STAFF DR 1-1:

Submit a copy of the leases or purchase agreements, including options, separate agreements, or deeds which Dogwood Corners has entered into in connection with the proposed solar facility, including the agreements for each of the parcels of the project.

Response: Please refer to the attached copies of the leases or purchase agreements, including options, separate agreements, or deeds which Dogwood Corners has entered into in connection with the proposed solar facility as well as the Petition for Confidential Treatment. The redacted copies are being filed as a separate attachment.

Witness: Megan Stahl

STAFF DR 1-2:

Detail any contracts by which Dogwood Corners has paid, has negotiated to pay, or any compensation paid to non-participating landowners, whether cash or otherwise, near the project. Include the terms of the agreements and which properties are involved in terms of distance to the project boundaries.

Response: Please refer to the attached copy of the Dogwood Corners Solar Project Participation Agreement template, which is being filed contemporaneously with a Petition for Confidential Treatment.

Witness: Megan Stahl

STAFF DR 1-3:

Provide a schedule for the project, starting from the receipt of the proposed certificate for construction to the completion of the project, including the length of each construction phase. Include in the response when Dogwood Corners believes peak construction will occur within the timeline.

Response: Dogwood Corners prepared the following preliminary construction schedule. These timeframes are estimated based on best available information but may need to be adjusted based on variability affecting some milestones timeframes. For example, timeframes may be adjusted based on delays in TVA interconnection procedures, equipment procurement, and timing of permit reviews and certificate approvals. Dogwood Corners is targeting a 2027 COD, but TVA indicated interconnection equipment procurement may push the overall schedule to a 2028 COD so the schedule reflects that estimate. If milestones are able to be achieved sooner Dogwood Corners will proceed in an attempt at a 2027 COD.

Milestone	Expected Completion Date
Construction Certificate Approval	March 2024
Interconnection Agreement Execution	June 2024
Site Diligence Completion	February 2025
Environmental Permits including National Environmental Policy Act Review and Approval	April 2026
Design and Engineering	November 2026
Notice to Proceed	January 2027
Site Mobilization	February 2027

Civil Completion	April 2027
All Materials Delivered on Site	June 2027
Mechanical/Electrical Completion	February 2028
Commissioning	May 2028
Commercial Operation Date	July 2028

Witness: Megan Stahl

STAFF DR 1-4:

Provide a list of permits that will be required from any other local, state, or federal agencies for the project. Include in the response the status of those permits.

Response: Dogwood Corners is evaluating necessary permits and approvals from federal, state and local regulatory agencies. The following is the current list of anticipated permits and agency consultations, but this list may be modified as Project design is finalized.

Agency Level	Anticipated Permit or Consultation	Agency	Status
Federal	National Environmental Policy Act Review	TVA	Not started
Federal	Clean Water Act Section 404	United States Army Corps of Engineers	In progress
Federal	National Historic Preservation Act Section 106 Cultural Compliance	Kentucky Heritage Council, State Historic Preservation Office	In progress
Federal	Federal Endangered Species Act - Section 7	United States Fish and Wildlife Service (USFWS), Kentucky Field Office	In progress
Federal	Floodplain Development Permit	Kentucky Energy and Environment Cabinet	Not started
Federal	75 FR 42296 Safe, Efficient Use and Preservation of the Navigable Airspace	FAA	Not started
Federal	Spill Prevention, Control, and Countermeasure Act	USEPA	Not started
Federal	Bald and Golden Eagle Protection Act of 1940, as amended	USFWS	Not started
Federal	Migratory Bird Treaty Act of 1918, as amended	USFWS	Not started
State	Clean Water Act Section 401 - Water Quality Certification	Kentucky Department for Environmental Protection (KDEP), Division of Water (DOW)	In progress

State	Kentucky Pollutant Discharge Elimination System / Kentucky KYR100000 Construction General Permit for Discharges from Construction Activities	KDEP, DOW, EEC	Not started
State	KRS Chapter 278 and 807 KAR 5:110	Kentucky Electrical Generation and Transmission Siting Board	In progress
State	Commercial Driveway Permit	Kentucky Transportation Cabinet	Not started
State	Kentucky Endangered Species Protection	Kentucky Department of Fish and Wildlife Resources (KDFWR)	Not started
Local	Christian County Road Department	County	Not started
Local	Electrical Permit	County	Not started
Local	Building Permit	County	Not started
Local	County Floodplain Permit	County	Not started

Witness: Megan Stahl

STAFF DR 1-5:

Refer to the Application, Record of Environmental Violations at 17. Provide the entities with a direct ownership interest in Dogwood Corners. Also provide the corporate structure of those entities

Response: Steel City Energy LLC has direct ownership interest in Dogwood Corners LLC. Steel City Energy LLC is a limited liability company.

Witness: Megan Stahl

STAFF DR 1-6:

Provide the company that will employ the individuals that are or will be responsible for ensuring compliance with the statements in the application any conditions imposed by the Siting Board during construction and operations of the project.

Response: Dogwood Corners LLC is the responsible company at the time of this response.

Witness: Megan Stahl

STAFF DR 1-7:

Verify if a power purchase agreement has been made. If so, provide.

Response: A power purchase agreement has not been made at the time of this response.

Witness: Megan Stahl

STAFF DR 1-8:

Refer to the Application, Public Notice Report at 10. Provide a summary of the concerns expressed by local residents regarding the project. Include in the response the steps, or changes to the project, Dogwood Corners has taken to address the concerns.

Response: The primary concerns expressed by local residents regarding the project include potential visual impacts, decommissioning at the end of the project, noise, preservation of wildlife habitat and potential impacts to property value. To address potential visual impact and noise concerns Dogwood Corners increased setbacks from 200 feet to at least 500 feet (but in many areas greater distances) from the Project to non-participating residences. Dogwood Corners is evaluating a new substation location that would move the facility away from Dogwood Kelly Road to a less visible location. Dogwood Corners also increased the areas where the Project will include vegetative screening and provided specific screening criteria to Christian County for review (11/1/22 Information for Solar Ordinance), as well as in the Project application to the Siting Board. To address concerns about decommissioning Dogwood Corners prepared a project specific decommissioning plan that was submitted to Christian County for review (by email 5/10/23). The decommissioning plan was updated and provided as part of the Project application to the Siting Board. To address noise concerns Dogwood Corners provided general references related to noise from example solar projects (provided by email 10/23/22) and prepared a project specific Noise Analysis that was provided as part of the Project application to the Siting Board. Dogwood Corners planned the Project to avoid and minimize impacts to natural resources, such as through placement of Project facilities outside of streams and wetlands and to minimize tree clearing. To further address the community's concerns related to wildlife habitats, Dogwood Corners adjusted the Project fencing to keep wildlife corridors open, committed to install wildlife permeable fencing that will allow movement of small mammals through the Project area, and is committed to planting pollinator species and creating foraging habitat during construction restoration of the Project. To address concerns about potential impacts to property values Dogwood Corners commissioned an independent expert to prepare a project specific Property Value Impact Analysis that was submitted to Christian County for review (by mail March 2023) and was updated and provided as part of the Project application to the Siting Board. The analysis concluded that the solar development proposed at the subject property will have no impact on the value of adjoining or abutting properties and that the proposed use is in harmony with the area in which it is located.

Witness: Megan Stahl

STAFF DR 1-9:

Refer to the Application, Public Notice Report at 11. Provide a summary of the meetings with Christian County Judge Executive Steve Tribble, Treasurer Walter Cummings, former County Attorney Mike Foster, and several magistrates. Include in the response the steps, or changes to the project, Dogwood Corners has taken to address issues raised.

Response: On June 8, 2022, Dogwood Corners send a letter to the Christian County Fiscal Court to provide information in support the request for approval of an Inducement Resolution ("Resolution") for the Dogwood Corners project ("Project"). With the letter Dogwood Corners provided a Project map as well as Project details including proposed energy generation capacity, site control, interconnection, community impact, economic benefits and taxes. On June 13, 2022, Dogwood Corners met with Christian County Judge Executive Steve Tribble, Treasurer Walter Cummings, former County Attorney Mike Foster, and several magistrates to discuss the information provided and additional details about the process to obtain an Industrial Revenue Bond, coordination with Kentucky Economic Development Finance Authority, and the benefits it would provide for both the Project and the County. On June 14, 2022, Dogwood Corners attended the Christian County Fiscal Court meeting where the Fiscal Court unanimously approved the requested Resolution.

Witness: Megan Stahl

STAFF DR 1-10:

Refer to the electronic case files and public comment folder. Explain if any of the citizens that have provided public comments have attended the public meetings or if there has been any outreach to these parties regarding the project.

<u>Response</u>:

The information in the table below is based on the Dogwood Corners, LLC-provided sign-in sheets at both of the public meetings, dated 9/22/22 and 8/17/23, and to the best of our knowledge accurately reflects the attendance of the meetings.

Public Commenter	Have they attended a public meeting	Which meeting(s)	Outreach Made
Douglas Kirkman	Yes	9/22/22 and 8/17/23	Phone calls (7/19/23, 9/6/23) and email (9/11/23)
Krystal Kirkman	Yes	9/22/22 and 8/17/23	
Logan Kirkman	No	N/A	
Jerry "Mickey" Noel	Yes	9/22/22 and 8/17/23	In-person meeting on 6/14/22 and attempt by phone on 7/19/23
Sherry Noel	Yes	9/22/22 and 8/17/23	
Heather Cook	Yes	9/22/22 and 8/17/23	Phone calls (12/1/22, 7/19/23) and email (12/1/22)
Danny Cook	Yes	9/22/22 and 8/17/23	
Brylee Barnes	No	N/A	
Brian Burkhead	Yes	9/22/22 and 8/17/23	Phone call on 10/30/23
Lisa Burkhead	Yes	9/22/22	
Shirley Farmer	No	N/A	
Darrel Tipton	Yes	9/22/22 and 8/17/23	Attempts to call but numbers provided were disconnected or did not have a voicemail
Valery Tipton	No	N/A	
Samuel P Morris	No	N/A	Additional outreach by phone, email (8/29/23) and in-person meeting
Brandon T Garnett	Yes	8/17/23	Phone call on 10/25/23
Philip Garnett	Yes	8/17/23	Phone call on 10/25/23
Eugenia H Westerfield	Yes	9/22/22 and 8/17/23	Attempted phone call on 7/19/23

Whitney Westerfield	No	N/A	Phone, email (10/27/22, 11/2/22, 7/19/23), and virtual meeting
Wayne Hunt	Yes	8/17/23	Phone call on 10/26/23

Witness: Megan Stahl

STAFF DR 1-11:

Refer to the Application, Compliance with Local Ordinances and Regulations at 7. Provide any orders from the Christian County Circuit Court related to the declaratory judgment action.

Response: The Christian County Circuit Court has not yet issued an order related to the declaratory judgement action. However, the parties have briefed relevant issues, participated in two oral arguments, and are awaiting a decision from the Court.

Witness: Megan Stahl and Counsel for Dogwood Corners

STAFF DR 1-12:

Refer to the Application, Compliance with Local Ordinances and Regulations at 7. Provide the date the Christian County Fiscal Court enacted Ordinance 22-004.

Response: The Christian County Fiscal Court voted on the purported ordinance on November 29, 2022.

Witness: Megan Stahl and Counsel for Dogwood Corners

STAFF DR 1-13:

Refer to the Application, Compliance with Local Ordinances and Regulations at 7. Explain any communication with the Christian County Fiscal Court before the enactment of Ordinance 22-004.

<u>Response</u>:

Dogwood Corners made numerous attempts to work with and provide input to the Christian County Fiscal Court prior to enactment of Ordinance 22-004. On October 26, 2022, Dogwood Corners received an email from County Attorney John Soyars accepting a request for a meeting, which was scheduled for October 31, 2022. During the October 31, 2022 phone meeting with Mr. Soyars and Whitney Westerfield Dogwood Corners presented project updates and solar ordinance consideration based on the Project team's understanding of the community's concerns. Following that meeting, on November 1, 2022, Dogwood Corners sent an email to all Fiscal Court members to provide a summary of the meeting with Mr. Soyars and Mr. Westerfield and to urge consideration of Dogwood Corners' proposed ordinance suggestions. The information provided to the Fiscal Court is attached (Attachment DR1-13a). On November 3, 2022, Mr. Soyars provided the Fiscal Court's draft ordinance. Dogowood Corners reviewed the ordinance and provided feedback. Mr. Soyars provided a follow up email on November 7, 2022 that included an updated ordinance with deviation language. On November 10, 2022, representatives of Dogwood Corners attended and spoke at the Fiscal Court meeting. At that meeting Dogwood Corners provided background information related to public outreach for the Project, the Project development process, justification for the siting of the Project, benefits the Project could bring to the community, consistency of the Project with existing County planning documents, Dogwood Corner's support for a solar ordinance and confirmation that the Project would like to work with the Fiscal Court on development of the ordinance (Attachment DR1-13b). Dogwood Corners followed up with a letter to the Christian County Attorney regarding legal concerns with the County's draft ordinance (Attachment DR1-13c). Representatives of Dogwood Corners attended and spoke at the November 22, 2022 Fiscal Court meeting to express concerns with implications of a 2,000-foot setback including the very minimal areas within the county that would be available for solar development, lack of evidence to support the need for such an excessive setback, and to urge the Fiscal Court to consider the community members that are supportive of the renewable energy development (Attachment DR1-13d). Following the meeting, on November 23, 2022, Dogwood Corners followed up with requested information related to noise concerns by providing an email with noise references describing typical sound levels for common sounds and general research from example solar projects about projected or actual noise levels (Attachment DR1-13e). Finally, immediately prior to approval of Ordinance 22-004 representatives from Dogwood Corners attended and spoke at the November 29, 2022 Fiscal Court meeting to reiterate concerns with the draft ordinance from a procedural and substantive perspective, uncertainty surrounding the "deviation" process and request to work with the County to set reasonable regulations (Attachment DR1-13f).

Witness: Megan Stahl

1. Project Timeline

The Project is early- to mid-stage in the development process. The overall Project schedule (shown below) supports the Project's ability to adjust over the next few months prior to submission to the Siting Board.

Milestone Schedule

- Application to Siting Board: in the first half of 2023 (~9-12 month review process)
- Interconnection Agreement: mid 2023
- National Environmental Policy Act review 2024-2025 (~12 month process)
- Final Design and Procurement: 2025
- Construction Start: 2025
- Commercial Operation Date: 2026

2. Solar Ordinance Provisions

Oriden supports a solar ordinance and would like to work together on development of an ordinance that would set the ground rules for solar development in Christian County.

<u>Setbacks</u>

<u>Agree with reasonable setbacks:</u>

- Distances shorter than 2,000' can still allow for minimization and mitigation of project impacts such as visibility and noise for adjoining landowners without excessively restricting participating landowners' ability to utilize their land
- Originally Oriden presented a 150' setback from non-participating residential structures
- **Based on community feedback Oriden now proposes a 500' setback from the Project fence line to non-participating residential structures**
- 500' is well above State Siting Board requirements (150'), Logan County (250'), and KY model solar zoning ordinance (100')
- Oriden agrees with other setbacks from Logan County ordinance:
    - From Project fence line to boundary line of any adjacent property, ROW for any municipal roadway or railway: 100'
    - From Project fence line to schools, churches, hospitals, cemeteries: 250'

<u>Visual Screening</u>

<u>Agree with requirements for visual screening</u>:

- Appropriate screening is very important to protect neighboring landowners' enjoyment of their property and for protection of property values
- **Based on community feedback Oriden proposes specific screening/buffering requirements**:
    - Development of a screening/buffering plan

  - 7-foot-minimum (consistent with National Electric Code) wildlife-permeable fence, double row of staggered evergreen trees minimum 5' in height at planting and maturing to minimum of 12'
  - Shall achieve opacity of 90% to a height of no less than 8' within 3 years of planting
- More robust than KY model solar zoning ordinance, Logan County and Mason County which only generally reference that screening must be provided, and generally consistent with Hopkinsville ordinance

<u>Decommissioning</u>

<u>Agree with requirements for decommissioning plan:</u>

- Project and decommissioning procedures would be consistent with future use of land for agriculture:
  - Project maintains permeable surfaces (other than semipermeable gravel access roads) that can be removed and de-compacted
  - Renewable projects support generational agriculture by allowing nutrient and land recharge
  - Renewable energy projects can be a supplement that enables families to keep their farms in the family
- Current Project leases contain decommissioning commitment:

If Lessee fails to remove any of the Solar Facilities, on the Property within twelve (12) months after the date the Term expires or the Lease terminates, such Solar Facilities shall be considered abandoned by Lessee and Landowner may either: (i) remove the remaining Solar Facilities from the Premises and dispose of them in its sole discretion without notice or liability to Lessee; or (ii) consider the Solar Facilities abandoned, at which time the remaining Solar Facilities shall become the property of Landowner. If Lessee fails to remove any of the Solar Facilities as required, and Landowner elects to remove such Solar Facilities at Landowner's expense, Lessee shall reimburse Landowner for all reasonable out-of-pocket costs of removing those Solar Facilities, less any salvage value received by Landowner, within thirty (30) days after receipt of an invoice from Landowner accompanied by reasonable supporting documentation, which amount may be drawn from the Removal Security.

- Siting board will require a project-specific decommissioning plan
  - Requires filing of a full and explicit plan at least one month prior to construction
  - Includes removal of above ground and below ground facilities
- **Based on community feedback Oriden proposes specific decommissioning requirements:**
  - Decommissioning plan prepared by a registered PE
  - Updated not less than once every 5 years
  - Includes costs, manner, financial assurances, revegetation and soil de-compacting procedures
  - Removal of below ground facilities to a depth no less than 3'
- More robust than KY model solar zoning ordinance (includes reference to decommissioning plan required by conditional use permit and protection of farmland and revegetation of

disturbed soil) and Logan County (no reference to decommissioning), and consistent with Hopkinsville and Mason County ordinances

Sound

Agree with requirements for sound modeling:

- Solar modules require the use of electrical equipment, such as inverters, which do emit some sound, but the frequency is the same as the AC electricity in your home
- Sound is generally not audible at the edge of the fenced boundary, but if audible, the sound is similar in volume to background noises and dissipates to inaudible 50 – 150 feet from the edge of the boundary
- **Based on community feedback Oriden proposes specific sound requirements:**
    - Project shall not be located so as to create an operational, sustained decibel level greater than 45 dBa at the property line of the parcel in which Project is located
    - Pre-construction sound study
    - Within twelve months after the project is fully operational the Project shall conduct a post-construction sound study and submit to the County
- More robust than KY model solar zoning ordinance, Logan County, and Hopkinsville ordinance, consistent with Mason County

Wildlife

Agree with requirements for wildlife habitat enhancement:

- The project will avoid impacts to stream and wetland resources outside of minor road crossings, as well as most existing forested habitat
- Protection of natural resources and fencing around but not in between solar panel bays will maintain open areas through which animals can continue to travel thereby maintaining wildlife corridors where possible
- Install wildlife permeable fencing
- Where appropriate create new wildlife habitat including installation of pollinator friendly species and foraging habitat
- **Based on community feedback Oriden proposes development of a wildlife habitat enhancement plan**

Public Outreach

- Began in 2019 and is continuing currently
- Oriden met with participating and *some* non-participating landowners, as well as elected officials
- September public meeting in was intended to further that outreach effort

Development Process

- We did not meet with every non-participating landowner, but certainly not true that we did not meet with any
- Some residents noted at the public meeting that we did not have enough details
- Development is a very long process and the appropriate time to involve public input is a difficult decision – need to have a feasible project to discuss, but don't want to be too far along to prohibit consideration of input
- We heard the community and are considering project adjustments based on feedback

Project sited in Christian County for specific reasons

- Minimal environmental impacts
- Conducive topography
- Higher elevation to minimize visibility from Greenville Road
- Positive response from participating landowners
- Optimal POI (Hopkinsville-Lost City 161 kV line bisects the project area)
- TVA RFP and interconnection studies show sufficient capacity

Economic Development Benefits to the Community

- Investment in the community
- Jobs – construction and ongoing service
    - Total (direct and spinoff) of approximately 370 new jobs in the County in year one, with new payroll of $18.2 million
    - Operationally the project will result in a couple full-time jobs
    - Opportunities for obtaining local goods and services, and for ongoing service-related contracts (maintenance, electrical, etc.)
- Increased tax base to the County and Schools through tangible property and real property tax
    - Due to the increased value of real estate, machinery and tangible property installed at the site
    - Over 36 years, this would lead to $5.2 million in property tax revenues for local government jurisdictions in Christian County
    - Current 11 parcels involved generated $9,600 in property taxes in 2021 compared to an average of approximately $144,000 likely to be generated per year by the solar project over the life of the project

Consistent with existing County plans:

- Christian County Vision 2030: Encourage and promote the adoption of green energy solutions in public and private sector which includes solar, wind, and other renewable sources (page 22).
- Hopkinsville-Christian County Sustainability Plan: A few key initiatives (among others) are areas in which Hopkinsville and Christian County will see action on in the near future: Discussion/Potential Implementation of Incentives for Private Development to Recognize Incorporation of Renewable Energy (page 32).
- Hopkinsville-Christian County Comprehensive Plan: Fort Campbell Compatibility Goals: Providing infrastructure that meets the needs of users, reduces overall costs, and limits dependence on non-renewable energy sources, (page 87).

<u>**General comments on ordinance**</u>

- Could be considered overregulation
- Experience with other ordinances from other states
- Taking of landowners' property rights

Dogwood Corners supports a solar ordinance
Would like to work together (so far provided information to magistrates)
Set the ground rules for solar development in the County
Listened to the community and understand concerns:

1. <u>Visual impact</u>

Suggested 2,000' ordinance is excessive, overly restrictive of property rights, discriminatory against solar, inconsistent with KY regulation / other ordinances

<u>Agree with reasonable setbacks:</u>

- Distances shorter than 2,000' can still allow for minimization and mitigation of project impacts such as visibility and noise for adjoining landowners without excessively restricting participating landowners' ability to utilize their land
- Originally Oriden presented a 150' setback from non-participating residential structures
- **Based on community feedback Oriden now proposes a 500' setback from the Project fence line to non-participating residential structures**
- 500' is well above State Siting Board approvals (150'), Logan County (250'), and KY model solar zoning ordinance (100')
  - Recognizes KRS 278.706 that includes a 2,000' setback to *residential neighborhood*, school, hospital, or nursing home facility
  - Issued approval for last 6 solar project reviews (all approved in 2022) with a 150' setback to residences
- Oriden agrees with other setbacks from Logan County ordinance:
  - From Project fence line to boundary line of any adjacent property, ROW for any municipal roadway or railway: 100'
  - From Project fence line to schools, churches, hospitals, cemeteries: 250'
- 2,000' would decrease buildable area of currently leased parcels to about ¼ of what would be potentially usable
- Would kill growth of industry that will stimulate economic development, increase the tax base, provide renewable energy
- Severely limits the rights of participating landowners, other residents of Christian County now and into the future

<u>Agree with requirements for visual screening</u>:

- Appropriate screening is very important to protect neighboring landowners' enjoyment of their property and for protection of property values
- **Based on community feedback Oriden proposes specific screening/buffering requirements**:
  - Development of a screening/buffering plan

    - 7-foot-minimum (consistent with National Electric Code) wildlife-permeable fence, double row of staggered evergreen trees minimum 5’ in height at planting and maturing to minimum of 12’
    - Shall achieve opacity of 90% to a height of no less than 8’ within 3 years of planting
  - More robust than KY model solar zoning ordinance, Logan County and Mason County which only generally reference that screening must be provided, and generally consistent with Hopkinsville ordinance

2. Decommissioning

Agree with requirements for decommissioning plan:

- Project and decommissioning procedures would be consistent with future use of land for agriculture:
  - Project maintains permeable surfaces (other than semipermeable gravel access roads) that can be removed and de-compacted
  - Renewable projects support generational agriculture by allowing nutrient and land recharge
  - Renewable energy projects can be a supplement that enables families to keep their farms in the family
- Current Project leases contain decommissioning commitment
- Siting board will require a project-specific decommissioning plan
  - Requires filing of a full and explicit plan at least one month prior to construction
  - Includes removal of above ground and below ground facilities
- **Based on community feedback Oriden proposes specific decommissioning requirements:**
  - Decommissioning plan prepared by a registered PE
  - Updated not less than once every 5 years
  - Includes costs, manner, financial assurances, revegetation and soil de-compacting procedures
  - Removal of below ground facilities to a depth no less than 3’
- More robust than KY model solar zoning ordinance (includes reference to decommissioning plan required by conditional use permit and protection of farmland and revegetation of disturbed soil) and Logan County (no reference to decommissioning), and consistent with Hopkinsville and Mason County ordinances

3. Noise

Agree with requirements for sound modeling:

- Solar modules require the use of electrical equipment, such as inverters, which emit some noise, but the frequency is the same as the electricity in your home
- Sound is generally not audible at the edge of the fenced boundary
- **Based on community feedback Oriden proposes specific sound requirements:**
  - Project shall not be located so as to create an operational, sustained decibel level greater than 45 dBa at the property line of the parcel in which Project is located
  - Pre-construction sound study
  - Within twelve months after the project is fully operational the Project shall conduct a post-construction sound study and submit to the County

- More robust than KY model solar zoning ordinance, Logan County, and Hopkinsville ordinance, consistent with Mason County

4. Wildlife

Agree with requirements for wildlife habitat enhancement:

- The project will avoid impacts to stream and wetland resources outside of minor road crossings, as well as most existing forested habitat
- Protection of natural resources and fencing around but not in between solar panel bays will maintain open areas through which animals can continue to travel thereby maintaining wildlife corridors where possible
- Install wildlife permeable fencing
- Where appropriate create new wildlife habitat including installation of pollinator friendly species and foraging habitat
- **Based on community feedback Oriden proposes development of a wildlife habitat enhancement plan**

5. Property values

- Solar projects can maintain property values compared to other higher impact development because they fit with the rural character of the existing community
- Solar projects are low impact (no lighting, no increase in traffic, negligible noise)
- Renewable energy projects can be a supplement that enables families to keep their farms in the family
- Solar projects are becoming more common as seen by interconnection queues across the country and as with other types of development they will become more accepted as they become more common

Community support

- So far you've only heard from a few constituents that oppose this project, but there are community members that support this project and renewable energy
- Jack Dixon:

"I strongly support renewable energy and the community benefits that go along with it. I also support agriculture. It is important to note that solar projects support generational agriculture by allowing nutrient recharge so the land can return to agricultural use when the project is decommissioned. Above all, however, I support property rights. Excessive regulation of solar projects is an infringement of my property rights. I urge the Court to consider that solar projects can be developed in a manner that addresses neighbors' concerns but also allows their constituents to use their land in a responsible way."

Urge court to consider this feedback and feedback of constituents before rushing to pass an overly restrictive ordinance

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November 20, 2022

John T. Soyars
Christian County Attorney
P. O. Box 24
Hopkinsville, Kentucky 42240

jtsoyars.christiancoatty@gmail.com

Re: **Proposed Solar Ordinance**

Dear Mr. Soyars:

Thank you for discussing certain aspects of the proposed Christian County ordinance related to solar-energy development. I wanted to follow up in writing about some of the concerns that my client, Oriden and its Dogwood Corners project, has about this ordinance. I believe that there are procedural defects that would invalidate the attempted adoption of this ordinance, as well as substantive concerns that would make it arbitrary.

Pursuant to KRS 67.080, a fiscal court is authorized to adopt ordinances related to "Planning, zoning, and subdivision control according to the provisions of KRS Chapter 100." The proposed ordinance clearly fits within the concept of a zoning regulation, as discussed in KRS 100.203, which includes "[m]inimum or maximum areas or percentages of areas, courts, yards, or other open spaces or bodies of water which are to be left unoccupied, and minimum distance requirements between buildings or other structures."

In order to adopt a zoning regulation, a county must follow the procedure set forth in KRS 100.207. This statute states that "the planning commission shall prepare the text and map of all zoning regulations and shall hold at least one (1) public hearing." After the planning commission's hearing, "the planning commission shall submit, along with their recommendation, a copy of the approved zoning regulation text" to the fiscal court. It is my understanding that the proposed ordinance currently being considered by the fiscal court has not received a hearing from the Hopkinsville-Christian County Planning Commission. Until the proper procedure is followed, any attempted adoption of the ordinance would be invalid.

In addition, KRS 100.217 states that no zoning regulation may have legal effect until a board of adjustment is appointed. It is my understanding that Christian County does not currently have a board of adjustment. Therefore, even if it was otherwise valid, the proposed ordinance would not have legal effect until Christian County established a board of adjustments.

STURGILL TURNER

A board of adjustments is vital to the statutory scheme for planning and zoning. This board is authorized to grant variances, which are defined as "a departure from dimensional terms of the zoning regulation pertaining to the height, width, length, or location of structures, and the size of yards and open spaces . . . ." It appears that the proposed ordinance attempts to authorize the Fiscal Court to accomplish a similar mechanism through a "deviation," but KRS Chapter 100 only affords that authority to a board of adjustments.

As I mentioned, I also believe components of the ordinance are substantively arbitrary. For example, the 2,000-foot setback from all property boundaries is an unreasonable interference with and regulation of solar-energy generating facilities. I am not aware of any other setback that the County has adopted for any other commercial or industrial facility. Moreover, to the extent that the Fiscal Court believes that setbacks are necessary to protect elements of health, safety, and welfare, these goals can be accomplished with significantly smaller setbacks than 2,000 feet.

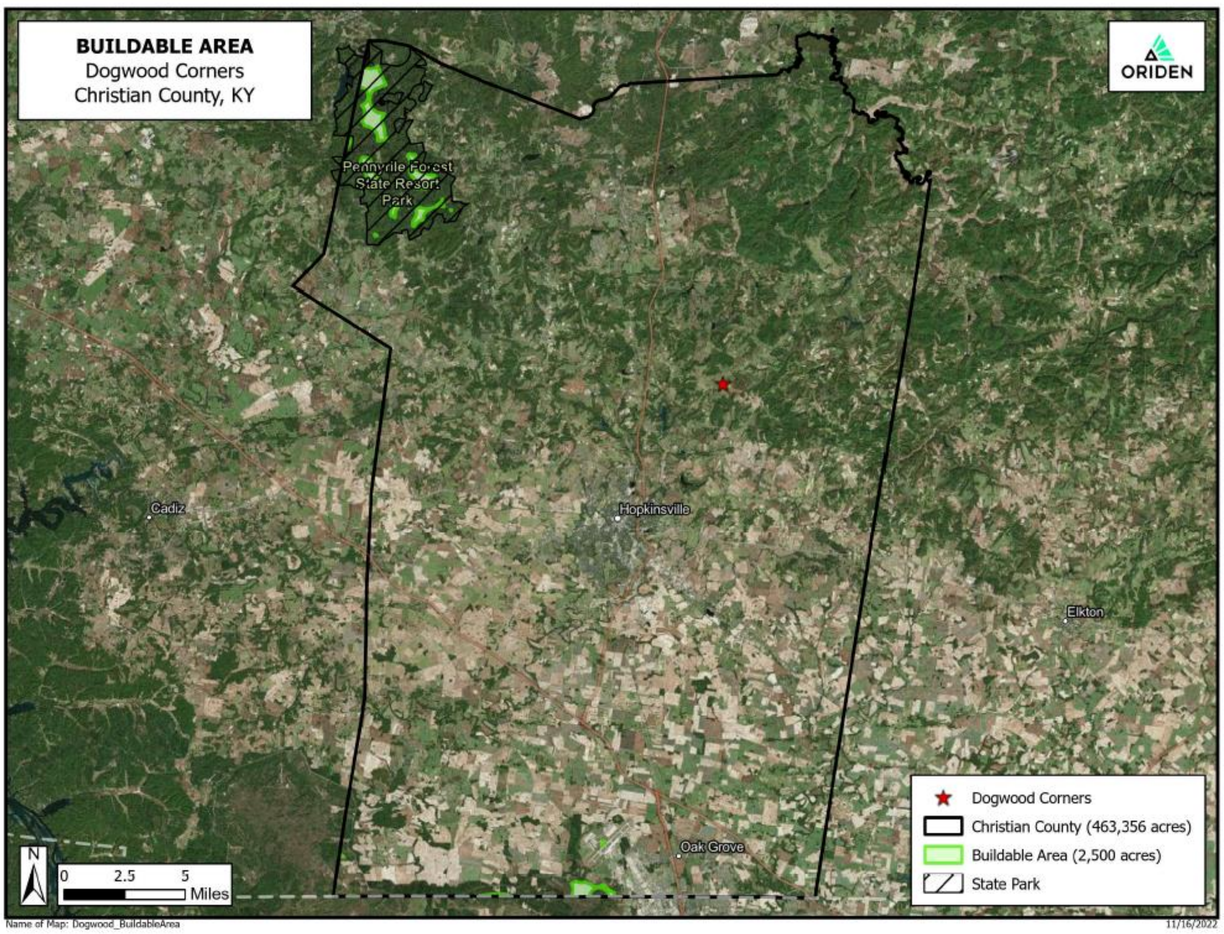
My client and I greatly appreciate the open dialogue that you and other County officials have had with us. Ultimately, we hope that the County adopts a lawful ordinance that balances all interests involved. Please contact me if you have any questions.

Sincerely,
STURGILL, TURNER, BARKER & MOLONEY, PLLC

M. Todd Osterloh

Christian County Fiscal Court Meeting
11/22/2022
Talking Points

1. You've noted in past meetings that you are supportive of solar energy projects.
2. There are three existing county plans that state County support for renewable energy: Christian County Vision 2030, Hopkinsville-Christian County Sustainability Plan, Hopkinsville-Christian County Comprehensive Plan.
3. Proposed ordinance, including 2,000' setbacks from everything, is not at all consistent with stated support and inconsistent with the existing county plans.
4. Review of entire county with added 2,000' buffer to lot lines and public roadways: result is almost no usable space for a solar project. Shared maps that show (in green) that the only usable space is within a state park and a few very small areas in southern Christian County.
5. More consistent with a ban on solar energy systems, and arbitrarily only on solar projects, rather than support.



6. No evidence to support the need for such an excessive setback as 2,000'.
    a. State statute says 2,000' from residential neighborhoods, etc. and the Christian County ordinance sets them at property boundaries.
    b. Heard comments that the 2,000' setback was intended to be protective of potential noise pollution. Numerous sources state that average noise levels range from 25 to 65 decibels. At 30 feet away 65 decibels is estimated to be the equivalent of the sound level of a conversation. By 500 feet, it would be inaudible.
    c. With appropriate screening a 2,000' setback is not necessary to mitigate visual impacts. Shared renderings.

7. Please consider the community members that are supportive of renewable energy projects, consider future generations, and follow the right process before enacting an overly restrictive ordinance.
8. An ordinance intended to adopt zoning regulation deserves a public hearing from the Hopkinsville-Christian County Planning Commission and deserves a board of adjustments capable of granting variances.

Relevant typical noise levels from CDC website:

Everyday Sounds and Noises	Average Sound Level (measured in decibels)	Typical Response (after routine or repeated exposure)
Softest sound that can be heard	0	Sounds at these dB levels typically don't cause any hearing damage.
Normal breathing	10	
Ticking watch	20	
Soft whisper	30	
Refrigerator hum	40	
Normal conversation, air conditioner	60	
Washing machine, dishwasher	70	You may feel annoyed by the noise
City traffic (inside the car)	80–85	You may feel very annoyed

https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html#:~:text=Common%20Sources%20of%20Noise%20and%20Decibel%20Levels&text=A%20whisper%20is%20about%2030,immediate%20harm%20to%20your%20ears.

General references:

"…string inverters are the most common culprits for generating a humming noise. However, the maximum noise level of a string inverter is around 45 decibels, so it shouldn't disturb you in any way."

https://www.projectsolaruk.com/blog/do-solar-panels-make-noise/#:~:text=Not%20all%20inverters%20will%20hum,disturb%20you%20in%20any%20way.

"Of course, inverters for larger solar arrays will generate significantly more noise–but only up close. At a distance of 10m, SMA's multi-kilowatt Sunny Central inverters, for example, have a sound pressure level of about 60dB. This is approximately equivalent to the amount of noise generated by large air conditioner, but as distance increases it will become less and less audible. Furthermore, because solar panels produce power only when the sun is shining, inverters will be completely silent at night."

https://www.solarchoice.net.au/blog/solar-inverter-decibel-levels-do-solar-farms-make-noise/

"The facility's inverters and transformers produce a sound when operating during peak power production hours, typically between 10am-2pm. At 150 feet, this sound is inaudible above natural ambient noise in rural areas. The sound created by the inverter during peak power production is typically in the range of 65 decibels at a distance of 30 feet – the equivalent of the sound created during normal conversation. The rest of the facility's equipment does not produce any audible sound and no sound is produced at night."

https://ccrenew.com/facts/#does-a-solar-farm-produce-a-lot-of-sound

<u>Examples from Projects submitted to Kentucky Public Service Commission Electric Generation and Transmission Siting Board (https://psc.ky.gov/Home/EGTSB):</u>

Hummingbird Solar Noise Assessment:

“During site operation, intermittent noise related to the panel tracking system and the constant noise of the inverters is expected. The increase in noise is negligible due to the distance between the panels / inverters and the nearest noise sensitive receptors. The nearest receptor (R105) is approximately 260 feet from the closest solar panels and approximately 788 feet from an inverter. Maximum sound levels from the tracking system can be expected to be the levels of a refrigerator hum at the nearest receptor (R105, 49.7 dBA), while the sounds will be much quieter at most receptors.

It should be noted that the trackers and the inverters for the panels themselves will not operate at night when residential receptors are most sensitive. During average daytime operation, the inverters will be similar in noise level (~48 dBA max) to a quiet library at the nearest receptor (R109). According to manufacturer specifications the loudest the substation transformer is expected to be is just over 60 dBA at 1m from the source, or the level of a normal conversation. Since the nearest receptor (R91) is approximately 792 ft from the substation, transformers are not expected to add additional noise above background noise as the noise levels are barely audible (12.2 dBA).”

Martin County Solar Facility Noise Assessment:

“During site operation, intermittent noise related to the panel tracking system and the constant noise of the inverters is expected. The increase in noise is negligible due to the distance between the panels / inverters and the nearest noise sensitive receptors. The nearest receptor is more than 250 feet from any solar panels and approximately 780 feet from an inverter. Sound levels from the tracking system can be expected to be the levels of a normal conversation at the nearest receptor (~62 dBA), while the sounds will be much quieter at most receptors. It should be noted that the trackers and the inverters for the panels themselves will not operate at night when residential receptors are most sensitive. During average daytime operation, the inverters will be similar in noise level (~35 dBA) to a soft whisper at the nearest receptor.”

Ashwood 86MW Solar Facility Noise Assessment:

“During site operation, intermittent noise related to the panel tracking system and the constant noise of the inverters is expected. The increase in noise is negligible due to the distance between the panels / inverters and the nearest noise sensitive receptors. The nearest receptor is more than 120 feet from any solar panels and approximately 500 feet from an inverter. Sound levels from the tracking system can be expected to be the levels of a normal conversation at the nearest receptor (~67 dBA), while the sounds will be much quieter at most receptors. During average operation, the inverters will be similar in noise level (~49 dBA) to a household air conditioner. According to manufacturer specifications the loudest the transformer is expected to be is just over 60 dBA, or the level of a normal conversation. Proposed vegetative buffers will further decrease perceived noise.”

Nov. 29, 2022 Talking Points

- Introduction

- We want to be transparent. We strongly believe that the County can adopt reasonable regulations addressing concerns and protecting the viability of projects that will benefit Christian County. We believe transparency furthers that goal.

- Concerns over procedure in adopting the ordinance

  - We have relayed these concerns to the County Attorney.

