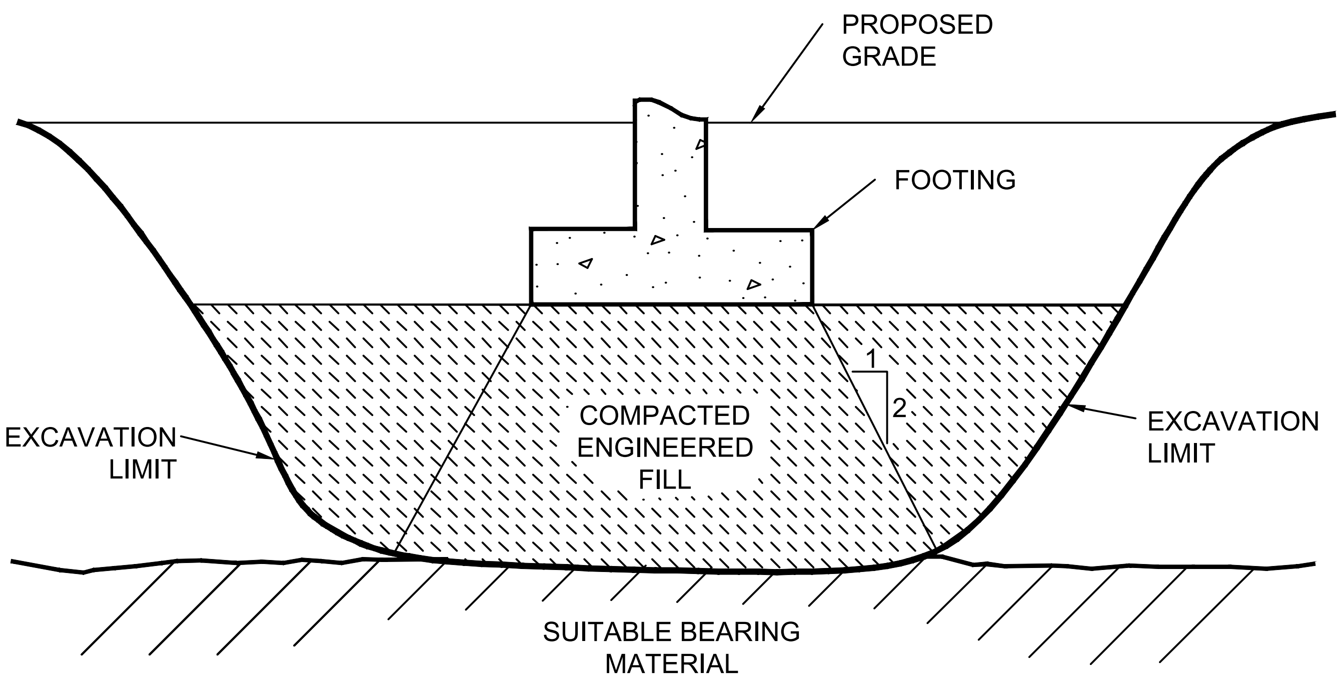

DESIGN ILLUSTRATION
FOOTINGS WITH UNDERCUTS

PROPOSED 3 MW SOLAR PROJECT
AES PETERSBURG GENERATING STATION
NORTH BLACKBURN ROAD AND FETTINGER LANE
PETERSBURG, INDIANA

Project Number: 170GC01330		Drn. By: AK
Date: 02/25/2022	Scale: NOT TO SCALE	Ckd. By: DH
ATLAS		3

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TEST BORING LOG

CLIENT: **AES**
PROJECT NAME: **Proposed 3MWac Solar Project**
PROJECT LOCATION: **North Blackburn Road and North Fettinger Lane, Petersburg, Indiana**

BORING #: **B-1**
JOB #: **170GC01330**
LATITUDE: **38.5212** degrees
LONGITUDE: **-87.2515** degrees

DRILLING and SAMPLING INFORMATION

Date Started	1/19/22	Hammer Wt.	140 lbs.
Date Completed	1/19/22	Hammer Drop	30 in.
Drill Foreman	C. Carroll	Spoon Sampler OD	2.0 in.
Inspector	D. Homm	Rock Core Dia.	-- in.
Boring Method	HSA	Shelby Tube OD	-- in.

TEST DATA

SURFACE ELEVATION 493.4

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	493.1	0.3									Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, medium stiff, SILTY CLAY (CL) with little sand	490.4	3.0		1	SS			2-3-4	21.9	1.25	
Brown and gray, moist, medium stiff, CLAY (CH) with little sand	487.4	6.0	5	2	SS			2-3-6	22.8	2.0	
Brown, moist, stiff, SILTY CLAY (CL)	485.4	8.0		3	SS			7-6-6	23.7	2.0	
Brown, moist, stiff, SILTY CLAY (CL) with trace sand	482.9	10.5	10	4	SS			4-5-6	26.4	2.25	
Brown, moist, very stiff, CLAY (CH) with little sand	480.4	13.0		5	SS			6-8-9	41.7	1.25	
Brown, slightly moist, hard, SILTY CLAY (CL) with trace sand	476.4	17.0	15	6	SS			10-17-25		4.0	
Gray and brown, slightly moist, hard, SILTY CLAY (CL) with little sand	473.4	20.0	20	7	SS			27-42-35		4.5+	
Bottom of Test Boring at 20.0 ft.											

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools: None ft.
At Completion: None ft.
After -- hours: -- ft.
Cave Depth: -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT **AES**
PROJECT NAME **Proposed 3MWac Solar Project**
PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-2**
JOB # **170GC01330**
LATITUDE **38.5211** degrees
LONGITUDE **-87.2509** degrees

DRILLING and SAMPLING INFORMATION

Date Started **1/19/22**
Date Completed **1/19/22**
Drill Foreman **C. Carroll**
Inspector **D. Homm**
Boring Method **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2.0** in.
Rock Core Dia. **--** in.
Shelby Tube OD **--** in.

TEST DATA

SURFACE ELEVATION 494.4

SOIL CLASSIFICATION	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	494.1	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown and dark brown, moist, medium stiff, SILTY CLAY (CL) with some sand, trace gravel, and trace roots				1	SS		2-2-4	21.1	2.0	
	491.4	3.0								
Brown, very moist to moist, medium stiff to stiff, SILTY CLAY (CL)				2	SS		3-3-5	26.3	0.75	
			5							
				3	SS		5-6-5	20.6	2.5	
	486.4	8.0								
Brown and reddish brown, moist, very stiff, SILTY CLAY (CL) with little sand and trace weathered shale fragments				4	SS		5-11-10	17.9	2.0	
			10							
				5	SS		9-14-14		4.0	
	481.4	13.0								
Gray, weathered, SILTSTONE				6	SS	Cave	18-50/0.3			
			15							
	475.1	19.3		7	SS		20-50/0.3			
Bottom of Test Boring at 19.3 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **--** hours **--** ft.
Cave Depth **14.0** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT: **AES**
PROJECT NAME: **Proposed 3MWac Solar Project**
PROJECT LOCATION: **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING #: **B-3**
JOB #: **170GC01330**
LATITUDE: **38.5211** degrees
LONGITUDE: **-87.2501** degrees

DRILLING and SAMPLING INFORMATION

Date Started: **1/19/22**
Date Completed: **1/19/22**
Drill Foreman: **C. Carroll**
Inspector: **D. Homm**
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler OD: **2.0** in.
Rock Core Dia.: **--** in.
Shelby Tube OD: **--** in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION 489.5

Soil Classification	Stratum Elevation	Stratum Depth, ft
4 in. Topsoil	489.2	0.3
Brown, moist, soft to medium stiff, SILTY CLAY (CL) with trace sand	481.5	8.0
Brown and gray, moist, stiff to very stiff, SILTY CLAY (CL) with trace sand and gravel	472.5	17.0
Gray and brown, slightly moist, hard, SILTY CLAY (CL) with some sand, sandstone fragments, and siltstone fragments	470.1	19.4
Bottom of Test Boring at 19.4 ft.		

Sample No.	Sample Type	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
1	SS	3-2-3	27.3	0.5	Ground surface elevation and coordinates estimated from GPS equipment
2	SS	3-3-4	20.5	0.5	
3	SS	4-4-5	20.8	1.0	
4	SS	4-7-8	22.2	1.5	
5	SS	11-11-13	19.8	3.0	
6	SS	6-10-11	22.0	3.5	
7	SS	17-50/0.4			

Depth Scale, ft: 5, 10, 15

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT	AES	BORING #	B-4
PROJECT NAME	Proposed 3MWac Solar Project	JOB #	170GC01330
PROJECT LOCATION	North Blackburn Road and North Fettinger Lane	LATITUDE	38.5211 degrees
	Petersburg, Indiana	LONGITUDE	-87.2494 degrees

DRILLING and SAMPLING INFORMATION

Date Started	1/19/22	Hammer Wt.	140 lbs.
Date Completed	1/20/22	Hammer Drop	30 in.
Drill Foreman	C. Carroll	Spoon Sampler OD	2.0 in.
Inspector	D. Homm	Rock Core Dia.	-- in.
Boring Method	HSA	Shelby Tube OD	-- in.

TEST DATA

SOIL CLASSIFICATION — SURFACE ELEVATION 493.6

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	493.3	0.3							Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, soft, SILTY CLAY (CL)				1	SS	1-2-3	21.8	1.25	
	490.1	3.5							
Brown, moist, medium stiff, SILTY CLAY (CL)				2	SS	3-3-4	28.2	0.5	**Sample No. 2:** Atterberg Limits: LL=32 PL=23 PI=9
			5						
				3	SS	6-3-5	28.1	1.0	
	485.6	8.0							
Orangish brown, moist, very stiff, CLAY (CH) with trace sand				4	SS	4-6-10	26.0	3.0	
			10						
				5	SS	8-11-11	19.7	3.75	
	480.6	13.0							
Gray, moist, stiff, SILTY CLAY (CL) with little sand and trace gravel				6	SS	4-6-6	21.1	0.75	
			15						
	476.6	17.0							
Gray, weathered, SANDY SILTSTONE									
	474.3	19.3		7	SS	14-50/0.3			
Bottom of Test Boring at 19.3 ft.									

Cave depth noted at 13.0 ft.

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater

- Noted on Drilling Tools: None ft.
- At Completion: None ft.
- After 24 hours: None ft.
- Cave Depth: 13.0 ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT **AES**
PROJECT NAME **Proposed 3MWac Solar Project**
PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-5**
JOB # **170GC01330**
LATITUDE **38.5211** degrees
LONGITUDE **-87.2487** degrees

DRILLING and SAMPLING INFORMATION

Date Started **1/19/22**
Date Completed **1/20/22**
Drill Foreman **C. Carroll**
Inspector **D. Homm**
Boring Method **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2.0** in.
Rock Core Dia. **--** in.
Shelby Tube OD **--** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION 487.0	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Sampler Graphics / Recovery Graphics	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	486.7	0.3									Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, soft to medium stiff, SILTY CLAY (CL)				1	SS			2-2-3	26.7	1.25	
				2	SS			2-3-3	25.9	0.5	
			5								
	481.0	6.0									
Brown, very moist, medium stiff, SILTY CLAY (CL) with trace sand				3	SS			5-4-5	22.6	0.25	
	479.0	8.0									
Brown and gray, slightly moist, hard, SILTY CLAY (CL) with some sand and sandstone fragments	478.0	9.0		4	SS			6-10-21		4.5+	
			10								
Gray and brown, weathered, SANDY SILTSTONE and SANDSTONE				5	SS			25-50/0.3			
							Cave				
				6	SS			50/0.3			
			15								
	470.0	17.0									
Bottom of Test Boring at 17.0 ft.											Auger refusal at 17 ft.

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **13.0** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT	AES	BORING #	B-6
PROJECT NAME	Proposed 3MWac Solar Project	JOB #	170GC01330
PROJECT LOCATION	North Blackburn Road and North Fettinger Lane	LATITUDE	38.5207 degrees
	Petersburg, Indiana	LONGITUDE	-87.2513 degrees

DRILLING and SAMPLING INFORMATION

Date Started	1/19/22	Hammer Wt.	140 lbs.
Date Completed	1/19/22	Hammer Drop	30 in.
Drill Foreman	C. Carroll	Spoon Sampler OD	2.0 in.
Inspector	D. Homm	Rock Core Dia.	-- in.
Boring Method	HSA	Shelby Tube OD	-- in.

TEST DATA

SURFACE ELEVATION 500.7

SOIL CLASSIFICATION	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	500.4	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, medium stiff, SILTY CLAY (CL) with little sand and trace roots	497.7	3.0		1	SS		2-3-3	21.5	2.0	
Light brown, moist, medium stiff, SILTY CLAY (CL) with trace sand	494.7	6.0	5	2	SS		5-4-6	22.3	1.5	
Brown, moist, stiff, SILTY CLAY (CL)	492.7	8.0		3	SS		7-6-6	23.7	0.5	
Brown, moist, stiff to very stiff, SILTY CLAY (CL) with little sand and trace gravel	487.7	13.0	10	4	SS		3-5-7	24.2	3.0	
				5	SS		6-8-10	28.1	3.0	
Gray and brown, moist, stiff, CLAY (CH) with little sand	483.7	17.0	15	6	SS		3-4-7	27.5	1.25	
Gray, moist, very stiff, CLAY (CH) with some sand and trace gravel	480.7	20.0	20	7	SS		7-7-9	28.8	2.75	
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools None ft.
At Completion None ft.
After -- hours -- ft.
Cave Depth -- ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT **AES**

PROJECT NAME **Proposed 3MWac Solar Project**

PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-7**

JOB # **170GC01330**

LATITUDE **38.5207** degrees

LONGITUDE **-87.2505** degrees

DRILLING and SAMPLING INFORMATION

Date Started	**1/19/22**	Hammer Wt.	**140** lbs.
Date Completed	**1/19/22**	Hammer Drop	**30** in.
Drill Foreman	**C. Carroll**	Spoon Sampler OD	**2.0** in.
Inspector	**D. Homm**	Rock Core Dia.	**--** in.
Boring Method	**HSA**	Shelby Tube OD	**--** in.

TEST DATA

SOIL CLASSIFICATION (SURFACE ELEVATION 501.4)	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	501.1	0.3							Ground surface elevation and coordinates estimated from GPS equipment Bulk sample obtained from 0 - 5 ft below the ground surface **Bulk Sample 1:** Atterberg Limits: LL=38 PL=21 PI=17 Percent finer than No. 200 sieve = 97.5%
Brown, very moist, soft, SILTY CLAY (CL) with trace sand				1	SS	3-2-3	27.9	1.75	
				2	SS	3-2-3	26.3	0.5	
	495.4	6.0	5						
Brown, very moist, medium stiff, SILTY CLAY (CL-ML) with trace sand				3	SS	3-4-4	23.1	1.25	
	493.4	8.0							
Brown, moist, medium stiff, SILTY CLAY (CL) with little sand				4	SS	4-3-6	20.7	2.25	
	490.9	10.5	10						
Orangish brown and gray, moist to slightly moist, very stiff to stiff, SILTY CLAY (CL) with little sand and trace weathered sandstone fragments				5	SS	6-8-10	24.6	3.0	
				6	SS	6-6-7		4.5+	
			15						
	483.4	18.0							
Brown, slightly moist, very stiff, SILTY CLAY (CL) with little sand and trace gravel				7	SS	8-9-10			
	481.4	20.0	20						
Bottom of Test Boring at 20.0 ft.									

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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Fax (317) 849-4278

TEST BORING LOG

CLIENT: **AES**
PROJECT NAME: **Proposed 3MWac Solar Project**
PROJECT LOCATION: **North Blackburn Road and North Fettinger Lane, Petersburg, Indiana**

BORING #: **B-8**
JOB #: **170GC01330**
LATITUDE: **38.5207** degrees
LONGITUDE: **-87.2498** degrees

DRILLING and SAMPLING INFORMATION

Date Started: **1/19/22**
Date Completed: **1/19/22**
Drill Foreman: **C. Carroll**
Inspector: **D. Homm**
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler OD: **2.0** in.
Rock Core Dia.: **--** in.
Shelby Tube OD: **--** in.

TEST DATA

SURFACE ELEVATION 497.4

SOIL CLASSIFICATION	Stratum Elevation	Stratum Depth, ft	Sample No.	Sample Type	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	497.1	0.3						Ground surface elevation and coordinates estimated from GPS equipment
Black, gray, and brown, moist, silty clay with little sand (FILL)			1	SS	3-4-5	17.1		
	493.9	3.5						
Brown, slightly moist to moist, stiff to medium stiff, SILTY CLAY (CL) with little sand			2	SS	5-6-7	20.3	3.5	
			3	SS	5-8-8	18.3	3.0	
			4	SS	4-3-5	18.8	1.0	
			5	SS	4-6-7	19.7	4.0	
	484.4	13.0						
Brown and gray, moist, stiff to very stiff, SILTY CLAY (CL) with little sand			6	SS	4-5-6	20.1	1.5	
			7	SS	6-7-10		3.5	
	477.4	20.0						
Bottom of Test Boring at 20.0 ft.								

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT: **AES**
PROJECT NAME: **Proposed 3MWac Solar Project**
PROJECT LOCATION: **North Blackburn Road and North Fettinger Lane, Petersburg, Indiana**

BORING #: **B-9**
JOB #: **170GC01330**
LATITUDE: **38.5207** degrees
LONGITUDE: **-87.2490** degrees

DRILLING and SAMPLING INFORMATION

Date Started	1/19/22	Hammer Wt.	140 lbs.
Date Completed	1/20/22	Hammer Drop	30 in.
Drill Foreman	C. Carroll	Spoon Sampler OD	2.0 in.
Inspector	D. Homm	Rock Core Dia.	-- in.
Boring Method	HSA	Shelby Tube OD	-- in.

TEST DATA

SURFACE ELEVATION 491.9

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	491.6	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, silty clay with little sand (FILL)	488.4	3.5		1	SS		2-3-3	23.8		
Brown, gray, and red, moist, silty clay with little sand and trace gravel (FILL)	485.9	6.0	5	2	SS		4-6-7	17.6		
Gray, moist, very stiff to medium stiff, SILTY CLAY (CL) with little sand	481.4	10.5	10	3	SS		9-7-9	17.6	1.5	
				4	SS		5-3-5	20.6	1.5	
Brown, moist, stiff, SILTY CLAY (CL) with trace sand	478.9	13.0		5	SS	Cave depth 12.6	6-5-6	27.2	0.75	
Brown, very moist, medium stiff, SILTY CLAY (CL-ML) with trace sand	473.9	18.0	15	6	SS		3-3-4	20.9	0.75	
Light brown, very moist, medium stiff, SILTY CLAY (CL-ML) with little sand	471.9	20.0	20	7	SS		3-3-4	20.1		
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **12.6** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT: **AES**
PROJECT NAME: **Proposed 3MWac Solar Project**
PROJECT LOCATION: **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING #: **B-10**
JOB #: **170GC01330**
LATITUDE: **38.5202** degrees
LONGITUDE: **-87.2514** degrees

DRILLING and SAMPLING INFORMATION

Date Started	**1/19/22**	Hammer Wt.	**140** lbs.
Date Completed	**1/20/22**	Hammer Drop	**30** in.
Drill Foreman	**C. Carroll**	Spoon Sampler OD	**2.0** in.
Inspector	**D. Homm**	Rock Core Dia.	**--** in.
Boring Method	**HSA**	Shelby Tube OD	**--** in.

TEST DATA

SOIL CLASSIFICATION

SURFACE ELEVATION 507.0

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	506.7	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, very moist to moist, soft to medium stiff, SILTY CLAY (CL)				1	SS		2-2-3	27.7	0.5	
				2	SS		2-3-3	25.8	0.25	
			5							
				3	SS		4-3-5	20.1	1.0	**Sample No. 3:** Unconfined compressive strength = 1.7 tsf Dry density = 109.2 pcf
Brown and gray, moist, stiff to very stiff, CLAY (CH) with little sand	499.0	8.0								
				4	SS		3-5-8	25.8	2.75	**Sample No. 4:** Atterberg Limits: LL=63 PL=26 PI=37 Percent finer than No. 200 sieve = 98.4%
			10							
				5	SS		10-9-9	33.1	2.5	
Brown and dark brown, moist, hard to very stiff, SANDY CLAY (CL) with weathered sandstone fragments	494.0	13.0				Cave				
				6	SS		7-28-14		1.5	
			15							
				7	SS		8-14-14			
Bottom of Test Boring at 20.0 ft.	487.0	20.0	20							

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **13.4** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT **AES**
PROJECT NAME **Proposed 3MWac Solar Project**
PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-11**
JOB # **170GC01330**
LATITUDE **38.5202** degrees
LONGITUDE **-87.2507** degrees

DRILLING and SAMPLING INFORMATION

Date Started **1/19/22**
Date Completed **1/19/22**
Drill Foreman **C. Carroll**
Inspector **D. Homm**
Boring Method **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2.0** in.
Rock Core Dia. **--** in.
Shelby Tube OD **--** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION 506.3

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	506.0	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, silty clay with little sand and trace gravel (FILL)				1	SS		4-7-4	15.5		
	502.8	3.5								
Brown, moist, stiff to medium stiff, SILTY CLAY (CL) with trace sand				2	SS		4-5-6	23.6	1.75	
			5							
				3	SS		7-7-8	23.9	1.25	
				4	SS		2-3-3	21.2	0.5	
			10							
	495.8	10.5								
Brown, moist, medium stiff, SILTY CLAY (CL) with little sand				5	SS		3-4-6	24.1	1.75	
	493.3	13.0								
Gray, moist, very stiff, SILTY CLAY (CL) with little sand and weathered siltstone fragments				6	SS		3-6-10		3.25	
			15							
	488.3	18.0								
Brown, very moist, very stiff, SILTY CLAY (CL) with trace sand				7	SS		6-6-11	33.6		
	486.3	20.0	20							
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **--** hours **--** ft.
Cave Depth **--** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT	AES	BORING #	B-12
PROJECT NAME	Proposed 3MWac Solar Project	JOB #	170GC01330
PROJECT LOCATION	North Blackburn Road and North Fettinger Lane	LATITUDE	38.5201 degrees
	Petersburg, Indiana	LONGITUDE	-87.2500 degrees