  - The statutory scheme in Kentucky for zoning regulations requires strict adherence to procedure outlined in KRS Chapter 100.

  - There must first be a hearing for the ordinance before the Planning Commission. It is my understanding that has not occurred.

  - In addition, before any zoning regulation can be enforced, there must be a board of adjustments (BOA) appointed. Here again, I do not believe this has occurred.

  - We believe that enactment of this ordinance would be declared to be invalid without following these procedural steps.

- Concerns over substance of the ordinance

  - Start with the deviation for setbacks allowed to be granted by Fiscal Court

    - Goes back to BOA. The statutes allow BOAs to grant variances to setbacks. As a result, Fiscal Court probably does not have authority to consider a deviation because that is left to the BOA.

    - Moreover, there is no procedure described as to how a request deviation would be processed.

  - Waiver by property owner

    - Concept is good.

    - Currently only applies to boundary line, but not residence, building or structure (or any other item listed in the ordinance, such as rights-of-way)

    - It would be arbitrary to allow a waiver for property boundaries, but not others.

  - 2,000-foot setback to property boundaries and residences

- We believe that this is arbitrary
- We are not aware of any other setback that the County has adopted for any other commercial or industrial facility
- State statute only applies to residential neighborhood, not residence or boundary
- 2,000-foot setback has no correlation to the impact of visual aesthetics or noise in most scenarios. These concerns can be addressed with significantly smaller setbacks.

- The County and its agencies have supported development of renewable energy.
    - We want to work with the County to set reasonable regulations that will ensure the community benefits from solar development.
    - But the ordinance under consideration is not reasonable. There is virtually no land in the County that could be developed into a solar facility with these setbacks.
        - And because of that, this ordinance severely curtails property rights in this County.
    - We'd urge you to take a step back and really consider what reasonable regulations are necessary that directly correlate to legitimate concerns. As a part of that process, we believe that there must be a hearing before the Planning Commission prior to consideration and adoption of this zoning regulation.

-

STAFF DR 1-14:

Refer to the Application, Compliance with Local Ordinances and Regulations at 7. Provide any public comments Dogwood Corners made during the Christian County Fiscal Court proceedings related to Ordinance 22-004.

Response: Representatives of Dogwood Corners attended and spoke at the Fiscal Court meetings held on November 10, 22 and 29. Summaries of the comments made are included as Attachments DR1-13b, DR1-13d, and DR1-13f above.

Witness: Megan Stahl

STAFF DR 1-15:

Refer to the Response to Deficiency Letter, Christian County Ordinance 22004, Section 2 at page 3 of 5.3 Ordinance 22-004 allows an applicant to request a deviation from the setbacks contained in the ordinance. Explain if Dogwood Corners has requested a deviation from the local setbacks.

Response: Dogwood Corners has not requested a deviation from the Fiscal Court related to the local setbacks. There are several factors as to why a deviation has not been requested. First and foremost, as has been explained in this matter, Ordinance 22-004 should be held to be void *ab initio* because Christian County failed to adhere to the requirements of KRS Chapter 100. This is the subject of Christian Circuit Court Case No. 2022-CI-01010, which is still pending. It is Dogwood Corners' position that, because Ordinance 22-004 is void *ab initio*, there are no local setbacks for which a deviation is needed.

This particular provision further demonstrates problems with the purported ordinance. This type of "deviation" is known as a "variance" under KRS Chapter 100. The adoption of "variances" is also controlled by KRS Chapter 100. A variance is "a departure from dimensional terms of the zoning regulation pertaining to the height, width, length, or location of structures, and the size of yards and open spaces where such departure meets the requirements of KRS 100.241 to 100.247." KRS 100.111. Only Boards of Adjustments and Planning Commissions have "power to hear and decide on applications for variances" pursuant to the standards found at KRS 100.243. KRS 100.241 and 100.203(5), (6). Again, these "deviations" are "variances," and are controlled by KRS Chapter 100 through a comprehensive statutory scheme. Thus, the statutory scheme may not authorize Fiscal Court to act in this way.

Moreover, this provides no guidance on how a deviation is requested, the procedure by which Fiscal Court will determine whether a deviation is appropriate, and the impact of an agreement with a neighboring property owner, which is mentioned elsewhere in the purported ordinance.

Dogwood Corners expressed these concerns to Christian County on multiple occasions, including orally at a Fiscal Court meeting on November 29, 2022 (Attachment DR1-13f), and by letter dated November 20, 2022 (Attachment DR1-13c).

Witness: Megan Stahl and Counsel for Dogwood Corners

STAFF DR 1-16:

Refer to the Application, Effect on Kentucky Electricity Generation System at 15. Provide a copy of the most recent Tennessee Valley Authority (TVA) Feasibility Study Report and System Impact Study Report.

Response: TVA indicated they would provide redacted versions of the Feasibility Study and System Impact Study Reports. Dogwood Corners will submit these reports as soon as TVA provides them.

Witness: Megan Stahl

STAFF DR 1-17:

Refer to the Application, Attachment G, Economic Report. Also refer to the Application, Description of the Proposed Site at 4. The Economic Report states eleven parcels of land are being used for the project. The Application states eight parcels of land are being used for the project. Explain the discrepancy.

Response: The correct parcel number is eleven parcels. The Application stated eight in error.

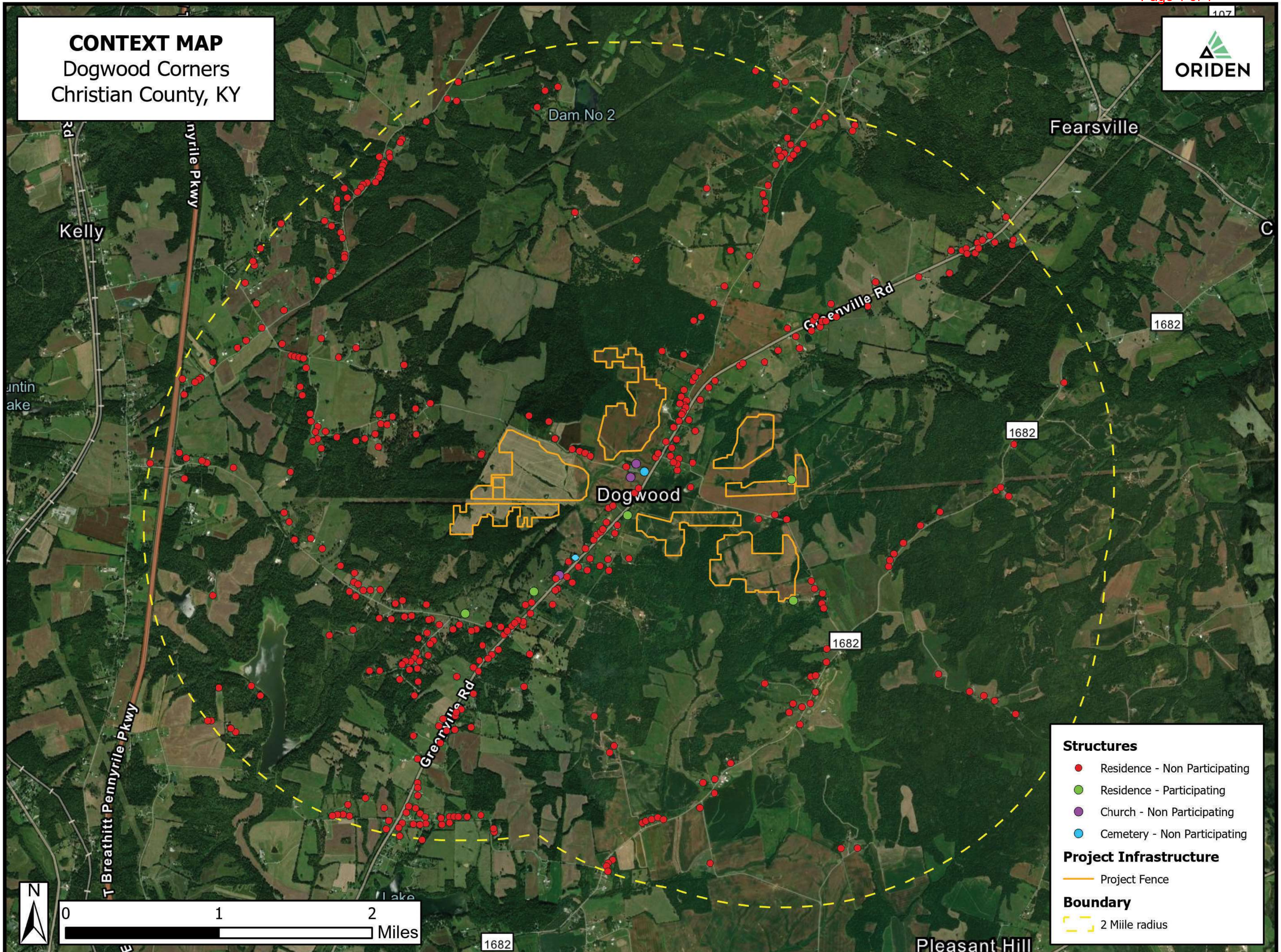
Witness: Megan Stahl

STAFF DR 1-18:

Refer to the Application, Attachment A, Context Map. Provided an updated context map that contains any community structures including churches, cemeteries, or community centers.

Response: Please refer to the attached Context Map.

Witness: Megan Stahl



Name of Map: Dogwood_Structures

10/31/2023

STAFF DR 1-19:

Refer to the Application, Section 2, Site Assessment Report (SAR), Appendix B, Preliminary Site Layout. Provided an updated site layout that contains:

a. Parcel boundaries.

b. Perimeter fences.

c. Access roads.

d. Access points.

e. Transmission line.

f. Substation and interconnection.

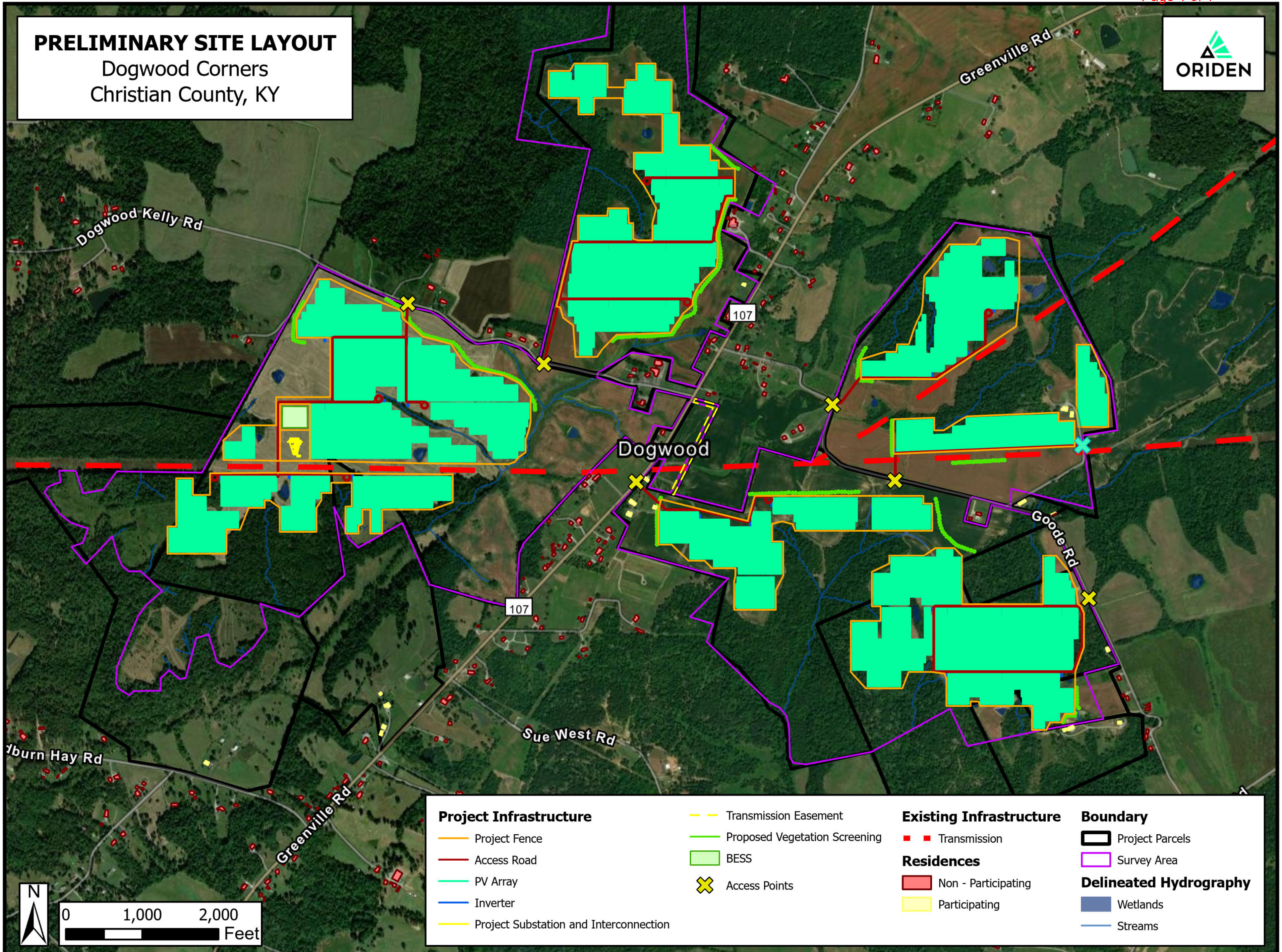
g. Battery energy storage system (BESS).

h. Vegetative screening.

<u>Response</u>: Please refer to the attached, updated Preliminary Site Layout. Dogwood Corners anticipates that it will need to change the location of the substation and interconnection, and is working to finalize that location. When the location is finalized, Dogwood Corners will supplement this response with another updated Site Layout Plan.

<u>Witness</u>: Megan Stahl

PRELIMINARY SITE LAYOUT
Dogwood Corners
Christian County, KY



STAFF DR 1-20:

Provide if access to the New Zion Church on Greenville Road will be impacted due to construction or operation of the Project. If yes, explain mitigation measures planned to alleviate impacts to the New Zion Church.

Response: We do not anticipate access to the New Zion Church to be impacted due to construction or operation of the Project. The previously submitted Traffic Impact Study (Appendix F of the Site Assessment Report) concluded that "the construction for this project will not adversely affect traffic operations on any of the roadways in and around the project area" and "[a]fter construction is complete, the site will be managed with negligible added traffic demand. During the operational phase of the project, the surrounding roadway network will continue to operate at an acceptable LOS during the peak hours."

Witness: Megan Stahl and Shane Kelley

STAFF DR 1-21:

Provide any geotechnical reports for the project.

Response: Please refer to the attached geotechnical report prepared by Triad Engineering, Inc., dated September 28, 2022.

Witness: Bradley A. Reynolds and Lee McCoy

Report of
Geotechnical Exploration

Dogwood Corners Solar Project
Hopkinsville, Kentucky

Triad Project No. 04-22-0345

Prepared For:

Ms. Megan Stahl, Development Manager
Oriden
106 Isabella Street, Suite 400
Pittsburgh, PA 15212

Prepared by:

TRIAD ENGINEERING, INC.

10541 Teays Valley Road
Scott Depot, West Virginia 25560
www.triadeng.com

September 28, 2022

MD | OH | PA | VA | WV

TRIAD ENGINEERING, INC. TRIAD Listens, Designs & Delivers

September 28, 2022

Ms. Megan Stahl, Development Manager
Oriden
106 Isabella Street, Suite 400
Pittsburgh, PA 15212

RE: Report of Geotechnical Exploration
Dogwood Corners Solar Project
Hopkinsville, Kentucky
Triad Project No. 04-22-0345

Dear Ms. Stahl:

In accordance with your request, we have completed a geotechnical exploration for the Dogwood Corners Solar Project in Hopkinsville, Kentucky. The work was performed in accordance with the scope of services outlined in our proposal dated July 27, 2022 and authorized by the original Consultant Service Agreement dated July 27, 2021. The exploration was performed to evaluate the subsurface conditions encountered at the proposed project for the limited purposes of preparing design and construction recommendations for geotechnical aspects of the project. It is emphasized that subsurface conditions may vary dramatically between test locations, and Triad makes no representations as to subsurface conditions other than those encountered at the specific test locations.

This report has been prepared for the exclusive use of Oriden, LLC for specific application to the design of the Dogwood Corners Solar Project located in Hopkinsville, Kentucky. Triad's responsibilities and liabilities are limited to our Client and apply only to their use of our report for the purposes described above. To observe compliance with design concepts and specifications, and to facilitate design changes in the event that subsurface conditions differ from those anticipated prior to construction, it is recommended that Triad be retained to provide continuous engineering and testing services during the earthwork and foundation construction phases of the work.

We appreciate the opportunity to assist you on this project and trust this report satisfies your needs at this time. Please feel free to contact us if you have questions concerning this report, or if we can provide further assistance.

Sincerely,

TRIAD ENGINEERING, INC.

Bradley A. Reynolds, P.E.
Senior Geotechnical Engineer

Lee McCoy, P.E.
Senior Engineer

STATE OF KENTUCKY
L. LEE
McCOY, JR.
25932
LICENSED
PROFESSIONAL ENGINEER

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Report of Geotechnical Exploration
Dogwood Corners Solar Energy Project
Hopkinsville, Kentucky
Triad Project No. 04-22-0345

FOREWORD

This report has been prepared for the exclusive use of Oriden, LLC for specific application to the design of the proposed Dogwood Corners Solar Energy Project in Hopkinsville, Kentucky. The work has been performed in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

This report should not be used for estimation of construction quantities and/or costs, and contractors should conduct their own exploration of site conditions for these purposes. Please note that Triad is not responsible for any claims, damages or liability associated with any other party's interpretation of the data or re-use of these data or engineering analyses without the express written authorization of Triad. Additionally, this report must be read in its entirety. Individual sections of this report may cause the reader to draw incorrect conclusions if considered in isolation from each other.

The conclusions and recommendations contained in this report are based, in part, upon our field observations and data obtained from the field exploration at the site. The nature and extent of variations may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations presented herein. Similarly, in the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained herein shall not be considered valid unless the changes are reviewed, and the conclusions are modified or verified in writing by Triad.

It is recommended that we be provided the opportunity to review the final grading plan, overall foundation design, and specifications so that earthwork and foundation recommendations may be properly interpreted and implemented.

SITE AND PROJECT DESCRIPTION

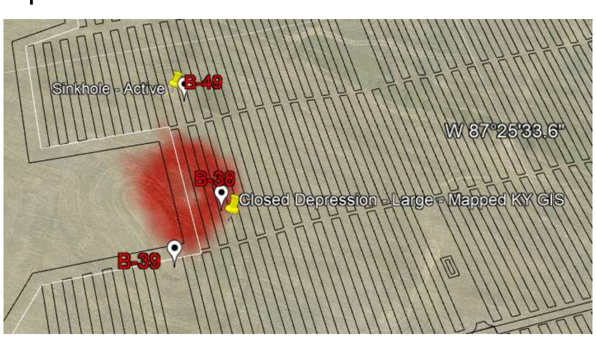
The proposed 125-megawatt ("MW") AC solar plus 25 MW AC storage project is located approximately 6.5 miles outside of the city of Hopkinsville, in Christian County, Kentucky. Specifically, the project site includes multiple parcels of land on the eastern and western sides of Greenville Road both north and south of the intersections with Dogwood Kelly Road and Goode Road. The site location is shown on Figure No. A-1 included in Appendix A.

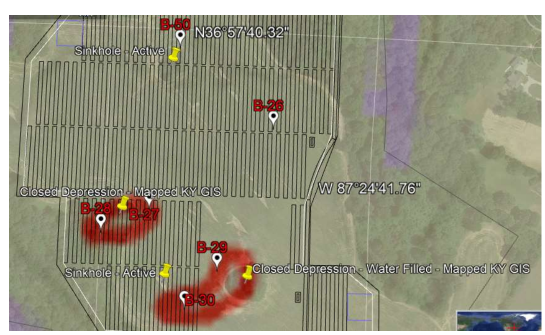
At the time of our field exploration, the majority of the development area was covered with tall corn with the exception of isolated wooded areas, fence lines, pastures, and drainage swales/ditches. Therefore, it should be noted that our visual exploration of the site was limited to pathways created in the corn fields to access the boring locations and/or existing access roads.

Scattered wooded areas were located throughout all parcels while pasture areas were limited to the Wilson and Houchens properties. Significantly eroded drainage swales and ditches were present across the majority of the parcels and in some instances were over 20 feet wide and several feet deep. The larger swales and ditches are clearly illustrated on Google Earth® imagery while the smaller swales and ditches are not illustrated but were encountered during the field exploration. Several existing ponds were present at the time of our field exploration but are generally outside the limits of the solar arrays. Based on the wetland delineation performed by others, several ponds and wetlands are present through the site and will be avoided.

Based on a review of historic photogrammetry, several ponds existed throughout the Miller parcel in the general vicinity of borings B-36 and B-40. These ponds were clearly present prior to 2019 but were filled, and the site was regraded. It should be anticipated that these old pond areas will have existing fill that will be encountered during construction. An image of the old ponds is provided below:

According to a search for potential sinkholes utilizing GIS data from the Kentucky Geological Survey (KGS), three mapped features were documented within the planned project site and solar arrays. In addition to the mapped features, three additional actively subsiding sinkholes were observed during the field exploration. The features are illustrated on Figures A-2 and A-3 in Appendix A and below. A detailed summary and description of the features are provided in the Development in Karst section of the report.





The concept plan indicates construction of several separate solar arrays, numerous inverter pads, new substation, new roadways, and several stormwater management basins. Grading information was not provided. However, we assume that final grades will roughly match current grades and that maximum cuts and fills for the project will be on the order of 10 feet or less. It is also assumed that any structures planned will be small, lightly loaded, and will probably consist of prefabricated units bearing on concrete slabs on grade.

We understand that the typical foundations for the solar arrays will consist of driven steel H-piles. Detailed loading information was not provided. However, based on our past experience with similar projects, we anticipate the following approximate column loads: total downward load of 8 to 10 kips, total uplift load of 4 to 6 kips, total lateral shear load of 2 to 4 kips, and total overturning moment of 4 to 8 kip-ft. The structural engineer for the project should verify that the assumed design loads are consistent with the actual design loads.

GEOLOGIC SETTING

General

According to the Geologic Map of the Kelly Quadrangle, Kentucky (1964), the site is underlain by rocks of Chesterian Age which is comprised of multiple geologic formations, specifically the Tar Springs Sandstone, Vienna Limestone, and Waltersburg Sandstone. The Glen Dean Limestone and ultimately the Hardinsburg Sandstone underlay these formations at depths varying from less than 30 feet to 140 feet. The Tar Springs Sandstone covers the majority of the solar array areas with some isolated areas (boring locations B-1, B-2, and B-9) within the Vienna Limestone formation. A Site Geologic Plan, Figure A-6, is included in Appendix A of this report.

The Tar Springs Sandstone is generally described as, "Sandstone, shale, and limestone: Sandstone is light to dark brown, fine to medium grained, thin to thick bedded, locally cross-bedded, locally argillaceous. Massive shaly sandstone 70 feet thick in western part of quadrangle thins to 30 feet in northwestern part. Shale is grayish black to grayish green, soft, commonly sandy and interbedded with sandstone. Limestone is light to dark gray, medium to coarse grained, thin bedded, sandy, shaly, fossiliferous, locally cross-bedded; exposed as thin unit in few outcrops mostly in central and southern areas; equivalent to highest limestone in Glen Dean Formation."

The Vienna Limestone is generally described as, "Limestone, light- to dark-gray, fine- to medium-grained, medium- to thick-bedded, locally oolitic, fossiliferous; commonly nodules of chert coalesce and form thin discontinuous beds. Chert composed mostly of silicified fossils, less commonly structureless. Poorly exposed; commonly only a red clay soil containing angular chert fragments is exposed."

The Waltersburg Formation is generally described as, "Shale and siltstone: Shale is grayish black; commonly weathers to soft poorly exposed grayish-green clay. Siltstone is light brown, very thin bedded, interbedded with shale, poorly exposed."

The Glen Dean Limestone is generally described as, "Limestone, shale, and sandstone: Limestone is light to dark gray, medium grained, locally cross-bedded, shaly, oolitic, sandy; occurs everywhere at the base of the formation and at top in part of area; upper unit thins from 25 feet thick in northwest to 3 feet in northeast and is missing or present locally elsewhere. Shale is greenish gray, soft, locally calcareous, commonly sandy, poorly exposed, forms middle member. The shale and upper limestone grade into and interfinger laterally with sandstone of the Tar Springs Sandstone. The top of the Glen Dean Formation thus is mapped at the top of the upper limestone where it is well developed and above the lower limestone where the shale and upper limestone pass into sandstone."

The Hardinsburg Sandstone is generally described as, "Sandstone, shale, and limestone: Sandstone is light tan to brown, fine to medium grained, thin to medium bedded, locally argillaceous and calcareous; sparse poorly preserved brachiopod casts and molds present in some beds; locally weathers out along joints as rhombohedral blocks as long as 2 feet; limestone pebble conglomeratic sandstone at base interbedded with the underlying Haney Limestone Member. Shale is greenish gray to grayish black to dull brownish red, soft, poorly exposed. Limestone about 15 feet below top was not observed in outcrop but reported in drill-hole records to be sandy and shaly and 8 to 12 feet thick. Limestone about 45 feet above base is light to dark reddish gray, coarse grained, sandy; less than 2 feet thick, in outcrop only found at one locality in south-central part of quadrangle; present in drill holes in northern part of quadrangle."

The limestone rock formations of the Vienna Limestone and Glen Dean Limestone that underly the site are solution-prone, highly dissolving, highly calcareous and weather differentially. Based on the Karst Occurrence in Kentucky map developed by the Kentucky Geological Survey, the site is located within an area underlain by bedrock with high potential for karst development. Although the site surface geology consists of the Tar Springs Sandstone, this formation is very thin (less than 30 feet) in areas and is immediately underlain by the Glen Dean Limestone formation and other limestone formations with increasing depth.

Karst Features and Active Sinkholes

As discussed, according to a search for potential sinkholes utilizing GIS data from the Kentucky Geological Survey (KGS), three mapped features were documented within the planned project site and solar arrays. In addition to the mapped features, three actively subsiding sinkholes were also observed during the field exploration. The features are illustrated on Figure Nos. A-2 and A-3 in Appendix A.

Miller Property

An approximate 200-foot diameter closed depression is located in the vicinity of borings B-38 and B-39. There were no active signs of sinkholes observed within the depression, but clear subsidence was apparent during our field investigations. The western side of the depression had a relatively steep topographic grade with highly weathered sandstone outcrops. The depression is documented on the KGS GIS data and can be observed on Google Earth® photogrammetry prior to 1986.

An active sinkhole was observed immediately north of the closed depression and directly west of boring B-49. The sinkhole was approximately 25 feet in diameter and 15 feet deep. Dense clayey soils were observed on the sidewalls of the sinkhole with loose soils in the bottom. A visible throat was not observed in the bottom of the sinkhole, but recent subsidence and loose soil conditions were apparent from recent precipitation events and runoff. Based on a review of the Google Earth® photogrammetry, the sinkhole could be observed on historical photogrammetry starting October 2019.

Wells Property

An approximate 30-foot diameter closed depression is located between borings B-27 and B-28 and is approximately 6 feet deep. There were no signs of an active sinkhole observed within the depression, but clear subsidence was apparent during our field investigations. The depression is documented on the KGS GIS data and can be observed on Google Earth® photogrammetry prior to 1986.

An approximate 130-foot diameter closed depression is located in the vicinity of boring B-29 and is approximately 6 feet deep. The depression is currently holding water, and it appears that the area is generally wet most of the year with fluctuating water levels based on precipitation events. The depression is documented on the KGS GIS data and can be observed on Google Earth® photogrammetry in 1986.

An approximate 80-foot diameter closed depression/sinkhole is located directly south of boring B-50. The depression/sinkhole is approximately 10 feet deep with active subsidence observed within the depression/sinkhole. The area included very dense vegetation with scattered areas of old fencing and debris located in the bottom of the depression/sinkhole. The depression/sinkhole appeared to be present in 1986 based on Google Earth® photogrammetry.

An active sinkhole was observed immediately west of the closed depression and directly west of boring B-29 and directly north of boring B-30. The sinkhole is approximately 10 feet in diameter and 6 feet deep. Very dense vegetation was present within the sinkhole, so a detailed visual inspection could not be completed. Based on a review of the Google Earth® photogrammetry, the sinkhole could be observed on historical photogrammetry starting April 2019.

Development in Karst Terrain

Karst terrain, such as that which underlies the site, is characterized by caves, internal subterranean drainage and topographic features such as depressions and recently collapsing sinkholes and sinking streams. These features are all the result of the dissolution of soluble limestone bedrock by groundwater. As groundwater enters fractures and bedding planes in soluble carbonate bedrock, it slowly (over millions of years) dissolves the rock and enlarges the fractures. This results in the formation of solutioning channels or underground streams or ravines. Sinkholes are created by the subsidence of unconsolidated materials (soils) into underlying voids such as solutioning channels or caves. Usually, subsidence occurs slowly and steadily over geologic time. Many sinkholes, however, are caused by a sudden collapse of a solutioning cave when the roof of the cave becomes too thin to support the overburden materials.

It is important to note that there are certain risks that an owner must accept when developing in these karst areas. These risks can include groundwater contamination and flooding due to the unpredictable groundwater flow paths within the bedrock, but primarily subsidence. In all these instances, water is the primary cause of the problem. Alterations in the ground surface, particularly in cut areas, during construction can impact the natural drainage within the site, and it is common to have additional solutioning features develop in these areas as a result of construction. Although not anticipated as part of this project, normal blasting required to remove hard rock can create micro-fractures within the bedrock that will allow greater surface water infiltration into areas that may normally not receive water and, in turn, disturb old solutioning features and/or possibly create new solutioning features.

FIELD EXPLORATION

Soil Test Borings

The scope of work included drilling fifty (50) test borings with Standard Penetration Testing (SPT) and split barrel sampling (ASTM D 1586) at select intervals to the noted termination depths. The approximate test locations are shown on Figure Nos. A-2 through A-5 in Appendix A. The test locations were chosen by Triad and established in the field by Triad geotechnical personnel using coordinates from Google Earth® and a hand-held GPS device. Elevations of the borings were estimated from Google Earth® terrain. Therefore, the surface elevations should be considered approximate.

Geotechnical personnel from our office were present full time during the field exploration to log all recovered soil samples and observe groundwater and rock conditions. The recovered soil samples were transported to our laboratory for further testing. Detailed descriptions of materials encountered in the borings are contained on the logs in Appendix B. Figure B-1 contains a description of the classification system and terminology utilized.

Soil Electrical Resistivity (ER) Testing

Soil electrical resistivity testing was also completed at three locations on the site. The approximate test locations are shown on Figure Nos. A-2 through A-5. At select locations, measurements were taken to determine average soil resistivity at five “a”-spacings of 2, 5, 10, 20, and 50 feet in three sets of arrays performed in a triangular orientation and identified as test locations RL-1 through RL-5 at each test location. The apparent resistivity measurements for the entire site ranged from approximately 494 to 51,705 ohm-centimeters (Ωcm). The results of the four-point resistivity testing are included in Appendix B.

The equipment used to collect the data included a resistivity meter, with four metal electrodes and a connecting wire. An AEMC 4-point earth/ground electrical resistance tester (Model 6472) was utilized to collect the data. Resistivity testing was completed in general accordance with ASTM method G57, “Standard Test Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method.”

Four electrodes in co-linear arrays were positioned in the ground for each measurement. To check the accuracy of the single resistivity array, a perpendicular array was set up at each test location for all electrode spacings. Electrical current was input to the ground through the two outer electrodes of the array. The voltage drop produced by the resulting electrical field was measured across the two inner electrodes. The “a” spacing was increased with each set of measurements, expanding the array about a common center. Increasing the electrode separation increases the depth of investigation and indicates vertical variation in resistivity.

SUBSURFACE CONDITIONS

Subsurface Strata

Auger and spoon refusal was encountered at 44 of the test boring locations at depths ranging from 4.3 to 15.3 feet below existing grades. The materials encountered in the borings are generally described below. Stratification lines indicated on the logs represent the approximate boundaries between material types.

Topsoil: Topsoil was encountered at the ground surface at all test locations. The topsoil ranged in thickness from approximately 5 to 18 inches.

Residual Soils: Residual soils were encountered in all test locations. The residual soils were encountered below the topsoil, and they extended to refusal depths or termination depths or graded to weathered rock. The residual soils generally consisted of multicolored clay, silt, sand, and gravel with varying amounts of organics. Based on SPT N-values varying from 4 blows per foot to 50 blows per two inches of penetration, and pocket penetrometer values ranging from 1.75 to greater than 4.5 tons per square foot (tsf), the residual materials exhibited a stiff to hard consistency and a medium dense to very dense relative density. The majority of the residual soils exhibited a very stiff consistency and a medium dense relative density.

Weathered Rock: Weathered rock was encountered below the residual soils and extended to termination and refusal depths in all boring locations except B-7, B-14, B-17, B-18, B-23, B-27, B-32, B-38, B-41, B-43, B-46, B-49, and B-50. The weathered rock generally consisted of multicolored shale, sandstone, and limestone. Based on SPT N-values varying from 48 blows per foot to 50 blows per zero inches of penetration, the weathered rock materials exhibited a very dense relative density.

Groundwater Observations

Groundwater was not encountered during drilling and was not present upon completion of the drilling. However, wet weather swales, ditches, natural drainage ways, and several existing ponds are located at the site. Therefore, due to the existing features and clayey residual soils, perched groundwater conditions should be expected during construction. It is important to note that fluctuations in groundwater levels may occur due to variations in environmental conditions, recent precipitation events, surface drainage, and other factors which may not have been evident at the time measurements were made and reported herein.

LABORATORY TESTING

Soil samples obtained from the borings were visually classified in the field by geotechnical engineering personnel from Triad. All laboratory soil tests were performed in accordance with applicable ASTM Standards. Detailed results of the laboratory tests are contained in Appendix C. The results of the tests are summarized below.

TEST TYPE	TEST RESULTS
Natural Moisture Contents	4.3 to 30.9%
Atterberg Limits: Liquid Limit Plasticity Index	 28 to 44 10 to 22
Percent Passing No. 200 Sieve	69 to 96%
USCS Soil Classification	CL (all samples)
Standard Proctor Results Maximum Dry Density Optimum Moisture Content	 107.1 to 110.1 pcf 16.4% to 18.2 %

Thermal conductivity, oxidation-reduction potential and corrosivity tests were performed by our subcontractor, and the results of those tests are also provided in Appendix C.

CONCLUSIONS AND RECOMMENDATIONS FOR DESIGN

General Discussion

The subsurface information obtained from the field exploration, our past experience with similar projects, and the noted design criteria were the basis for our assessment of the geotechnical issues currently existing at the site. Our geotechnical recommendations associated with the design and construction of foundations are presented below.

Preliminary pile load testing at numerous locations was completed at the site prior to our exploration. Results of the preliminary load testing were provided for our review. Based on the results of the preliminary pile load tests, several pile locations encountered refusal at relatively shallow depths of less than 5 feet. The majority of the piles, however, were driven to depths ranging from 6 to 7 feet without encountering refusal. Therefore, some limited pre-drilling may be necessary to achieve design embedment depth within select areas of the site. Since pile load tests were performed at the site, we assume that data can be compared to the recommended design values to establish final design parameters.

As previously noted, significantly eroded drainage swales and ditches were present across the majority of the parcels, and in some instances, were over 20 feet wide and several feet deep. We anticipate that the design grading and stormwater management control will limit the concentrated erosion. It is strongly recommended that the design engineer factor in the erodibility of the existing soils during heavy precipitation and runoff events so that erosion does not occur within areas of construction and pile locations. Erosion around existing piles will reduce pile capacity and could cause movement of the panel framing system.

Karst Design Recommendations

As previously discussed, based on the Karst Occurrence in Kentucky map developed by the Kentucky Geological Survey, the site is located within an area underlain by bedrock with high potential for karst development. Due to the current karst activity both mapped and observed within the site, an elevated risk of future sinkhole development exists. Therefore, it is important to note that there are risks that an owner must accept when developing in karst areas.

Based on current activity, certain areas of the site have an increased risk level of karst activity in comparison to other areas of the site. This is likely due to the thickness of the Tar Springs Sandstone formation over the underlying Glen Dean Limestone formation. Therefore, we recommend that buffers limiting solar array construction be established around all existing karst features and areas of elevated karst activity. We recommended that preliminary buffers be established at an approximate distance of 200 feed beyond the last closed contour line of the features. Approximate buffers are illustrated on the attached figures and were established based on the existing features and areas of overlapping buffers.

The ultimate size of the buffers should be established based on the level of risk the developer is willing to accept, weighing the potential costs associated with future adjustment of the existing solar array support systems, possible reconstruction of severely damaged solar arrays and remediation of karst features if they develop. The amount of future subsidence within the existing depressions and potential for sinkhole development is not predictable but should be anticipated to occur at some point in time. Additional deep borings with rock coring in combination with detailed geophysical survey techniques can be completed to further assess the level of risk of future subsidence. However, remediation of the existing karst features may not be cost effective due to the depth of limestone bedrock below the existing Tar Spring Sandstone. At a minimum, Triad should conduct additional site reconnaissance once the existing corn has been harvested and the vegetation/foliage is reduced to further assess the existing features and locate any additional existing features that were not observed due to the existing corn and dense vegetation. As you are aware, visual observations at the site were extremely limited due to the existing corn and dense vegetation.

Karst Preventative Measures

As discussed, there are certain risks that an owner must accept when developing in karst areas. The level of these risks, however, cannot be clearly defined since they are partially controlled by nature. Nevertheless, certain design and construction measures can and should be implemented to help minimize potential risks associated with future sinkhole development within the site. All these suggested measures are associated with implementing proper site drainage, minimizing water infiltration, and reducing groundwater fluctuation during and after construction. These additional measures include the following:

- Positive slopes should be maintained within all solar array areas and around all proposed structures both during and after construction is complete. Failure to maintain positive drainage at the site will increase the risk of karst related activity at the site.

- Utility trenches should be backfilled with on-site clayey soils with limited to no gravel bedding. Utility trenches tend to serve as conduits to accumulate subsurface water and allow flow along the trench area, particularly through bedding stone. This condition increases the risk of potential future solutioning activity beneath and/or around the utility line.

- Drainage ditches and stormwater management structures should be lined with on-site low permeability clayey soils to limit concentrated areas of infiltration and reduce the risk of karst activity and sinkhole development.

- Remediation of existing karst features/sinkholes and promoting positive drainage away from the existing features.

Foundations

Solar Panels

We understand that foundations for the solar panels will likely consist of driven steel H piles. Based upon the results of the field exploration and our understanding of the project, it appears that the piles will bear within the residual layer. We recommend that the geotechnical design parameters listed in the following table be utilized for foundation design. Due to the topsoil and the anticipated soil disturbance during construction, we recommend that the upper one (1) foot of soil be neglected for providing axial and/or lateral pile resistance. Due to the anticipated small pile section, we assume that the piles will be designed as friction piles.

PRELIMINARY RECOMMENDED GEOTECHNICAL FOUNDATION DESIGN PARAMETERS	
Friction Factor (tan δ) for Skin Friction: Soil to Driven Steel	0.42

PRELIMINARY RECOMMENDED GEOTECHNICAL FOUNDATION DESIGN PARAMETERS	
Lateral Soil Subgrade Modulus (Residuum or dense controlled fill), k	90 pci
Preliminary Moist Unit Weight (Residuum or dense controlled fill)	130 pcf
Cohesion (Residuum or dense controlled fill)	500 psf
Angle of Internal Friction (Residuum or dense controlled fill)	32°
Allowable Passive Pressure (Residuum or controlled fill)	250 psf per foot of depth
Adfreeze stress	1,500 psf
Frost Depth	18 inches

Equipment Pads

We understand that several small structures such as inverter pads and shelters for equipment will be constructed on the project site. It is assumed that the foundations for these small structures will be monolithic concrete slabs with turned down edges. The loading for these types of structures is expected to be less than 1 ksf.