DRILLING and SAMPLING INFORMATION

Date Started	1/19/22	Hammer Wt.	140 lbs.
Date Completed	1/20/22	Hammer Drop	30 in.
Drill Foreman	C. Carroll	Spoon Sampler OD	2.0 in.
Inspector	D. Homm	Rock Core Dia.	-- in.
Boring Method	HSA	Shelby Tube OD	-- in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION 501.2	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	500.9	0.3									Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, silty clay with trace sand and coal (FILL)	498.2	3.0		1	SS			3-4-5	21.0	1.0	
Gray, moist, stiff, SILTY CLAY (CL) with little sand and sandstone fragments	495.2	6.0	5	2	SS			3-5-8	12.3	1.5	
Brown and gray, moist, very stiff, SILTY CLAY (CL) with little sand and weatehered sandstone fragments	493.2	8.0		3	SS			9-9-11	16.9	2.0	
Black, brown, and gray, moist, stiff to very stiff, CLAY (CH) with little sand and trace coal	488.2	13.0	10	4	SS			4-6-8	25.9	1.5	
				5	SS			7-10-11	29.5	3.0	
Brown, very moist, medium stiff, SILTY CLAY (CL) with trace sand	484.2	17.0	15	6	SS		Cave depth (16.0 ft)	4-4-4	30.7	0.5	
Brown and dark brown, moist, very stiff, CLAY (CH) with little sand and trace weathered siltstone fragments	481.2	20.0	20	7	SS			6-7-10	33.0	2.25	
Bottom of Test Boring at 20.0 ft.											

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools None ft.
At Completion None ft.
After 24 hours None ft.
Cave Depth 16.0 ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT	**AES**	BORING #	**B-13**
PROJECT NAME	**Proposed 3MWac Solar Project**	JOB #	**170GC01330**
PROJECT LOCATION	**North Blackburn Road and North Fettinger Lane**	LATITUDE	**38.5201** degrees
	Petersburg, Indiana	LONGITUDE	**-87.2492** degrees

DRILLING and SAMPLING INFORMATION

Date Started	**1/19/22**	Hammer Wt.	**140** lbs.
Date Completed	**1/20/22**	Hammer Drop	**30** in.
Drill Foreman	**C. Carroll**	Spoon Sampler OD	**2.0** in.
Inspector	**D. Homm**	Rock Core Dia.	**--** in.
Boring Method	**HSA**	Shelby Tube OD	**--** in.

TEST DATA

SOIL CLASSIFICATION — SURFACE ELEVATION 494.9

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	494.6	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, very moist, soft, SILTY CLAY (CL) with little sand				1	SS		3-2-2	25.2	0.5	
	491.9	3.0								
Brown and gray, moist, stiff to very stiff, CLAY (CH) with little sand				2	SS		4-6-8	12.6	1.5	**Sample No. 2:** Atterberg Limits: LL=51 PL=20 PI=31 Percent finer than No. 200 sieve = 81.5%
			5							
				3	SS		8-10-12	20.4	1.0	
	486.9	8.0								
Brown and gray, moist, medium stiff to very stiff, SILTY CLAY (CL) with little sand and trace siltstone fragments				4	SS		4-3-5	18.1	2.0	
			10							
				5	SS		6-7-9	17.9	2.0	
	481.9	13.0				Cave Depth				
Orangish brown and brown, moist, stiff, SILTY CLAY (CL) with little sand and trace gravel				6	SS		3-5-7			
			15							
				7	SS		5-7-7			
	474.9	20.0	20							
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **13.0** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT **AES**
PROJECT NAME **Proposed 3MWac Solar Project**
PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-14**
JOB # **170GC01330**
LATITUDE **38.5196** degrees
LONGITUDE **-87.2513** degrees

DRILLING and SAMPLING INFORMATION

Date Started **1/19/22**
Date Completed **1/20/22**
Drill Foreman **C. Carroll**
Inspector **D. Homm**
Boring Method **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2.0** in.
Rock Core Dia. **--** in.
Shelby Tube OD **--** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION 511.3

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	511.0	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, very moist, soft, SILTY CLAY (CL) with trace sand	508.3	3.0		1	SS		3-2-3	26.4	0.75	
Brown and gray, moist, medium stiff, SILTY CLAY (CL) with trace sand	503.3	8.0	5	2	SS		2-2-4	24.9	1.5	
				3	SS		4-4-5	19.7	1.0	
Brown, moist to slightly moist, stiff to very stiff, SILTY CLAY (CL) with little sand	498.3	13.0	10	4	SS		5-5-9	25.9	3.0	
				5	SS		9-11-11	17.9	4.5+	
Brown and gray, slightly moist, very stiff, SILTY CLAY (CL) with little sand and weathered siltstone fragments	494.3	17.0	15	6	SS	Cave Depth	9-9-19			
Gray and red, weathered, SILTSTONE	491.5	19.8		7	SS		11-47-50/0.3			
Bottom of Test Boring at 19.8 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **14.0** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT	AES	BORING #	B-15
PROJECT NAME	Proposed 3MWac Solar Project	JOB #	170GC01330
PROJECT LOCATION	North Blackburn Road and North Fettinger Lane	LATITUDE	38.5196 degrees
	Petersburg, Indiana	LONGITUDE	-87.2503 degrees

DRILLING and SAMPLING INFORMATION

Date Started	1/17/22	Hammer Wt.	140 lbs.
Date Completed	1/18/22	Hammer Drop	30 in.
Drill Foreman	C. Carroll	Spoon Sampler OD	2.0 in.
Inspector	D. Homm	Rock Core Dia.	-- in.
Boring Method	HSA	Shelby Tube OD	-- in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION 505.2	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	504.9	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown and gray, moist, silty clay with trace sand, roots, and coal (FILL)				1	SS		3-4-4	16.3		
	501.7	3.5								
Brown, moist, silty clay with trace sand and coal (FILL)				2	SS		3-4-5	26.1		
			5							
	499.2	6.0								
Brown, moist, silty clay with little sand, weathered sandstone fragments and coal fragments (FILL)				3	SS		7-8-7	28.7		
				4	SS		3-5-6	17.5		
			10							
	494.2	11.0								
Brown, moist, very stiff to stiff, SILTY CLAY (CL) with trace sand				5	SS		6-9-10	20.7	3.5	
				6	SS		3-4-7		0.75	
			15							
	488.2	17.0				Cave depth				
Brown and black, moist, very stiff, SILTY CLAY (CL) with trace sand, weathered sandstone fragments and coal fragments				7	SS		7-7-9			
	485.2	20.0	20							
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools None ft.
At Completion None ft.
After 24 hours None ft.
Cave Depth 17.1 ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT: **AES**
PROJECT NAME: **Proposed 3MWac Solar Project**
PROJECT LOCATION: **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING #: **B-16**
JOB #: **170GC01330**
LATITUDE: **38.5197** degrees
LONGITUDE: **-87.2497** degrees

DRILLING and SAMPLING INFORMATION

Date Started: **1/17/22**
Date Completed: **1/18/22**
Drill Foreman: **C. Carroll**
Inspector: **D. Homm**
Boring Method: **HSA**

Hammer Wt.: **140** lbs.
Hammer Drop: **30** in.
Spoon Sampler OD: **2.0** in.
Rock Core Dia.: **--** in.
Shelby Tube OD: **--** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION 502.4

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	502.1	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Light brown, slightly moist, soft to medium stiff, SILTY CLAY (CL) with trace sand and sandstone fragments				1	SS		3-3-2	16.4	1.5	
				2	SS		3-3-3	12.6	2.0	
			5							
	496.4	6.0								
Brown, moist, medium stiff, CLAY (CH) with trace sand and gravel				3	SS		5-4-4	32.2	2.5	
	494.4	8.0								
Gray, brown, and black, moist, medium stiff, CLAY (CH) with trace sand, sandstone fragments, and coal				4	SS		3-4-5	24.0	2.5	
			10							
	491.9	10.5								
Brown and gray, moist, very stiff, CLAY (CH) with trace sand and gravel				5	SS		8-8-9	31.5	1.5	
	488.9	13.5								
Brown, moist, soft to medium stiff, SILTY CLAY (CL) with trace sand				6	SS	Cave	3-2-3	26.5	1.0	
			15							
				7	SS		4-4-4	23.7	1.25	
	482.4	20.0	20							
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **14.0** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT	AES	BORING #	B-17
PROJECT NAME	Proposed 3MWac Solar Project	JOB #	170GC01330
PROJECT LOCATION	North Blackburn Road and North Fettinger Lane	LATITUDE	38.5192 degrees
	Petersburg, Indiana	LONGITUDE	-87.2510 degrees

DRILLING and SAMPLING INFORMATION

Date Started	1/19/22	Hammer Wt.	140 lbs.
Date Completed	1/20/22	Hammer Drop	30 in.
Drill Foreman	C. Carroll	Spoon Sampler OD	2.0 in.
Inspector	D. Homm	Rock Core Dia.	-- in.
Boring Method	HSA	Shelby Tube OD	-- in.

TEST DATA

SOIL CLASSIFICATION — SURFACE ELEVATION 511.3

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	511.0	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, soft, SILTY CLAY (CL) with trace sand				1	SS		2-2-3	25.0	0.5	
	508.3	3.0								
Gray, moist, very soft to medium stiff, SILTY CLAY (CL)				2	SS		2-2-1	26.1	0.5	**Sample No. 2:** Atterberg Limits: LL=32 PL=22 PI=10
			5							
				3	SS		4-4-3	26.7	0.25	
	503.3	8.0								
Brown, moist, medium stiff, SILTY CLAY (CL) with trace sand				4	SS		2-3-3	21.7	0.25	**Sample No. 4:** Unconfined compressive strength = 0.9 tsf Dry density = 105.4 pcf
			10							
				5	SS		4-4-5	20.7	1.0	
	498.3	13.0				Cave (13.4)				
Brown and gray, moist, stiff to very stiff, CLAY (CH) with trace sand				6	SS		4-6-8	32.2	3.5	
			15							
				7	SS		7-7-10		2.5	
	491.3	20.0	20							
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools None ft.
At Completion None ft.
After 24 hours None ft.
Cave Depth 13.4 ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT	**AES**	BORING #	**B-18**
PROJECT NAME	**Proposed 3MWac Solar Project**	JOB #	**170GC01330**
PROJECT LOCATION	**North Blackburn Road and North Fettinger Lane**	LATITUDE	**38.5192** degrees
	Petersburg, Indiana	LONGITUDE	**-87.2503** degrees