For design of the foundations and slabs, a maximum allowable bearing pressure of 3,000 psf or a modulus of subgrade reaction, “k,” of 100 pci should be utilized for design. All foundations should be constructed to bear on approved residual materials or new controlled fill. A minimum dimension of 2 feet for continuous footings should be considered. In addition, exterior foundations should bear at least 24 inches below the final outside grade (based on a 100-year return for bare soil) for frost protection.

We estimate that total settlements for foundations bearing on approved residual soils and/or new controlled fill will be one (1) inch or less. Differential settlements are anticipated to be one-half of the total settlements. Differential settlements along continuous wall footings are not expected to exceed an angular distortion of 0.0015 inch/inch.

A minimum 4-inch layer of crushed stone such as AASHTO #57 aggregate can be placed under the slab-on-grade to serve as a capillary water barrier and a leveling surface. Proper joint installation should be specified and maintained throughout construction of the floor slabs. Joints should be installed in the floor slabs in accordance with the recommendations specified by the Portland Cement Association (PCA) or American Concrete Institute (ACI).

Seismic Classification

The site soils were evaluated and classified according to the 2015 International Building Code Section 1613 - Earthquake Loads - Site Ground Motion. This building code establishes the criteria for project site evaluation. Section 1613.3.2 and 2016 ASCE-7

Standard-Table 20.3-1 defines the parameters for determining the seismic site class based on N-values. The seismic site class may be determined by calculating an average N-value of subsurface materials to a depth of 100 feet. Based on the results of the test borings, the site has an average N-value of over 50. Using the calculated N-value along with knowledge of the site geologic setting, the seismic site class and additional seismic information is tabulated below.

Seismic Site Class	C
Soil Profile Name	Very Dense Soil and Soft Rock
Site amplification factor at 0.2 second, F_a	1.2
Site amplification factor at 1.0 second, F_v	1.602
MCE_R ground motion (for 0.2 sec. period), S_s	0.499
MCE_R ground motion (for 1.0 sec. period), S_1	0.198

Based on results from the borings, published regional geologic information and the probable maximum strength of an earthquake in this area, it is our opinion that liquefaction potential for the on-site soils during seismic activity is low. Seismic coefficients and other seismic information to be considered for structural design of the project are provided in Appendix D of this report.

CONSTRUCTION RECOMMENDATIONS

Site Preparation

For areas proposed to receive new fill, new building construction or equipment pads, initial site clearing and grubbing should include removal of topsoil and root matter, old fill (if encountered) from filling old ponds and any other deleterious materials. After removal of topsoil and root matter, the subgrade soils should be heavily proof-rolled with approved construction equipment to locate isolated soft spots or areas of excessive "pumping" which are too wet to accommodate compacted fill. These areas should be either scarified, air-dried to a sufficient moisture content and re-compacted prior to fill placement, mechanically stabilized or excavated to a level of stable soils. The exposed subgrade should be inspected and tested by Triad personnel prior to placement of compacted fill. We assume that solar panel areas constructed at grade and not requiring new fill will be left in an “as is” type condition with little clearing and grubbing.

Excavation Areas

In general, the residual soils present can be excavated with conventional earth moving equipment such as backhoes and tracked loaders. Excavations within the underlying weathered sandstone and sandstone bedrock will require heavy ripping and large tracked excavation equipment for effective removal. Blasting is not anticipated as part of the site development and generally not recommended due to the existing karst activity.

During excavation operations, dry conditions should be maintained within the cut areas at all times in order to minimize the need for additional undercutting or aeration of soils. The contractor should be prepared to implement, if necessary, temporary de-watering measures in these areas during construction. These measures include sloping the cut areas to appropriate sump pit(s) and pumping accumulated surface runoff from precipitation. All cut areas should be sealed at the end of each day, to the extent which construction practicality will permit, to help prevent infiltration of precipitation and subsequent unsuitable soil conditions. Due to the underlying clayey soils and evident perched water conditions within the existing ponds, areas of perched groundwater should be expected during construction activities and should be controlled as summarized above.

All utility trenches should be sloped and/or supported in accordance with current Occupational Safety and Health Administration (O.S.H.A.) requirements. Trenches below structure and pavement areas should be backfilled in accordance with the Controlled Fill section of this report.

Controlled Fill

Satisfactory Soils

On-site residual clayey soils can generally be used for fill provided that compaction criteria are strictly maintained. However, the soils may need to be dried on the order of 5 to 20 percent by weight to achieve a moisture content suitable for proper compaction. The low to medium plasticity clays are relatively sensitive to moisture fluctuations and typically can be effectively placed and compacted only during drier seasons. Use of these soils during wet or rainy seasons is often futile due to the time and effort required to dry the material to achieve adequate compaction. Therefore, earthwork construction during the approximate period of late fall to early spring is generally very difficult with the limestone derived soils in this region. Locally available weathered rock fill or graded crushed aggregate can be considered as alternate fill material during adverse weather conditions.

Fill materials should not contain any debris, waste, or frozen materials and they should contain less than two (2) percent vegetation-organic materials by weight. Also, materials classified as CH, MH, OL, OH, or Pt are not suitable for use as structural fill. However, materials that classify as CH or MH are suitable for fill in SWM areas. Maximum rock sizes should not exceed 3 inches. The on-site soils are generally suitable for re-use as structural fill provided that proper drainage, grading, and sloping is maintained both during and after construction.

All controlled fill should be approved by a geotechnical engineer prior to placement as controlled fill, and representative samples should be submitted by the contractor one week prior to placement of that material to allow time for completion of the necessary laboratory tests.

Placement and Compaction

Before compaction, each layer should be moistened or aerated as necessary to obtain the required compaction. Each layer should be compacted to the required percentage of maximum dry density. Fill should not be placed on surfaces that are muddy or frozen or have not been approved by testing and/or proof-rolling. Free water should be prevented from appearing on the surface during or subsequent to compaction operations.

Soil material which is removed because it is too wet to permit proper compaction can be spread and allowed to dry. Drying can be facilitated by discing or harrowing until the moisture content is reduced to an acceptable level. When the soil is too dry, water should be applied uniformly to the subgrade surface or to the layer to be compacted.

All fill material compacted by heavy compaction equipment should be placed in maximum 9-inch loose lifts. All fill material compacted by hand-operated tampers or light compaction equipment should be placed in maximum 4-inch loose lifts. Each lift of fill placed on sloping areas of the site should be benched or “notched” into the existing slope to avoid creation of a smooth interface between the fill and existing ground.

Fill material should be compacted to at least 98 percent of the laboratory maximum dry density as determined by the Standard Proctor method (ASTM D 698). The moisture content of the soils should be at or within two (2) percentage points of the optimum moisture content.

Solar Panel Pile Foundation Construction

Auger and spoon refusal was encountered at 44 of the test boring locations at depths ranging from 4.3 to 15.3 feet below existing grades. Materials exhibiting N-values of over 50 were typically encountered at depths ranging from as shallow as 2.5 feet to over 15 feet below existing grades. The material below those depths were typically clays with significant amounts of sand and gravel or dense weathered sandstone. In comparing the pile refusal depths and boring logs, it appears that refusal during pile installation correspond to N-values over 50 blows per foot. Based on our experience and results of the pile testing, we believe that the small pile sections can probably be driven within the residual soil layers, and possibly penetrate the dense weathered sandstone to a limited depth. Therefore, some limited pre-drilling of piles should be anticipated in some areas of the project site. We understand that the C-Pile sections used during the initial pile driving and testing will be substituted with H-Pile sections. We recommend that additional pile testing be performed within select areas of the site utilizing H-Pile sections to determine if further penetration can be achieved within the materials exhibiting N-values of over 50.

Equipment Pad Foundation Construction

We anticipate that conventional earth excavation equipment such as a backhoe can be utilized to excavate the on-site soils or controlled fill for foundation construction. We recommend that any loose materials present at the bottom of footing excavations because of excavation operations be re-compacted in order to minimize differential settlements. Any isolated soft areas that may be encountered during foundation excavations should be removed to underlying firm materials. Widening of over-excavations will also be required if soft conditions are encountered. Detailed recommendations can be provided at the time of construction if these conditions are present. Backfill in over-excavations should consist of controlled fill including an approved on-site fill and/or imported granular material compacted in accordance with the recommendations presented in this report.

All footing excavations for the proposed structures should be examined by a geotechnical engineer or a qualified representative from our office prior to placing concrete to confirm that the required bearing support is available.

Access Road Construction

We recommend that permanent gravel access drives include a minimum section thickness of 6 inches of approved dense graded aggregate. In order to stabilize the subgrade and reduce maintenance of the gravel drive, stabilization fabric could be utilized between the subgrade and dense graded aggregate. Drainage ditches should be constructed for any gravel access roads to maintain drainage and divert runoff away from the subgrade. It is very important that the subgrade be properly sloped to help maintain drainage after construction. The drainage ditches should also be lined with on-site clayey soils to limit concentrated infiltration and potential karst activity.

Any wet/unstable soils present at the subgrade level during grading operations should be either scarified, aerated and re-compacted or should be removed and replaced with suitable fill materials. Any unsuitable subgrade soils should be corrected immediately prior to placement of stone. It is very important that the stone be placed immediately after final soil subgrade approval has been obtained due to the potential for subgrade softening from adverse weather conditions. In addition, heavy construction traffic should be limited from traveling across approved final subgrade areas that have been subjected to adverse weather conditions to help maintain a stable subgrade prior to pavement construction.

Karst Feature and Sinkhole Remediation

Existing karst features and sinkholes, with the exception of the depression located southeast of Boring B-29 that is mapped as a wetland, should be repaired as part of the site development. The remediation of the active sinkholes located immediately south of boring B-50, between borings B-27 and B-28, northwest of boring B-30 and immediately west of boring B-38 should involve cleaning of the loose soil, soft weathered sandstone rock and miscellaneous debris to depths of dense weathered rock or any observed throat of the sinkhole. The excavation should extend away from the center of the sinkhole, as necessary, to remove all loose soils. If a throat of the sinkhole or solution channel is encountered, it should then be cleaned out and surrounding rock is exposed. A large trackhoe and possible hand excavations will likely be required to achieve this desired goal.

Refusal depths of the borings in close proximity to the existing sinkholes was 10 feet or less. Therefore, the contractor should be prepared to extend the vertical excavation a minimum of 10 feet and should be prepared to excavate to greater depths if required. Upon completion of the excavation operations, any defined throat of the sinkhole should be filled with varying sized rock to plug the throat. The initial rock should be sized greater than or approximately equal to B/2, where "B" is the width of the throat and then grading to smaller aggregate to develop a reverse graded filler. Upon completion of aggregate placement, if required, the area should be covered with a non-woven geotextile fabric and filled with compacted low permeability on-site clayey soils. The clayey soils should be placed and compacted in a controlled manner to not less than 98 percent of the maximum dry density based on the Standard Proctor moisture-density test (ASTM D 698). Fill materials should be placed in loose lifts not more than 6 inches for light compaction equipment and 10 inches for material compacted by heavy compaction equipment. Moisture contents of the fill materials should be adjusted, as necessary, to achieve the required compaction. Compaction testing should be performed on each lift of material placed.

The large mapped depression located in the vicinity of borings B-38 and B-39 should be remediated by removing the existing topsoil and loose materials and capping the depression with compacted low permeability clayey soils as noted above. Positive drainage away from all karst features should be established as part of the remediation process.

We recommend that Triad be retained to provide on-site consulting and oversight services during remediation. A geotechnical engineer or geologist should be present full time during all remediation work to aid in directing the remediation contractor and to document all remediation activities.

Construction Observation

We recommend that Triad be retained to observe the construction activities to verify that the field conditions are consistent with the findings of our exploration. If significant variations are encountered, or if the design is altered, we should be notified.

The geotechnical engineer should provide personnel as required to observe and document proof-rolling prior to fill placement. In addition, all fill material should be monitored, tested, and approved during fill construction. Field density tests should be performed in accordance with ASTM D 6938 (nuclear method). A minimum of three field density tests should be performed for each lift of fill placed or a minimum of one test for every 2,500 square feet of fill placed to confirm the required soil compaction.

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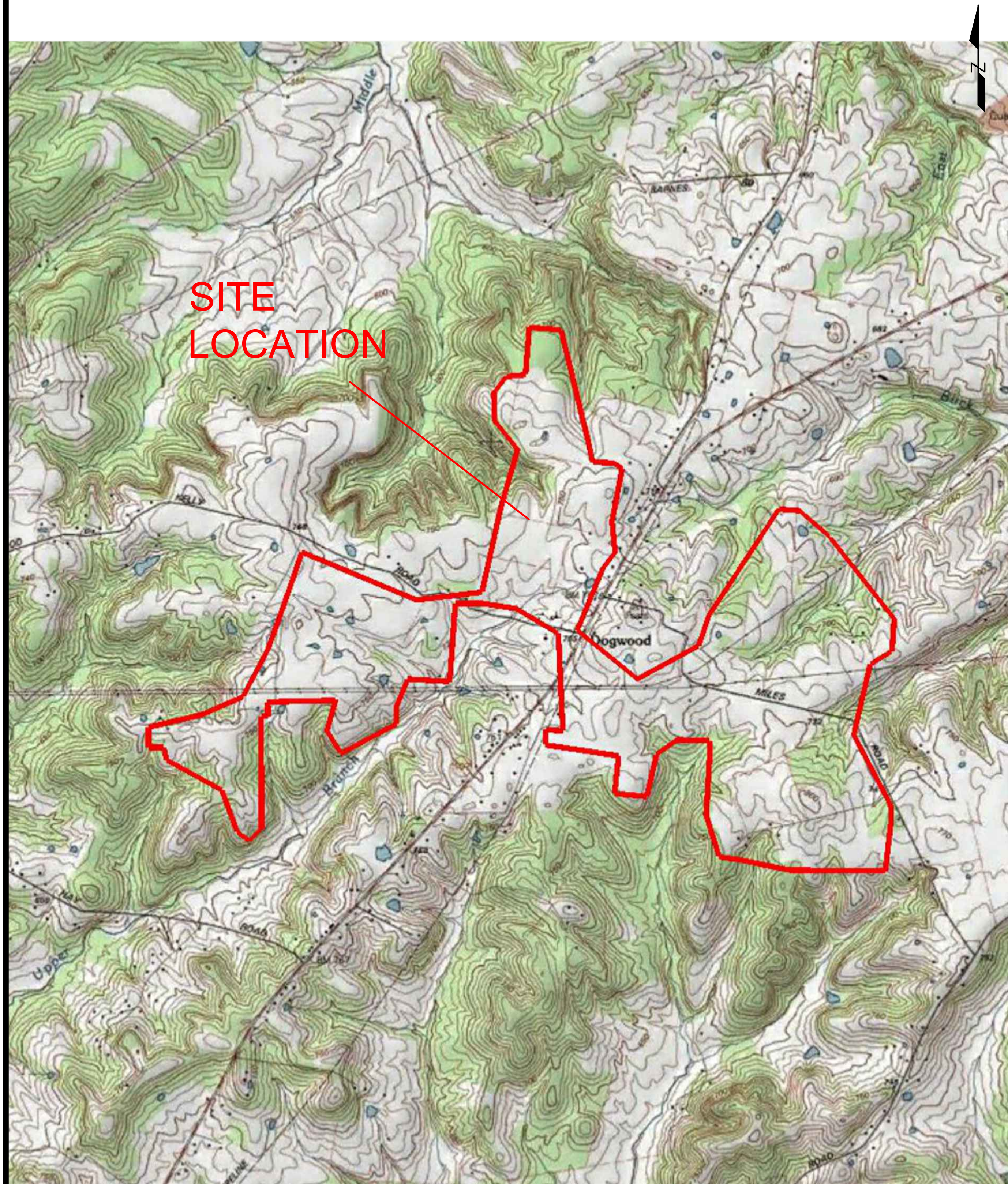
APPENDIX A

Illustrations



HOPKINSVILLE KENTUCKY		SITE LOCATION PLAN	TRIAD ENGINEERING, INC. www.triadeng.com 1075-D SHERMAN AVENUE HAGERSTOWN, MD 21740
PREPARED BY: ARK	REVIEWED BY: BAR	DOGWOOD CORNERS SOLAR PROJECT	
DATE: 9/22/2022	SCALE: N/A	PROJECT NO:04-22-0345 Figure: A-1	

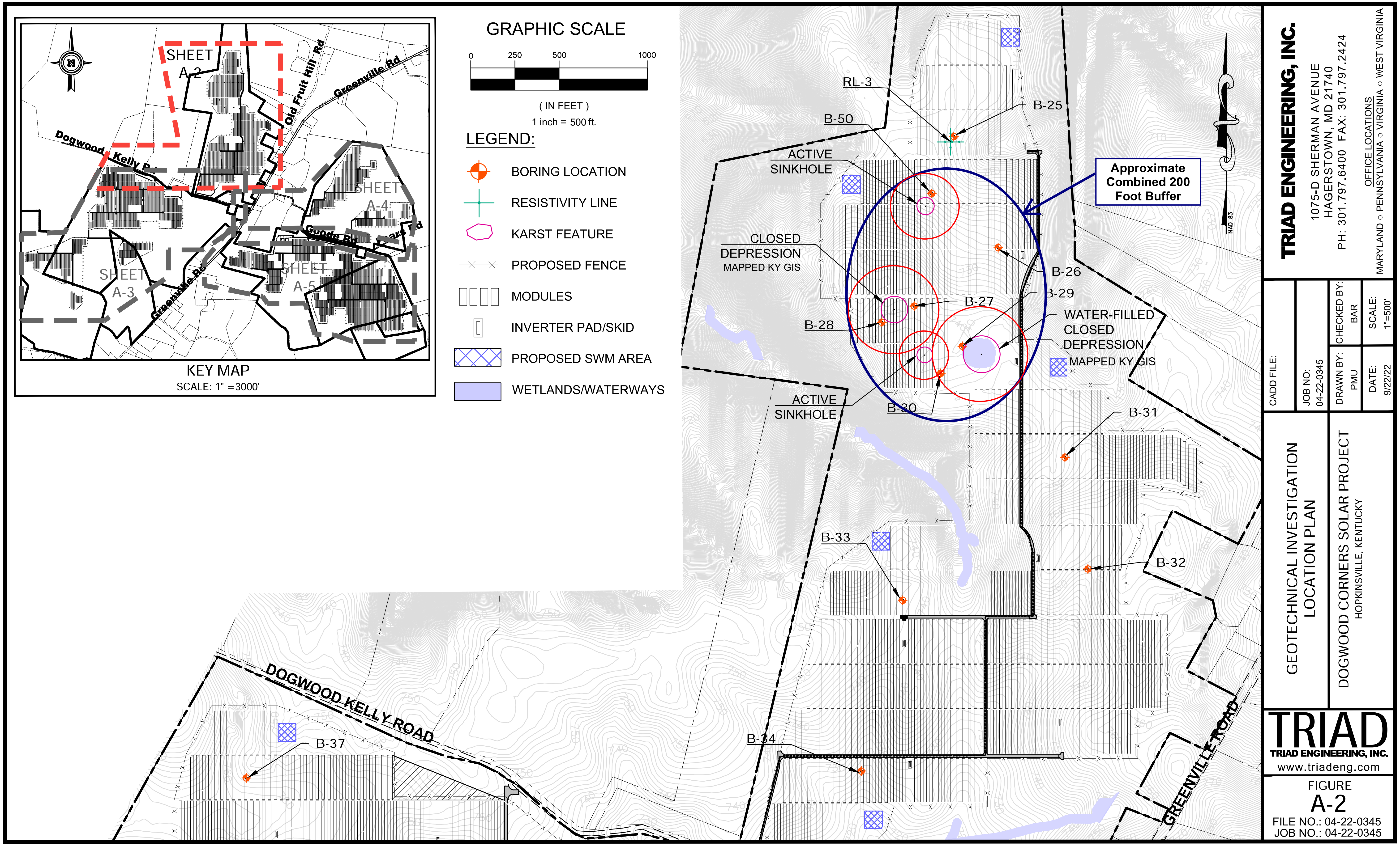

SHEET A-2
SHEET A-3
SHEET A-4
SHEET A-5
Old Fruit Hill Rd
Greenville Rd
Dogwood Kelly Rd
Goode Rd
KEY MAP
SCALE: 1" =3000'
GRAPHIC SCALE
0
250
500
1000
(IN FEET)
1 inch = 500 ft.
LEGEND:
BORING LOCATION
RESISTIVITY LINE
KARST FEATURE
PROPOSED FENCE
MODULES
INVERTER PAD/SKID
PROPOSED SWM AREA
WETLANDS/WATERWAYS
RL-3
B-25
B-50
ACTIVE
SINKHOLE
Approximate
Combined 200
Foot Buffer
CLOSED
DEPRESSION
MAPPED KY GIS
B-26
B-29
B-27
B-28
WATER-FILLED
CLOSED
DEPRESSION
MAPPED KY GIS
ACTIVE
SINKHOLE
B-30
B-31
B-33
B-32
B-34
B-37
DOGWOOD KELLY ROAD
GREENVILLE ROAD
NAD 83
TRIAD ENGINEERING, INC.
1075-D SHERMAN AVENUE
HAGERSTOWN, MD 21740
PH: 301.797.6400 FAX: 301.797.2424
OFFICE LOCATIONS
MARYLAND ○ PENNSYLVANIA ○ VIRGINIA ○ WEST VIRGINIA
CADD FILE:
JOB NO: 04-22-0345
DRAWN BY: PMU
CHECKED BY: BAR
DATE: 9/22/22
SCALE: 1"=500'
GEOTECHNICAL INVESTIGATION
LOCATION PLAN
DOGWOOD CORNERS SOLAR PROJECT
HOPKINSVILLE, KENTUCKY
TRIAD
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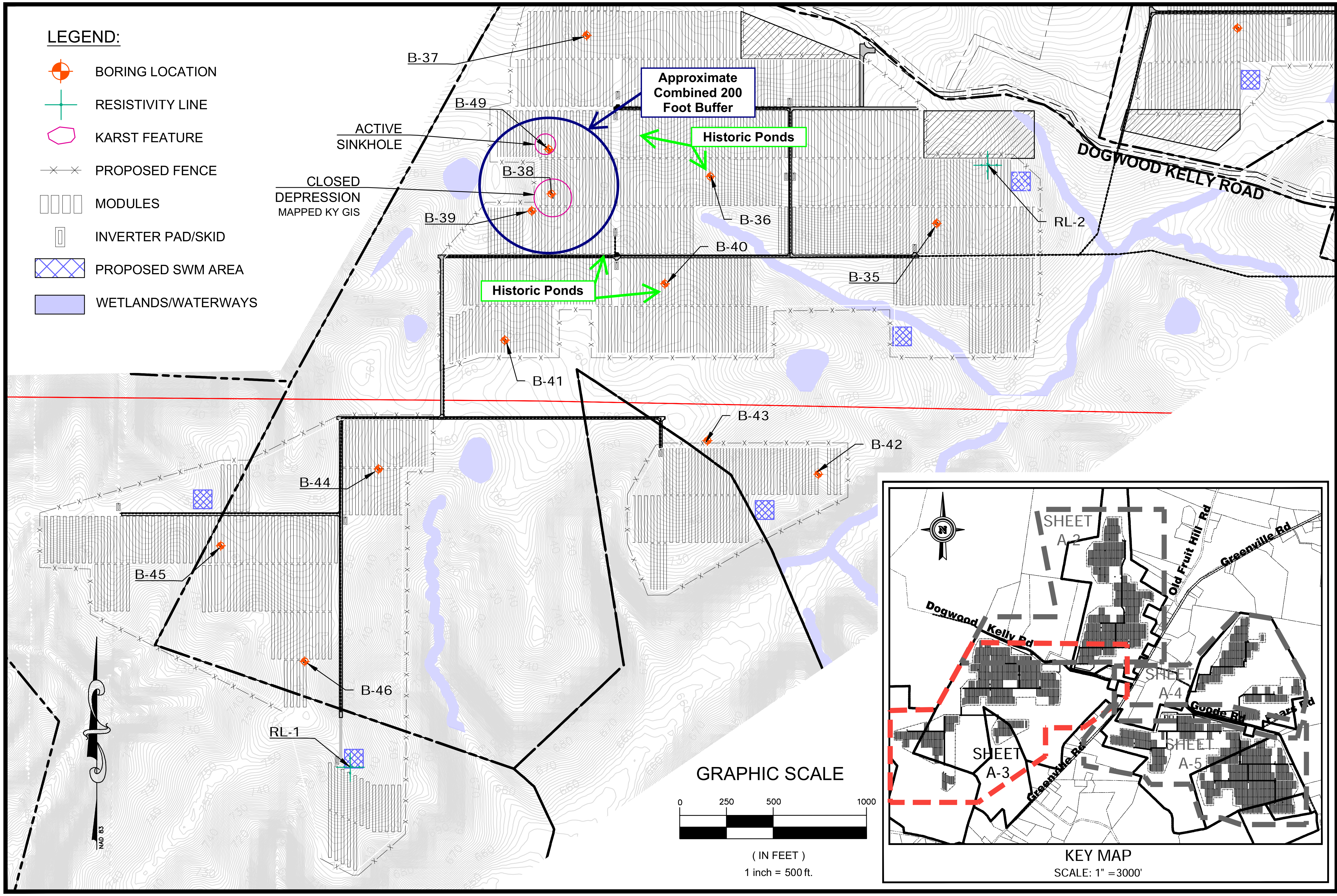
FIGURE
A-2
FILE NO.: 04-22-0345
JOB NO.: 04-22-0345



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CHECKED BY: BAR
DATE: 9/22/22
SCALE: 1"=500'

GEOTECHNICAL INVESTIGATION LOCATION PLAN
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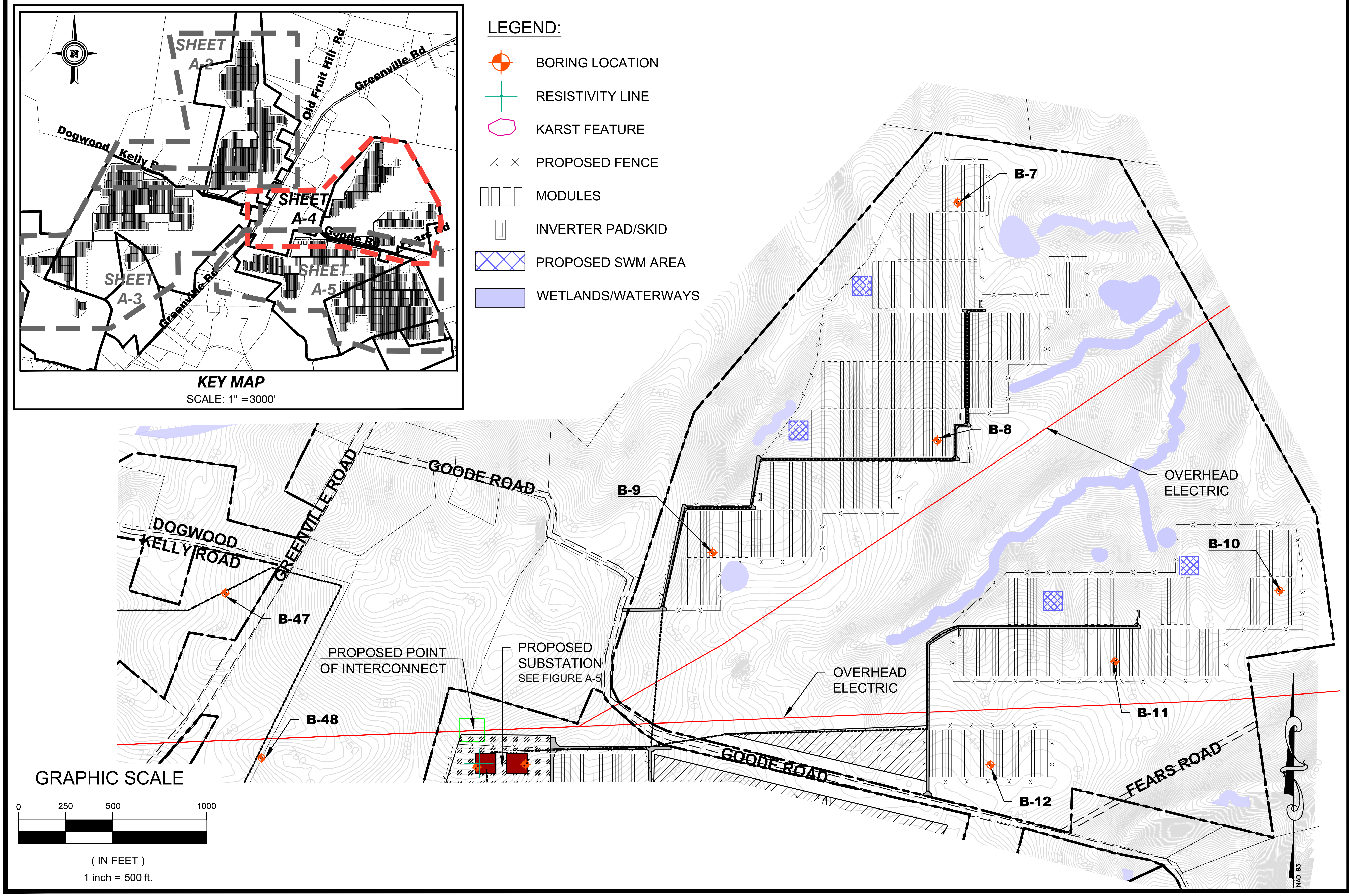
FIGURE
A-3
FILE NO.: 04-22-0345
JOB NO.: 04-22-0345



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CADD FILE:	JOB NO: 04-22-0345	DRAWN BY: PMU	CHECKED BY: BAR
		DATE: 9/22/22	SCALE: 1"=500'

GEOTECHNICAL INVESTIGATION LOCATION PLAN

DOGWOOD CORNERS SOLAR PROJECT
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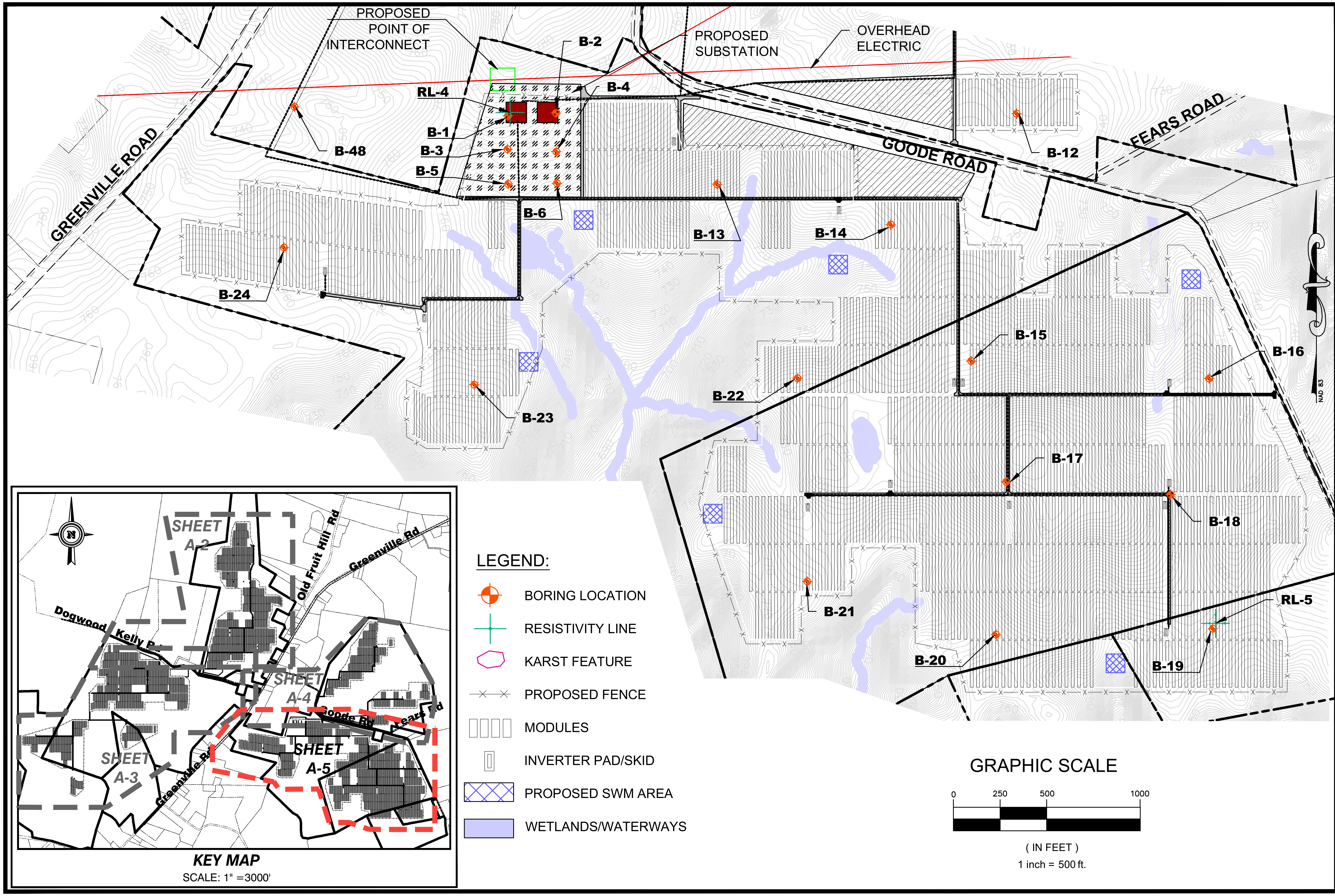
FIGURE
A-4
FILE NO.: 04-22-0345
JOB NO.: 04-22-0345



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HAGERSTOWN, MD 21740
PH: 301.797.6400 FAX: 301.797.2424

OFFICE LOCATIONS
MARYLAND ○ PENNSYLVANIA ○ VIRGINIA ○ WEST VIRGINIA

CADD FILE:	JOB NO: 04-22-0345	DRAWN BY: PMU	CHECKED BY: BAR	DATE: 9/22/22	SCALE: 1"=500'

GEOTECHNICAL INVESTIGATION LOCATION PLAN

DOGWOOD CORNERS SOLAR PROJECT
HOPKINSVILLE, KENTUCKY

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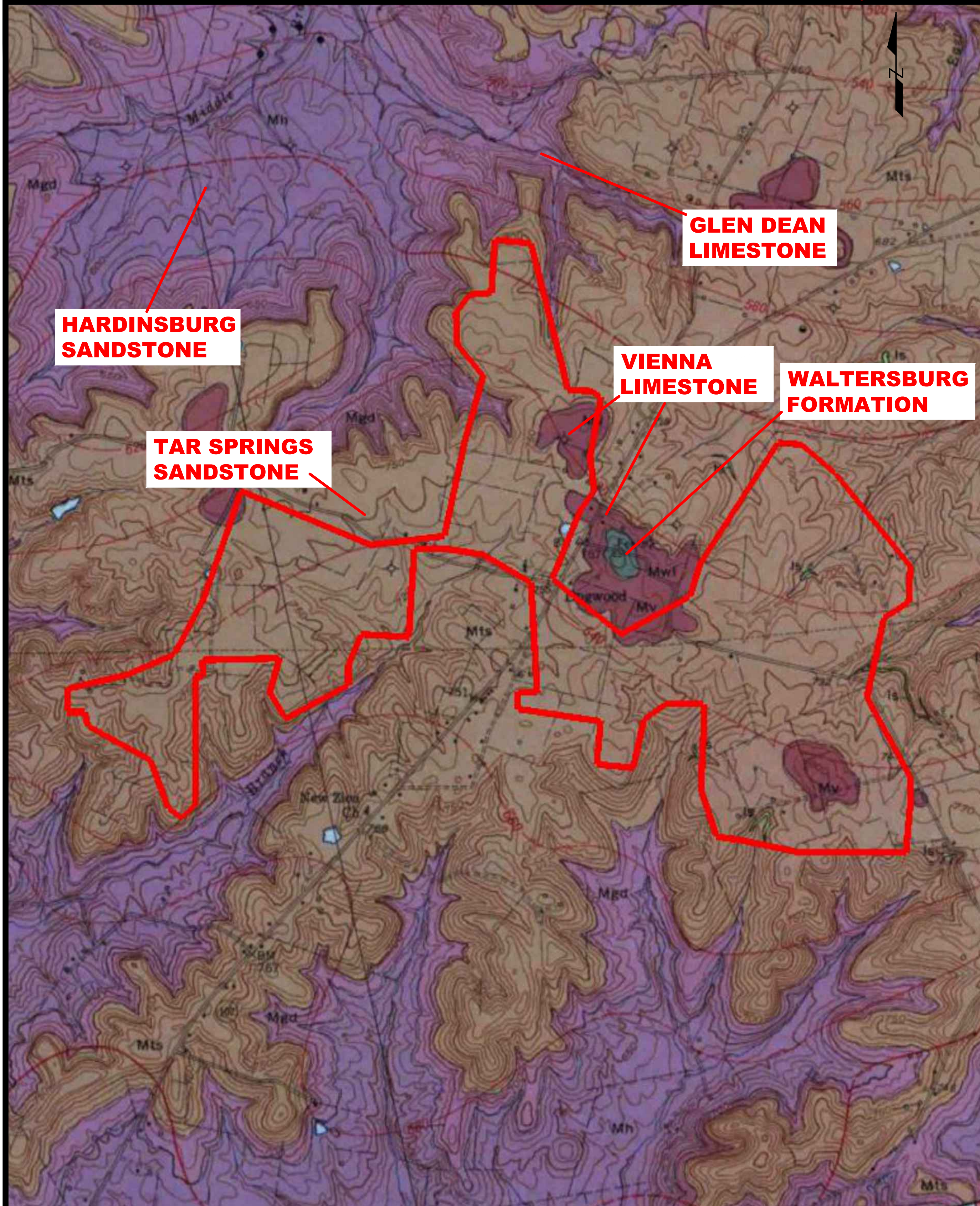
FIGURE
A-5

FILE NO.: 04-22-0345
JOB NO.: 04-22-0345



HOPKINSVILLE KENTUCKY		SITE GEOLOGIC PLAN
PREPARED BY: ARK	REVIEWED BY: BAR	DOGWOOD CORNERS SOLAR PROJECT
DATE: 9/22/2022	SCALE: N/A	PROJECT NO:04-22-0345 Figure: A-6

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TRIAD ENGINEERING, INC.

APPENDIX B

Field Exploration

Triad Engineering, Inc.

Field Exploration

A representative of Triad was present to direct the drill crew, log recovered samples and observe groundwater conditions. The borings were drilled utilizing a CME-550 rotary auger drill rig and Wildcat. Samples of in-situ soil and weathered bedrock were obtained using a split-barrel sampler while performing Standard Penetration Tests (ASTM D 1586). The results of these tests (N-values) are commonly interpreted to provide an index to strength, consistency or relative density of the sampled materials and their ability to support foundations.

Groundwater levels were checked both during and after drilling operations. Groundwater levels encountered during the auger drilling are recorded on the individual logs. Groundwater levels indicated after rock coring operations are not considered representative of true groundwater levels, due to the introduction of water into the borehole during rock coring. It is emphasized that groundwater levels typically vary and are dependent upon climatic conditions and other environmental factors.