DRILLING and SAMPLING INFORMATION

Date Started	**1/19/22**	Hammer Wt.	**140** lbs.
Date Completed	**1/20/22**	Hammer Drop	**30** in.
Drill Foreman	**C. Carroll**	Spoon Sampler OD	**2.0** in.
Inspector	**D. Homm**	Rock Core Dia.	**--** in.
Boring Method	**HSA**	Shelby Tube OD	**--** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION 507.3	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	507.0	0.3								Ground surface elevation and coordinates estimated from GPS equipment Bulk sample obtained from 0 - 5 ft below the ground surface **Bulk Sample 1:** Atterberg Limits: LL=46 PL=19 PI=27 Percent finer than No. 200 sieve = 87.2%
Brown, moist, silty clay with trace sand, roots, and weathered sanstone fragments (FILL)	503.8	3.5		1	SS		2-2-2	18.7		
Black, brown, and gray, moist, silty clay with trace sand, coal, and sandstone fragments (FILL)	501.3	6.0	5	2	SS		4-5-6	16.5		
Brown, moist, very stiff, SILTY CLAY (CL) with trace sand	499.3	8.0		3	SS		8-7-9	22.7	1.25	
Brown, slightly moist, stiff, SILTY CLAY (CL) with little sand and trace coal	496.8	10.5	10	4	SS		5-5-6	15.7	4.0	
Brown, slightly moist, very stiff, SILTY CLAY (CL) with trace sand	494.3	13.0		5	SS		8-10-9		3.0	
Brown and gray, moist, medium stiff, CLAY (CH) with trace sand and sandstone fragments	490.3	17.0	15	6	SS	Cave Depth	3-4-6	23.5	1.75	
Brown, moist, stiff, SILTY CLAY (CL) with trace sand and siltstone fragments	487.3	20.0	20	7	SS		6-7-8		0.5	
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **14.6** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT **AES**
PROJECT NAME **Proposed 3MWac Solar Project**
PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-19**
JOB # **170GC01330**
LATITUDE **38.5188** degrees
LONGITUDE **-87.2512** degrees

DRILLING and SAMPLING INFORMATION

Date Started	**1/17/22**	Hammer Wt.	**140** lbs.
Date Completed	**1/18/22**	Hammer Drop	**30** in.
Drill Foreman	**C. Carroll**	Spoon Sampler OD	**2.0** in.
Inspector	**D. Homm**	Rock Core Dia.	**--** in.
Boring Method	**HSA**	Shelby Tube OD	**--** in.

TEST DATA

SOIL CLASSIFICATION / SURFACE ELEVATION 514.8	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	514.5	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, medium stiff, SILTY CLAY (CL) with trace sand				1	SS		3-5-4	21.9	2.0	
	511.8	3.0								
Brown, moist, stiff, SILTY CLAY (CL) with little sand				2	SS		3-5-6	28.4	3.5	
			5							
	508.8	6.0								
Brown, moist to slightly moist, medium stiff to hard, SILTY CLAY (CL) with trace sand				3	SS		8-10-12	19.7	2.5	
				4	SS		2-3-4	26.9	1.0	
			10							
				5	SS		7-9-12		4.0	
				6	SS		9-12-19		4.5+	
			15							
						Cave				
				7	SS		15-20-24		4.5+	
	494.8	20.0	20							
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **16.2** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

ATLAS
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TEST BORING LOG

CLIENT **AES**
PROJECT NAME **Proposed 3MWac Solar Project**
PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-20**
JOB # **170GC01330**
LATITUDE **38.5188** degrees
LONGITUDE **-87.2505** degrees

DRILLING and SAMPLING INFORMATION

Date Started **1/17/22**
Date Completed **1/17/22**
Drill Foreman **C. Carroll**
Inspector **D. Homm**
Boring Method **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2.0** in.
Rock Core Dia. **--** in.
Shelby Tube OD **--** in.

TEST DATA

SOIL CLASSIFICATION SURFACE ELEVATION 509.5	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	509.2	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Dark brown, moist, silty clay with trace sand and roots (FILL)				1	SS		2-1-3	22.0		
	506.0	3.5								
Brown and reddish brown, moist, stiff, SILTY CLAY (CL) with trace sand and sandstone fragments				2	SS		3-4-7	19.8	2.0	
			5							
	503.5	6.0								
Brown, moist, very stiff, SILTY CLAY (CL) with trace sand				3	SS	Cave	6-7-9	21.9	1.0	
	500.9	8.6								
Bottom of Test Boring at 8.6 ft.				4	SS		50/0.1			Auger refusal at 8.6 ft.

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **--** hours **--** ft.
Cave Depth **7.0** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT: **AES**
PROJECT NAME: **Proposed 3MWac Solar Project**
PROJECT LOCATION: **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING #: **B-21**
JOB #: **170GC01330**
LATITUDE: **38.5188** degrees
LONGITUDE: **-87.2498** degrees

DRILLING and SAMPLING INFORMATION

Date Started	**1/17/22**	Hammer Wt.	**140** lbs.
Date Completed	**1/18/22**	Hammer Drop	**30** in.
Drill Foreman	**C. Carroll**	Spoon Sampler OD	**2.0** in.
Inspector	**D. Homm**	Rock Core Dia.	**--** in.
Boring Method	**HSA**	Shelby Tube OD	**--** in.

TEST DATA

SURFACE ELEVATION 508.8

SOIL CLASSIFICATION	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Groundwater	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
4 in. Topsoil	508.5	0.3								Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, medium stiff to stiff, SILTY CLAY (CL) with trace sand				1	SS		2-3-4	26.3	1.0	
				2	SS		2-3-4	23.8	0.5	
			5							
				3	SS		5-7-7	16.9	1.75	
	500.8	8.0								
Brown, moist, very stiff, CLAY (CH) with trace sand				4	SS		5-8-11	19.5	3.75	
	498.3	10.5	10							
Brown, slightly moist, hard to very stiff, SILTY CLAY (CL) with little sand				5	SS		11-15-17		2.75	
				6	SS		5-7-12		4.5+	
			15							
						Cave depth (16.2 ft)				
				7	SS		14-17-20		2.0	
	488.8	20.0	20							
Bottom of Test Boring at 20.0 ft.										

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **24** hours **None** ft.
Cave Depth **16.2** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

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TEST BORING LOG

CLIENT **AES**
PROJECT NAME **Proposed 3MWac Solar Project**
PROJECT LOCATION **North Blackburn Road and North Fettinger Lane**
Petersburg, Indiana

BORING # **B-22**
JOB # **170GC01330**
LATITUDE **38.5182** degrees
LONGITUDE **-87.2513** degrees

DRILLING and SAMPLING INFORMATION

Date Started **1/17/22**
Date Completed **1/17/22**
Drill Foreman **C. Carroll**
Inspector **D. Homm**
Boring Method **HSA**

Hammer Wt. **140** lbs.
Hammer Drop **30** in.
Spoon Sampler OD **2.0** in.
Rock Core Dia. **--** in.
Shelby Tube OD **--** in.

TEST DATA

SOIL CLASSIFICATION
SURFACE ELEVATION 524.8

Soil Classification	Stratum Elevation	Stratum Depth, ft	Depth Scale, ft	Sample No.	Sample Type	Standard Penetration Test, Blows per 6 in. Increments	Moisture Content, %	Pocket Penetrometer PP-tsf	Remarks
3 in. Topsoil	524.5	0.3							Ground surface elevation and coordinates estimated from GPS equipment
Brown, moist, soft to medium stiff, SILTY CLAY (CL) with trace sand				1	SS	2-2-3	27.6	0.25	
				2	SS	2-3-4	24.4	0.75	
			5						
				3	SS	4-5-4	20.7	0.25	**Sample No. 3:** Unconfined compressive strength = 0.6 tsf Dry density = 106.2 pcf
	516.8	8.0							
Brown and gray, moist, medium stiff to very stiff, CLAY (CH) with little sand				4	SS	3-5-5	26.5	3.25	**Sample No. 4:** Unconfined compressive strength = 2.0 tsf Dry density = 98.3 pcf
			10						
				5	SS	7-8-10	21.1	2.5	
	511.8	13.0							
Brown and light brown, weathered, SANDY SILTSTONE				6	SS	9-15-21			
			15						
				7	SS	21-22-20			
	504.8	20.0	20						
Bottom of Test Boring at 20.0 ft.									

Sample Type
SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Depth to Groundwater
Noted on Drilling Tools **None** ft.
At Completion **None** ft.
After **--** hours **--** ft.
Cave Depth **17.0** ft.

Boring Method
HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
CA - Casing Advancer
MD - Mud Drilling
HA - Hand Auger

FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

NON-COHESIVE SOILS

(Silt, Sand, Gravel and Combinations)

Density		SPT*
Very Loose	-	5 blows/ft or less
Loose	-	6 to 10 blows/ft
Medium Dense	-	11 to 30 blows/ft
Dense	-	31 to 50 blows/ft
Very Dense	-	51 blows/ft or more

Relative Proportions

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

Particle Size Identification

Boulders	-	8 inch or greater	
Cobbles	-	3 to 8 inch	
Gravel	-	Coarse	- 1 to 3 inch
		Medium	- ½ to 1 inch
		Fine	- ¼ to ½ inch
Sand	-	Coarse	2.00mm to ¼ inch (dia. of pencil lead)
		Medium	0.42 to 2.00mm (dia. of broom straw)
		Fine	0.074 to 0.42mm (dia. of human hair)
Silt			0.074 to 0.002mm (cannot see particles)

COHESIVE SOILS

(Clay, Silt and Combinations)

Consistency		SPT*
Very Soft	-	3 blows/ft or less
Soft	-	4 to 5 blows/ft
Medium Stiff	-	6 to 10 blows/ft
Stiff	-	11 to 15 blows/ft
Very Stiff	-	16 to 30 blows/ft
Hard	-	31 blows/ft or more

Plasticity

Degree of Plasticity	Plasticity Index
None to slight	0 - 4
Slight	5 - 7
Medium	8 - 22
High to Very High	over 22

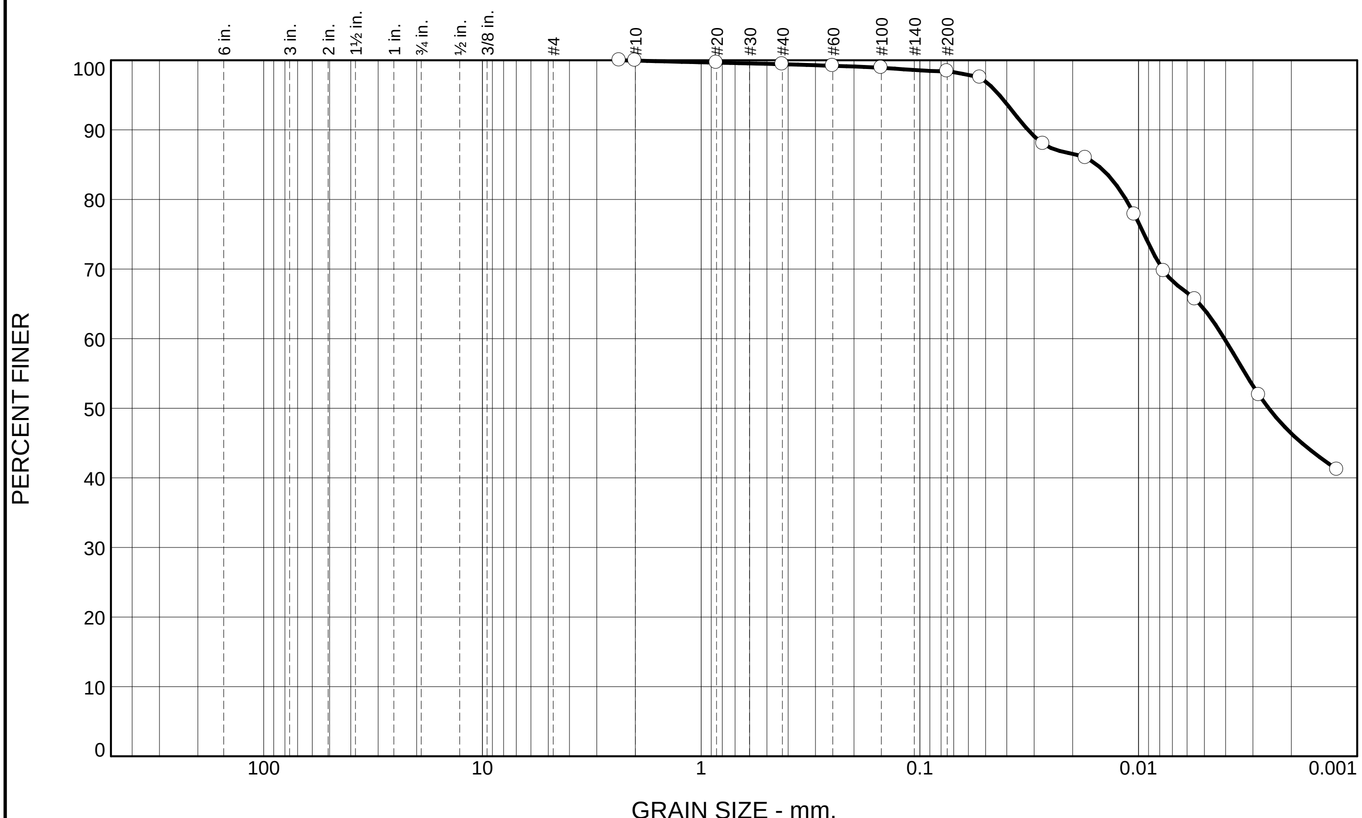
Classification on the logs are made by visual inspection of samples.
*Based upon results of Standard Penetration Test as described below.

Standard Penetration Test — Driving a 2.0" O.D. 1-3/8" I.D. sampler a distance of 12 inches into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. It is customary for ATC to drive the split-barrel sampler 6 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the split-barrel sampler and making the test are recorded for each 6 inches of penetration of the sampler (Example – 6-8-9). The standard penetration test result can be obtained by adding the last two figures (i.e., 8 + 9 = 17 blows/ft). The Standard Penetration Test is performed according to ASTM D-1586-18.

Strata Changes — In the column "Soil Classifications" on the Test Boring Logs the horizontal lines represent strata changes. A solid line (______) represents an actually observed change. A dashed line (_ _ _ _ _ _) represents an estimated change.

Ground Water observations were made at the times and conditions indicated on the Test Boring Logs. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.5	1.0	34.2	64.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#10	99.9		
#20	99.7		
#40	99.4		
#60	99.2		
#100	98.9		
#200	98.4		
#270	97.5		

* (no specification provided)

Material Description

Clay with trace Sand

Atterberg Limits

PL= 26 LL= 63 PI= 37

Coefficients

D_{90}= 0.0320 D_{85}= 0.0155 D_{60}= 0.0040
D_{50}= 0.0025 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

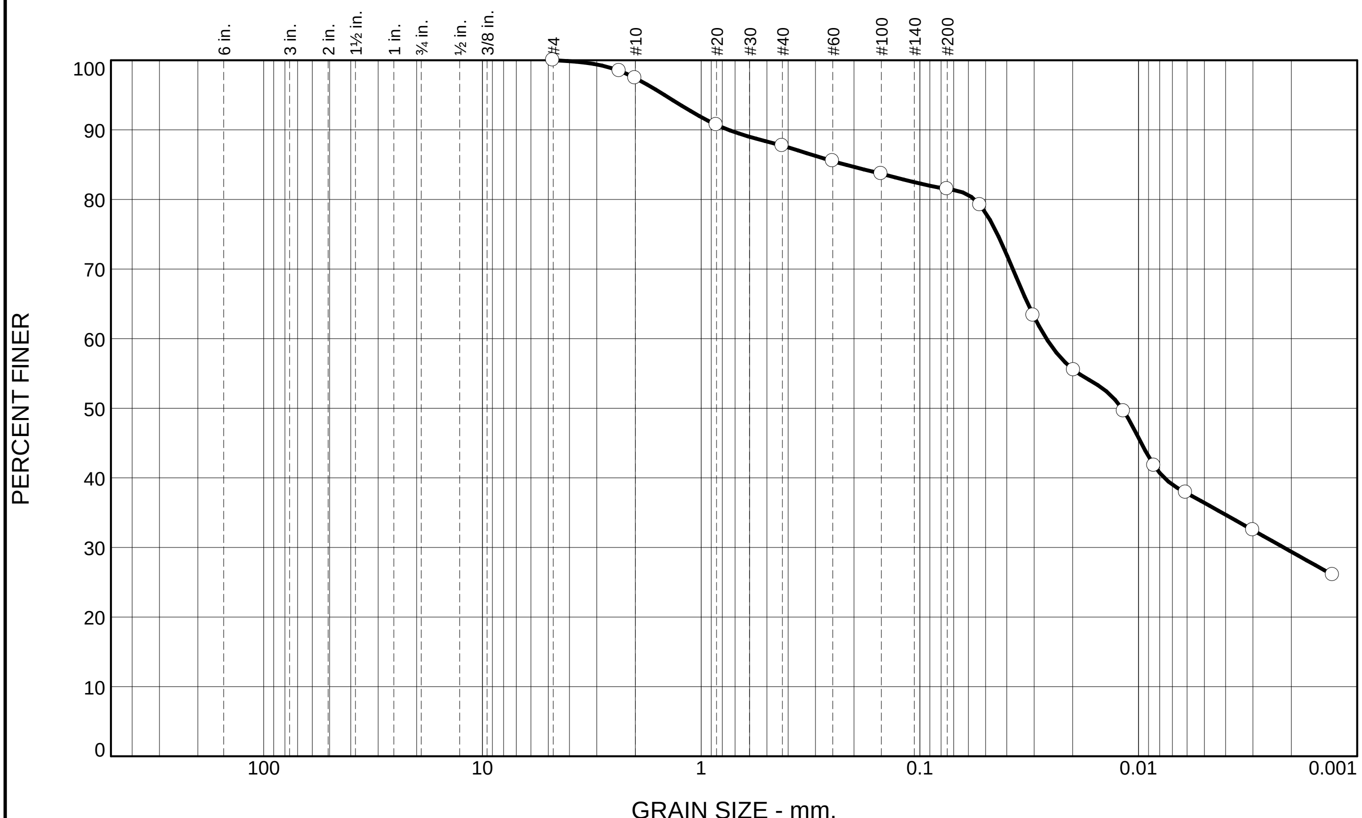
Source of Sample: 13737 **Depth:** 8.5'-10.0'
Sample Number: B-10; S-4 **Date:**

ATC Group Services LLC

Indianapolis, Indiana

Client: IPL
Project: Solar Farm
Project No: 170GC01330 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.6	9.7	6.2	45.1	36.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	98.5		
#10	97.4		
#20	90.7		
#40	87.7		
#60	85.5		
#100	83.7		
#200	81.5		
#270	79.2		

* (no specification provided)

Material Description

Clay with little Sand

Atterberg Limits

PL= 20 LL= 51 PI= 31

Coefficients

D_{90}= 0.7496 D_{85}= 0.2189 D_{60}= 0.0264
D_{50}= 0.0119 D_{30}= 0.0022 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO=

Remarks

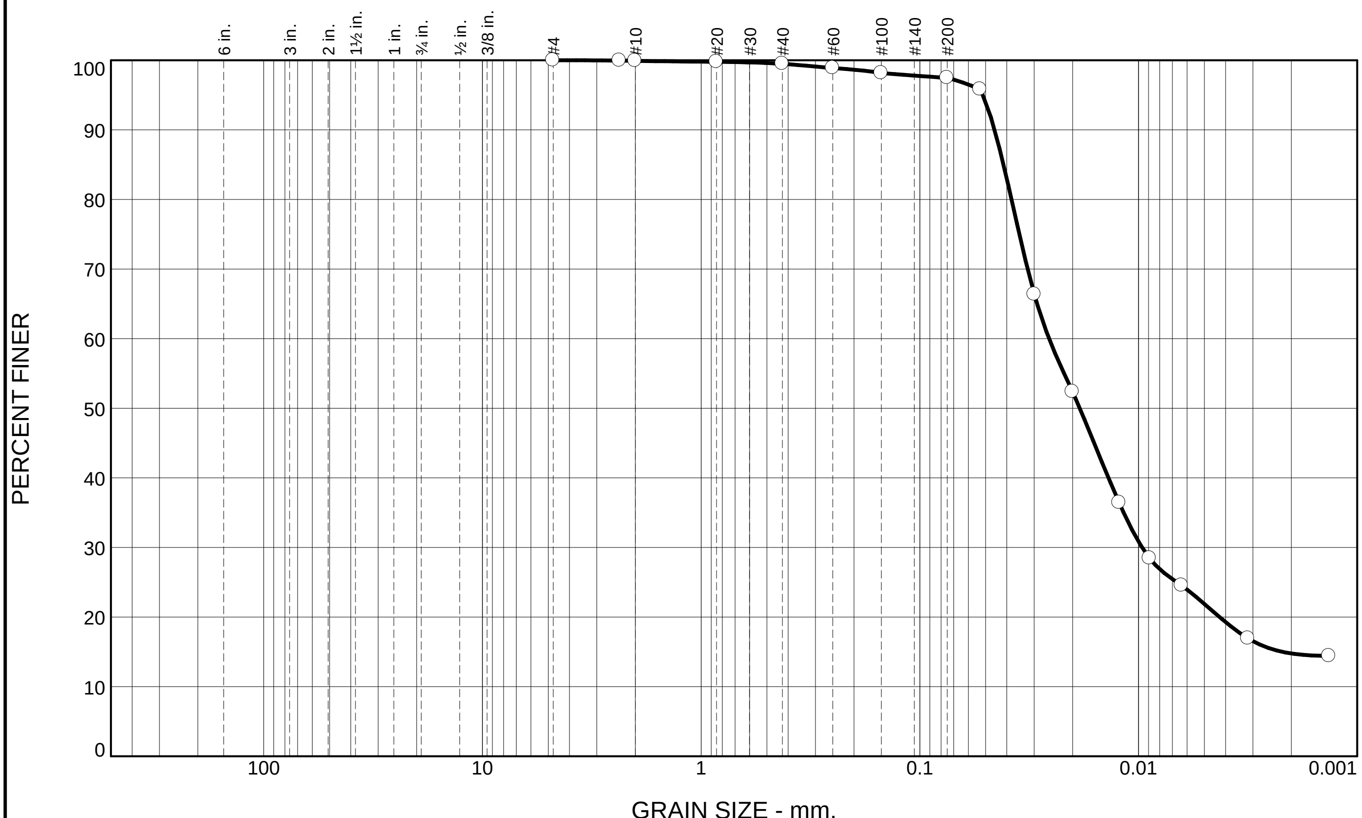
Source of Sample: 13737 **Depth:** 3.5'-5.0'
Sample Number: B-13; S-2 **Date:**