It is also emphasized that the lines shown on the logs are estimates of the changes in material. Actual changes may be gradual and may vary from those indicated on the logs, and the subsurface conditions between the borings may differ from those depicted on the logs. The boreholes were backfilled upon completion of the drilling with auger cuttings. Samples were transported to our office for temporary storage and additional analysis. The samples will be discarded after a period of 60 days unless other arrangements are made.

KEY TO IDENTIFICATION OF SOIL AND WEATHERED BEDROCK SAMPLES

Descriptor Sequence	
1	Color
2	Primary Component
3	Fractions
4	Moisture
5	Descriptors
6	Plasticity
7	Consistency/ Relative Density
8	Deposition Type

1. Color	
Gray	Tan
Brown	Black
Orange	Red
Green	Yellow
Purple	Blue
Modifiers	
Light	Lighter side of color range
Dark	Darker side of color range
Mottled	Irregularly marked with spots of different colors
Banded	Alternating shades or colors

2. Primary Component	
Component	**Grain Size**
Boulders	≥ 12 inches
Cobbles	3 to 12 inches
Coarse Gravel	1 to 3 inches
Medium Gravel	$^{3}/_{8}$ to 1 inch
Fine Gravel	$^{5}/_{64}$ to $^{3}/_{8}$ inch
Coarse Sand	#40 to #10
Fine Sand	#200 to #40
Silt/Clay	≤ #200

3. Fractions	
And	≥ 35%
Some	20 to 35%
Little	10 to 20%
Trace	< 10%

4. Moisture	
Dry	Dry to touch
Damp	Slightly moist
Moist	No visible free water
Wet	Visible free water

5. Descriptors	
Fissile	Splits easily along closely spaced parallel planes (breaks into plates)
Hackly	Jagged or irregular fracture planes
Slickenside	Polished and striated surface that results from friction along a fault plane
Laminated	Alternating thin layers of varying material or colors less than ¼” thick
Lensed	Inclusion of small pockets of different soils
Saprolitic	Completely weathered rock that retains the appearance of the original rock structure but has only a trace of the original bond strength
Micaceous	Containing mica minerals
Varved	Laminated sediment consisting of alternating layers of fine sand and silt or clay deposited in still water

6. Plasticity of Fine-Grained Soils

Fine-Grained Component	Plasticity	Estimated Plasticity Index (PI)	Smallest Thread Diameter	Thread Characteristics	Dilatancy
Predominately Silt: Silt ↑ More Silt ↑	Non-Plastic	0 - 2%	Ball cracks	Dries rapidly; a 1/8-inch thread cannot be rolled at any water content	Moist ball sheds water when shaken giving a glossy appearance
	Low Plasticity	3 - 10%	$^{1}/_{8}$ to $^{1}/_{4}$ inch	Feels powdery when drying out during rolling; thread can barely be rolled	Moist ball retains water or sheds water slowly when shaken
Predominately Clay: ↓ More Clay ↓ Clay	Medium Plasticity	> 10 - 20%	$^{1}/_{16}$ inch	Thread cannot be rerolled after reaching plastic limit	
	Highly Plastic	> 20%	$^{1}/_{32}$ inch	Thread can be rerolled after reaching plastic limit	Moist ball retains water when shaken

7a. Relative Density of Granular Coarse-Grained Soils

Descriptor	N-Value
Very Loose	≤ 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

7b. Consistency of Fine-Grained Soils

Descriptor	Pocket Penetrometer (tons/ft^2)	N-Value
Very Soft	≤ 0.25	≤ 2
Soft	≥ 0.25 - 0.5	3 - 4
Medium Stiff	> 0.5 - 1.0	5 - 8
Stiff	> 1.0 - 2.0	9 - 15
Very Stiff	> 2.0 - 4.0	16 - 30
Hard	> 4	≥ 31

8. Type of Deposit	
Alluvium	Sediment deposited by moving water
Colluvium	Sediment deposited by gravity
Fill	Manmade deposit
Fluviomarine	Stratified materials formed by the combined action of river and sea processes
Glacial Outwash	Sediment deposited by glacial meltwater; commonly sand and gravel
Glacial Till	Unsorted sediment deposited by glacier
Glacial Lake Deposit	Sediment deposited in glacial lake; commonly silt and clay
Residuum	Insoluble material remaining from weathered rock
Weathered Bedrock	Bedrock that has been weathered

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FIGURE B-1

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-1**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/17/22 Drill/Method: CME 550
Date Completed: 8/18/22 Driller: VB (TERRA TESTING) Ground Elev.: 769

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Sample No.	Sample Type	Blow Counts	Recovery (%)
S-1	Standard Split Spoon	4-4-7 PP: 3.75-4.5	100%
S-2	Standard Split Spoon	7-9-9 PP: >4.5	100%
S-3	Standard Split Spoon	3-6-10 PP: 2-3	100%
S-4	Standard Split Spoon	8-14-19 PP: >4.5	100%
S-5	Standard Split Spoon	13-19-27 PP: >4.5	100%
S-6	Standard Split Spoon	11-16-22 PP: >4.5	100%
S-7	Standard Split Spoon	14-24-50/0.5 PP: >4.5	100%
S-8	Standard Split Spoon	34-22-50/0.5	87%
S-9	Standard Split Spoon	20-21-27	100%

Strata Depth (ft)	MATERIAL DESCRIPTION	Strata Elevation
1.0	**TOPSOIL**	768.0
5.0	Tan **CLAY**, little gravel, trace sand, damp, medium plasticity, very stiff to hard, **residuum**	764.0
8.0	Tan and gray **CLAY**, trace sand, damp, medium plasticity, stiff to very stiff, **residuum**	761.0
16.0	Tan **CLAY**, little shale gravel, trace sand, damp, saprolitic, medium plasticity, hard, **residuum**	753.0
20.5	Gray **SHALE**, dry, very dense, **weathered bedrock**	748.5

Boring terminated at 20.5 feet

Depth (feet): 5.0, 10.0, 15.0, 20.0, 25.0

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-2**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/18/22 Drill/Method: CME 550
Date Completed: 8/18/22 Driller: VB (TERRA TESTING) Ground Elev.: 762

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-6-8 PP: 4	100%		1.0	**TOPSOIL**				761.0
	S-2	Standard Split Spoon	6-8-10 PP: 3.5-4.5	100%		5.0	Tan and gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, very stiff to hard, **residuum**				757.0
5.0	S-3	Standard Split Spoon	4-6-7 PP: 1.75-2.5	100%							
	S-4	Standard Split Spoon	3-7-16 PP: >4.5	33%		8.5	Gray and tan **CLAY**, trace gravel, damp, medium plasticity, stiff to very stiff, **residuum**				753.5
10.0	S-5	Standard Split Spoon	13-22-26 PP: >4.5	100%							
	S-6	Standard Split Spoon	18-29-40 PP: >4.5	100%		15.0	Gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, hard, **residuum**				747.0
15.0	S-7	Standard Split Spoon	13-50/.09	100%		15.9	Tan **SANDSTONE**, dry, very dense, **weathered bedrock**				746.1
							Boring terminated at 15.9 feet				
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-3**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/18/22 Drill/Method: CME 550
Date Completed: 8/18/22 Driller: VB (TERRA TESTING) Ground Elev.: 762

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-6-9	100%		1.5	**TOPSOIL**				760.5
	S-2	Standard Split Spoon	6-7-11 PP: 3-4	100%							
5.0						5.3	Tan and gray **CLAY**, trace sand, damp, medium plasticity, very stiff, **residuum**				756.7
	S-3	Standard Split Spoon	4-5-2 PP: 1.75-2.25	100%		7.8	Tan and gray **CLAY**, trace gravel, damp, medium plasticity, stiff to very stiff, **residuum**				754.2
	S-4	Standard Split Spoon	6-10-16 PP: >4.5	100%							
10.0											
	S-5	Standard Split Spoon	15-23-22 PP: >4.5	100%							
	S-6	Standard Split Spoon	14-19-26 PP: >4.5	100%							
15.0						15.0	Tan and gray **CLAY**, trace gravel, trace to little sand, dry, medium plasticity, hard, **residuum**				747.0
	S-7	Standard Split Spoon	33-26-50/0.3	100%		16.3	Tan **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				745.7
							Boring terminated at 16.3 feet				
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Sheet 1 of 1

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**	Boring No.:	**B-4**
Logger:	MAR	Boring Location:	See boring location plan		
Date Started:	8/18/22	Drill/Method:	CME 550		
Date Completed:	8/18/22	Driller:	VB (TERRA TESTING)	Ground Elev.:	757

Legend: ■ Shelby Tube; ⊠ Standard Split Spoon; ◧ Core Sample; ⧄ Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	⊠	6-5-6			1.1	**TOPSOIL**				755.9
	S-2	⊠	7-9-10 PP: >4.5			5.0	Tan and gray **CLAY**, trace gravel, trace sand, damp, hard, **residuum**				752.0
5.0	S-3	⊠	4-6-7 PP: 2.5-3.75			8.0	Tan and gray **CLAY**, trace gravel, trace organics, damp to moist, medium to high plasticity, very stiff, **residuum**				749.0
	S-4	⊠	9-27-50/0.5				Tan **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				
10.0	S-5	⊠	26-50/0.5			10.8					746.2
							Auger refusal at 10.8 feet				
							Boring terminated at 10.8 feet				
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-5**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/18/22 Drill/Method: CME 550
Date Completed: 8/18/22 Driller: VB (TERRA TESTING) Ground Elev.: 756

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-5-9 PP: >4.5	100%		1.0	**TOPSOIL**				755.0
	S-2	Standard Split Spoon	5-10-13 PP: >4.5	100%			Tan and gray **CLAY**, little gravel, damp, medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	4-9-15 PP: >4.5	100%		8.0	- Some weathered sandstone gravel from 7.5 to 8.0 feet				748.0
	S-4	Standard Split Spoon	36-24-32 PP: >4.5	100%		11.0	Tan **CLAY**, little sand, trace gravel, dry, medium plasticity, hard, **residuum**				745.0
10.0	S-5	Standard Split Spoon	13-37-50/0.3 PP: >4.5	100%							
	S-6	Standard Split Spoon	50/0.3	100%		11.6	Tan **SHALE**, partially arenaceous, dry, very dense, **weathered bedrock**				744.4
15.0							Auger refusal at 11.6 feet				
20.0							Boring terminated at 11.8 feet				
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-6**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/18/22 Drill/Method: CME 550
Date Completed: 8/18/22 Driller: VB (TERRA TESTING) Ground Elev.: 751

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-11-32	100%		1.5	**TOPSOIL** - Sandstone boulder from 1.0 to 1.5 feet				749.5
	S-2	Standard Split Spoon	5-6-9 PP: 2.5-3.5	100%		5.0	Tan and gray **CLAY**, trace gravel, damp, medium to high plasticity, very stiff, **residuum**				746.0
5.0	S-3	Standard Split Spoon	12-17-21 PP: >4.5	100%							
	S-4	Standard Split Spoon	15-24-30 PP: >4.5	100%		10.0	Tan and gray **CLAY**, trace sand, trace gravel, damp, medium plasticity, hard, **residuum**				741.0
10.0	S-5	Standard Split Spoon	50/0.3	5%		10.3	Tan **SANDSTONE**, dry, very dense, **weathered bedrock**				740.7
							Auger refusal at 10.3 feet				
15.0							Boring terminated at 10.3 feet				
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-7**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/23/22 Drill/Method: CME 550
Date Completed: 8/23/22 Driller: VB (TERRA TESTING) Ground Elev.: 690

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	6-4-7	100%		1.2	**TOPSOIL**				688.8
	S-2	Standard Split Spoon	5-6-11 PP:3.25-3.75	100%		5.5	Tan and gray **CLAY**, trace sand, trace gravel, damp, medium plasticity, very stiff, **residuum**				684.5
5.0	S-3	Standard Split Spoon	15-36-33 PP:3.75-4.25	100%							
	S-4	Standard Split Spoon	6-9-13 PP:3.5-3.75	100%		10.0	Tan and gray **CLAY**, trace to little gravel, little sand, damp, medium plasticity, very stiff to hard, **residuum** - Sandstone cobble from 6.5 to 7.0 feet				680.0
10.0	S-5	Standard Split Spoon	6-10-12 PP:>4.5	100%		12.5	Tan and red **CLAY**, little gravel, little sand, damp, medium plasticity, hard, **residuum**				677.5
	S-6	Standard Split Spoon	3-4-5 PP:0.5-1.25	100%		15.0	Brown and black **CLAY**, trace sand, moist, medium plasticity, stiff, **residuum** - Weathered sandstone and shale at 14.5 to 15 feet				675.0
15.0	S-7	Standard Split Spoon	7-7-50/0.2 PP:0.5-1.0	100%		15.2	Brown and black **CLAY**, some sand, little gravel, wet, low plasticity, **residuum** Spoon refusal at 15.2 feet				674.8
20.0							Boring terminated at 15.2 feet.				
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-8**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/19/22 Drill/Method: CME 550
Date Completed: 8/19/22 Driller: VB (TERRA TESTING) Ground Elev.: 722

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-4-6	100%		1.2	**TOPSOIL**				720.8
5.0	S-2	Standard Split Spoon	9-12-14 PP: 4.25-4.5	100%		5.0	Tan and gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, hard, **residuum**				717.0
	S-3	Standard Split Spoon	5-6-9 PP: 2.25-2.75	100%		7.5	Tan and gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, very stiff, **residuum**				714.5
	S-4	Standard Split Spoon	18-26-50/0.3 PP: >4.5	100%		8.5	Tan and orange **CLAY**, trace shale gravel, trace sand, dry, saprolitic, hard, **residuum**				713.5
10.0	S-5	Standard Split Spoon	22-33-41	100%		11.5	Gray **SHALE**, dry, very dense, **weathered bedrock**				710.5
15.0							Auger refusal at 11.5 feet				
20.0							Boring terminated at 11.5 feet				
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-9**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/19/22 Drill/Method: CME 550
Date Completed: 8/19/22 Driller: VB (TERRA TESTING) Ground Elev.: 755

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	6-5-9	100%		1.2	**TOPSOIL**				753.8
	S-2	Standard Split Spoon	5-6-5 PP: 2.25-4	80%			Tan and gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, very stiff, **residuum**				
5.0	S-3	Standard Split Spoon	3-5-7 PP: 2-3.75	100%		8.0					747.0
	S-4	Standard Split Spoon	7-14-20 PP: >4.5	100%			Gray **CLAY**, trace sand, damp, saprolitic, medium plasticity, hard, **residuum**				
10.0	S-5	Standard Split Spoon	11-29-50/0.5	100%		11.0					744.0
	S-6	Standard Split Spoon	18-29-48 PP: >4.5	100%			Gray **SHALE**, dry, very dense, **weathered bedrock**				
	S-7	Standard Split Spoon	34-50/0.3	100%		14.8	Spoon refusal at 14.8 feet				740.2
15.0							Boring terminated at 14.8 feet				
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-10**

Logger: KRC Boring Location: See Boring Location Plan

Date Started: 8/23/22 Drill/Method: CME 550

Date Completed: 8/23/22 Driller: VB (TERRA TESTING) Ground Elev.: 710

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	7-5-7 PP:>4.5	100%		1.0	**TOPSOIL**				709.0
	S-2	Standard Split Spoon	8-10-11 PP:>4.5	100%			Tan **CLAY**, trace gravel, trace sand, trace organics, dry to damp, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Standard Split Spoon	4-4-7 PP: 3.5	100%		6.0					704.0
	S-4	Standard Split Spoon	5-12-13 PP:>4.5	100%			Gray **CLAY**, trace gravel, trace to little sand, dry to damp, medium plasticity, very stiff to hard, **residuum**				
10.0	S-5	Standard Split Spoon	8-13-18 PP:>4.5	100%		12.5					697.5
	S-6	Standard Split Spoon	12-17-36 PP:>4.5	100%		15.0	Gray **CLAY**, little sand, trace gravel, dry, saprolitic, medium plasticity, hard, **residuum**				695.0
15.0	S-7	Standard Split Spoon	29-31-50/0.3	100%		15.3	Gray **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				694.7
							Spoon refusal at 15.3 feet				
							Boring terminated at 15.3 feet				
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-11**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/23/22 Drill/Method: CME 550
Date Completed: 8/23/22 Driller: VB (TERRA TESTING) Ground Elev.: 730

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-5-4	100%		1.3	**TOPSOIL**				728.7
	S-2	Standard Split Spoon	7-10-12 PP:>4.5	100%		5.0	Brown **CLAY**, trace organics, trace sand, dry, medium plasticity, hard, **residuum**				725.0
5.0	S-3	Standard Split Spoon	11-9-11	40%			Tan **CLAY**, little gravel, trace sand, trace organics, dry, medium plasticity, hard, **residuum** - Small sandstone cobble from 6.0 to 6.5 feet				
	S-4	Standard Split Spoon	4-6-10 PP:>4.5	67%		10.5					719.5
10.0	S-5	Standard Split Spoon	11-18-26 PP:>4.5	100%			Brown **CLAY** and **SILT**, trace sand, trace gravel, dry, low plasticity, hard, **residuum**				
	S-6	Standard Split Spoon	16-40-50/0.3	77%		13.8					716.2
	S-7	Standard Split Spoon	50/0.3			14.1	Brown **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock** Spoon refusal at 14.1 feet				715.9
15.0							Boring terminated at 14.1 feet				
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-12**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/23/22 Drill/Method: CME 550
Date Completed: 8/23/22 Driller: VB (TERRA TESTING) Ground Elev.: 740

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Split Spoon	6-6-8	100%		1.0	**TOPSOIL**				739.0
	S-2	Split Spoon	7-7-12 PP:3.25->4.5	100%			Tan and gray **CLAY**, little gravel, trace sand, damp, saprolitic, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Split Spoon	4-8-13 PP:3.75->4.5	100%		8.0					732.0
	S-4	Split Spoon	7-29-21 PP:3.75->4.5	100%		10.0	Gray and tan **CLAY**, trace sand, trace gravel, damp, saprolitic, medium plasticity, hard, **residuum**				730.0
10.0	S-5	Split Spoon	34-32-50/0.4			11.4	Gray and tan **SANDSTONE** and **SHALE**, dry, very dense, **weathered bedrock**				728.6
							Auger refusal at 11.4 feet				
							Boring terminated at 11.4 feet				
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-13**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/25/22 Drill/Method: CME 550
Date Completed: 8/25/22 Driller: VB (TERRA TESTING) Ground Elev.: 734

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	7-7-10 PP:>4.5	100%		1.5	**TOPSOIL**				732.5
	S-2	Standard Split Spoon	9-13-10 PP:>4.5	60%			Tan and red **CLAY**, trace to little gravel, trace to little sand, dry to damp, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Standard Split Spoon	7-7-10 PP:3.5-3.75	100%		7.5					726.5
	S-4	Standard Split Spoon	4-6-7 PP:2.5-2.75	100%			Red, gray, and brown **CLAY**, trace gravel, trace sand, medium plasticity, very stiff, **residuum** - Little organics from 7.5 to 10.0 feet				
10.0	S-5	Standard Split Spoon	18-26-39 PP: 3.75	100%		12.5					721.5
	S-6	Standard Split Spoon	29-24-50/0.3	86%		13.8	Dark Gray **LIMESTONE**, dry, very dense, **weathered bedrock** Spoon refusal at 13.8 feet Boring terminated at 13.8 feet				720.2
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-14**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/25/22 Drill/Method: CME 550
Date Completed: 8/25/22 Driller: VB (TERRA TESTING) Ground Elev.: 744

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	7-8-8 PP:4.25	100%		1.2	**TOPSOIL**				742.8
	S-2	Standard Split Spoon	8-11-11 PP:>4.5	100%		5.0	Tan **CLAY** and **GRAVEL**, some sand, dry to damp, medium dense, hard (clay), **residuum**				739.0
5.0	S-3	Standard Split Spoon	5-6-10 PP:2.5-3.5	100%		7.8	Gray and red **CLAY**, trace gravel, trace sand, trace organics, damp, medium plasticity, very stiff, **residuum**				736.2
	S-4	Standard Split Spoon	6-10-6 PP:>4.5	100%			Gray, brown and tan **CLAY**, trace sand, trace gravel, damp to dry, medium plasticity, hard, **residuum**				
10.0	S-5	Standard Split Spoon	18-46-49 PP:>4.5	100%		11.5	Auger refusal at 11.5 feet				732.5
							Boring terminated at 11.5 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-15**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/23/22 Drill/Method: CME 550
Date Completed: 8/23/22 Driller: VB (TERRA TESTING) Ground Elev.: 770

Shelby Tube | Standard Split Spoon | Core Sample | Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1		9-9-7	100%		1.5	**TOPSOIL**				768.5
5.0	S-2		6-10-12 PP:>4.5	100%		5.0	Tan and gray **CLAY** and **SILT**, trace organics, dry, medium plasticity, hard, **residuum**				765.0
	S-3		7-10-10 PP:>4.5	100%		8.0	Tan and gray **CLAY**, trace gravel, trace sand, trace organics, damp, medium plasticity, hard, **residuum**				762.0
10.0	S-4		13-21-26 PP:>4.5	100%		10.0	Gray **CLAY**, trace sand, trace gravel, dry, medium plasticity, **residuum** - Sandstone gravel from 8.0 to 8.4 feet				760.0
	S-5		32-50/0.1	100%		10.6	Gray **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				759.4
15.0							Auger refusal at 10.6 feet Boring terminated at 10.6 feet				
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-16**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/23/22 Drill/Method: CME 550
Date Completed: 8/23/22 Driller: VB (TERRA TESTING) Ground Elev.: 750

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-5-4 PP:3.5	100%		1.0	**TOPSOIL**				749.0
	S-2	Standard Split Spoon	3-4-5 PP:2.0-2.5	100%		5.0	Tan and gray **CLAY**, trace sand, trace organics, damp, very stiff, **residuum**				745.0
5.0	S-3	Standard Split Spoon	3-6-8 PP:1.75-2.5	100%		7.7	Tan and gray **CLAY**, little organics, trace gravel, trace sand, damp, medium plasticity, stiff to very stiff, **residuum**				742.3
	S-4	Standard Split Spoon	5-9-10 PP:>4.5	100%		10.0	Gray and brown **CLAY**, trace sand, damp, medium plasticity, hard, **residuum**				740.0
10.0	S-5	Standard Split Spoon	24-50/0.3	100%		12.6	Gray **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				737.4
	S-6		50/0.1				Auger refusal at 12.6 feet Boring terminated at 12.6 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Sheet 1 of 1

Project Number: **04-22-0345**	Project Name: **Dogwood Corners Solar Energy Project**		Boring No.: **B-17**
Logger: KRC	Boring Location: See Boring Location Plan		
Date Started: 8/24/22	Drill/Method: CME 550		
Date Completed: 8/24/22	Driller: VB (TERRA TESTING)		Ground Elev.: 790

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Split Spoon	6-6-5 PP:>4.5	100%		1.0	**TOPSOIL**				789.0
	S-2	Split Spoon	5-4-7 PP: 2.5->4.5	53%			Red, brown and gray **CLAY**, trace sand, trace gravel, damp, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Split Spoon	5-4-6 PP:>2.5->4.5	100%							
	S-4	Split Spoon	13-18-18 PP:3.25->4.5	100%		10.0					780.0
10.0	S-5	Split Spoon	10-16-16 PP:>4.5	100%			Gray **CLAY**, damp, saprolitic, medium plasticity, hard, **residuum**				
	S-6	Split Spoon	21-24-33 PP:>4.5	100%			- 2 inch pocket of brown sand and gravel from 12.8 to 13.0 feet				
	S-7	Split Spoon	36-50/0.3 PP:>4.5	100%		14.8	Spoon refusal at 14.8 feet				775.2
15.0							Boring terminated at 14.8 feet				
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**
Logger:	KRC	Boring Location:	See Boring Location Plan
Date Started:	8/25/22	Drill/Method:	CME 550
Date Completed:	8/25/22	Driller:	VB (TERRA TESTING)

Boring No.: **B-18**

Ground Elev.: 755

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	6-5-6 PP:4.0->4.5	100%		0.8	**TOPSOIL**				754.2
						2.5	Tan **CLAY** and **GRAVEL**, little sand, trace organics, damp, hard, **residuum**				752.5
	S-2	Standard Split Spoon	2-1-3 PP:2.5	27%							
5.0						5.3	Gray **CLAY**, trace organics, damp, medium plasticity, very stiff, **residuum**				749.7
	S-3	Standard Split Spoon	9-17-27 PP:>4.5	100%							
	S-4	Standard Split Spoon	14-23-31 PP:>4.5	87%							
10.0											
	S-5	Standard Split Spoon	17-29-48 PP:>4.5	100%		11.5	- Red sandstone gravel at 5.3 to 5.5 feet Gray **CLAY**, dry, saprolitic, medium plasticity, hard, **residuum**				743.5
15.0											
20.0											
25.0											

Auger refusal at 11.5 feet

Boring terminated at 11.5 feet

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number:	04-22-0345	Project Name:	Dogwood Corners Solar Energy Project
Logger:	KRC	Boring Location:	See Boring Location Plan
Date Started:	8/24/22	Drill/Method:	CME 550
Date Completed:	8/24/22	Driller:	VB (TERRA TESTING)

Boring No.: B-19

Ground Elev.: 763

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-6-6	100%		1.2	**TOPSOIL**				761.8
	S-2	Standard Split Spoon	7-9-10 PP:3.5-4.5	100%			Tan and gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Standard Split Spoon	5-6-10 PP:4.0->4.5	100%		8.0	- Small pocket of soft gray clay PP=0.75				755.0
	S-4	Standard Split Spoon	3-5-11 PP:2.5-3.5	100%		10.7	Gray and red **CLAY**, trace sand, trace gravel, damp, saprolitic, medium plasticity, very stiff, **residuum**				752.3
10.0	S-5	Standard Split Spoon	9-16-50/0.3 PP:>4.5	100%		11.3	Red and brown **SANDSTONE**, partially argillaceous, damp, very dense, **weathered bedrock**				751.7
15.0							Auger refusal at 11.3 feet				
20.0							Boring terminated at 11.3 feet				
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-20**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/24/22 Drill/Method: CME 550
Date Completed: 8/24/22 Driller: VB (TERRA TESTING) Ground Elev.: 770

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	3-5-7	100%		1.5	**TOPSOIL**				768.5
5.0	S-2	Standard Split Spoon	5-7-8 PP:4.0->4.5	100%			Tan and gray **CLAY**, trace sand, trace to little gravel, damp, low to medium plasticity, very stiff to hard, **residuum**				
	S-3	Standard Split Spoon	5-6-8 PP:1.75-3.25	100%							
10.0	S-4	Standard Split Spoon	3-5-7 PP:3.25-3.75	100%		10.5					759.5
	S-5	Standard Split Spoon	8-27-36	100%		12.5	Brown and red **SANDSTONE GRAVEL**, and **SAND**, some clay, damp, very dense, **residuum**				757.5
	S-6	Standard Split Spoon	13-24-27 PP:>4.5	100%		14.5	Brown **CLAY**, some gravel, some sand, damp, hard, **residuum**				755.5
15.0	S-7	Standard Split Spoon	28-50/0.5	100%		15.0	Gray **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				755.0
							Spoon refusal at 15.0 feet				
20.0							Boring terminated at 15.0 feet				
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-21**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/24/22 Drill/Method: CME 550
Date Completed: 8/24/22 Driller: VB (TERRA TESTING) Ground Elev.: 768

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)
0.0–1.5	S-1	Standard Split Spoon	4-3-5 PP:3.5	100%	
2.5–4.0	S-2	Standard Split Spoon	9-11-12 PP:>4.5	100%	
5.0–6.5	S-3	Standard Split Spoon	8-9-13 PP:4.0->4.5	100%	
7.5–9.0	S-4	Standard Split Spoon	5-6-8 PP:2.5-3.75	100%	
10.0–10.1	S-5		50/0.1	100%	

Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
1.5	**TOPSOIL**				766.5
8.0	Tan and gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, hard, **residuum**				760.0
10.0 / 10.1	Red and gray **CLAY**, trace sand, trace gravel, damp, medium plasticity, very stiff, **residuum** - Pocket of brown fine sand at 8.7 feet				758.0 / 757.9
	Red and tan **SANDSTONE**, damp, very dense, **weathered bedrock**				

Auger refusal at 10.1 feet
Boring terminated at 10.1 feet

Depth scale: 5.0, 10.0, 15.0, 20.0, 25.0

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-22**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/29/22 Drill/Method: CME 550
Date Completed: 8/29/22 Driller: VB (TERRA TESTING) Ground Elev.: 767

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-4-4	100%		1.5	**TOPSOIL**				765.5
5.0, 10.0	S-2	Standard Split Spoon	7-10-13 PP:4.0->4.5	100%		12.5	Tan and gray **CLAY**, trace to little gravel, trace to little sand, damp, medium plasticity, very stiff to hard, **residuum**				754.5
	S-3	Standard Split Spoon	8-9-12 PP:3.0-4.5	100%							
	S-4	Standard Split Spoon	7-6-15 PP:3.5->4.5	60%							
	S-5	Standard Split Spoon	8-11-17 PP:3.5-4.5	100%							
	S-6	Standard Split Spoon	11-19-50/0.3 PP:>4.5	100%		13.8	Red and gray **SANDSTONE**, damp, partially argillaceous, very dense, **weathered bedrock**				753.2
15.0, 20.0, 25.0							Auger refusal at 13.8 feet Boring terminated at 13.8 feet				

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-23**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/17/22 Drill/Method: CME 550
Date Completed: 8/17/22 Driller: VB (TERRA TESTING) Ground Elev.: 765

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-4-4 PP: 3-3.5	100%		1.0	**TOPOSIL**				764.0
	S-2	Standard Split Spoon	9-11-11 PP: 3.25-4.25	100%			Tan and gray **CLAY**, trace sand, trace gravel, damp, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Standard Split Spoon	8-14-12 PP: 3.25-4	100%							
	S-4	Standard Split Spoon	5-5-8 PP: 2.25-3	100%							
10.0	S-5	Standard Split Spoon	4-50/0.3	100%		10.5					754.5
	S-6	Standard Split Spoon	8-20-25	100%		14.0	Orange and gray **SAND** and **GRAVEL**, some clay, damp, saprolitic, dense to very dense, **residuum**				751.0
15.0	S-7	Standard Split Spoon	10-16-10 PP: 2.5	100%		15.5	Orange **CLAY**, some sand, trace gravel, damp, very stiff, **residuum**				749.5
							Boring terminated at 15.5 feet				
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-24**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/17/22 Drill/Method: CME 550
Date Completed: 8/17/22 Driller: VB (TERRA TESTING) Ground Elev.: 757

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-5-4 PP: 3-3.5	100%		1.0	**TOPOSIL**				756.0
	S-2	Standard Split Spoon	9-8-7 PP: 3.25	100%			Tan and gray **CLAY**, trace gravel, damp, medium plasticity, very stiff, **residuum**				
5.0	S-3	Standard Split Spoon	4-7-25 PP: 3.5	100%		6.0					751.0
	S-4	Standard Split Spoon	8-30-39	100%		9.0	Orange and gray **SAND** and **GRAVEL**, some clay, damp, saprolitic, very dense, **residuum**				748.0
	S-5	Standard Split Spoon	19-50/0.3	100%		9.8	Orange **SANDSTONE**, dry, very dense, **weathered bedrock**				747.2
10.0							Auger refusal at 9.8 feet				
							Boring terminated at 9.8 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**	Boring No.:	**B-25**
Logger:	KRC	Boring Location:	See Boring Location Plan		
Date Started:	8/27/22	Drill/Method:	CME 550		
Date Completed:	8/27/22	Driller:	VB (TERRA TESTING)	Ground Elev.:	725

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-6-8 PP:>4.5	100%		1.0	**TOPSOIL**				724.0
	S-2	Standard Split Spoon	23-50/0.4	100%		3.0	Brown and gray **CLAY**, trace gravel, trace sand, dry, medium plasticity, **residuum**				722.0
	S-3	Standard Split Spoon	50/0.3			4.0	Tan **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				721.0
5.0							Auger refusal at 4.3 feet				
							Boring terminated at 4.3 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-26**

Logger: KRC Boring Location: See Boring Location Plan

Date Started: 8/27/22 Drill/Method: CME 550

Date Completed: 8/27/22 Driller: VB (TERRA TESTING) Ground Elev.: 728

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-4-4 PP:4.0-4.5	100%		1.5	**TOPSOIL**				726.5
	S-2	Standard Split Spoon	8-8-8 PP:3.5->4.5	100%		5.0	Tan **CLAY** and **GRAVEL**, little sand, dry, medium dense, **residuum**				723.0
5.0	S-3	Standard Split Spoon	50/0.4	80%							
	S-4		50/0.1	100%		5.6	Tan and orange **SANDSTONE**, dry, partially argillaceous, very dense, **weathered bedrock**				722.4
							Auger refusal at 5.6 feet Boring terminated at 5.6 feet				
10.0											
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-27**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/27/22 Drill/Method: CME 550
Date Completed: 8/27/22 Driller: VB (TERRA TESTING) Ground Elev.: 736

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	5-4-4	100%		1.5	**TOPSOIL**				734.5
	S-2	Standard Split Spoon	10-29-50/0.1 PP:3.0	100%		4.0	Red and gray **CLAY**, trace sand, little gravel, dry, medium plasticity, very stiff, **residuum** - Pocket of orange sand from 3.5 to 3.6 feet				732.0
	S-3	Standard Split Spoon	50/0.3	66%			Auger refusal at 4.3 feet				
5.0							Boring terminated at 4.3 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**	Boring No.:	**B-28**
Logger:	KRC	Boring Location:	See Boring Location Plan		
Date Started:	8/26/22	Drill/Method:	CME 550		
Date Completed:	8/26/22	Driller:	VB (TERRA TESTING)	Ground Elev.:	744

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	3-4-7	100%		1.0	**TOPSOIL**				743.0
	S-2	Standard Split Spoon	10-12-14 PP:>4.5	93%			Orange **CLAY**, trace sand, trace gravel, dry, medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	15-21-22 PP:>4.5	100%		7.5					736.5
	S-4	Standard Split Spoon	18-50/0.3	100%		8.3	Tan and orange **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				735.7
							Auger refusal at 8.3 feet				
10.0							Boring terminated at 8.3 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**
Logger:	KRC	Boring Location:	See Boring Location Plan
Date Started:	8/26/22	Drill/Method:	CME 550
Date Completed:	8/26/22	Driller:	VB (TERRA TESTING)

Boring No.: **B-29**

Ground Elev.: 742

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-5-4 PP:3.75 to 4.5	100%		1.1	**TOPSOIL**				740.9
	S-2	Standard Split Spoon	7-18-50/0.3 PP:3.0	100%		3.2	Gray and tan **CLAY**, trace grave, trace sand, damp, medium plasticity, very stiff to hard, **residuum**				738.8
5.0						5.0	Tan **GRAVEL** and **SAND**, little clay, dry, very dense, **residuum**				737.0
	S-3	Standard Split Spoon	50/0.3			5.3	Tan **SANDSTONE**, dry, very dense, **weathered bedrock**				736.7
							Auger refusal at 5.3 feet				
							Boring terminated at 5.3 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-30**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/26/22 Drill/Method: CME 550
Date Completed: 8/26/22 Driller: VB (TERRA TESTING) Ground Elev.: 738

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	2-4-3	100%		1.5	**TOPSOIL**				736.5
	S-2	Standard Split Spoon	25-36-35	100%		5.0	Tan **SAND** and **GRAVEL**, some clay, dry, lensed w/clay, very dense, **residuum**				733.0
5.0	S-3	Standard Split Spoon	9-13-27	100%		7.0	Tan **CLAY**, little gravel, trace sand, dry, saprolitic, medium plasticity, hard, **residuum**				731.0
	S-4		50/0.1	100%		7.1	Tan **SANDSTONE**, dry, very dense, **weathered bedrock**				730.9
							Auger refusal at 7.1 feet Boring terminated at 7.1 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345**
Project Name: **Dogwood Corners Solar Energy Project**
Boring No.: **B-31**
Logger: KRC
Boring Location: See Boring Location Plan
Date Started: 8/26/22
Drill/Method: CME 550
Date Completed: 8/26/22
Driller: VB (TERRA TESTING)
Ground Elev.: 745

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-4-4 PP:3.0			0.9	**TOPSOIL**				744.1
	S-2	Standard Split Spoon	2-4-4 PP:2.0-3.5			5.0	Gray and tan **CLAY**, trace gravel, trace sand, trace organics, damp, medium plasticity, very stiff, **residuum**				740.0
5.0	S-3	Standard Split Spoon	10-11-12 PP:>4.5								
	S-4	Standard Split Spoon	7-11-21 PP:3.5-4.5			10.0	Dark gray **CLAY**, trace gravel, trace sand, dry, medium plasticity, hard, **residuum**				735.0
10.0	S-5	Standard Split Spoon	24-50/0.1			10.6	Gray and tan **SANDSTONE**, dry, partially argillaceous, very dense, **weathered bedrock**				734.4
15.0											
20.0											
25.0											

Auger refusal at 10.6 feet

Boring terminated at 10.6 feet

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345**
Project Name: **Dogwood Corners Solar Energy Project**
Boring No.: **B-32**
Logger: KRC
Boring Location: See Boring Location Plan
Date Started: 8/26/22
Drill/Method: CME 550
Date Completed: 8/26/22
Driller: VB (TERRA TESTING)
Ground Elev.: 750

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	6-7-11 PP: >4.5	100%		1.3	**TOPSOIL**				748.7
	S-2	Standard Split Spoon	8-10-17 PP3.25-4.25	100%		5.0	Tan and red **CLAY**, little gravel, little sand, trace organics, damp, hard, medium plasticity, **residuum**				745.0
5.0	S-3	Standard Split Spoon	5-6-7 PP2.75-3.5	100%			Gray and red **CLAY**, trace sand, trace gravel, trace broken crinoid stems, damp, medium plasticity, very stiff to hard, **residuum**				
	S-4	Standard Split Spoon	4-4-6 PP:2.75-3.5	100%							
10.0	S-5	Standard Split Spoon	5-9-12 PP2.75-4.25	100%		13.0	- Trace organics from 10 to 13 feet				737.0
	S-6	Standard Split Spoon	5-10-10 PP: >4.5	100%			Gray **CLAY**, trace sand, trace organics, saprolitic, lensed with sand, medium plasticity, hard, **residuum**				
15.0	S-7	Standard Split Spoon	22-25-24 PP: >4.5	100%		15.5					734.5
							Boring terminated at 15.5 feet				
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-33**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/26/22 Drill/Method: CME 550
Date Completed: 8/26/22 Driller: VB (TERRA TESTING) Ground Elev.: 744

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	3-4-6 PP:>4.5	100%		1.3	**TOPSOIL**				742.7
	S-2	Standard Split Spoon	6-10-6 PP3.0-4.5	100%			Brown **CLAY**, trace sand, trace gravel, damp,medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	9-25-50/0.3 PP:>4.5	86%		6.3					737.7
						7.5	Brown **CLAY** and **GRAVEL**, some sand, damp, very dense, **residuum**				736.5
	S-4	Standard Split Spoon	29-50/0.2	100%		8.2	Brown and gray **SANDSTONE**, partially argillaceous, damp, **weathered bedrock**				735.8
10.0							Auger refusal at 8.2 feet				
							Boring terminated at 8.2 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-34**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/25/22 Drill/Method: CME 550
Date Completed: 8/25/22 Driller: VB (TERRA TESTING) Ground Elev.: 727

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)
0.0–1.5	S-1	Standard Split Spoon	3-4-5	100%	
2.5–4.0	S-2	Standard Split Spoon	9-8-9 PP:>4.5	73%	
5.0–6.5	S-3	Standard Split Spoon	18-17-17 PP:>4.5	100%	
7.5–9.0	S-4	Standard Split Spoon	9-9-10 PP:4.0	100%	
10.0–11.5	S-5	Standard Split Spoon	7-5-5 PP:1.25-1.5	100%	
12.5–12.8	S-6	Standard Split Spoon	50/0.3	66%	

Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Strata Elevation
1.5	**TOPSOIL**			725.5
5.0	Tan **CLAY**, trace gravel, trace sand, trace organics, dry, medium plasticity, hard, **residuum**			722.0
7.5	Tan **CLAY** and **GRAVEL**, some sand, dry, medium plasticity, hard, **residuum**			719.5
10.0	Tan **CLAY**, some gravel, little sand, dry, hard, **residuum**			717.0
12.5	Brown **CLAY** and **ORGANICS**, moist, medium plasticity, stiff, **residuum**			714.5
12.8	Gray **LIMESTONE**, dry, very dense, **weathered bedrock**			714.2

Auger refusal at 12.8 feet

Boring terminated at 12.8 feet

Remarks: Boring dry upon completion

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TEST BORING LOG

Sheet 1 of 1

Project Number: **04-22-0345**	Project Name: **Dogwood Corners Solar Energy Project**		Boring No.: **B-35**
Logger: KRC	Boring Location: See Boring Location Plan		
Date Started: 8/27/22	Drill/Method: CME 550		
Date Completed: 8/27/22	Driller: VB (TERRA TESTING)		Ground Elev.: 725

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Split Spoon	5-4-6 PP:>4.5	100%		1.0	**TOPSOIL**				724.0
	S-2	Split Spoon	8-9-12	100%			Tan **CLAY**, trace sand, trace gravel, trace organics, dry, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Split Spoon	5-6-8 PP:2.25-3.5	100%							
	S-4	Split Spoon	6-12-15 PP:3.75-4.5	100%							
10.0	S-5	Split Spoon	11-23-17 PP:>4.5	100%		10.5					714.5
	S-6	Split Spoon	21-17-50/0.2	100%		13.5	Brown **CLAY**, trace sand, trace gravel, trace organics, damp, saprolitic, medium plasticity, hard, **residuum**				711.5
	S-7		50/0.0			14.0	Dark gray **LIMESTONE**, dry, very dense, **weathered bedrock**				711.0
15.0							Spoon refusal at 14.0 feet				
							Boring terminated at 14.0 feet				
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**
Logger:	KRC	Boring Location:	See Boring Location Plan
Date Started:	8/27/22	Drill/Method:	CME 550
Date Completed:	8/27/22	Driller:	VB (TERRA TESTING)

Boring No.: **B-36**

Ground Elev.: 743

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	2-2-2 PP:2.5-3.5	100%		1.5	**TOPSOIL**				741.5
	S-2	Standard Split Spoon	4-6-7 PP:3.75-4.0	100%			Gray, tan and orange **CLAY**, trace gravel, trace sand, damp, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Standard Split Spoon	4-7-10 PP:2.25-4.0	100%			- Trace organics from 5.4 to 10 feet				
	S-4	Standard Split Spoon	6-10-6 PP:3.75->4.5	100%		10.0					733.0
10.0	S-5	Standard Split Spoon	50/0.3	100%		10.3	**SANDSTONE**, damp, partially argillaceous, very dense, **weathered bedrock**				732.7
							Auger refusal at 10.3 feet				
							Boring terminated at 10.3 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**
Logger:	KRC	Boring Location:	See Boring Location Plan
Date Started:	8/28/22	Drill/Method:	CME 550
Date Completed:	8/28/22	Driller:	VB (TERRA TESTING)

Boring No.: **B-37**

Ground Elev.: 758

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	3-3-4 PP:4.0	100%		0.6	**TOPSOIL**				757.4
	S-2	Standard Split Spoon	6-6-8 PP:3.0-4.5	100%		6.0	Gray and tan **CLAY**, trace gravel, trace organics, trace sand, damp, very stiff to hard, **residuum**				752.0
5.0	S-3	Standard Split Spoon	5-5-17 PP:2.5-3.25	100%		7.5	Orange and gray **CLAY**, little gravel, trace sand, trace organics, damp, medium plasticity, very stiff, **residuum**				750.5
	S-4	Standard Split Spoon	3-50/0.3	100%		8.3	Tan **SANDSTONE**, partially argillaceous, very dense, **weathered bedrock**				749.7
10.0							Auger refusal at 8.3 feet				
							Boring terminated at 8.3 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-38**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/28/22 Drill/Method: CME 550
Date Completed: 8/28/22 Driller: VB (TERRA TESTING) Ground Elev.: 750

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Split Spoon	4-6-5 PP:2.75-3.5	100%		1.1	**TOPSOIL**				748.9
	S-2	Split Spoon	4-3-3 PP:1.75-2.5	100%			Brown **CLAY**, damp to moist, low to medium plasticity, soft to very stiff, **residuum**				
5.0	S-3	Split Spoon	2-1-1 PP:0.5-0.75	100%							
	S-4	Split Spoon	WOH-WOH-1 PP:0.25-0.5	100%		10.5					739.5
10.0	S-5	Split Spoon	2-3-5 PP:1.0-2.0	100%			Brown **CLAY** and **SAND**, trace gravel, moist, low plasticity, stiff, **residuum**				
	S-6	Split Spoon	4-7-8 PP:1.75-2.75	100%							
15.0	S-7	Split Spoon	8-10-19	100%		16.0					734.0
	S-8	Split Spoon	12-24-17	100%		20.0	Red **SAND**, little clay, trace gravel, moist, saprolitic, medium dense, **residuum**				730.0
20.0	S-9	Split Spoon	13-25-16 PP:2.0-2.5	100%		23.5	Tan **SAND** and **GRAVEL**, little clay, damp, medium dense, **residuum**				726.5
	S-10	Split Spoon	20-10-19	87%							
25.0	S-11	Split Spoon	11-14-16	93%		25.5	Red and tan **SAND** and **CLAY**, trace gravel, wet, medium dense, **residuum**				724.5
							Boring terminated at 25.5 feet				

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number:	**04-22-0345**	Project Name:	**Dogwood Corners Solar Energy Project**
Logger:	KRC	Boring Location:	See Boring Location Plan
Date Started:	8/28/22	Drill/Method:	CME 550
Date Completed:	8/28/22	Driller:	VB (TERRA TESTING)

Boring No.: **B-39**

Ground Elev.: 758

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	26-50/0.3	100%		0.4	**TOPSOIL**				757.6
							Tan **SANDSTONE**, dry, very dense, **weathered bedrock**				
	S-2	Standard Split Spoon	50/0.3	100%							
5.0						5.0	Auger refusal at 5.0 feet				753.0
							Boring terminated at 5.0 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-40**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/29/22 Drill/Method: CME 550
Date Completed: 8/29/22 Driller: VB (TERRA TESTING) Ground Elev.: 749

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-5-4	100%		1.1	**TOPSOIL**				747.9
	S-2	Standard Split Spoon	5-6-10 PP:3.5-4.5	100%		5.0	Brown **CLAY**, trace gravel, trace sand, damp, medium plasticity, very stiff to hard, **residuum**				744.0
5.0	S-3	Standard Split Spoon	7-10-12 PP:3.0-3.25	100%		8.0	Brown **CLAY**, trace gravel, trace sand, damp, saprolitic, medium plasticity, **residuum**				741.0
	S-4	Standard Split Spoon	10-9-12 PP:3.0-4.5	100%		10.0	Gray and orange **CLAY** and **SAND**, little gravel, damp, saprolitic, medium plasticity, very stiff to hard, **residuum**				739.0
10.0	S-5	Standard Split Spoon	50/0.3	100%		10.3	Gray and orange **SANDSTONE**, damp, partially argillaceous, very dense, **weathered bedrock** Auger refusal at 10.3 feet				738.7
							Boring terminated at 10.3 feet				
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-41**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/28/22 Drill/Method: CME 550
Date Completed: 8/28/22 Driller: VB (TERRA TESTING) Ground Elev.: 762

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	3-4-6	100%		1.5	**TOPSOIL**				760.5
	S-2	Standard Split Spoon	9-8-13 PP:2.76-4.0	100%			Tan and gray **CLAY**, trace gravel, trace sand, damp, medium plasticity, very stiff to hard, **residuum**				
5.0	S-3	Standard Split Spoon	6-6-4 PP:3.75-4.0	100%							
	S-4	Standard Split Spoon	6-3-9 PP:3.5-4.5	100%		8.5					753.5
10.0						10.0	Gray and red **CLAY**, trace gravel, little sand, damp, saprolitic, medium plasticity, very stiff to hard, **residuum**				752.0
	S-5	Standard Split Spoon	12-17-50/0.2 PP:>4.5	100%		11.2	- Sandstone gravel from 10.0 to 10.5 feet Brown **CLAY**, trace sand, trace gravel, damp, medium plasticity, hard, **residuum**				750.8
							Auger refusal at 11.2 feet				
							Boring terminated at 11.2 feet				
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-42**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/29/22 Drill/Method: CME 550
Date Completed: 8/29/22 Driller: VB (TERRA TESTING) Ground Elev.: 716

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
						0.9	**TOPSOIL**				715.1
	S-1	Standard Split Spoon	6-7-5 PP:3.5-4.0	100%							
	S-2	Standard Split Spoon	25-47-50/0.3	100%		3.5	Brown **CLAY**, trace gravel, dry, low to medium plasticity, very stiff to hard, **residuum**				712.5
5.0	S-3	Standard Split Spoon	50/0.2			5.2	Tan **SANDSTONE**, dry, partially argillaceous, very dense, **weathered bedrock**				710.8
							Auger refusal at 5.2 feet				
							Boring terminated at 5.2 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-43**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/29/22 Drill/Method: CME 550
Date Completed: 8/29/22 Driller: VB (TERRA TESTING) Ground Elev.: 756

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-3-5	100%		1.3	**TOPSOIL**				754.7
	S-2	Standard Split Spoon	12-11-11 PP:>4.5	100%			Red **CLAY**, some sand, trace to little gravel, dry, medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	10-11-14 PP:>4.5	100%		6.5	Auger refusal at 6.5 feet				749.5
							Boring terminated at 6.5 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-44**

Logger: KRC Boring Location: See Boring Location Plan

Date Started: 8/29/22 Drill/Method: CME 550

Date Completed: 8/29/22 Driller: VB (TERRA TESTING) Ground Elev.: 759

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	3-3-5 PP:>4.5	100%		1.2	**TOPSOIL**				757.8
	S-2	Standard Split Spoon	5-8-10 PP:>4.5	100%			Brown, red and gray **CLAY**, trace gravel, trace sand, medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	6-7-11 PP:4.0-4.5	100%			- Saprolitic from 6 feet				
	S-4	Standard Split Spoon	11-19-24 PP:>4.5	100%		10.5					748.5
10.0	S-5	Standard Split Spoon	11-50/0.3	100%		10.8	Brown **SANDSTONE**, dry, partially argillaceous, very dense, **weathered bedrock**				748.2
							Auger refusal at 10.8 feet				
							Boring terminated at 10.8 feet				
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-45**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/29/22 Drill/Method: CME 550
Date Completed: 8/29/22 Driller: VB (TERRA TESTING) Ground Elev.: 758

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	9-6-7 PP:>4.5	100%		1.0	**TOPSOIL**				757.0
	S-2	Standard Split Spoon	7-12-13 PP:>4.5	93%			Brown, red and tan **CLAY**, trace sand, trace to little gravel, trace organics, dry, medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	9-10-13 PP:>4.5	100%		7.5					750.5
	S-4	Standard Split Spoon	50/0.3	100%		7.8	Red **SANDSTONE**, dry, partially argillaceous, very dense, **weathered bedrock**				750.2
							Auger refusal at 7.8 feet				
10.0							Boring terminated at 7.8 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-46**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/29/22 Drill/Method: CME 550
Date Completed: 8/29/22 Driller: VB (TERRA TESTING) Ground Elev.: 760

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	8-4-6	100%		1.2	**TOPSOIL**				758.8
	S-2	Standard Split Spoon	12-17-21 PP:>4.5	100%			Brown **CLAY**, dry, medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	1-10-12	73%		6.5					753.5
						8.0	Orange and red **CLAY** and **SAND**, trace gravel, dry, medium plasticity, hard, **residuum**				752.0
	S-4	Standard Split Spoon	23-11-16	73%		9.0	Tan and pink sandstone **GRAVEL**, dry, partially argillaceous, medium dense, **residuum**				751.0
							Auger refusal at 9.0 feet				
10.0							Boring terminated at 9.0 feet				
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

TEST BORING LOG

Sheet 1 of 1

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-47**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/25/22 Drill/Method: CME 550
Date Completed: 8/25/22 Driller: VB (TERRA TESTING) Ground Elev.: 740

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	4-4-4	100%		1.5	**TOPSOIL**				738.5
	S-2	Standard Split Spoon	7-7-8 PP:>4.5	100%			Gray and tan **CLAY**, trace gravel, trace sand, dry, medium plasticity, hard, **residuum**				
5.0	S-3	Standard Split Spoon	6-7-11 PP:4.0-.5	100%							
	S-4	Standard Split Spoon	7-21-37 PP:>4.5	100%							
10.0	S-5	Standard Split Spoon	19-39-50/0.3 PP:>4.5	86%		11.0					729.0
							Gray **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**				
	S-6	Standard Split Spoon	50/0.3	100%		12.8					727.2
							Auger refusal at 12.8 feet				
							Boring terminated at 12.8 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-48**
Logger: MAR Boring Location: See boring location plan
Date Started: 8/17/22 Drill/Method: CME 550
Date Completed: 8/17/22 Driller: VB (TERRA TESTING) Ground Elev.: 747

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)
S-1	Standard Split Spoon	6-10-12 PP: 3.75-4	133%	
S-2	Standard Split Spoon	4-12-12 PP: 3.75-4	100%	
S-3	Standard Split Spoon	10-35-50/0.4	100%	
S-4	Standard Split Spoon	48-50/0.4	100%	

Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Strata Elevation
1.0	**TOPOSIL**			746.0
1.8	Tan **CLAY**, some sand, little gravel, dry to damp, medium plasticity, very stiff, **residuum**			745.2
5.8	Tan and gray **CLAY**, damp, medium plasticity, very stiff, **residuum**			741.2
10.0	Orange **SANDSTONE**, partially argillaceous, dry, very dense, **weathered bedrock**			737.0

Auger refusal at 10.0 feet
Boring terminated at 10.0 feet

Depth (feet): 5.0, 10.0, 15.0, 20.0, 25.0

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Remarks: Boring dry upon completion

TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-49**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/28/22 Drill/Method: CME 550
Date Completed: 8/28/22 Driller: VB (TERRA TESTING) Ground Elev.: 760

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Standard Split Spoon	3-2-3 PP:1.0-1.75	100%		1.0	**TOPSOIL**				759.0
	S-2	Standard Split Spoon	4-4-5 PP:2.0-2.25	100%			Red **CLAY**, trace gravel, trace organics, trace sand, damp, medium plasticity, stiff, **residuum**				
5.0	S-3	Standard Split Spoon	12-50/0.3 PP:2.75-3.25	100%		5.5					754.5
						5.8	Orange and red **SAND**, trace gravel, trace clay, damp, very dense, **residuum**				754.2
	S-4	Standard Split Spoon	50/0.3	100%							
10.0	S-5	Standard Split Spoon	50/0.3			10.3	Tan **SAND**, damp, very dense, **residuum**				749.7
							Spoon refusal at 10.3 feet				
							Boring terminated at 10.3 feet				
15.0											
20.0											
25.0											

Remarks: Boring dry upon completion

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TEST BORING LOG

Project Number: **04-22-0345** Project Name: **Dogwood Corners Solar Energy Project** Boring No.: **B-50**
Logger: KRC Boring Location: See Boring Location Plan
Date Started: 8/27/22 Drill/Method: CME 550
Date Completed: 8/27/22 Driller: VB (TERRA TESTING) Ground Elev.: 724

Legend: Shelby Tube; Standard Split Spoon; Core Sample; Auger Probe

Depth (feet)	Sample No.	Sample Type	Blow Counts	Recovery (%)	RQD (RUN)	Strata Depth (ft)	MATERIAL DESCRIPTION	RQD (Strata)	Water Level	Graphic Log	Strata Elevation
	S-1	Split Spoon	3-5-4 PP:>4.5	100%		0.8	**TOPSOIL**				723.2
	S-2	Split Spoon	22-15-7 PP:>4.5	100%		2.7	Brown and gray **CLAY**, trace gravel, trace organics, dry, medium plasticity, medium plasticity, hard, **residuum**				721.3
						3.5	Red sandstone **GRAVEL**,little clay, little sand, dry, medium dense, **residuum**				720.5
5.0	S-3	Split Spoon	8-10-5 PP:>4.5	100%		7.5	Red and gray **CLAY**, trace gravel, trace sand, dry, medium plasticity, hard, **residuum** - Saprolitic from 5 feet				716.5
	S-4	Split Spoon	50/0.2	50%			Auger refusal at 7.7 feet				
							Boring terminated at 7.7 feet				
10.0											
15.0											
20.0											
25.0											

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Remarks: Boring dry upon completion

Report Date: 8\18\2022
Project No.: 04-22-0345
Project Name: Dogwood Corners Solar
Location: RL-1/600 Feet South of B-46
Soil Description: Clay Residuum grading to weathered Sandstone
Conditions: Partly Cloudy 80's
Test Completed by BAR/NJW
Test Method: Four Point Resistivity Test
Test Instrument: AEMC Model 4500 Digital Earth Resistance Tester

LOCATION	A-SPACING (ft)	METER READING (ohms)	SOIL RESISTIVITY* (ohms-cm)
E-W	2	51.00	19533.0
	5	41.20	39449.0
	10	22.70	43470.5
	20	7.35	28150.5
	50	0.50	4787.5
N-S	2	73.80	28265.4
	5	46.30	44332.3
	10	27.00	51705.0
	20	6.52	24971.6
	50	0.26	2489.5

* Soil Resistivity (ohms-cm) = 191.5 x A (ft) x R (ohms)

NOTE: Geology includes the Tar Springs Sandstone of the Mississippian Age.

SOIL RESISTIVITY FIELD REPORT

FIGURE NO.
RL-1

Report Date: 8\17\2022
Project No.: 04-22-0345
Project Name: Dogwood Corners Solar
Location: RL-2 /B-35
Soil Description: Clay Residuum grading to weathered Limestone
Conditions: Partly Cloudy 80's
Test Completed by BAR/MAR
Test Method: Four Point Resistivity Test
Test Instrument: AEMC Model 4500 Digital Earth Resistance Tester

LOCATION	A-SPACING (ft)	METER READING (ohms)	SOIL RESISTIVITY* (ohms-cm)
E-W	2	4.70	1800.1
	5	2.23	2135.2
	10	1.36	2604.4
	20	0.90	3447.0
	50	0.69	6606.8
N-S	2	1.29	494.1
	5	0.99	947.9
	10	0.84	1608.6
	20	0.72	2757.6
	50	0.67	6415.3

* Soil Resistivity (ohms-cm) = 191.5 x A (ft) x R (ohms)

NOTE: Geology includes the Tar Springs Sandstone of the Mississippian Age.

SOIL RESISTIVITY FIELD REPORT

FIGURE NO. RL-2

Report Date: 8\18\2022
Project No.: 04-22-0345
Project Name: Dogwood Corners Solar
Location: RL-3 / B-25
Soil Description: Clay Residuum grading to weathered Sandstone
Conditions: Sunny 80's
Test Completed by BAR/NJW
Test Method: Four Point Resistivity Test
Test Instrument: AEMC Model 4500 Digital Earth Resistance Tester

LOCATION	A-SPACING (ft)	METER READING (ohms)	SOIL RESISTIVITY* (ohms-cm)
N-S	2	94.20	36078.6
	5	34.60	33129.5
	10	10.90	20873.5
	20	3.70	14171.0
	50	1.82	17426.5
E-W	2	65.60	25124.8
	5	17.40	16660.5
	10	4.44	8502.6
	20	1.70	6511.0
	50	0.90	8617.5

* Soil Resistivity (ohms-cm) = 191.5 x A (ft) x R (ohms)

NOTE: Geology includes the Tar Springs Sandstone of the Mississippian Age.

SOIL RESISTIVITY FIELD REPORT

FIGURE NO.
RL-3

Report Date: 8\18\2022
Project No.: 04-22-0345
Project Name: Dogwood Corners Solar
Location: RL-4 / B-1
Soil Description: Clay Residuum grading to weathered Shale and Sandstone
Conditions: Partly cloudy 80's
Test Completed by BAR/NJW
Test Method: Four Point Resistivity Test
Test Instrument: AEMC Model 4500 Digital Earth Resistance Tester

LOCATION	A-SPACING (ft)	METER READING (ohms)	SOIL RESISTIVITY* (ohms-cm)
E-W	2	21.40	8196.2
	5	5.25	5026.9
	10	0.97	1857.6
	20	0.43	1646.9
	50	0.24	2298.0
N-S	2	27.90	10685.7
	5	5.75	5505.6
	10	1.08	2068.2
	20	0.47	1800.1
	50	0.28	2681.0

* Soil Resistivity (ohms-cm) = 191.5 x A (ft) x R (ohms)

NOTE: Geology includes the Tar Springs Sandstone of the Mississippian Age.

	SOIL RESISTIVITY FIELD REPORT	FIGURE NO. RL-4

Report Date: 8\18\2022
Project No.: 04-22-0345
Project Name: Dogwood Corners Solar
Location: RL-5 / B-19
Soil Description: Clay Residuum grading to weathered Sandstone
Conditions: Partly cloudy 80's
Test Completed by BAR/NJW
Test Method: Four Point Resistivity Test
Test Instrument: AEMC Model 4500 Digital Earth Resistance Tester

LOCATION	A-SPACING (ft)	METER READING (ohms)	SOIL RESISTIVITY* (ohms-cm)
E-W	2	16.00	6128.0
	5	3.95	3782.1
	10	1.04	1991.6
	20	0.58	2221.4
	50	0.52	4979.0
N-S	2	18.20	6970.6
	5	4.20	4021.5
	10	0.95	1819.3
	20	0.49	1876.7
	50	0.41	3925.8

* Soil Resistivity (ohms-cm) = 191.5 x A (ft) x R (ohms)

NOTE: Geology includes the Tar Springs Sandstone of the Mississippian Age.

SOIL RESISTIVITY FIELD REPORT

FIGURE NO. RL-5

TRIAD ENGINEERING, INC.

APPENDIX C

Laboratory Testing

Triad Engineering, Inc.

Laboratory Testing

The samples obtained from the test borings were visually classified in the field by geotechnical engineering personnel from Triad. The recovered soils were further evaluated by laboratory testing. Laboratory soils tests were conducted in accordance with applicable ASTM standards as listed below:

1. Moisture content tests were performed in accordance with ASTM D 2216.

2. Atterberg Limits tests, consisting of the liquid limit, plastic limit, and plasticity index, were performed in accordance with ASTM D 4318.

3. Sieve analyses with washed No. 200 sieve tests were performed in accordance with ASTM D 1140.

4. Standard Proctor moisture-density relations tests were performed in accordance with ASTM D 698.

5. Thermal Conductivity of Soil was conducted in accordance with ASTM D 5334, and Oxidation-Reduction Potential of Water testing was performed in accordance with ASTM D 1498-14. These tests were completed by our subcontractor Geotesting Express.

6. Corrosivity testing was conducted by our subcontractor, Geotechnics, in accordance with numerous AASHTO standard test methods as indicated on the results sheets.

A summary and details of the laboratory test results are included on the following pages of this appendix.

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SOIL DATA SUMMARY

BORING NO.	SAMPLE DEPTH (ft)	SAMPLE TYPE	NATURAL MOISTURE (%)	ATTERBERG LIMITS			GRADATION			USCS SOIL CLASS.	STANDARD PROCTOR	
				LL	PL	PI	% GRAVEL	% SAND	% FINES		MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE (%)
RL-1	1.0 - 3.0	BULK	7.7	32	20	12	0	5	95	CL	107.9	16.9
RL-3	1.0 - 3.0	BULK	9.9	36	21	15	0	4	96	CL	107.1	18.2
RL-4	1.0 - 3.0	BULK	14.7	38	19	19	1	8	91	CL	110.1	16.4
RL-5	1.0 - 3.0	BULK	9.5	37	22	15	0	3	96	CL	107.5	17.3
B-3	2.5 - 4.0	SS	20.3									
B-3	5.0 - 6.5	SS	30.9									
B-7	1.0 - 3.0	BULK	26.6	34	22	12	0	14	86	CL		
B-7	2.5 - 4.0	SS	16.4									
B-7	5.0 - 6.5	SS	10.5									
B-8	2.5 - 4.0	SS	17.3									
B-8	5.0 - 6.5	SS	19.6									
B-10	2.5 - 4.0	SS	18.0									
B-10	5.0 - 6.5	SS	19.6									
B-13	2.5 - 4.0	SS	13.2									
B-13	5.0 - 6.5	SS	20.5									
B-15	2.5 - 4.0	SS	15.9									
B-15	5.0 - 6.5	SS	23.8									
B-17	2.5 - 4.0	SS	27.9									
B-17	5.0 - 6.5	SS	21.4	44	23	21	0	24	76	CL		
B-19	2.5 - 4.0	SS	18.8									
B-19	5.0 - 6.5	SS	20.3									
B-23	2.5 - 4.0	SS	16.9	28	16	12	2	18	80	CL		
B-23	5.0 - 6.5	SS	18.3									
B-28	2.5 - 4.0	SS	10.3									
B-28	5.0 - 6.5	SS	15.0									
B-31	2.5 - 4.0	SS	4.3	43	21	22	2	9	89	CL		
B-31	5.0 - 6.5	SS	14.9									
B-34	2.5 - 4.0	SS	13.2									
B-34	5.0 - 6.5	SS	15.3									
B-35	1.0 - 3.0	BULK	23.2	32	22	10	4	27	69	CL		
B-37	2.5 - 4.0	SS	19.7									
B-37	5.0 - 6.5	SS	24.9									
B-40	2.5 - 4.0	SS	20.6									
B-40	5.0 - 6.5	SS	15.1									
B-44	2.5 - 4.0	SS	19.0									
B-44	5.0 - 6.5	SS	20.3	36	14	22	1	30	69	CL		
B-45	2.5 - 4.0	SS	14.7									
B-45	5.0 - 6.5	SS	15.6									

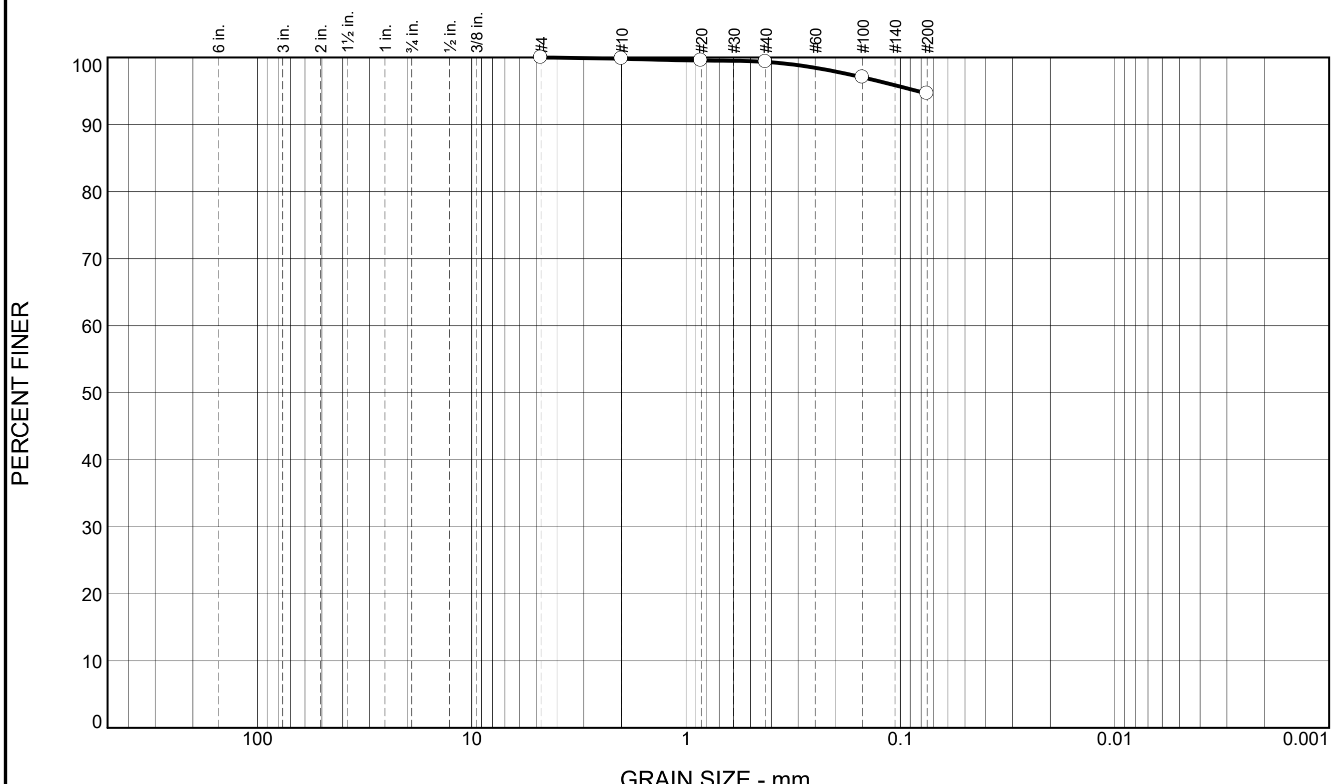
TRIAD ENGINEERING, INC.

Notes:
1) Soil tests performed in accordance with recognized ASTM testing standards.
2) SS = Split Spoon UD = Undisturbed
RC = Rock Core BULK = Bulk Sample

PROJECT NUMBER: 04-22-0345
PROJECT NAME: Dogwood Corners Solar Project
LOCATION: Hopkinsville, Kentucky

FIGURE C-1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.4	4.8	94.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.6		
#40	99.4		
#100	97.0		
#200	94.6		

* (no specification provided)

Material Description

Light brown lean clay

Atterberg Limits

PL= 20 LL= 32 PI= 12

Coefficients

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

Classification

USCS= CL AASHTO= A-6(11)

Remarks

Source of Sample: RL-1 **Depth:** 1.0' - 3.0'
Sample Number: RL-1

Date: 8/24/2022

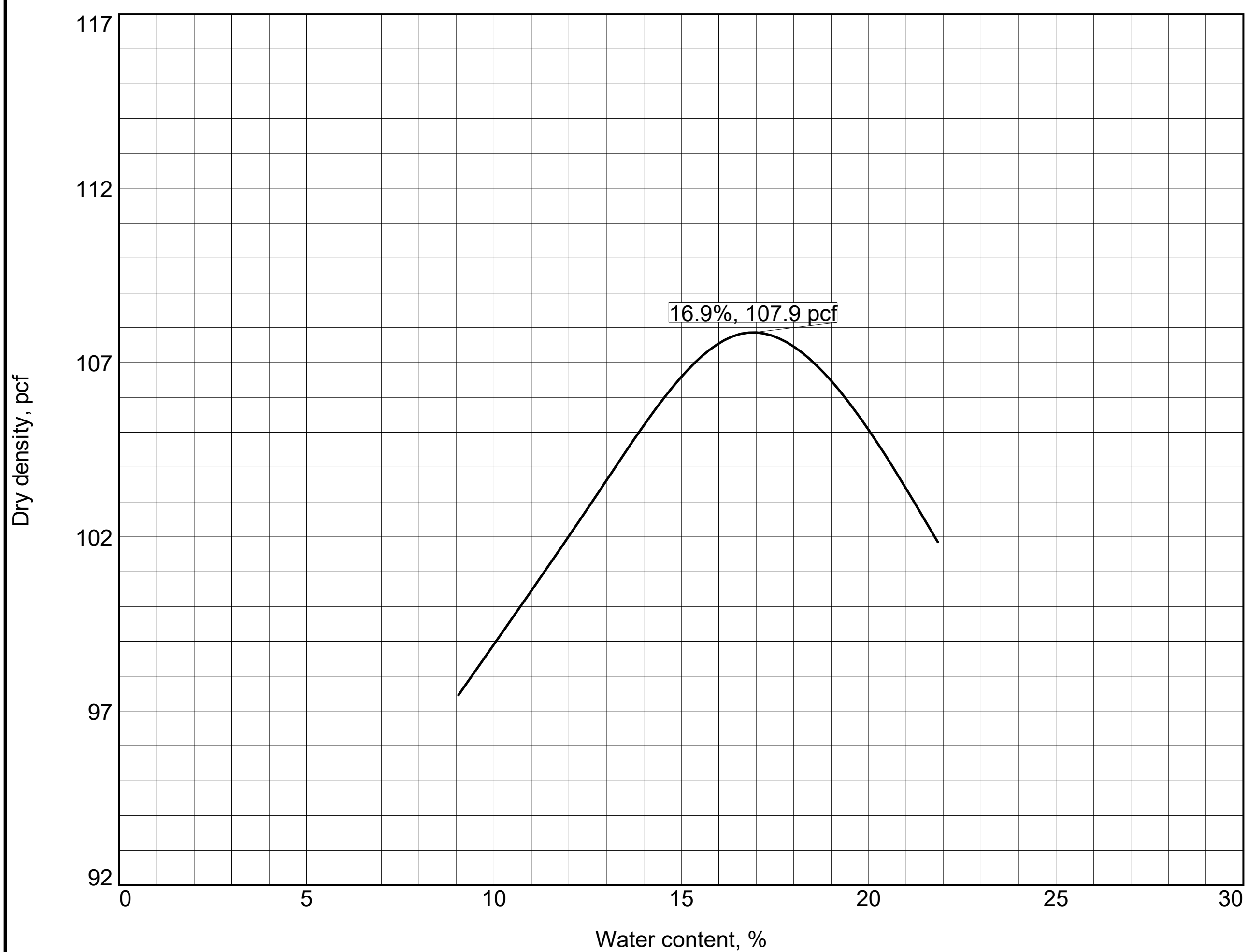
Triad Engineering, Inc.

Morgantown, WV

Client: Oriden Power
Project: Dogwood Solar
Project No: 04-22-0345 **Figure C-2**

Tested By: DTB **Checked By:** JKM

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1.0' - 3.0'	CL	A-6(11)	7.7		32	12	0.0	94.6

TEST RESULTS

Maximum dry density = 107.9 pcf

Optimum moisture = 16.9 %

MATERIAL DESCRIPTION

Light brown lean clay

Project No. 04-22-0345 **Client:** Oriden Power

Project: Dogwood Solar

Date: 8/25/2022

Source of Sample: RL-1 **Sample Number:** RL-1

Triad Engineering, Inc.

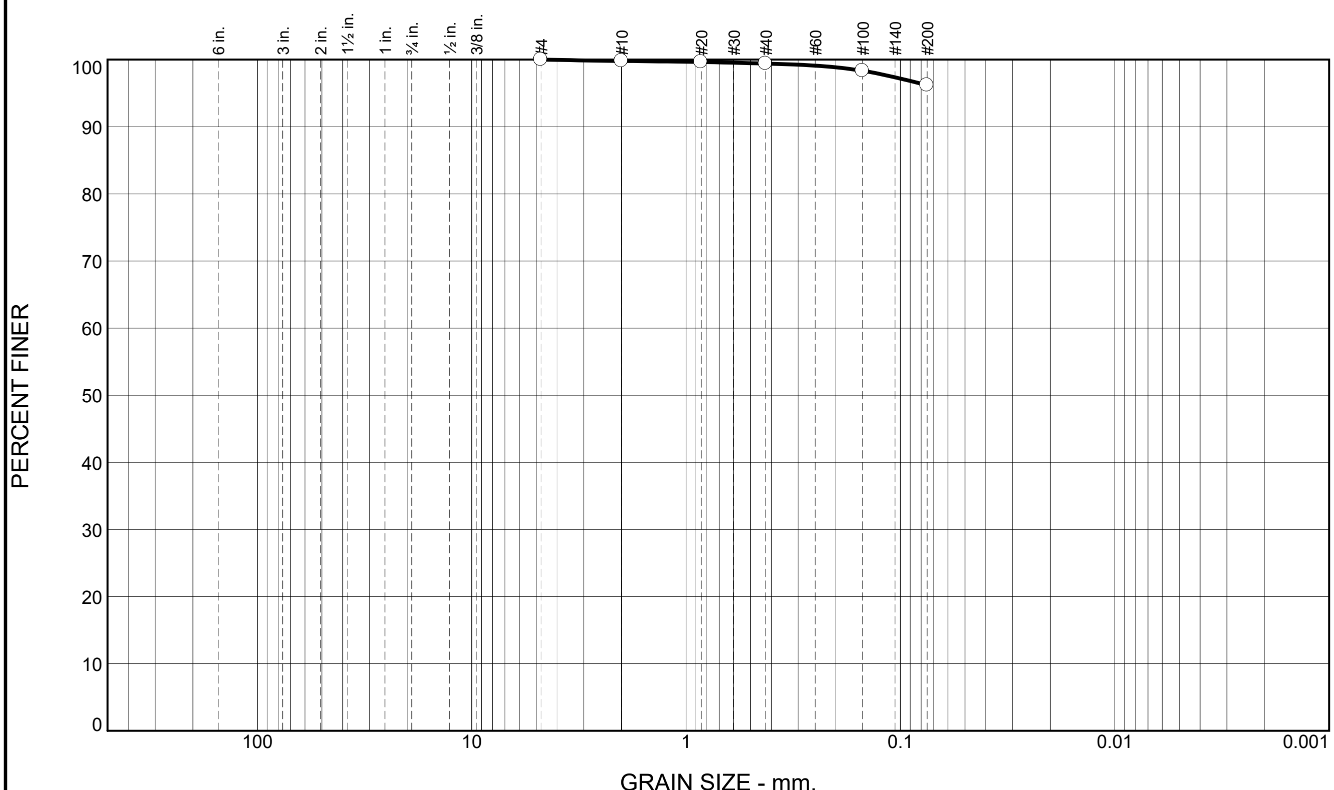
Morgantown, WV

Remarks:

Figure C-3

Tested By: LMC **Checked By:** JKM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	0.4	3.2	96.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.6		
#40	99.4		
#100	98.3		
#200	96.2		

* (no specification provided)

Material Description

Medium brown lean clay

Atterberg Limits

PL= 21 LL= 36 PI= 15

Coefficients

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

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Source of Sample: RL-3 **Depth:** 1.0' - 3.0'
Sample Number: RL-3

Date: 8/24/2022

Triad Engineering, Inc.