ATC Group Services LLC

Indianapolis, Indiana

Client: IPL
Project: Solar Farm
Project No: 170GC01330 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	0.4	2.0	75.6	21.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#8	100.0		
#10	99.9		
#20	99.8		
#40	99.5		
#60	98.9		
#100	98.2		
#200	97.5		
#270	95.8		

* (no specification provided)

Material Description

Silty Clay with trace Sand

Atterberg Limits

PL= 21 LL= 38 PI= 17

Coefficients

D_{90}= 0.0455 D_{85}= 0.0414 D_{60}= 0.0256
D_{50}= 0.0186 D_{30}= 0.0096 D_{15}= 0.0022
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

Source of Sample: 13739 **Depth:** 0.0'-5.0'
Sample Number: B-7; Bulk **Date:**

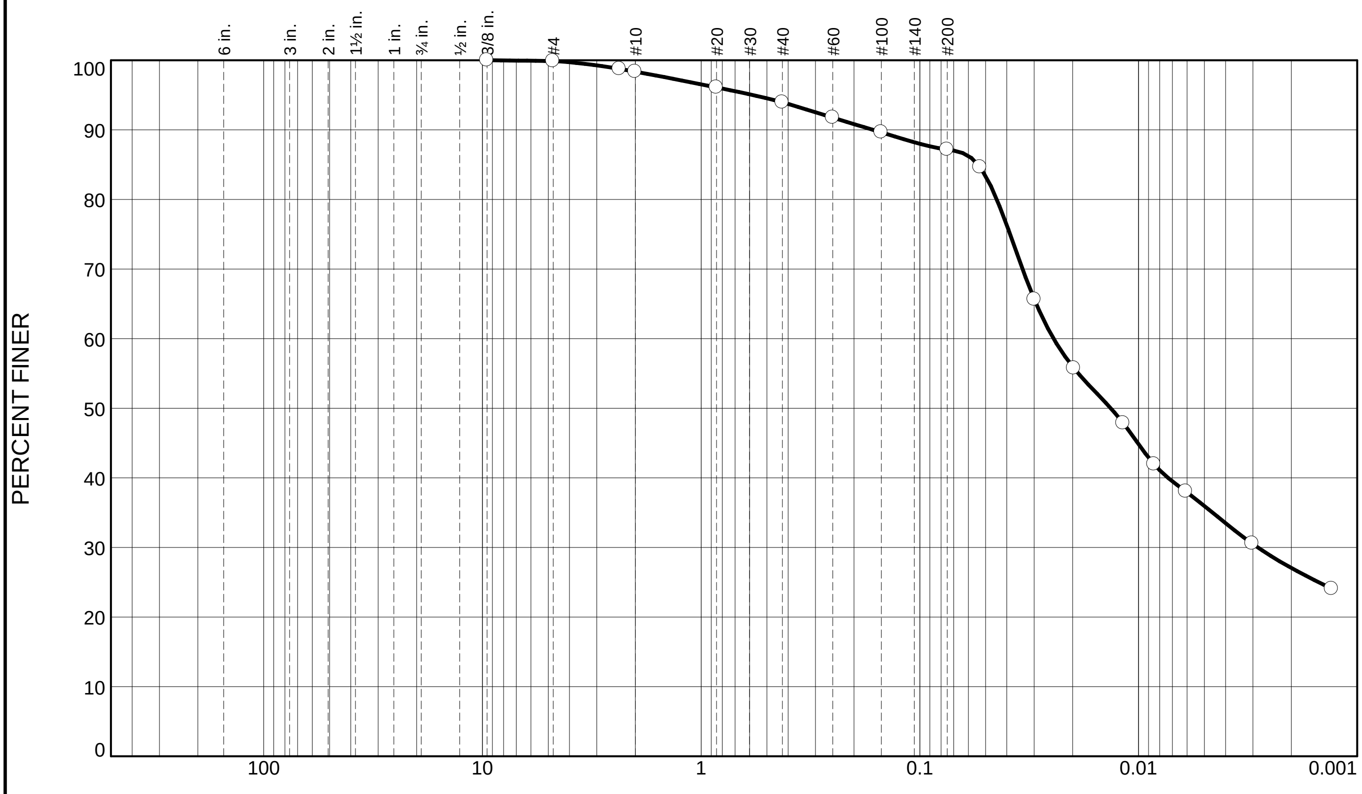
ATC Group Services LLC

Indianapolis, Indiana

Client: IPL
Project: Solar Farm

Project No: 170GC01330 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	1.5	4.4	6.8	51.2	36.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8	100.0		
#4	99.9		
#8	98.8		
#10	98.4		
#20	96.1		
#40	94.0		
#60	91.7		
#100	89.6		
#200	87.2		
#270	84.6		

* (no specification provided)

Material Description

Silty Clay with little Sand

Atterberg Limits

PL= 19 LL= 46 PI= 27

Coefficients

D_{90}= 0.1634 D_{85}= 0.0541 D_{60}= 0.0244
D_{50}= 0.0134 D_{30}= 0.0028 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO=

Remarks

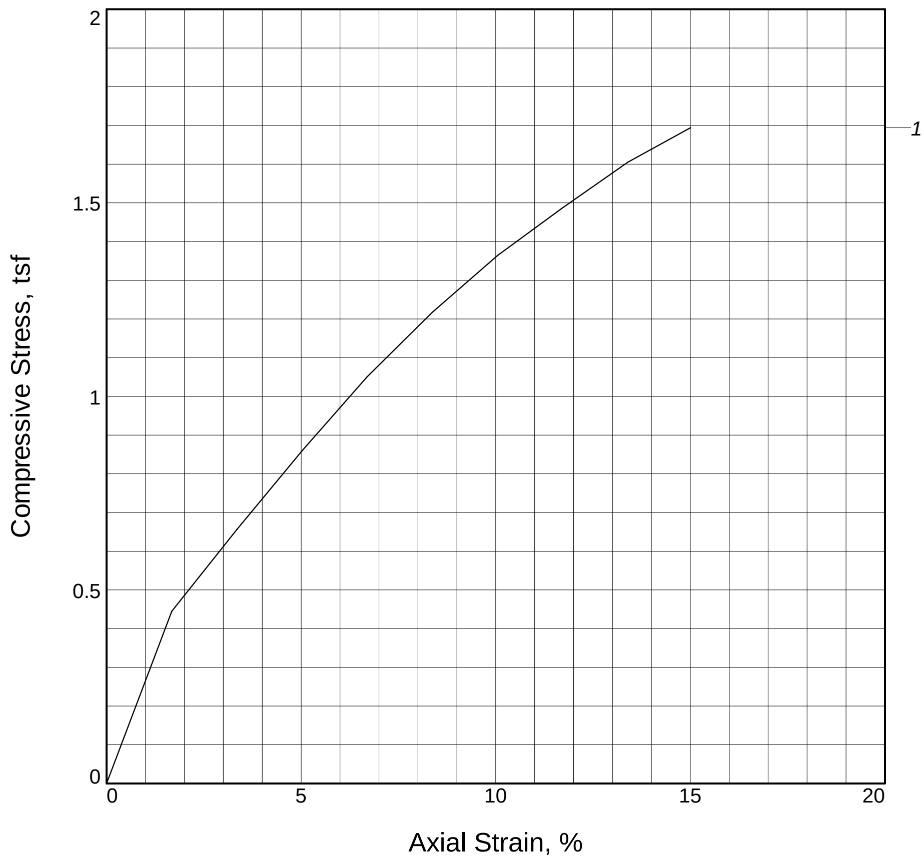
Source of Sample: 13739 **Depth:** 0.0'-5.0'
Sample Number: B-18; Bulk **Date:**

ATC Group Services LLC

Indianapolis, Indiana

Client: IPL
Project: Solar Farm
Project No: 170GC01330 **Figure**

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	1.694			
Undrained shear strength, tsf	0.847			
Failure strain, %	15.0			
Strain rate, %/min.	2.00			
Water content, %	20.1			
Wet density, pcf	131.1			
Dry density, pcf	109.2			
Saturation, %	99.9			
Void ratio	0.5442			
Specimen diameter, in.	1.38			
Specimen height, in.	2.99			
Height/diameter ratio	2.16			

Description: 13737-2

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** Split spoon

Project No.: 170GC01330
Date Sampled:
Remarks:

Client: IPL

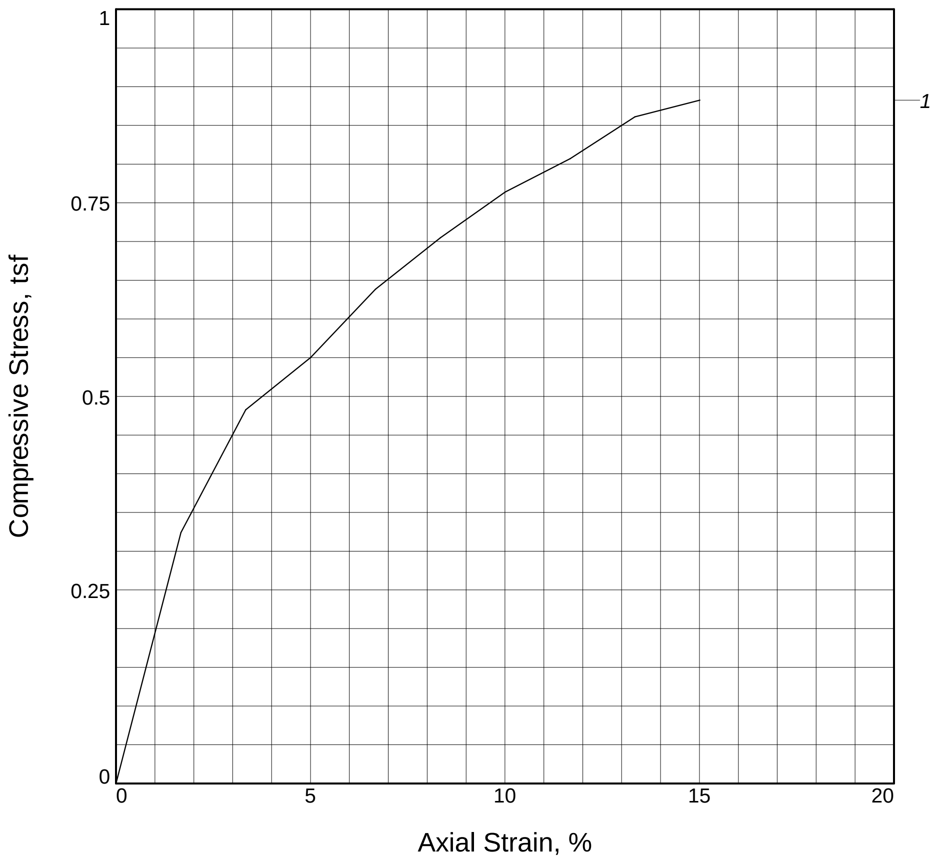
Project: Solar Farm

Source of Sample: 13737 **Depth:** 6-7.5'
Sample Number: B-10; S-3

UNCONFINED COMPRESSION TEST
ATC Group Services LLC
Indianapolis, Indiana

Figure QU13737B

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	0.883			
Undrained shear strength, tsf	0.441			
Failure strain, %	15.0			
Strain rate, %/min.	2.00			
Water content, %	21.7			
Wet density, pcf	128.2			
Dry density, pcf	105.4			
Saturation, %	97.7			
Void ratio	0.5997			
Specimen diameter, in.	1.35			
Specimen height, in.	3.00			
Height/diameter ratio	2.21			