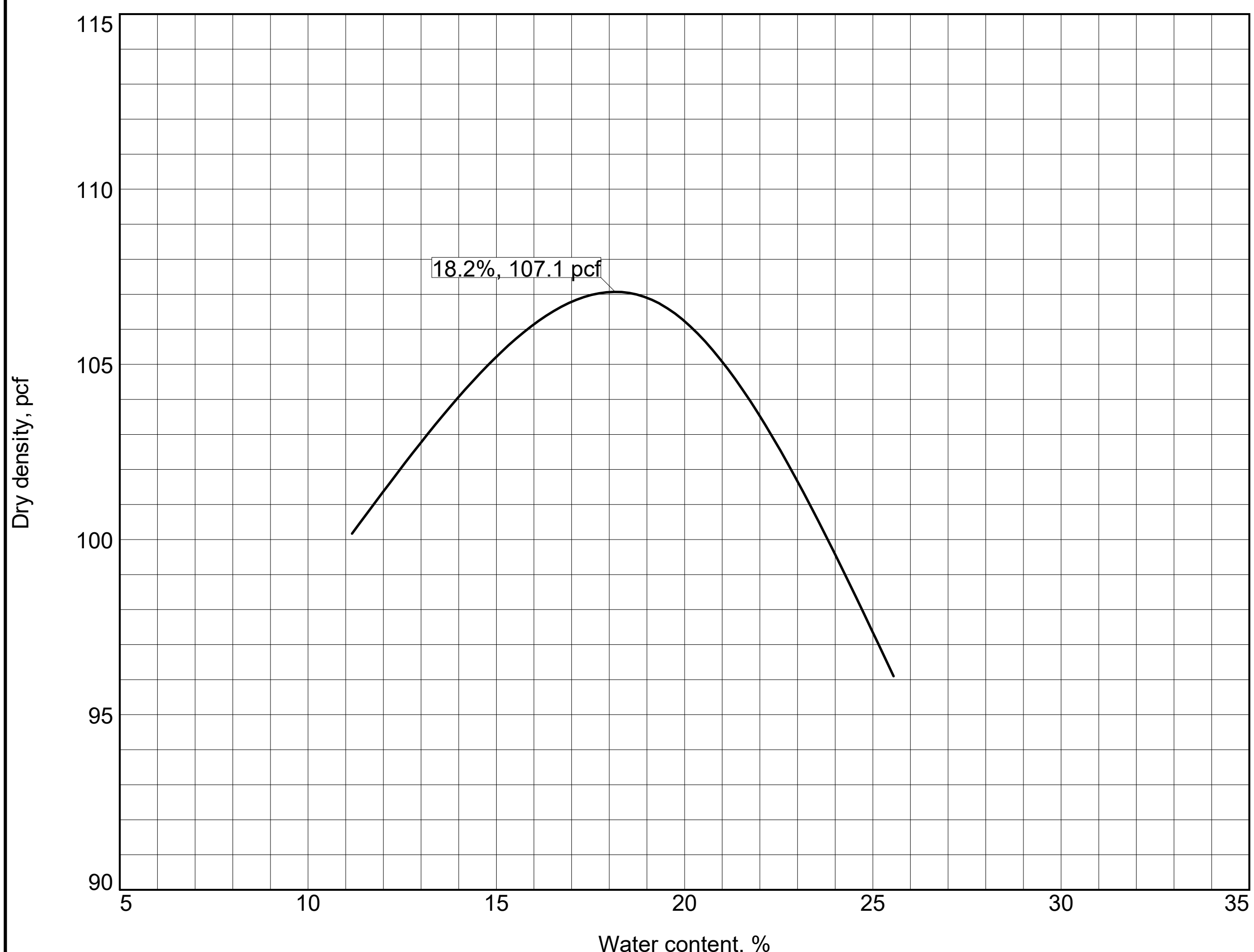
Morgantown, WV

Client: Oriden Power
Project: Dogwood Solar

Project No: 04-22-0345 **Figure C-4**

Tested By: DTB **Checked By:** JKM

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1.0' - 3.0'	CL	A-6(15)	9.9		36	15	0.0	96.2

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.1 pcf Optimum moisture = 18.2 %	Medium brown lean clay

Project No. 04-22-0345 **Client:** Oriden Power
Project: Dogwood Solar
Date: 8/25/2022
Source of Sample: RL-3 **Sample Number:** RL-3

Triad Engineering, Inc.

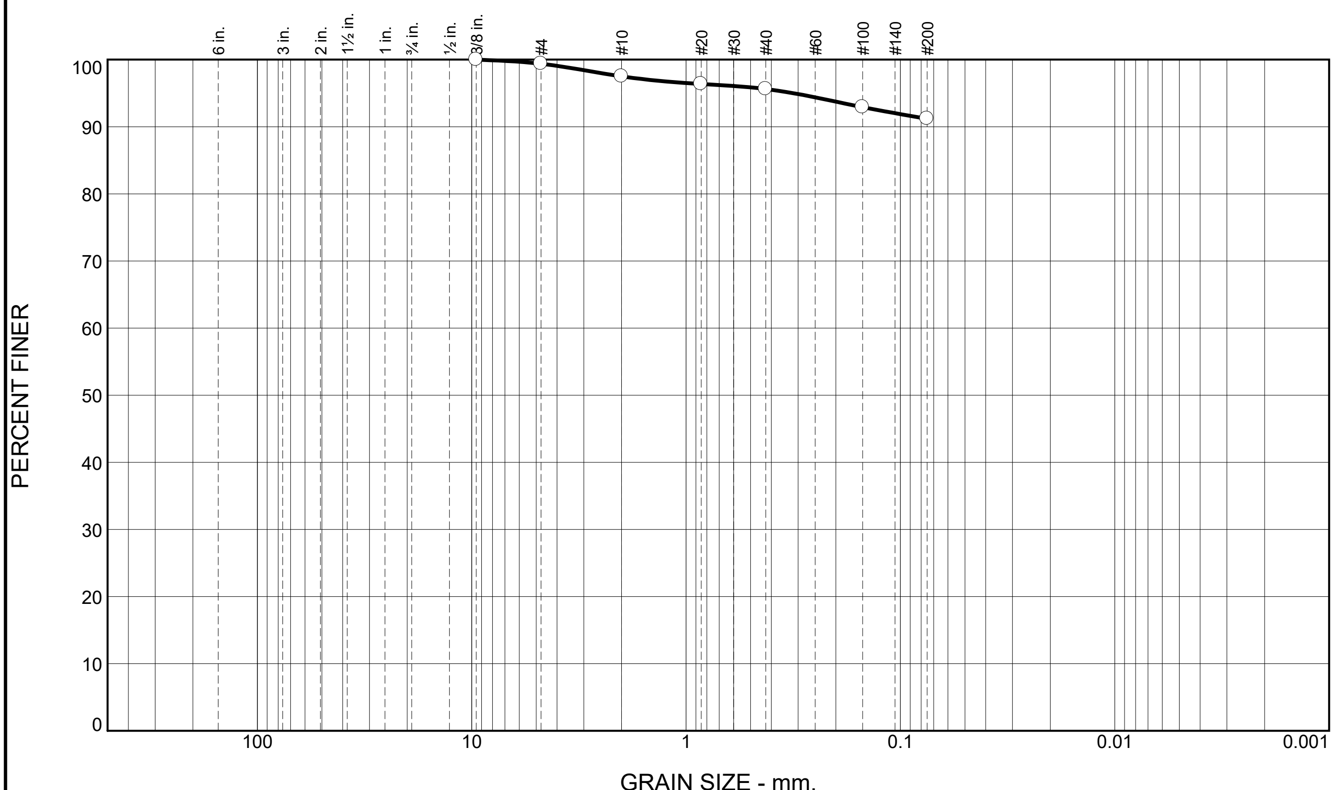
Morgantown, WV

Remarks:

Figure C-5

Tested By: LMC **Checked By:** JKM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	1.9	1.9	4.4	91.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.4		
#10	97.5		
#20	96.4		
#40	95.6		
#100	92.9		
#200	91.2		

* (no specification provided)

Material Description

Medium brown lean clay

Atterberg Limits

PL= 19 LL= 38 PI= 19

Coefficients

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

Classification

USCS= CL AASHTO= A-6(17)

Remarks

Source of Sample: RL-4 **Depth:** 1.0' -3.0'
Sample Number: RL-4

Date: 824/2022

Triad Engineering, Inc.

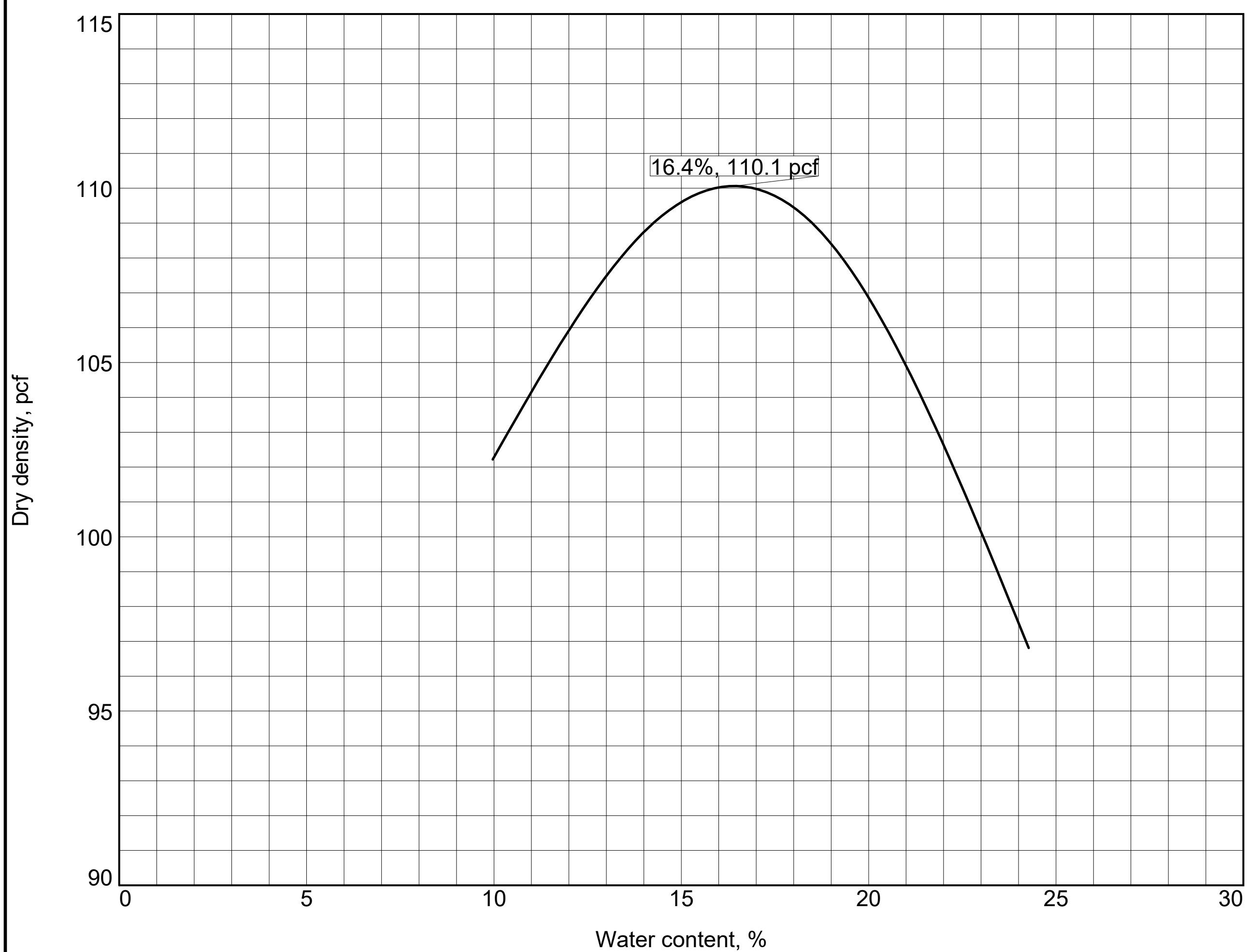
Morgantown, WV

Client: Oriden Power
Project: Dogwood Solar

Project No: 04-22-0345 **Figure C-6**

Tested By: DTB **Checked By:** JKM

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1.0' -3.0'	CL	A-6(17)	14.7		38	19	0.0	91.2

TEST RESULTS

Maximum dry density = 110.1 pcf

Optimum moisture = 16.4 %

MATERIAL DESCRIPTION

Medium brown lean clay

Project No. 04-22-0345 **Client:** Oriden Power

Project: Dogwood Solar

Date: 8/25/2022

Source of Sample: RL-4 **Sample Number:** RL-4

Triad Engineering, Inc.

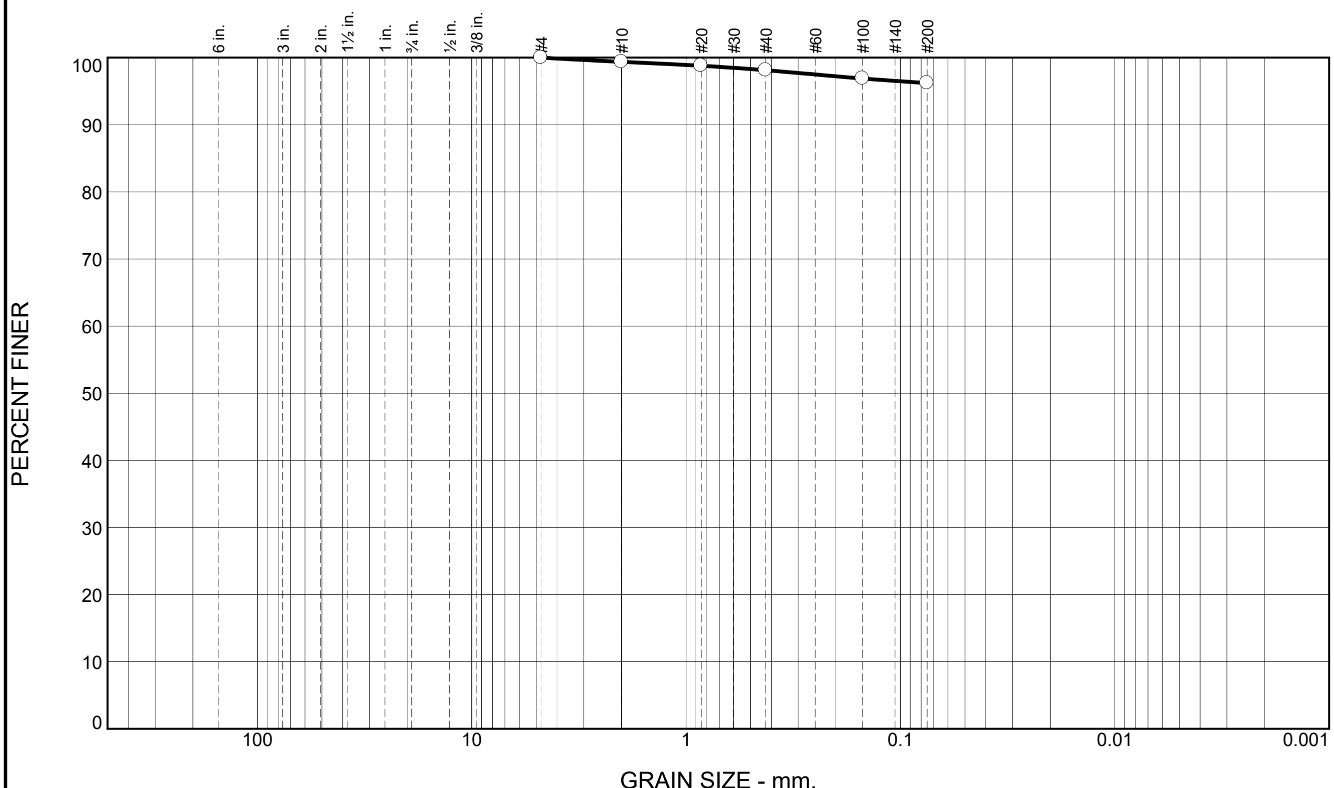
Morgantown, WV

Remarks:

Figure C-7

Tested By: LMC **Checked By:** JKM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	1.3	1.9	96.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	98.8		
#40	98.1		
#100	96.9		
#200	96.2		

* (no specification provided)

Material Description

Light brown lean clay

Atterberg Limits

PL= 22 LL= 37 PI= 15

Coefficients

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

Classification

USCS= CL AASHTO= A-6(15)

Remarks

Source of Sample: RL-5 **Depth:** 1.0' - 3.0'
Sample Number: RL-5

Date: 8/24/2022

Triad Engineering, Inc.

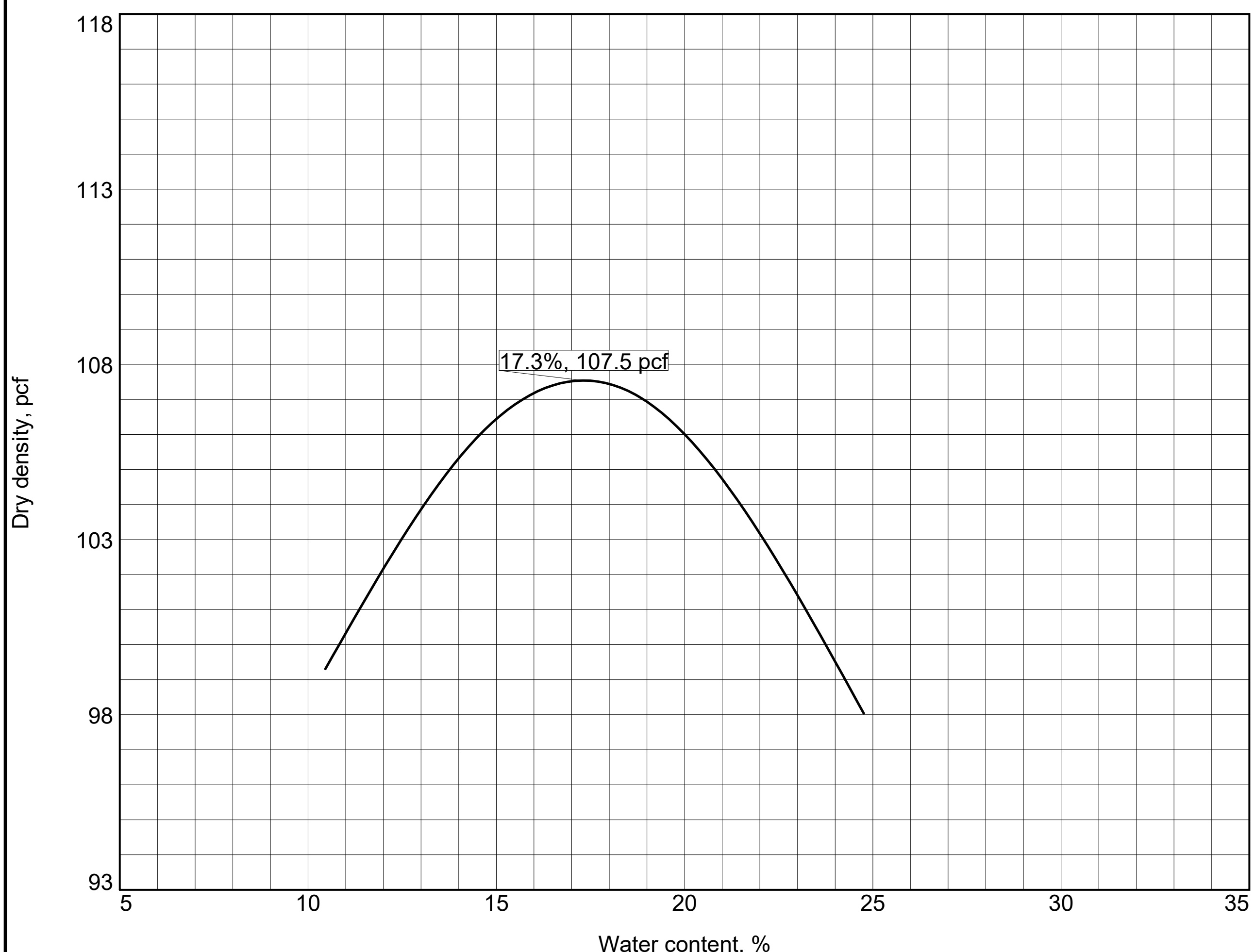
Morgantown, WV

Client: Oriden Power
Project: Dogwood Solar

Project No: 04-22-0345 **Figure C-8**

Tested By: DTB **Checked By:** JKM

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method C Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
1.0' - 3.0'	CL	A-6(15)	9.5		37	15	0.0	96.2

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 107.5 pcf Optimum moisture = 17.3 %	Light brown lean clay

Project No. 04-22-0345 **Client:** Oriden Power
Project: Dogwood Solar
Date: 8/25/2022
Source of Sample: RL-5 **Sample Number:** RL-5

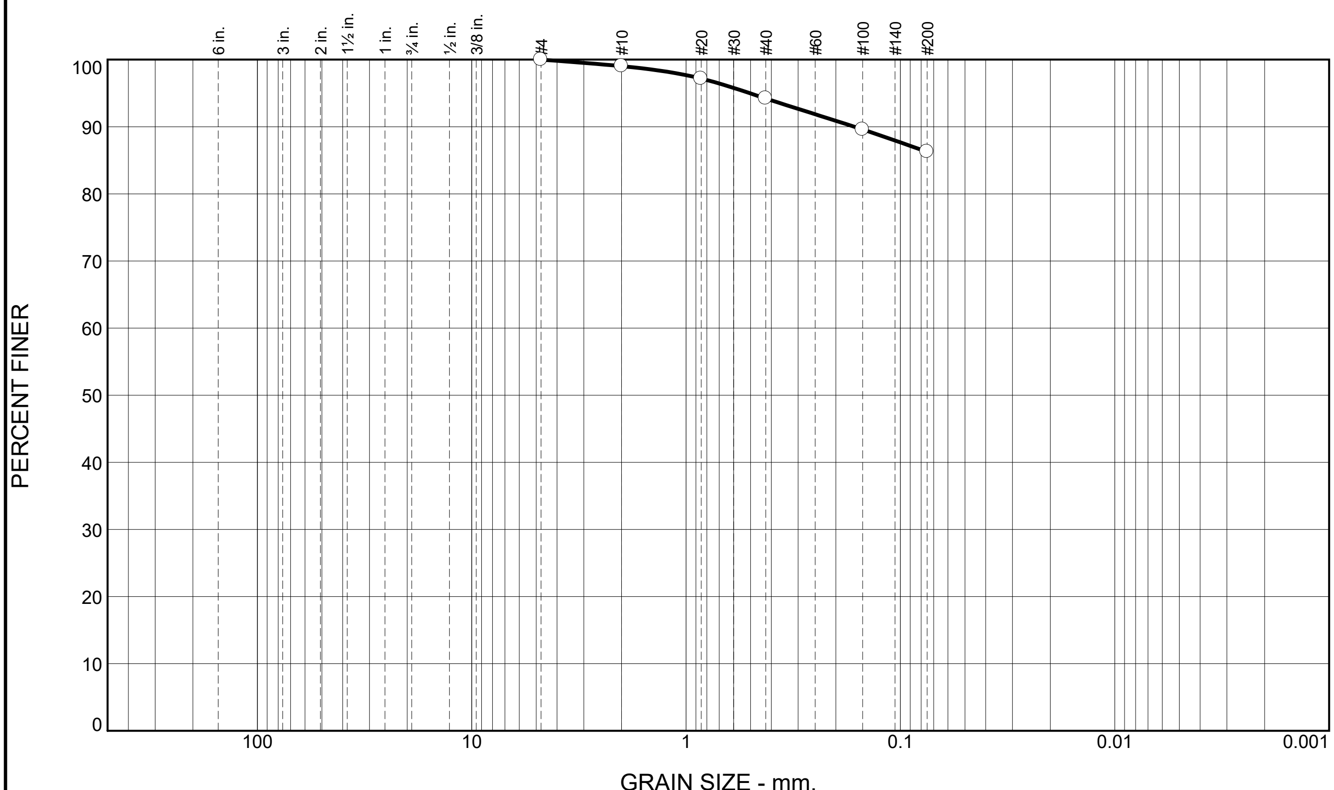
Triad Engineering, Inc.
Morgantown, WV

Remarks:

Figure C-9

Tested By: LMC **Checked By:** JKM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	5	8	86	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#10	99		
#20	97		
#40	94		
#100	90		
#200	86		

* (no specification provided)

Soil Description

BROWN LEAN CLAY

Atterberg Limits

PL= 22 LL= 34 PI= 12

Coefficients

D_{90}= 0.1641 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(10)

Remarks

Location: B-7
Sample Number: BULK **Depth:** 1.0' - 3.0' **Date:** 9/21/22

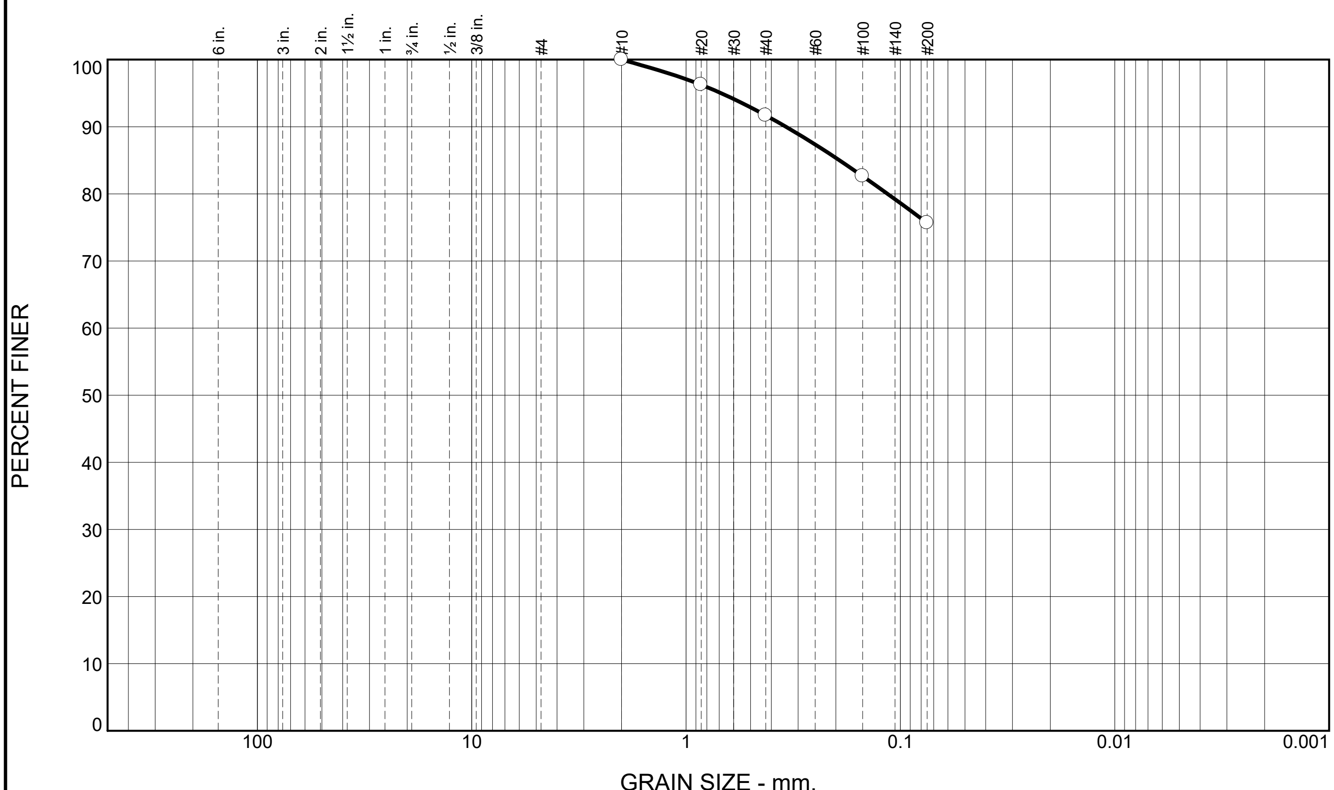
Triad Engineering, Inc.

St. Albans, WV

Client: ORIDEN POWER
Project: DOGWOOD CORNERS ENERGY PROJECT
Project No: 04-22-0345 **Figure C-10**

Tested By: NRC **Checked By:** BRETT MORRIS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	8	16	76	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100		
#20	96		
#40	92		
#100	83		
#200	76		

* (no specification provided)

Soil Description

GREYISH BROWN LEAN CLAY WITH SAND

Atterberg Limits

PL= 23 LL= 44 PI= 21

Coefficients

D_{90}= 0.3423 D_{85}= 0.1925 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(16)

Remarks

Location: B-17
Sample Number: S-3 **Depth:** 5.0' - 6.5' **Date:** 9/22/22

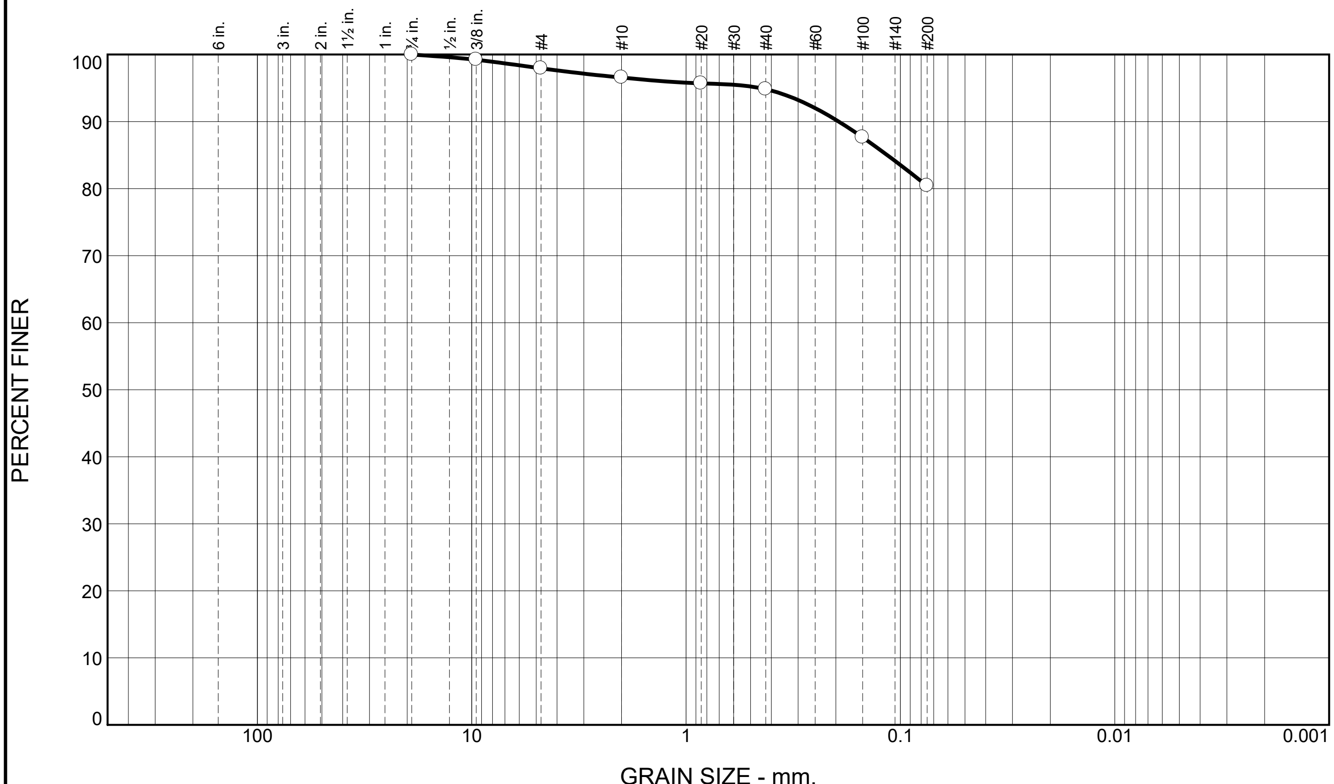
Triad Engineering, Inc.

St. Albans, WV

Client: ORIDEN POWER
Project: DOGWOOD CORNERS ENERGY PROJECT
Project No: 04-22-0345 **Figure C-11**

Tested By: NRC **Checked By:** BRETT MORRIS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	1	2	15	80	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
3/8"	99		
#4	98		
#10	97		
#20	96		
#40	95		
#100	88		
#200	80		

* (no specification provided)

Soil Description

LIGHT BROWN LEAN CLAY WITH SAND

Atterberg Limits

PL= 16 LL= 28 PI= 12

Coefficients

D_{90}= 0.1941 D_{85}= 0.1153 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(8)

Remarks

Location: B-23
Sample Number: S-2 **Depth:** 2.5' - 4.0' **Date:** 9/22/22

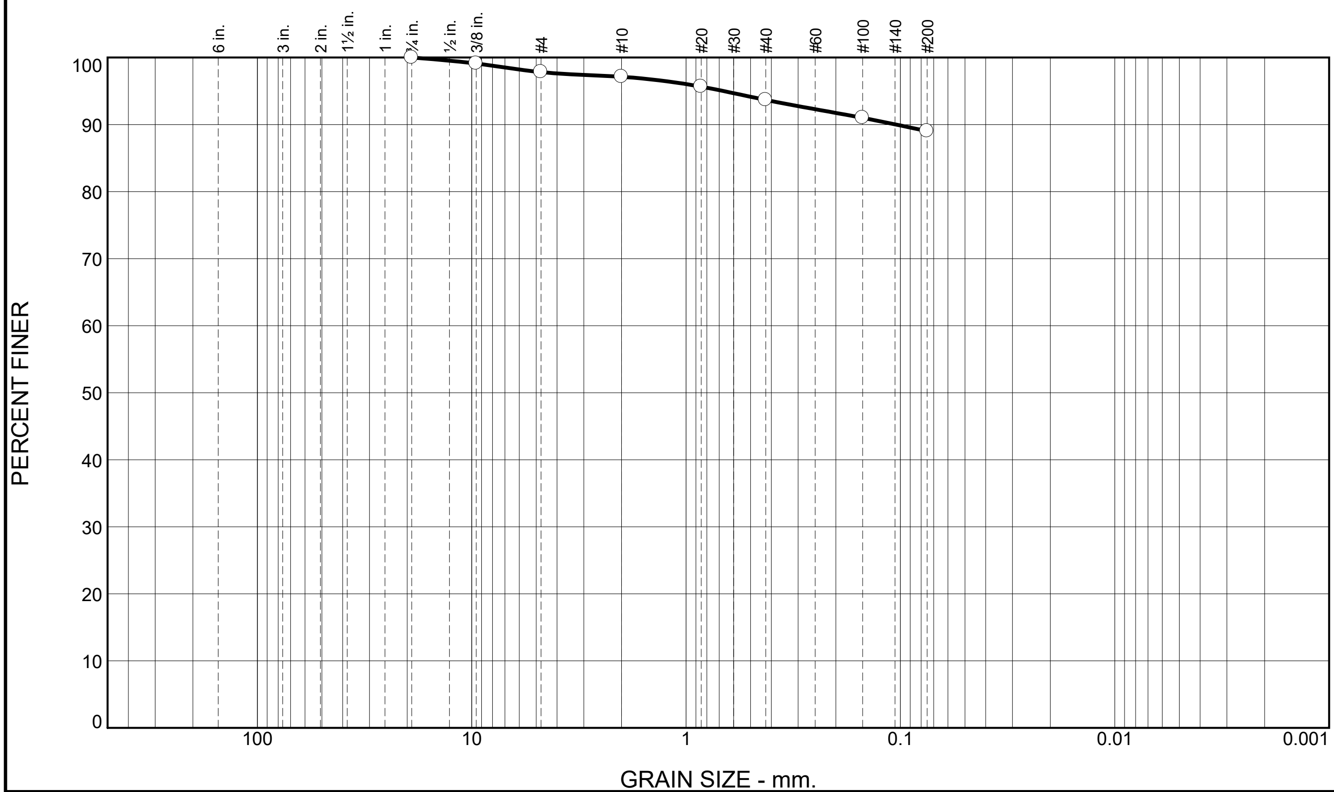
Triad Engineering, Inc.

St. Albans, WV

Client: ORIDEN POWER
Project: DOGWOOD CORNERS ENERGY PROJECT
Project No: 04-22-0345 **Figure C-12**

Tested By: NRC **Checked By:** BRETT MORRIS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	1	3	5	89	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
3/8"	99		
#4	98		
#10	97		
#20	96		
#40	94		
#100	91		
#200	89		

* (no specification provided)

Soil Description

LIGHT BROWN LEAN CLAY

Atterberg Limits

PL= 21 LL= 43 PI= 22

Coefficients

D_{90}= 0.1049 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(20)

Remarks

Location: B-31
Sample Number: S-2 **Depth:** 2.5' - 4.0' **Date:** 9/22/22

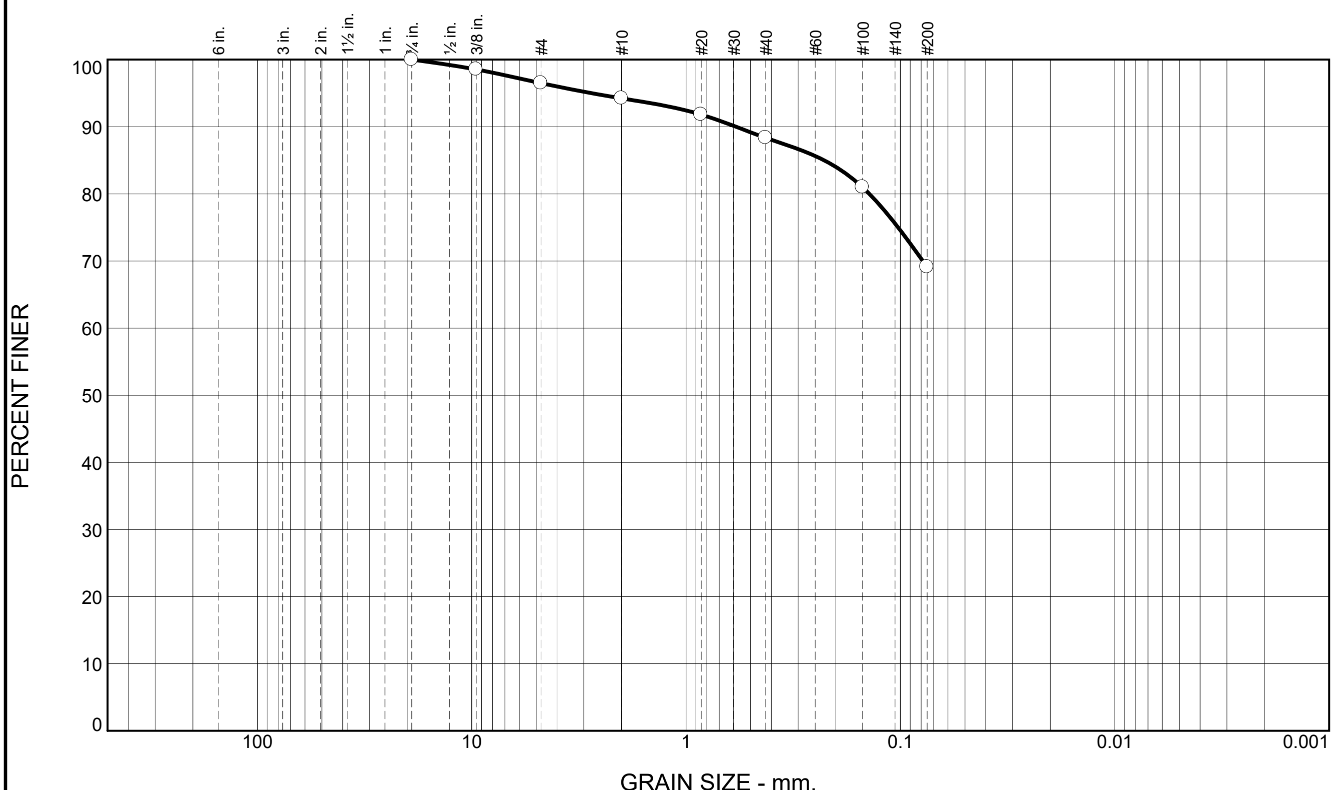
Triad Engineering, Inc.

St. Albans, WV

Client: ORIDEN POWER
Project: DOGWOOD CORNERS ENERGY PROJECT
Project No: 04-22-0345 **Figure C-13**

Tested By: NRC **Checked By:** BRETT MORRIS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	4	2	6	19	69	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
3/8"	99		
#4	96		
#10	94		
#20	92		
#40	88		
#100	81		
#200	69		

* (no specification provided)

Soil Description

BROWN SANDY LEAN CLAY

Atterberg Limits

PL= 22 LL= 32 PI= 10

Coefficients

D_{90}= 0.5848 D_{85}= 0.2271 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(5)

Remarks

Location: B-35
Sample Number: BULK **Depth:** 1.0' - 3.0' **Date:** 9/21/22

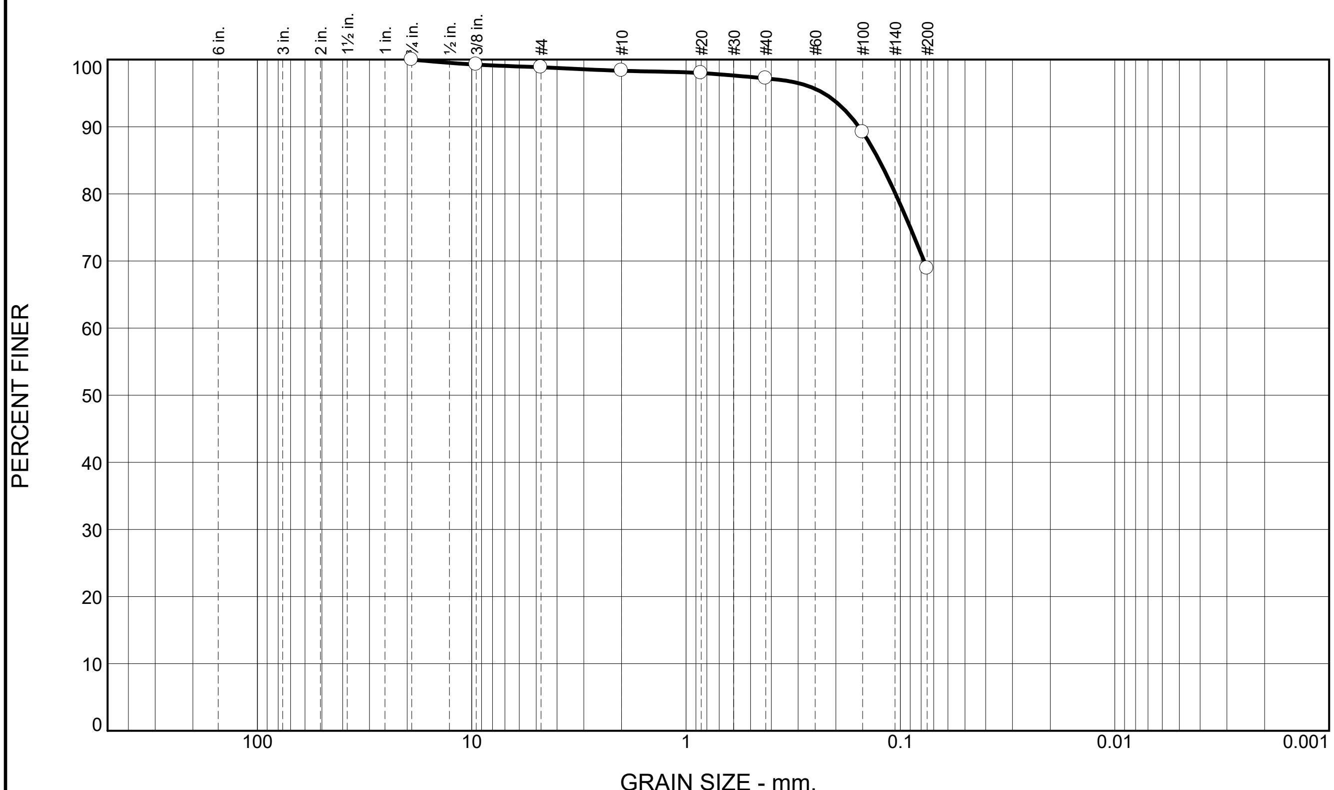
Triad Engineering, Inc.

St. Albans, WV

Client: ORIDEN POWER
Project: DOGWOOD CORNERS ENERGY PROJECT
Project No: 04-22-0345 **Figure C-14**

Tested By: NRC **Checked By:** BRETT MORRIS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	1	1	28	69	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
3/8"	99		
#4	99		
#10	98		
#20	98		
#40	97		
#100	89		
#200	69		

* (no specification provided)

Soil Description

REDDISH BROWN SANDY LEAN CLAY

Atterberg Limits

PL= 14 LL= 36 PI= 22

Coefficients

D_{90}= 0.1562 D_{85}= 0.1256 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

Remarks

Location: B-45
Sample Number: S-3 **Depth:** 5.0' - 6.5' **Date:** 9/21/22

Triad Engineering, Inc.

St. Albans, WV

Client: ORIDEN POWER
Project: DOGWOOD CORNERS ENERGY PROJECT
Project No: 04-22-0345 **Figure C-15**

Tested By: NRC **Checked By:** BRETT MORRIS

October 3, 2022

Project No. 2022-629-001

Mr. Brad Reynolds
Triad Engineering, Inc.
1075 D Sherman Ave.
Hagerstown, MD 21740

Transmittal
Laboratory Test Results
Dogwood Solar 04-22-0345

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (*Method B*)

Client:	Triad Engineering, Inc.	Boring No.:	RL-1
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-1
Lab ID:	2022-629-001-001	Description:	Brown Clay

(- # 10 Sieve material)

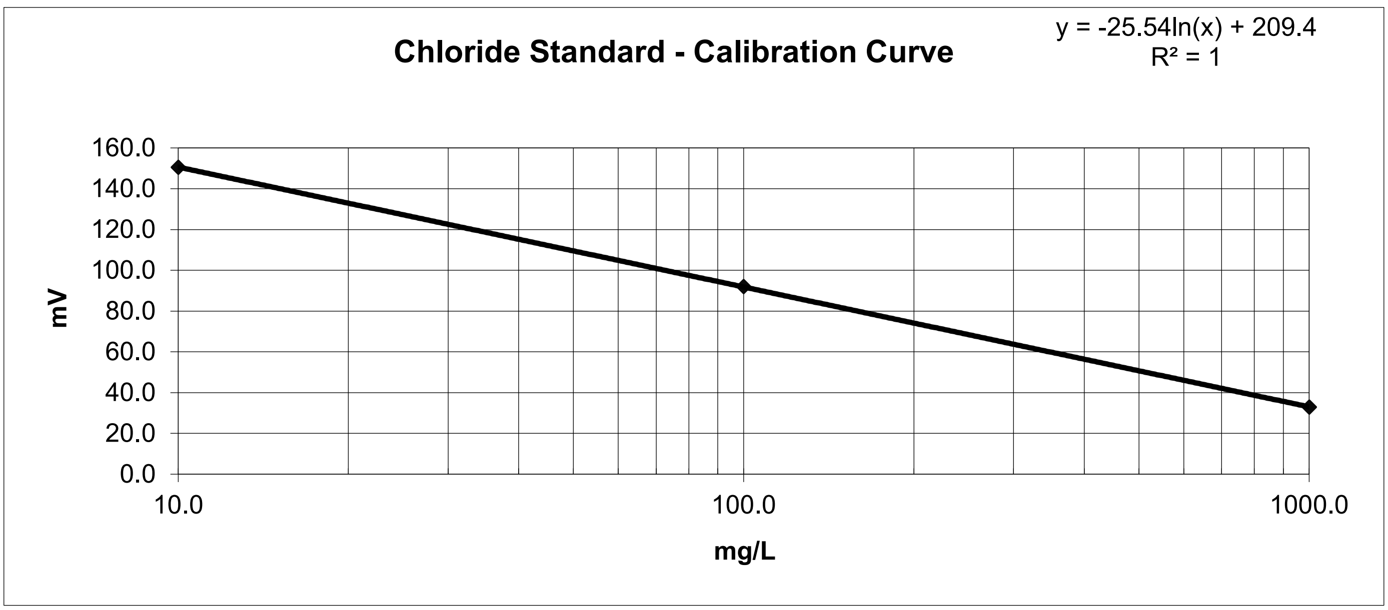
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	150.5
100.0 mg/L	92.0
1000.0 mg/L	32.9

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	146.2	11.88	11.88

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5°C.



Notes:

Tested By	JAM	Date	9/21/22	Checked By	BRB	Date	9/22/22

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pH OF SOILS

AASHTO T 289-91 (2013)

Client:	Triad Engineering, Inc.
Client Reference:	Dogwood Solar 04-22-0345
Project No.:	2022-629-001

Lab ID:	001
Boring No.:	RL-1
Depth (ft):	1.0-3.0'
Sample No.:	RL-1
Drying Tare No.:	33
Testing Tare No.:	I
Temperature (^{o}C):	21.8
pH of Sample:	**5.95**

Meter Calibration (as used each day)		
Buffer pH	Meter Reading	Meter Model
4.00	4.00	ORION 720A
7.00	7.02	
10.00	7.02	

Tested By	JAM	Date	9/20/22	Checked By	BRB	Date	9/21/22

 DCN: CT-S36B DATE 6/5/14 REVISION: 1

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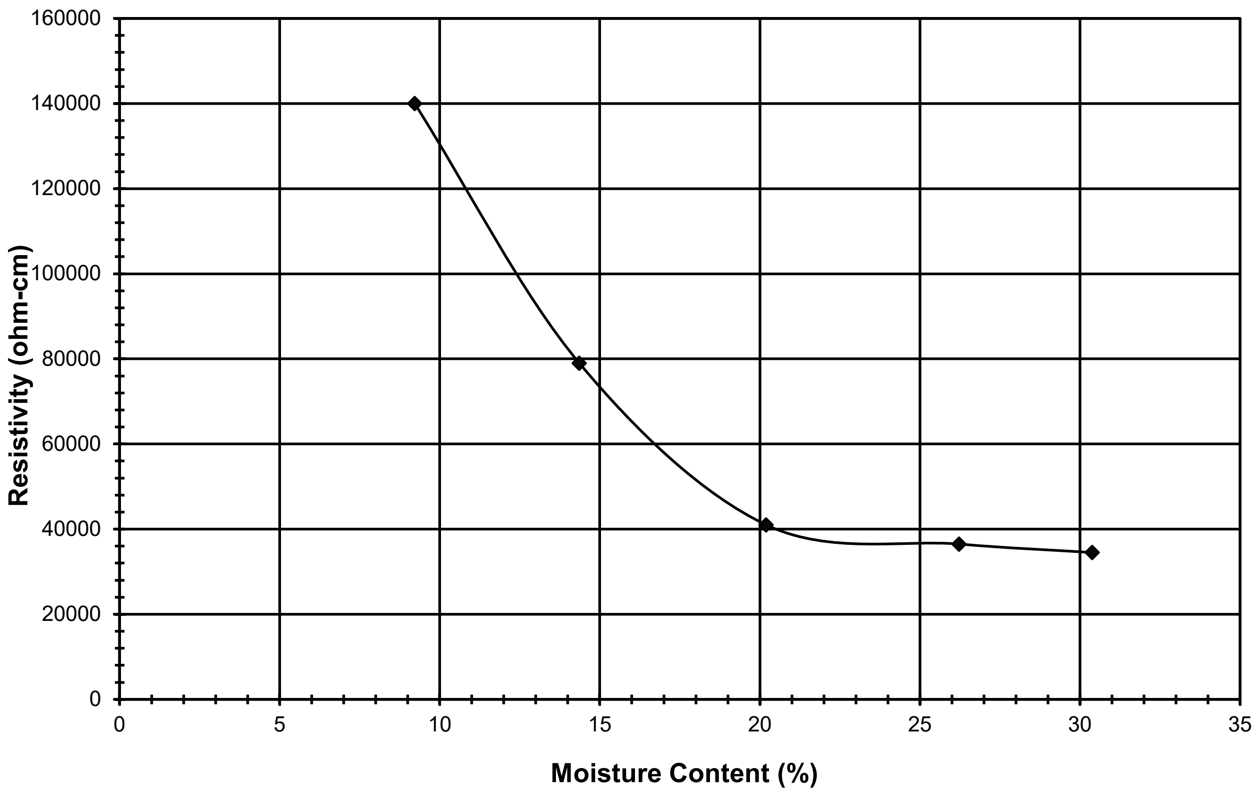
Minimum Resistivity

AASHTO T288-12

Client:	Triad Engineering, Inc.	Boring No.:	RL-1
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-1
Lab ID:	2022-629-001-001	Visual Description:	Brown Clay
		(- #10 Sieve material)	

Tare No.:	355	326	43	507	315
Tare & Wet Specimen (g):	36.88	40.99	57.99	59.08	39.33
Tare & Dry Specimen (g):	35.30	38.24	51.44	50.83	34.49
Tare Weight (g):	18.16	19.09	19.01	19.36	18.56
Moisture Content (%):	**9.2**	**14.4**	**20.2**	**26.2**	**30.4**
Resistance (ohm):	**140000**	**79000**	**41000**	**36500**	**34500**
Resistivity (ohm-cm):	**140000**	**79000**	**41000**	**36500**	**34500**

Note: The ratio of Miller Box area versus distance between electrodes is equal to 1.



Soil Class	*Corrosion Resistance*	*Specific Resistivity (ohm-cm)*
1	Excellent	10,000 - 6,000
2	Good	6,000 - 4,500
3	Fair	4,500 - 2,000
4	Bad	2,000 - 0

Tested By JAM *Date* 9/21/2022 *Checked By* BRB *Date* 9/22/2022

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Water-Soluble Sulfate Ion Content in Soil

AASHTO T 290-95 (2020)

Client:	Triad Engineering, Inc.	Boring No.:	RL-1
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-1
Lab ID:	2022-629-001-001	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)								
0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)								
Underrange	Underrange	6	22	47	68	129	179	241

Measurement of Barium Chloride Turbidity

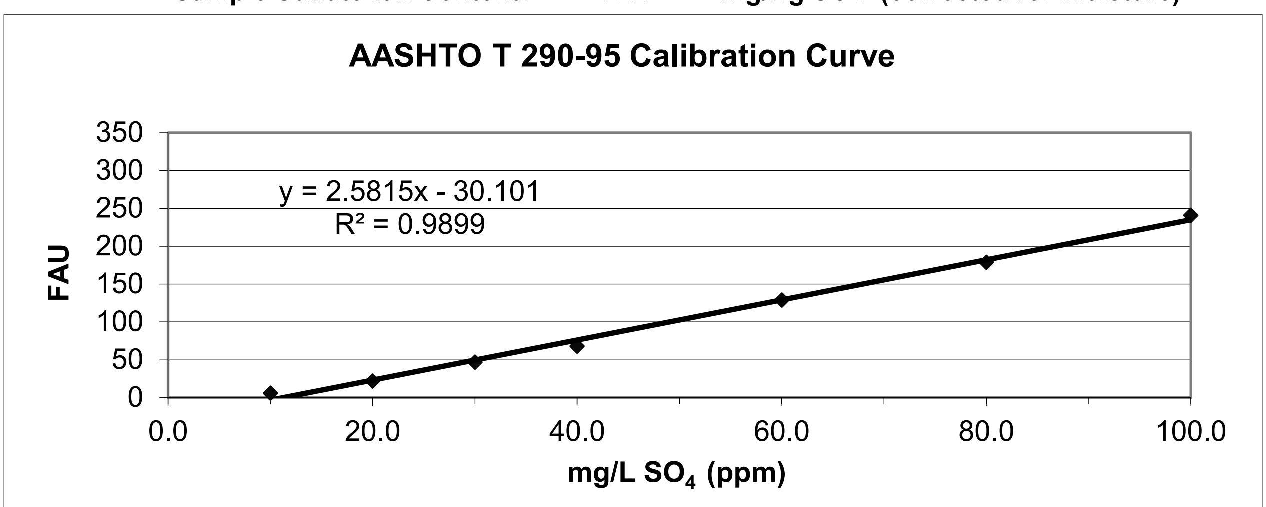
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	31
Sample Diluted:	No
Sulfate Solution Added (ml):	0

Sample Moisture Content

Tare Number:	1731
Weight of Tare & Wet Sample (g):	185.45
Weight of Tare & Dry Sample (g):	183.94
Weight of Tare (g):	82.83
Weight of Water (g):	1.51
Weight of Dry Sample (g):	101.11
Moisture Content (%):	1.49

Sample Sulfate Ion Concentration:	23.67	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	71.0	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	72.1	**mg/Kg SO4 (corrected for moisture)**



Tested by:	JAM	Date:	9/23/22	Checked by:	BRB	Date:	9/26/2022

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THERMAL CONDUCTIVITY OF SOILS

ASTM D5334-14

Client:	Triad Engineering, Inc.	Boring No.:	RL-1
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0
Project No.:	2022-629-001	Sample No.:	RL-1
Lab ID:	2022-629-001-001		

Visual Description: Light Brown Clay (Remolded)

Mold / Specimen

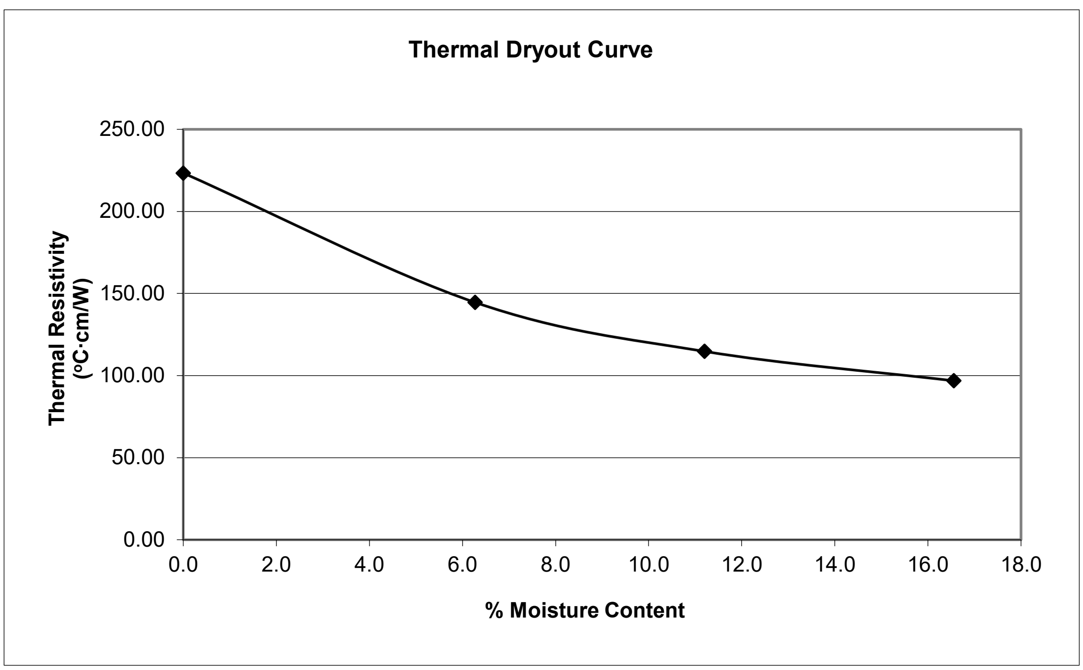
Point No.	**1**	**2**	**3**	**4**
Mold ID:	P	P	P	P
Weight of Sample and Mold (g):	2704	2628	2558	2469
Weight of Mold (g):	1050	1050	1050	1050
Sample Volume (cm^3):	863	863	863	863

Moisture Content / Density

Weight of Water (g):	235.00	159.00	89.00	0.00
Weight of Dry Sample (g):	1419.38	1419.38	1419.38	1419.38

Wet Density (g/cm^3):	1.92	1.83	1.75	1.65
Wet Density (pcf):	119.7	114.2	109.1	102.7
Moisture Content (%):	**16.6**	**11.2**	**6.3**	**0.0**
Dry Density (pcf):	**102.7**	**102.7**	**102.7**	**102.7**

Thermal Conductivity (W/(m·K))	1.033	0.872	0.692	0.448
Thermal Resistivity (^{o}C·cm/W)	96.83	114.74	144.59	223.38



Tested By	JAC	*Date*	9/30/22	*Checked By*	NJM	*Date*	10/3/22

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (*Method B*)

Client:	Triad Engineering, Inc.	Boring No.:	RL-3
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-3
Lab ID:	2022-629-001-002	Description:	Brown Clay

(- # 10 Sieve material)

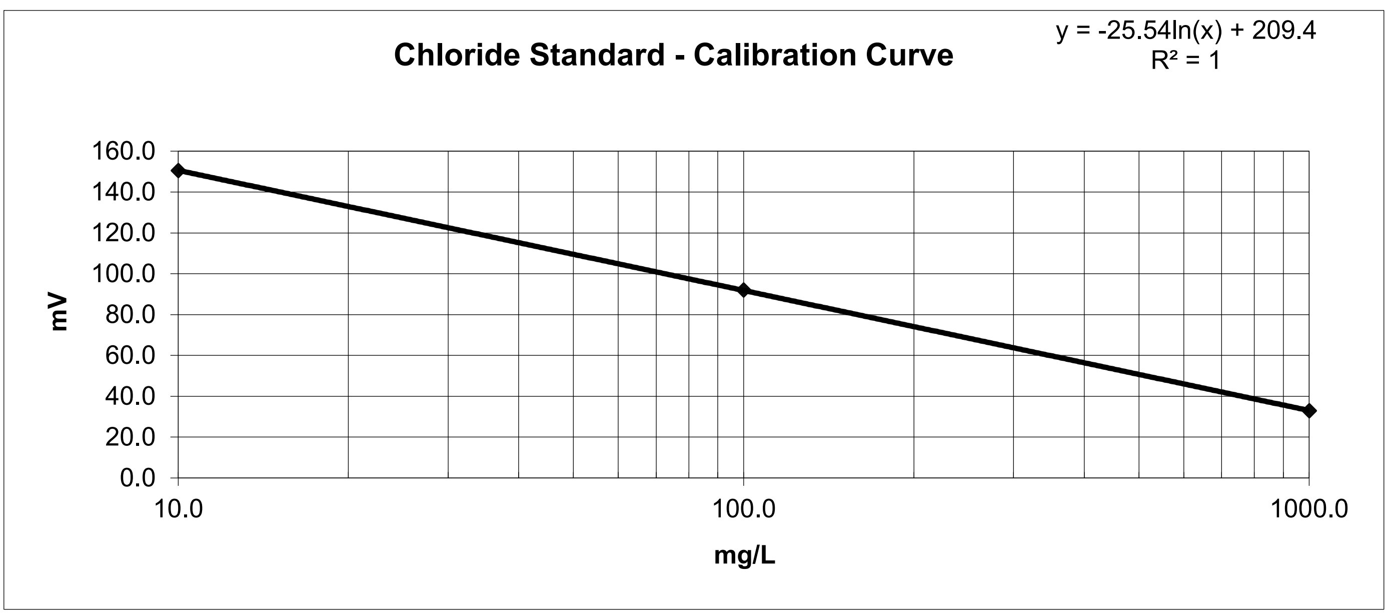
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD		MILLIVOLTS (mV)
10.0	mg/L	150.5
100.0	mg/L	92.0
1000.0	mg/L	32.9

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	122.1	30.53	30.53

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5^{o}C.



Notes:

Tested By	JAM	Date	9/21/22	Checked By	BRB	Date	9/22/22

 DCN: CT-S63A DATE: 6/2/14 REVISION: 1

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pH OF SOILS

AASHTO T 289-91 (2013)

Client:	Triad Engineering, Inc.
Client Reference:	Dogwood Solar 04-22-0345
Project No.:	2022-629-001

Lab ID:	002
Boring No.:	RL-3
Depth (ft):	1.0-3.0'
Sample No.:	RL-3
Drying Tare No.:	63
Testing Tare No.:	A
Temperature (^{o}C):	21.8
pH of Sample:	**5.41**

Meter Calibration (as used each day)		
Buffer pH	Meter Reading	Meter Model
4.00 7.00 10.00	4.00 7.02 7.02	ORION 720A

Tested By	JAM	Date	9/20/22	Checked By	BRB	Date	9/21/22

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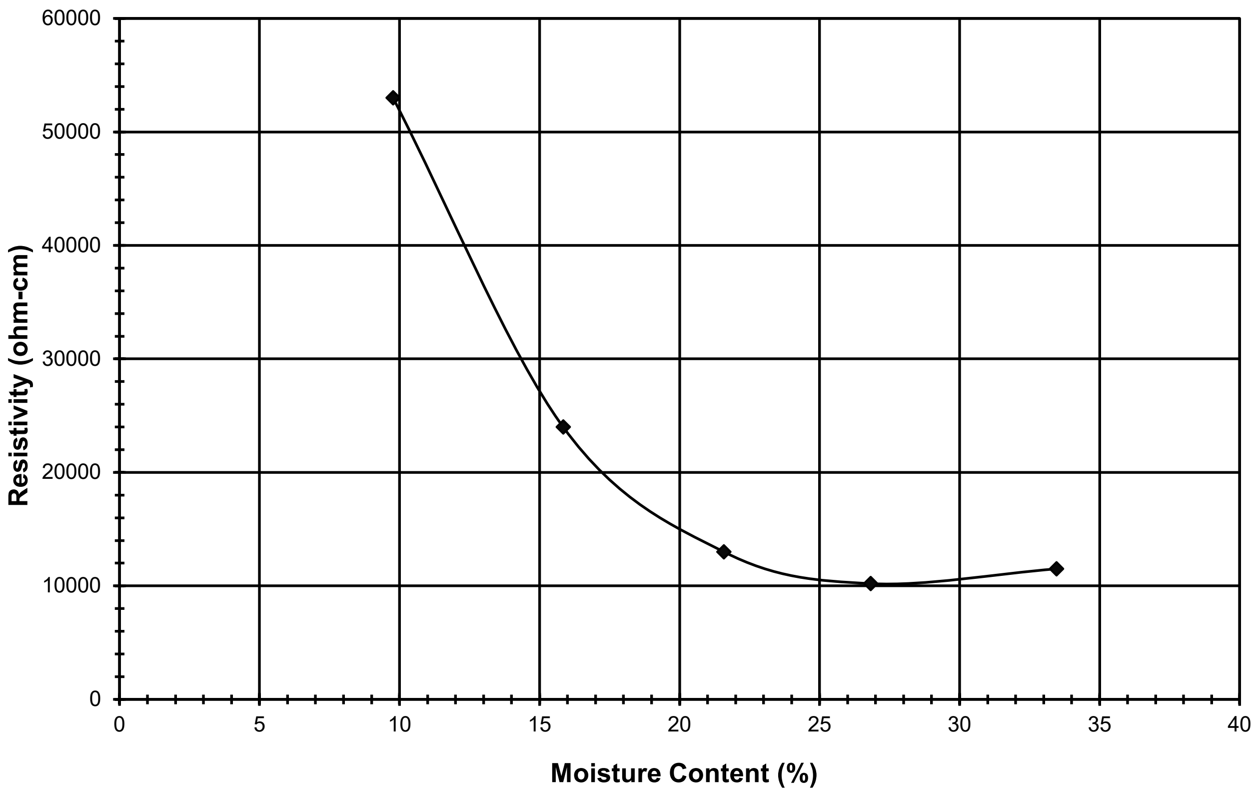
Minimum Resistivity

AASHTO T288-12

Client:	Triad Engineering, Inc.	Boring No.:	RL-3
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-3
Lab ID:	2022-629-001-002	Visual Description:	Brown Clay
		(- #10 Sieve material)	

Tare No.:	279	262	511	254	175
Tare & Wet Specimen (g):	38.67	31.82	50.08	50.74	55.25
Tare & Dry Specimen (g):	37.16	28.94	44.62	44.99	46.33
Tare Weight (g):	21.70	10.76	19.32	23.55	19.67
Moisture Content (%):	**9.8**	**15.8**	**21.6**	**26.8**	**33.5**
Resistance (ohm):	**53000**	**24000**	**13000**	**10200**	**11500**
Resistivity (ohm-cm):	**53000**	**24000**	**13000**	**10200**	**11500**

Note: The ratio of Miller Box area versus distance between electrodes is equal to 1.



Soil Class	*Corrosion Resistance*	*Specific Resistivity (ohm-cm)*
1	Excellent	10,000 - 6,000
2	Good	6,000 - 4,500
3	Fair	4,500 - 2,000
4	Bad	2,000 - 0

Tested By JAM *Date* 9/21/2022 *Checked By* BRB *Date* 9/22/2022

 DCN: CT-S56, DATE: 4/23/04, REVISION: 1

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Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2020)

Client:	Triad Engineering, Inc.	Boring No.:	RL-3
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-3
Lab ID:	2022-629-001-002	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)	0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)	Underrange	Underrange	6	22	47	68	129	179	241

Measurement of Barium Chloride Turbidity

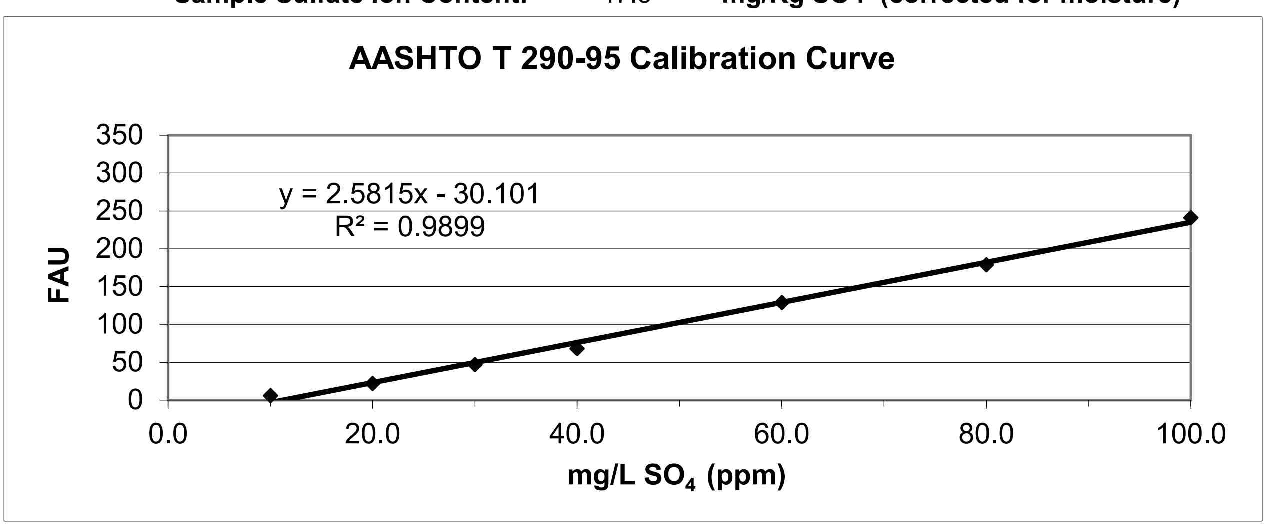
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	11
Sample Diluted:	No
Sulfate Solution Added (ml):	5

Sample Moisture Content

Tare Number:	ZY
Weight of Tare & Wet Sample (g):	189.05
Weight of Tare & Dry Sample (g):	186.42
Weight of Tare (g):	82.98
Weight of Water (g):	2.63
Weight of Dry Sample (g):	103.44
Moisture Content (%):	2.54

Sample Sulfate Ion Concentration:	15.42	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	46.3	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	47.5	**mg/Kg SO4 (corrected for moisture)**



Tested by:	JAM	Date:	9/23/22	Checked by:	BRB	Date:	9/26/2022

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THERMAL CONDUCTIVITY OF SOILS

ASTM D5334-14

Client:	Triad Engineering, Inc.	Boring No.:	RL-3
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0
Project No.:	2022-629-001	Sample No.:	RL-3
Lab ID:	2022-629-001-002		

Visual Description: Brown Clay (Remolded)

Mold / Specimen

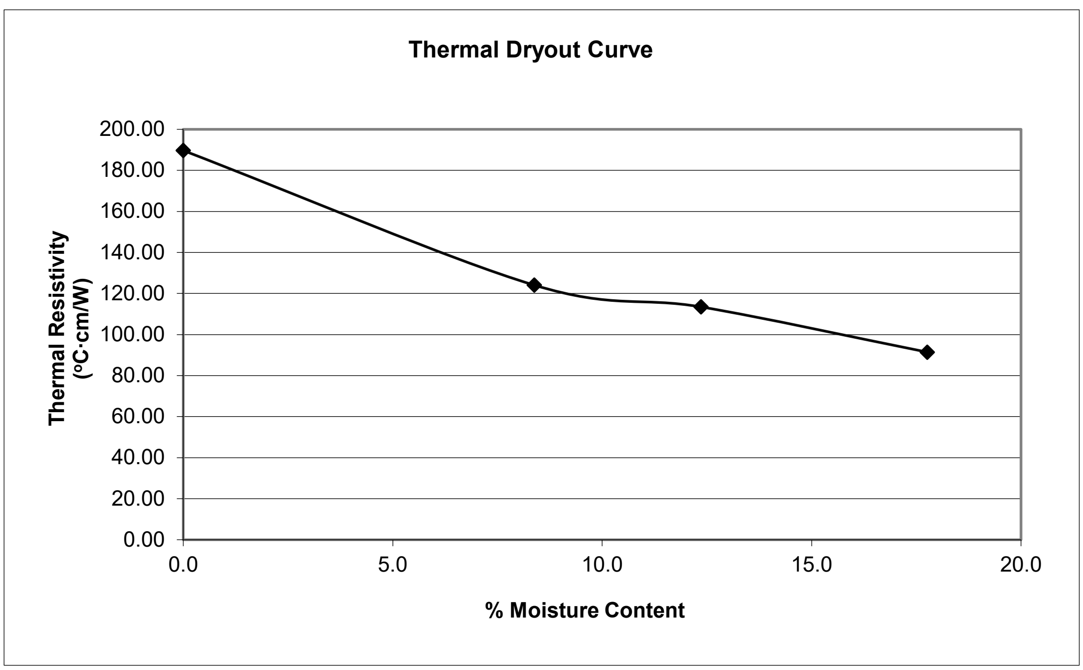
Point No.	**1**	**2**	**3**	**4**
Mold ID:	O	O	O	O
Weight of Sample and Mold (g):	2738	2662	2606	2488
Weight of Mold (g):	1080	1080	1080	1080
Sample Volume (cm^3):	860	860	860	860

Moisture Content / Density

Weight of Water (g):	250.00	174.00	118.00	0.00
Weight of Dry Sample (g):	1407.60	1407.60	1407.60	1407.60

Wet Density (g/cm^3):	1.93	1.84	1.77	1.64
Wet Density (pcf):	120.3	114.8	110.7	102.2
Moisture Content (%):	**17.8**	**12.4**	**8.4**	**0.0**
Dry Density (pcf):	**102.2**	**102.2**	**102.2**	**102.2**

Thermal Conductivity (W/(m·K))	1.094	0.881	0.806	0.527
Thermal Resistivity (^{o}C·cm/W)	91.44	113.47	124.07	189.68



Tested By	JAC	*Date*	9/30/22	*Checked By*	NJM	*Date*	10/3/22

DCN: CT-S69, DATE: 4/20/18, REVISION: 1

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (*Method B*)

Client:	Triad Engineering, Inc.	Boring No.:	RL-4
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-4
Lab ID:	2022-629-001-003	Description:	Brown Clay

(- # 10 Sieve material)

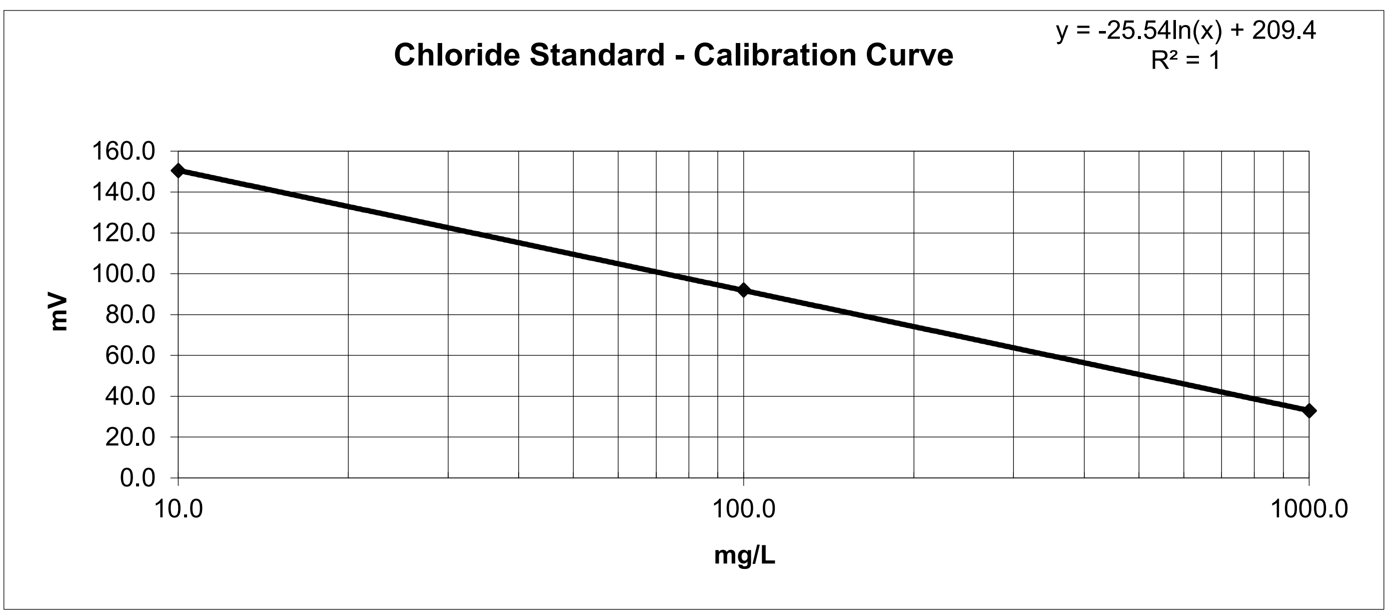
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD		MILLIVOLTS (mV)
10.0	mg/L	150.5
100.0	mg/L	92.0
1000.0	mg/L	32.9

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	116.4	38.16	38.16

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5°C.