Description: 13738-18

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** Split spoon

Project No.: 170GC01330
Date Sampled:
Remarks:

Figure QU13738R

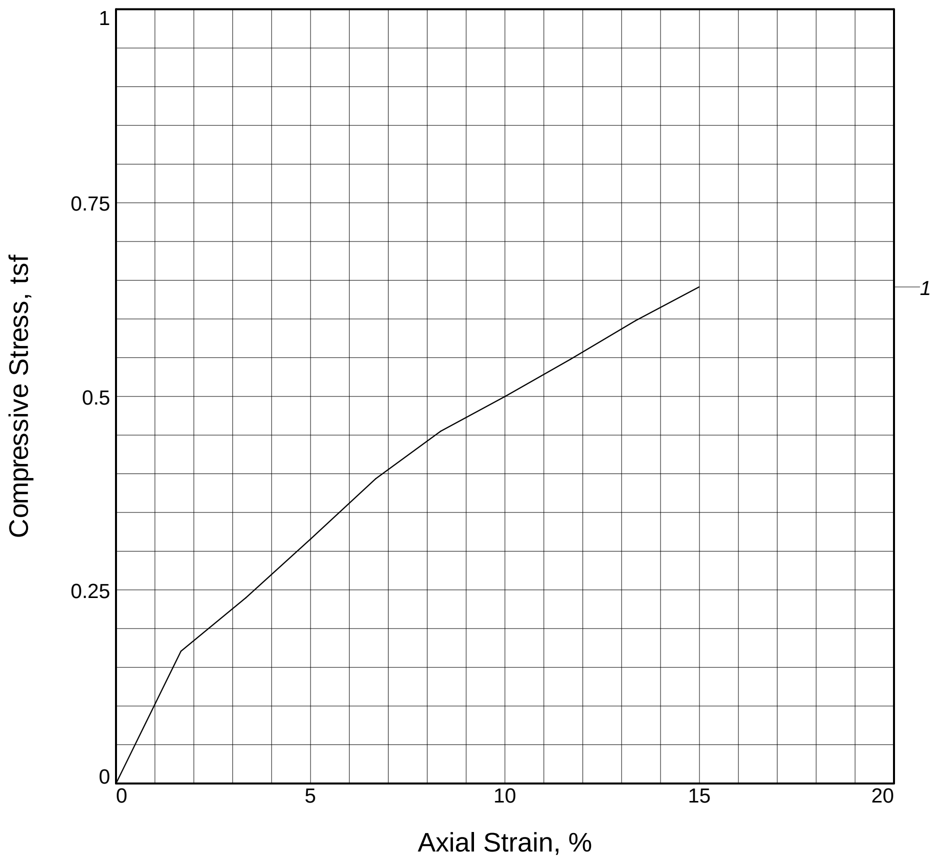
Client: IPL

Project: Solar Farm

Source of Sample: 13738 **Depth:** 8.5-10'
Sample Number: B-17; S-4

UNCONFINED COMPRESSION TEST
ATC Group Services LLC
Indianapolis, Indiana

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	0.641			
Undrained shear strength, tsf	0.321			
Failure strain, %	15.0			
Strain rate, %/min.	2.00			
Water content, %	20.7			
Wet density, pcf	128.2			
Dry density, pcf	106.2			
Saturation, %	95.3			
Void ratio	0.5870			
Specimen diameter, in.	1.36			
Specimen height, in.	3.00			
Height/diameter ratio	2.20			

Description: 13739-14

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** Split spoon

Project No.: 170GC01330
Date Sampled:
Remarks:

Figure QU13739N

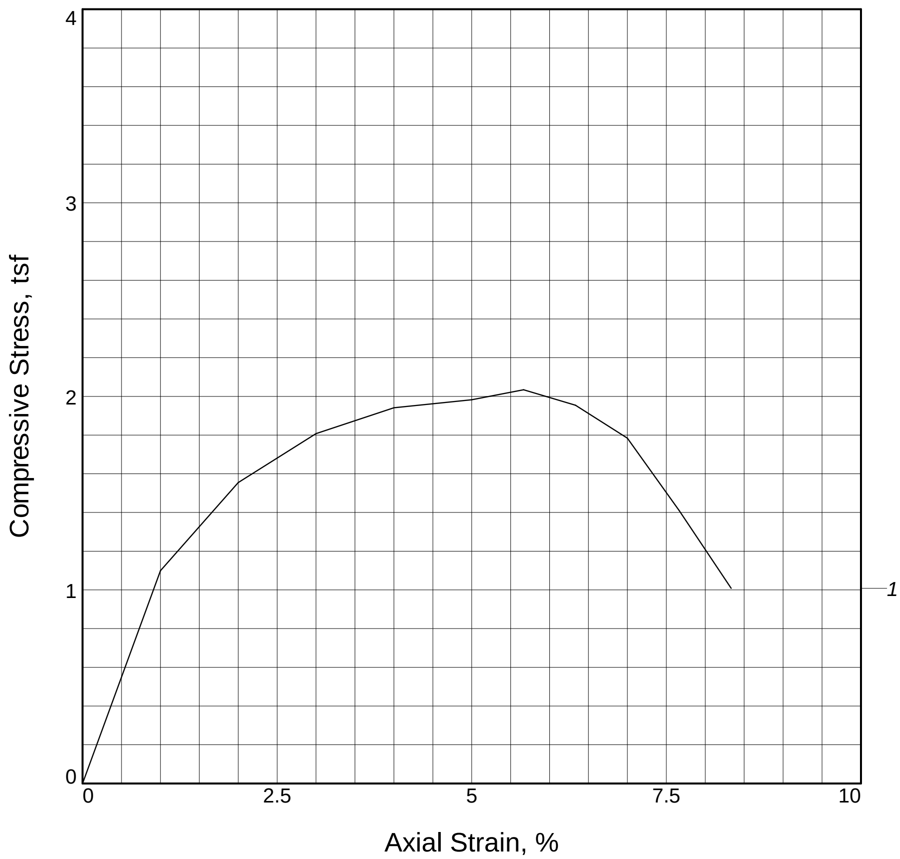
Client: IPL

Project: Solar Farm

Source of Sample: 13739 **Depth:** 6-7.5'
Sample Number: B-22; S-3

UNCONFINED COMPRESSION TEST
ATC Group Services LLC
Indianapolis, Indiana

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, tsf	2.034			
Undrained shear strength, tsf	1.017			
Failure strain, %	5.7			
Strain rate, %/min.	2.00			
Water content, %	26.5			
Wet density, pcf	124.3			
Dry density, pcf	98.3			
Saturation, %	99.9			
Void ratio	0.7151			
Specimen diameter, in.	1.36			
Specimen height, in.	3.00			
Height/diameter ratio	2.21			

Description: 13739-15

LL =	PL =	PI =	Assumed GS= 2.7	Type: Split spoon

Project No.: 170GC01330
Date Sampled:
Remarks:

Figure QU13739O

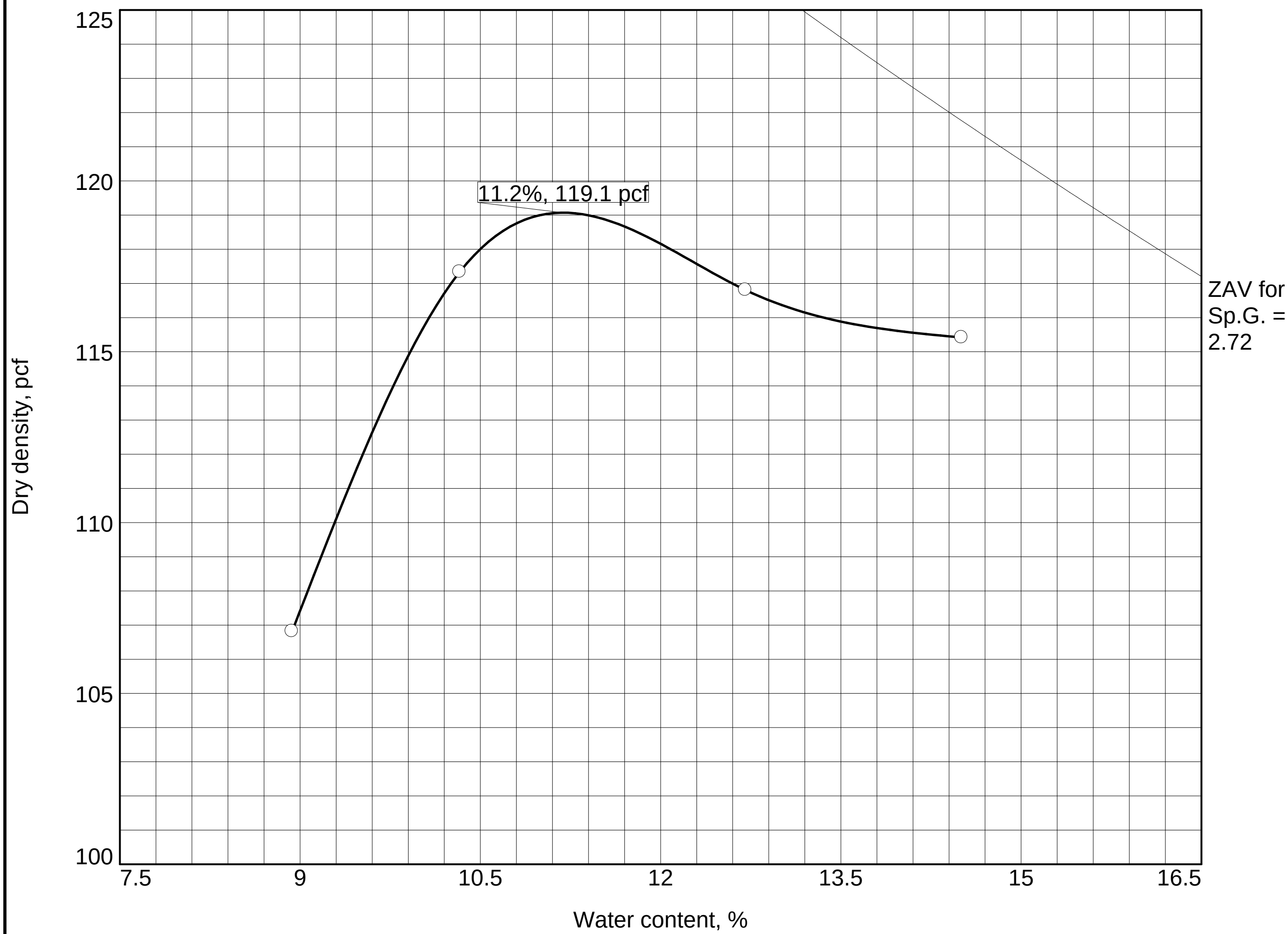
Client: IPL

Project: Solar Farm

Source of Sample: 13739 **Depth:** 8.5-10'
Sample Number: B-22; S-4

UNCONFINED COMPRESSION TEST
ATC Group Services LLC
Indianapolis, Indiana

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0.0'-5.0'	CL		26.3		38	17	0.0	97.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 119.1 pcf Optimum moisture = 11.2 %	Silty Clay with trace Sand

Project No. 170GC01330 **Client:** IPL
Project: Solar Farm

○**Source of Sample:** 13739 **Sample Number:** B-7; Bulk

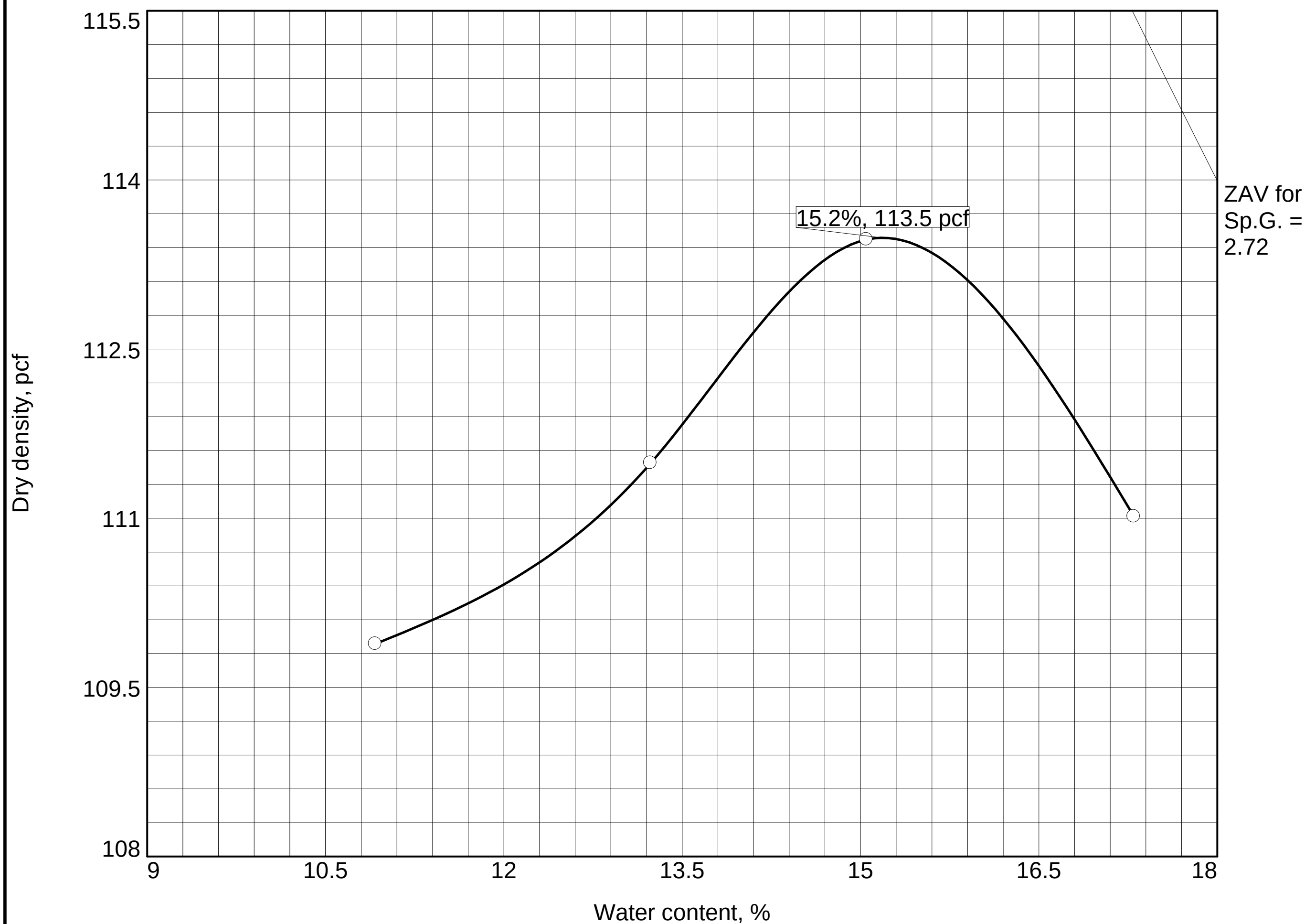
Remarks:

ATC Group Services LLC

Indianapolis, Indiana

Figure

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
0.0'-5.0'	CL		25.6		46	27	0.1	87.2

TEST RESULTS

Maximum dry density = 113.5 pcf

Optimum moisture = 15.2 %

MATERIAL DESCRIPTION

Silty Clay with little Sand

Project No. 170GC01330 **Client:** IPL

Project: Solar Farm

○**Source of Sample:** 13739 **Sample Number:** B-18; Bulk

ATC Group Services LLC

Indianapolis, Indiana

Remarks:

Figure

GeoTesting EXPRESS

Client:	Atlas Technical Consultants, LLC
Project Name:	IPL Solar Farm
Project Location:	Petersburg, IN
GTX #:	315056
Start Date:	02/19/22
End Date:	02/22/22
Tested By:	sjt
Checked By:	bfs
Preparation:	Target Compaction: 80% of the maximum dry density (119.1 pcf) at 9.2% moisture content. Values specified by client. Material > 3/8-inch screened out of sample prior to testing (0%).

Thermal Conductivity of Soil by ASTM D5334

Boring	Sample	Depth, ft	Sample Description	Moisture Content, %	Wet Density, pcf	Dry Density, pcf	Thermal Conductivity, $^{W}/_{m°K}$	Thermal Resistivity, $^{°K\,cm}/_{W}$
B-7	Bulk	0-5	Moist, yellowish brown clay	9.4	103.6	94.7	1.12	90

Notes: $^{W}/_{m°K}$ = Watts per Meter °Kelvin
$^{°K\,cm}/_{W}$ = °Kelvin Centimeter per Watt

GeoTesting EXPRESS

Client:	Atlas Technical Consultants, LLC
Project Name:	IPL Solar Farm
Project Location:	Petersburg, IN
GTX #:	315056
Start Date:	02/19/22
End Date:	02/22/22
Tested By:	sjt
Checked By:	bfs
Preparation:	Target Compaction: 85% of the maximum dry density (119.1 pcf) at 13.2% moisture content. Values specified by client. Material > 3/8-inch screened out of sample prior to testing (0%).

Thermal Conductivity of Soil by ASTM D5334

Boring	Sample	Depth, ft	Sample Description	Moisture Content, %	Wet Density, pcf	Dry Density, pcf	Thermal Conductivity, W/m°K	Thermal Resistivity, °K cm/W
B-7	Bulk	0-5	Moist, yellowish brown clay	13.4	114.8	101.2	1.52	66

Notes:
W/m°K = Watts per Meter °Kelvin
°K cm/W = °Kelvin Centimeter per Watt

GeoTesting EXPRESS

Client:	Atlas Technical Consultants, LLC
Project Name:	IPL Solar Farm
Project Location:	Petersburg, IN
GTX #:	315056
Start Date:	02/19/22
End Date:	02/22/22
Tested By:	sjt
Checked By:	bfs
Preparation:	Target Compaction: 90% of the maximum dry density (119.1 pcf) at 11.2% moisture content. Values specified by client. Material > 3/8-inch screened out of sample prior to testing (0%).

Thermal Conductivity of Soil by ASTM D5334

Boring	Sample	Depth, ft	Sample Description	Moisture Content, %	Wet Density, pcf	Dry Density, pcf	Thermal Conductivity, W/m°K	Thermal Resistivity, °K cm/W
B-7	Bulk	0-5	Moist, yellowish brown clay	10.7	118.7	107.2	1.45	69

Notes: W/m°K = Watts per Meter °Kelvin
°K cm/W = °Kelvin Centimeter per Watt

Client:	Atlas Technical Consultants, LLC
Project Name:	IPS Solar Firm
Project Location:	Petersburg, IN
GTX #:	315056
Start Date:	02/18/22
End Date:	02/21/22
Tested By:	sjt/jlw
Checked By:	bfs
Preparation:	Target Compaction: 80% of the maximum dry density (113.5 pcf) at 13.2% moisture content. Values specified by client. Material > 3/8-inch screened out of sample prior to testing (0%).

Thermal Conductivity of Soil by ASTM D5334

Boring	Sample	Depth, ft	Sample Description	Moisture Content, %	Wet Density, pcf	Dry Density, pcf	Thermal Conductivity, $^{W}/_{m°K}$	Thermal Resistivity, $^{°K\ cm}/_{W}$
B-18	Bulk	0-5	Moist, yellowish brown clay	13.1	103.0	91.0	0.88	114

Notes: $^{W}/_{m°K}$ = Watts per Meter °Kelvin
$^{°K\ cm}/_{W}$ = °Kelvin Centimeter per Watt

GeoTesting EXPRESS

Client:	Atlas Technical Consultants, LLC
Project Name:	IPS Solar Firm
Project Location:	Petersburg, IN
GTX #:	315056
Start Date:	02/18/22
End Date:	02/21/22
Tested By:	sjt/jlw
Checked By:	bfs
Preparation:	Target Compaction: 85% of the maximum dry density (113.5 pcf) at 17.2% moisture content. Values specified by client. Material > 3/8-inch screened out of sample prior to testing (0%).

Thermal Conductivity of Soil by ASTM D5334

Boring	Sample	Depth, ft	Sample Description	Moisture Content, %	Wet Density, pcf	Dry Density, pcf	Thermal Conductivity, W/m°K	Thermal Resistivity, °K cm/W
B-18	Bulk	0-5	Moist, yellowish brown clay	17.6	113.5	96.4	1.59	63

Notes: W/m°K = Watts per Meter °Kelvin
°K cm/W = °Kelvin Centimeter per Watt

GeoTesting EXPRESS

Client:	Atlas Technical Consultants, LLC
Project Name:	IPS Solar Firm
Project Location:	Petersburg, IN
GTX #:	315056
Start Date:	02/18/22
End Date:	02/21/22
Tested By:	sjt/jlw
Checked By:	bfs
Preparation:	Target Compaction: 90% of the maximum dry density (113.5 pcf) at 15.2% moisture content. Values specified by client. Material > 3/8-inch screened out of sample prior to testing (0%).

Thermal Conductivity of Soil by ASTM D5334

Boring	Sample	Depth, ft	Sample Description	Moisture Content, %	Wet Density, pcf	Dry Density, pcf	Thermal Conductivity, W/m°K	Thermal Resistivity, °K cm/W
B-18	Bulk	0-5	Moist, yellowish brown clay	15.6	118.1	102.1	1.54	65

Notes: W/m°K = Watts per Meter °Kelvin
°K cm/W = °Kelvin Centimeter per Watt

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL *of the Geoprofessional Business Association*

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