Notes:

Tested By	JAM	Date	9/21/22	Checked By	BRB	Date	9/22/22

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pH OF SOILS

AASHTO T 289-91 (2013)

Client: Triad Engineering, Inc.
Client Reference: Dogwood Solar 04-22-0345
Project No.: 2022-629-001

Lab ID: 003
Boring No.: RL-4
Depth (ft): 1.0-3.0'
Sample No.: RL-4

Drying Tare No.: 23
Testing Tare No.: F

Temperature (^{o}C): 21.8

pH of Sample: **5.21**

Meter Calibration (as used each day)		
Buffer pH	Meter Reading	Meter Model
4.00 7.00 10.00	4.00 7.02 7.02	ORION 720A

Tested By JAM Date 9/20/22 Checked By BRB Date 9/21/22

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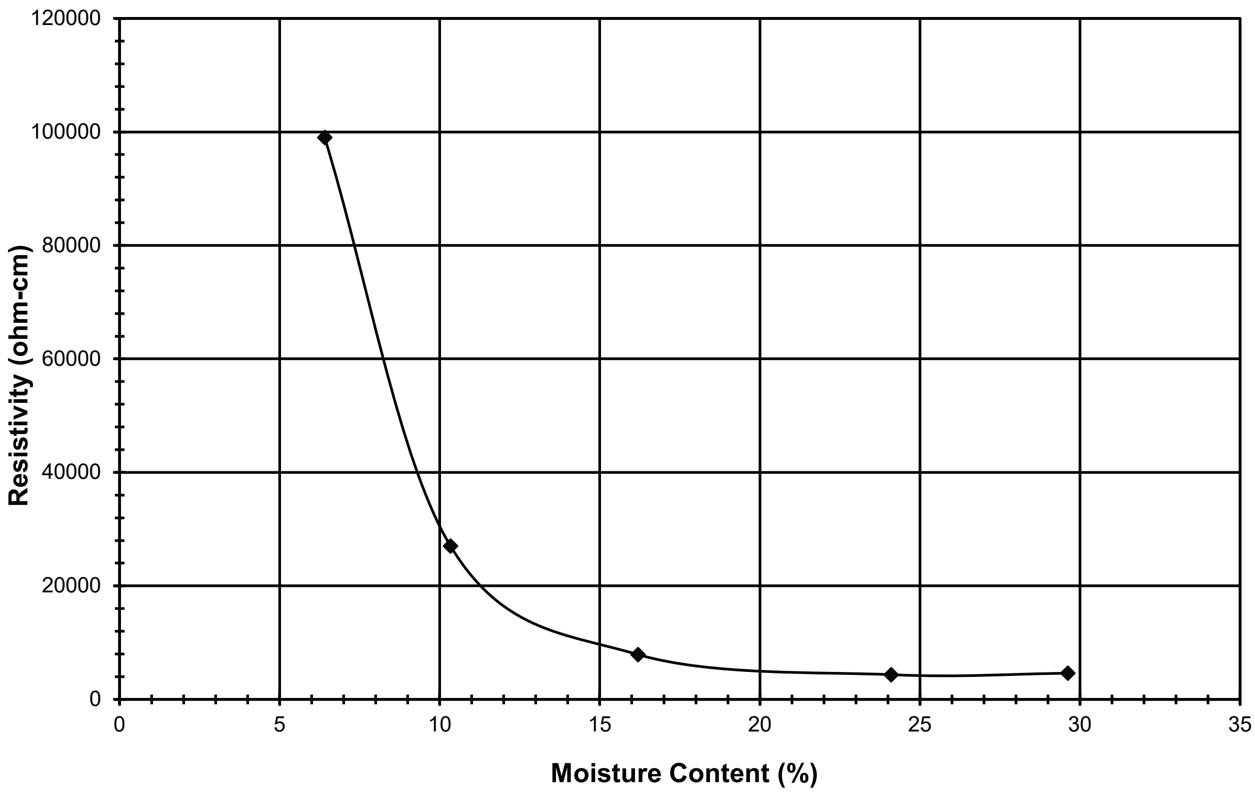
Minimum Resistivity

AASHTO T288-12

Client:	Triad Engineering, Inc.	Boring No.:	RL-4
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-4
Lab ID:	2022-629-001-003	Visual Description:	Brown Clay
			(- #10 Sieve material)

Tare No.:	257	2	408	394	259
Tare & Wet Specimen (g):	35.87	36.42	44.02	64.68	80.03
Tare & Dry Specimen (g):	34.69	34.83	40.84	54.85	66.43
Tare Weight (g):	16.27	19.45	21.20	14.06	20.51
Moisture Content (%):	**6.4**	**10.3**	**16.2**	**24.1**	**29.6**
Resistance (ohm):	**99000**	**27000**	**7900**	**4350**	**4600**
Resistivity (ohm-cm):	**99000**	**27000**	**7900**	**4350**	**4600**

Note: The ratio of Miller Box area versus distance between electrodes is equal to 1.



Soil Class	*Corrosion Resistance*	*Specific Resistivity (ohm-cm)*
1	Excellent	10,000 - 6,000
2	Good	6,000 - 4,500
3	Fair	4,500 - 2,000
4	Bad	2,000 - 0

Tested By JAM *Date* 9/21/2022 *Checked By* BRB *Date* 9/22/2022

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Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2020)

Client:	Triad Engineering, Inc.	Boring No.:	RL-4
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-4
Lab ID:	2022-629-001-003	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)

0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0

Spectrophotometer Readings (FAU)

Underrange	Underrange	6	22	47	68	129	179	241

Measurement of Barium Chloride Turbidity

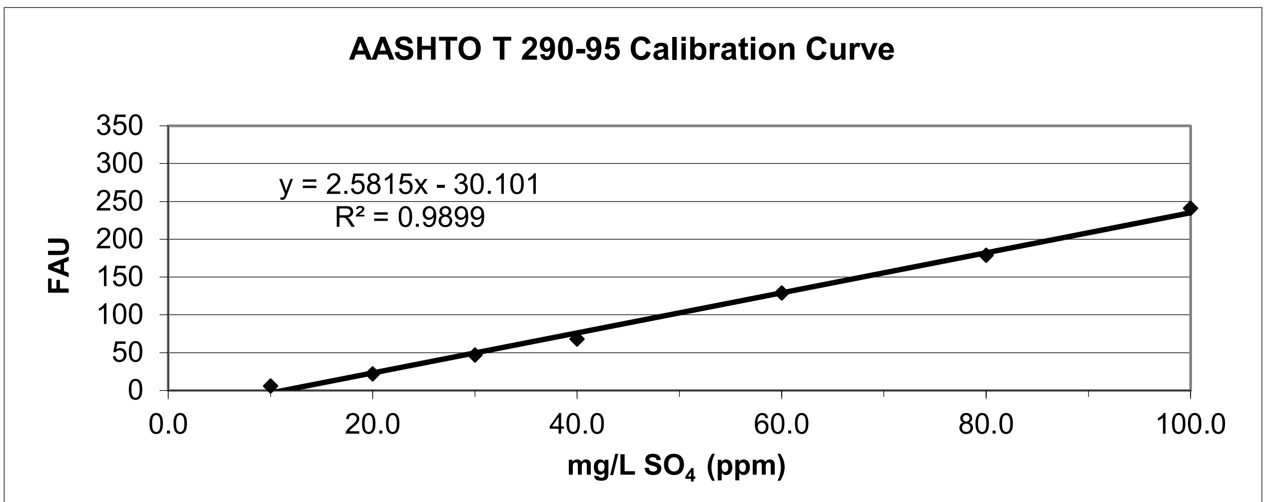
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	44
Sample Diluted:	No
Sulfate Solution Added (ml):	0

Sample Moisture Content

Tare Number:	1693
Weight of Tare & Wet Sample (g):	189.83
Weight of Tare & Dry Sample (g):	186.79
Weight of Tare (g):	82.67
Weight of Water (g):	3.04
Weight of Dry Sample (g):	104.12
Moisture Content (%):	2.92

Sample Sulfate Ion Concentration:	28.70	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	86.1	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	88.7	**mg/Kg SO4 (corrected for moisture)**



Tested by:	JAM	Date:	9/23/22	Checked by:	BRB	Date:	9/26/2022

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THERMAL CONDUCTIVITY OF SOILS

ASTM D5334-14

Client:	Triad Engineering, Inc.	Boring No.:	RL-4
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0
Project No.:	2022-629-001	Sample No.:	RL-4
Lab ID:	2022-629-001-003		

Visual Description: Brown Clay (Remolded)

Mold / Specimen

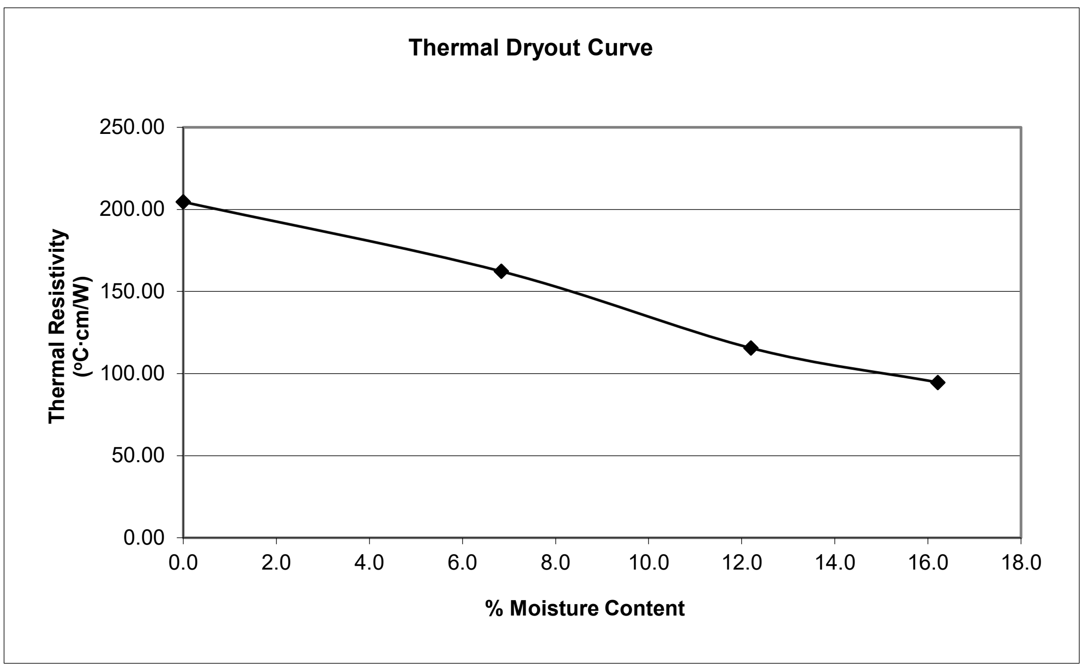
Point No.	**1**	**2**	**3**	**4**
Mold ID:	D	D	D	D
Weight of Sample and Mold (g):	2817	2757	2677	2575
Weight of Mold (g):	1083	1083	1083	1083
Sample Volume (cm^3):	889	889	889	889

Moisture Content / Density

Weight of Water (g):	242.00	182.00	102.00	0.00
Weight of Dry Sample (g):	1492.45	1492.45	1492.45	1492.45

Wet Density (g/cm^3):	1.95	1.88	1.79	1.68
Wet Density (pcf):	121.8	117.6	112.0	104.8
Moisture Content (%):	**16.2**	**12.2**	**6.8**	**0.0**
Dry Density (pcf):	**104.8**	**104.8**	**104.8**	**104.8**

Thermal Conductivity (W/(m·K))	1.057	0.865	0.616	0.489
Thermal Resistivity (^{o}C·cm/W)	94.63	115.58	162.25	204.57



Tested By	JAC	*Date*	9/30/22	*Checked By*	NJM	*Date*	10/3/22

 DCN: CT-S69, DATE: 4/20/18, REVISION: 1 *S:Excel\Excel Qa\Spreadsheets\Thermal Conductivity (rem).xls*

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (*Method B*)

Client:	Triad Engineering, Inc.	Boring No.:	RL-5
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-5
Lab ID:	2022-629-001-004	Description:	Brown Clay

(- # 10 Sieve material)

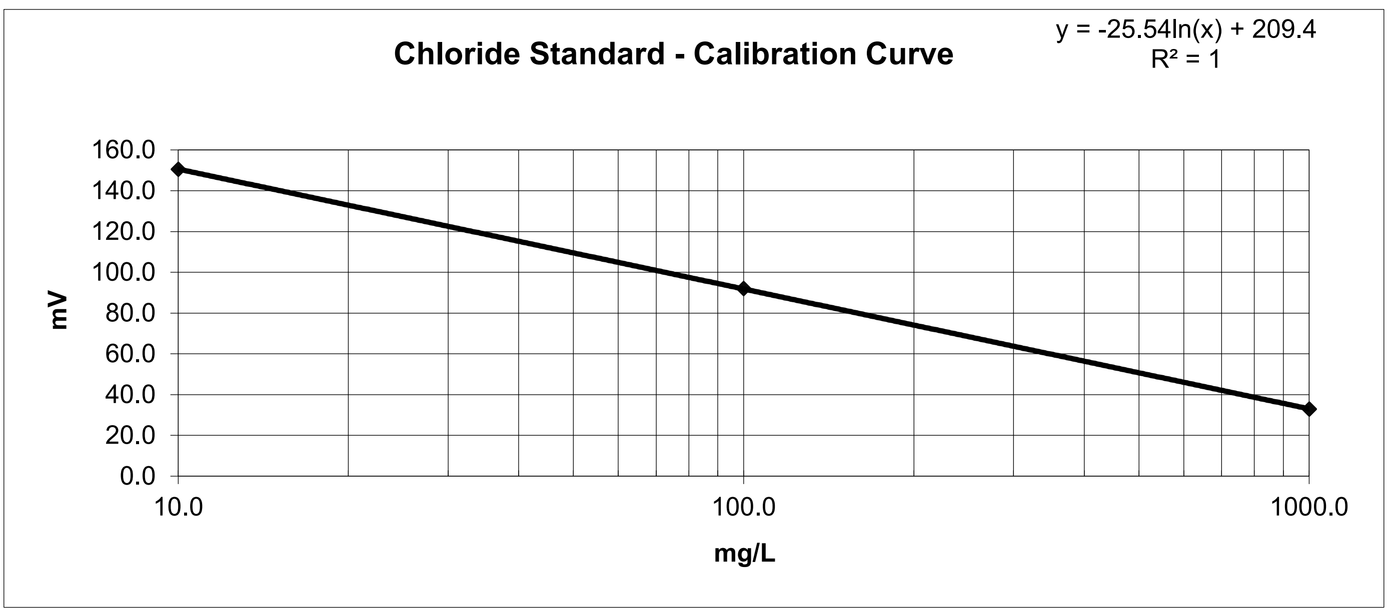
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	150.5
100.0 mg/L	92.0
1000.0 mg/L	32.9

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	116.7	37.72	37.72

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5°C.



Notes:

Tested By	JAM	Date	9/21/22	Checked By	BRB	Date	9/22/22

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pH OF SOILS

AASHTO T 289-91 (2013)

Client:	Triad Engineering, Inc.
Client Reference:	Dogwood Solar 04-22-0345
Project No.:	2022-629-001

Lab ID:	004
Boring No.:	RL-5
Depth (ft):	1.0-3.0'
Sample No.:	RL-5
Drying Tare No.:	17
Testing Tare No.:	G
Temperature (^oC):	21.8
pH of Sample:	**5.21**

Meter Calibration (as used each day)		
Buffer pH	Meter Reading	Meter Model
4.00	4.00	ORION 720A
7.00	7.02	
10.00	7.02	

Tested By	JAM	Date	9/20/22	Checked By	BRB	Date	9/21/22

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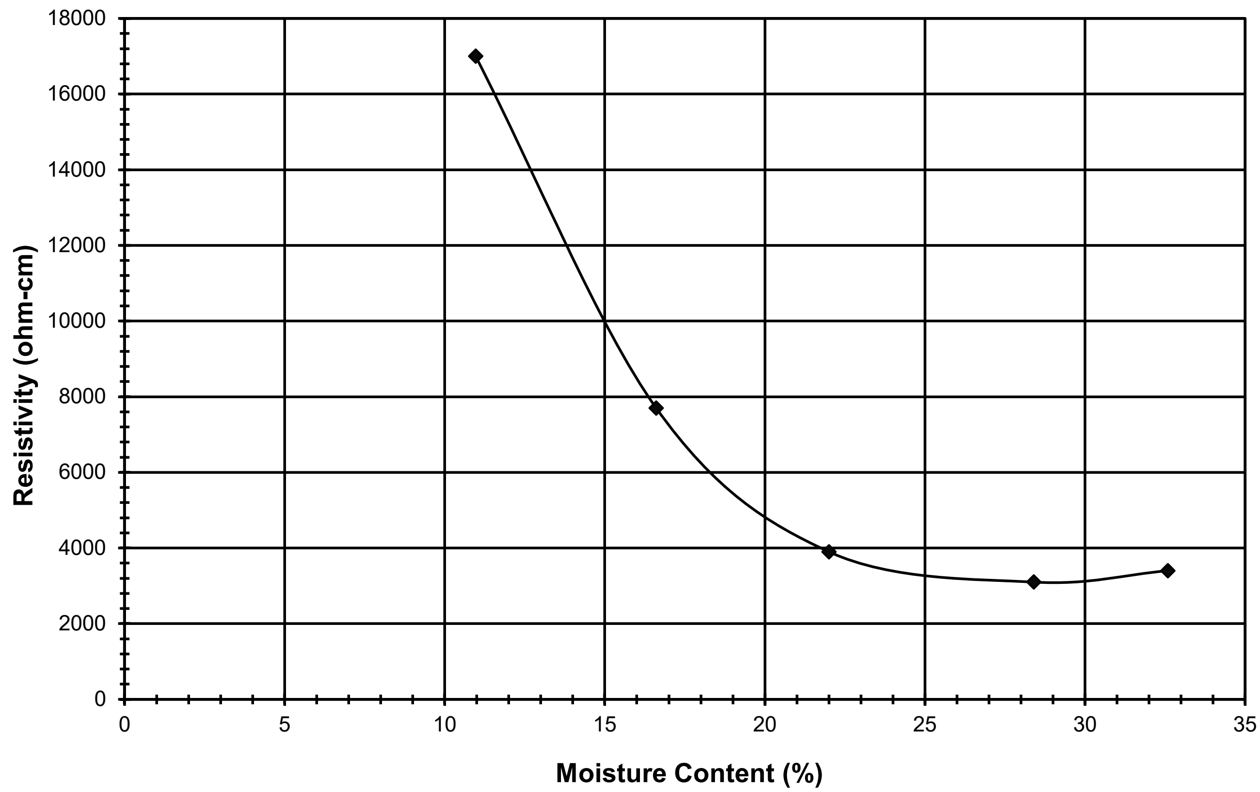
Minimum Resistivity

AASHTO T288-12

Client:	Triad Engineering, Inc.	Boring No.:	RL-5
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-5
Lab ID:	2022-629-001-004	Visual Description:	Brown Clay
		(- #10 Sieve material)	

Tare No.:	325	241	454	334	3
Tare & Wet Specimen (g):	36.34	47.10	48.25	58.11	48.99
Tare & Dry Specimen (g):	34.65	43.03	42.23	49.54	41.59
Tare Weight (g):	19.24	18.52	14.87	19.36	18.88
Moisture Content (%):	**11.0**	**16.6**	**22.0**	**28.4**	**32.6**
Resistance (ohm):	**17000**	**7700**	**3900**	**3100**	**3400**
Resistivity (ohm-cm):	**17000**	**7700**	**3900**	**3100**	**3400**

Note: The ratio of Miller Box area versus distance between electrodes is equal to 1.



Soil Class	*Corrosion Resistance*	*Specific Resistivity (ohm-cm)*
1	Excellent	10,000 - 6,000
2	Good	6,000 - 4,500
3	Fair	4,500 - 2,000
4	Bad	2,000 - 0

Tested By JAM *Date* 9/23/2022 *Checked By* BRB *Date* 9/23/2022

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Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2020)

Client:	Triad Engineering, Inc.	Boring No.:	RL-5
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0'
Project No.:	2022-629-001	Sample No.:	RL-5
Lab ID:	2022-629-001-004	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)	0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)	Underrange	Underrange	6	22	47	68	129	179	241

Measurement of Barium Chloride Turbidity
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

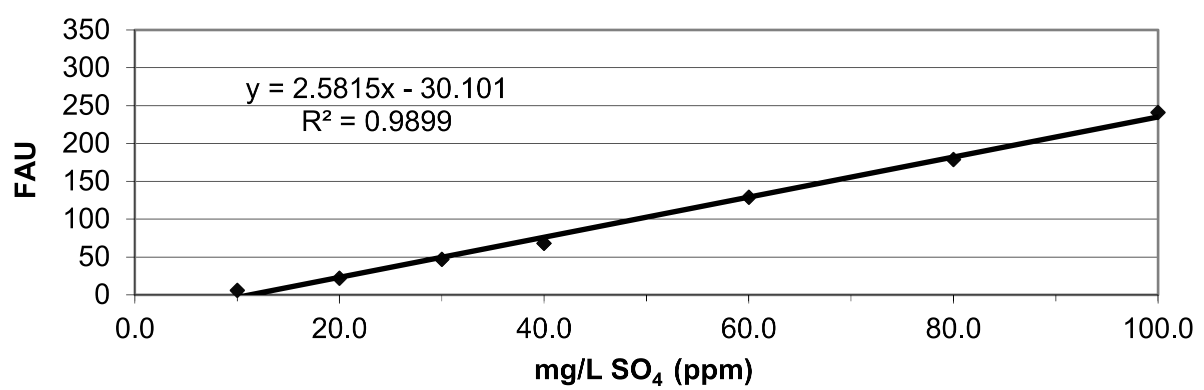
Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	62
Sample Diluted:	No
Sulfate Solution Added (ml):	0

Sample Moisture Content

Tare Number:	888
Weight of Tare & Wet Sample (g):	215.83
Weight of Tare & Dry Sample (g):	213.32
Weight of Tare (g):	110.14
Weight of Water (g):	2.51
Weight of Dry Sample (g):	103.18
Moisture Content (%):	2.43

Sample Sulfate Ion Concentration:	35.68	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	107.0	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	109.7	**mg/Kg SO4 (corrected for moisture)**

AASHTO T 290-95 Calibration Curve



Tested by:	JAM	Date:	9/23/22	Checked by:	BRB	Date:	9/26/2022

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THERMAL CONDUCTIVITY OF SOILS

ASTM D5334-14

Client:	Triad Engineering, Inc.	Boring No.:	RL-5
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	1.0-3.0
Project No.:	2022-629-001	Sample No.:	RL-5
Lab ID:	2022-629-001-004		

Visual Description: Light Brown Clay (Remolded)

Mold / Specimen

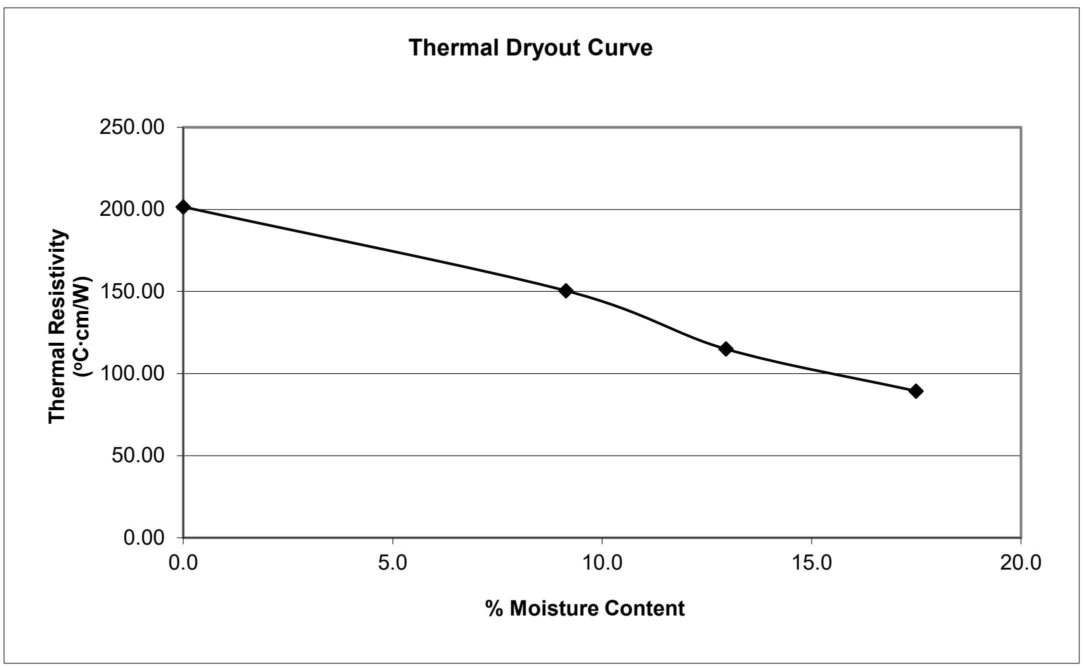
Point No.	**1**	**2**	**3**	**4**
Mold ID:	Q	Q	Q	Q
Weight of Sample and Mold (g):	2758	2694	2640	2511
Weight of Mold (g):	1099	1099	1099	1099
Sample Volume (cm^3):	868	868	868	868

Moisture Content / Density

Weight of Water (g):	247.00	183.00	129.00	0.00
Weight of Dry Sample (g):	1412.17	1412.17	1412.17	1412.17

Wet Density (g/cm^3):	1.91	1.84	1.78	1.63
Wet Density (pcf):	119.3	114.7	110.8	101.5
Moisture Content (%):	**17.5**	**13.0**	**9.1**	**0.0**
Dry Density (pcf):	**101.5**	**101.5**	**101.5**	**101.5**

Thermal Conductivity (W/(m·K))	1.119	0.870	0.665	0.496
Thermal Resistivity (°C·cm/W)	89.36	114.93	150.46	201.57



Tested By	JAC	*Date*	9/30/22	*Checked By*	NJM	*Date*	10/3/22

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October 4, 2022

Project No. 2022-629-002

Mr. Brad Reynolds
Triad Engineering, Inc.
1075 D Sherman Ave.
Hagerstown, MD 21740

Transmittal
Laboratory Test Results
Dogwood Solar 04-22-0345

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (*Method B*)

Client:	Triad Engineering, Inc.	Boring No.:	B-7
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	NA
Project No.:	2022-629-002	Sample No.:	BAG-1
Lab ID:	2022-629-002-001	Description:	Brown Clay

(- # 10 Sieve material)

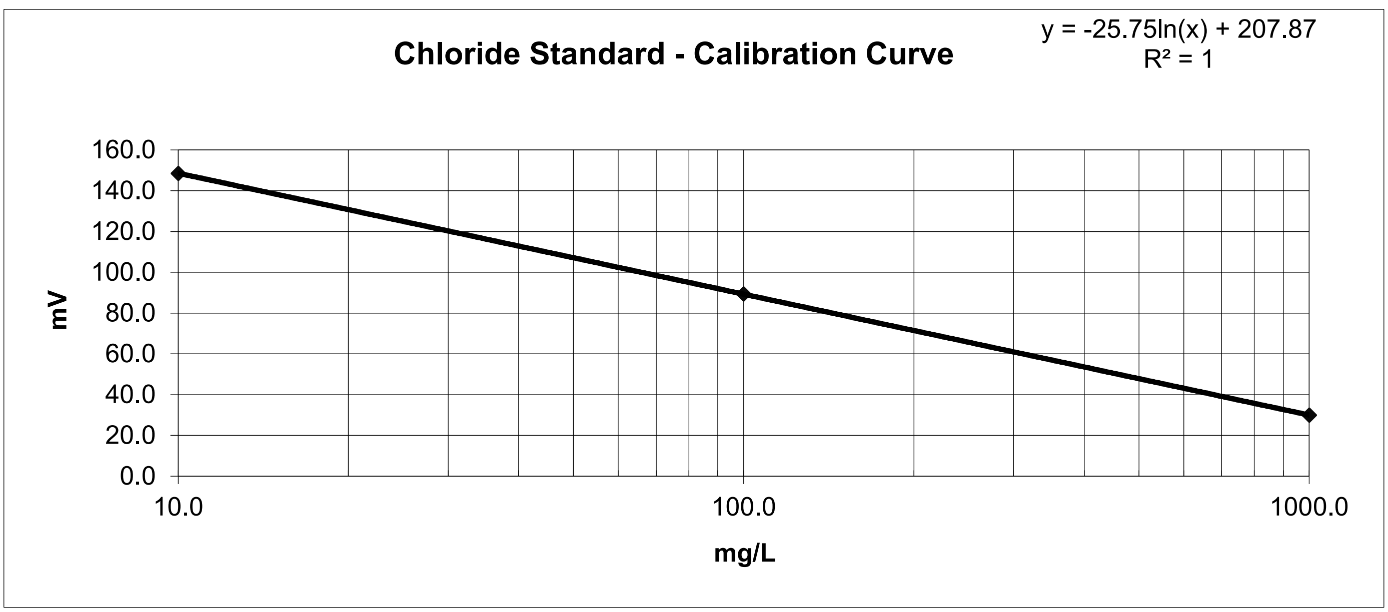
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	148.5
100.0 mg/L	89.4
1000.0 mg/L	29.9

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	158.8	6.72	6.72

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5°C.



Notes:

Tested By	JAM	Date	9/28/22	Checked By	BRB	Date	9/29/22

 DCN: CT-S63A DATE: 6/2/14 REVISION: 1

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pH OF SOILS
AASHTO T 289-91 (2013)

Client: Triad Engineering, Inc.
Client Reference: Dogwood Solar 04-22-0345
Project No.: 2022-629-002

Lab ID: 001
Boring No.: B-7
Depth (ft): NA
Sample No.: BAG-1

Drying Tare No.: 2003
Testing Tare No.: I

Temperature (^{o}C): 21

pH of Sample: **5.05**

Meter Calibration (as used each day)		
Buffer pH	Meter Reading	Meter Model
4.00 7.00 10.00	4.00 7.00 10.04	ORION 720A

Tested By JAM Date 9/28/22 Checked By BRB Date 9/29/22

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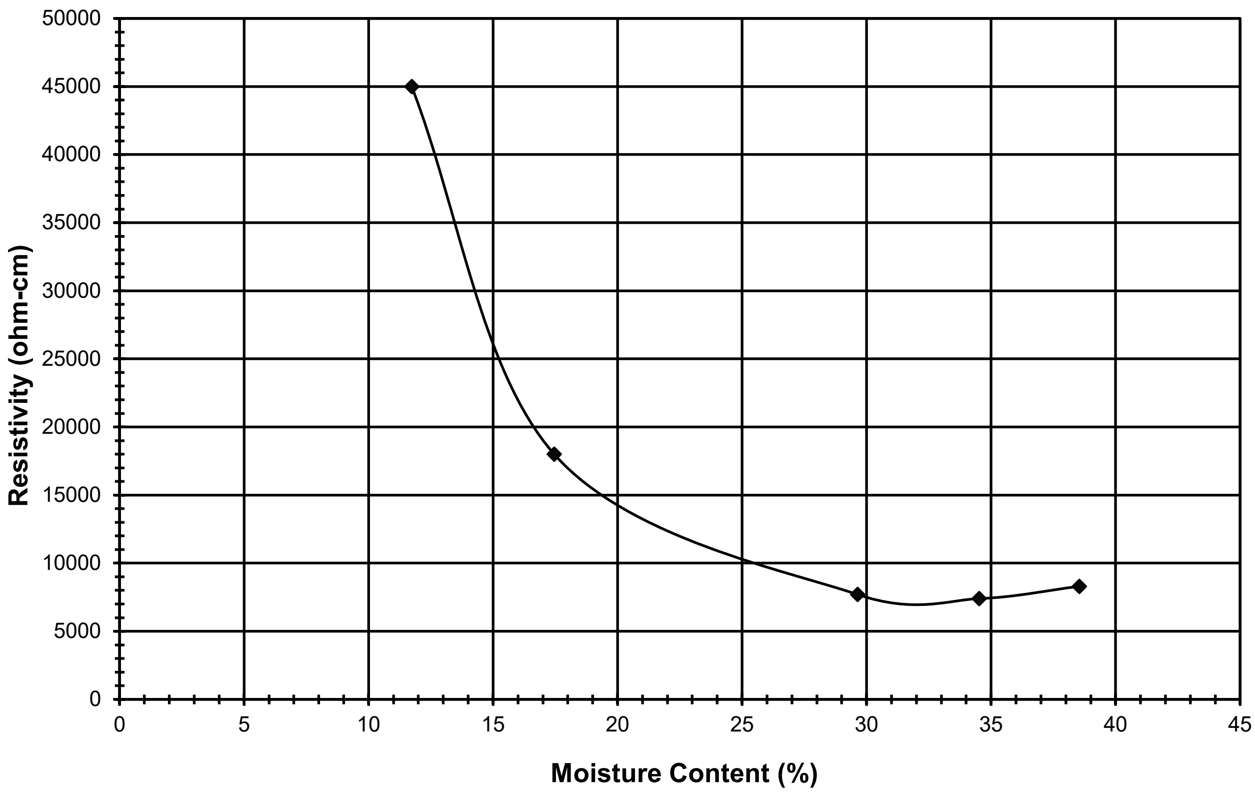
Minimum Resistivity

AASHTO T288-12

Client:	Triad Engineering, Inc.	Boring No.:	B-7
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	NA
Project No.:	2022-629-002	Sample No.:	BAG-1
Lab ID:	2022-629-002-001	Visual Description:	Brown Clay
		(- #10 Sieve material)	

Tare No.:	254	262	150	43	271
Tare & Wet Specimen (g):	45.36	40.30	64.05	52.17	51.97
Tare & Dry Specimen (g):	43.07	35.91	53.92	43.66	43.46
Tare Weight (g):	23.55	10.76	19.74	19.01	21.38
Moisture Content (%):	**11.7**	**17.5**	**29.6**	**34.5**	**38.5**
Resistance (ohm):	**45000**	**18000**	**7700**	**7400**	**8300**
Resistivity (ohm-cm):	**45000**	**18000**	**7700**	**7400**	**8300**

Note: The ratio of Miller Box area versus distance between electrodes is equal to 1.



Soil Class	*Corrosion Resistance*	*Specific Resistivity (ohm-cm)*
1	Excellent	10,000 - 6,000
2	Good	6,000 - 4,500
3	Fair	4,500 - 2,000
4	Bad	2,000 - 0

Tested By JAM *Date* 10/3/2022 *Checked By* BRB *Date* 10/4/2022

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Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2020)

Client:	Triad Engineering, Inc.	Boring No.:	B-7
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	NA
Project No.:	2022-629-002	Sample No.:	BAG-1
Lab ID:	2022-629-002-001	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)	0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)	Underrange	Underrange	6	22	47	68	129	179	241

Measurement of Barium Chloride Turbidity

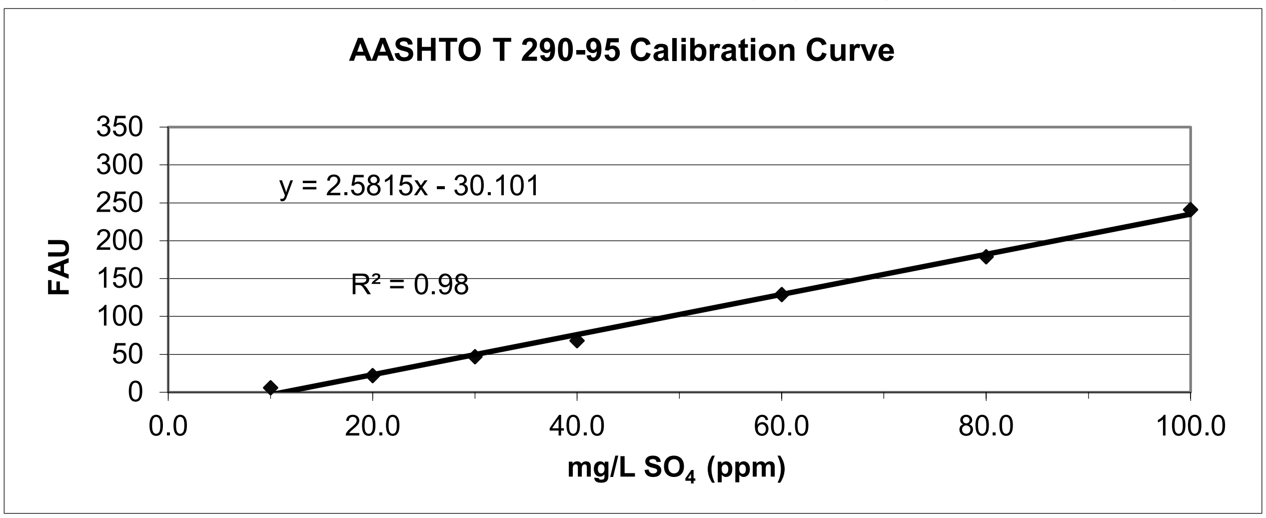
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2{\cdot}2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	25
Sample Diluted:	No
Sulfate Solution Added (ml):	0

Sample Moisture Content

Tare Number:	886
Weight of Tare & Wet Sample (g):	233.99
Weight of Tare & Dry Sample (g):	231.85
Weight of Tare (g):	109.26
Weight of Water (g):	2.14
Weight of Dry Sample (g):	122.59
Moisture Content (%):	1.75

Sample Sulfate Ion Concentration:	21.34	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	64.0	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	65.2	**mg/Kg SO4 (corrected for moisture)**



Tested by:	JAM	Date:	9/29/22	Checked by:	BRB	Date:	10/2/2022

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CHLORIDE ION CONTENT IN SOILS

AASHTO T 291 - 94 (2018) (*Method B*)

Client:	Triad Engineering, Inc.	Boring No.:	B-35
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	NA
Project No.:	2022-629-002	Sample No.:	BAG-1
Lab ID:	2022-629-002-002	Description:	Brown Clay
		(- # 10 Sieve material)	

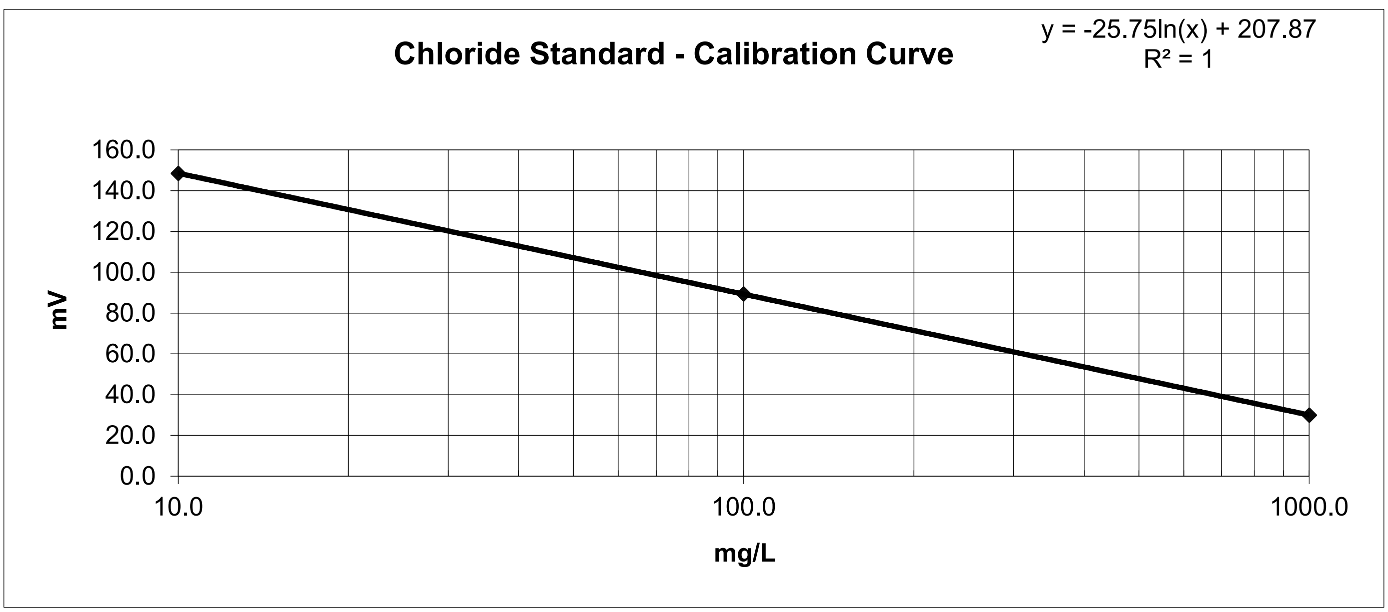
CHLORIDE STANDARD: CALIBRATION CURVE

STANDARD	MILLIVOLTS (mV)
10.0 mg/L	148.5
100.0 mg/L	89.4
1000.0 mg/L	29.9

MEASUREMENT OF CHLORIDES

		CONCENTRATION (mg/L)	CONCENTRATION (mg/kg)
Sample Weight (g):	100.0		
Water added to Sample (ml):	100.0		
Size of Sample Aliquot (ml):	25.0		
Sample Reading (mV):	144.4	11.76	11.76

Notes: 1) Samples and standards were buffered by the addition of an equal volume of the 0.2 M KNO_3 solution (1:1 volume).
2) Samples were dried for a minimum of 12 hours at 110 $^{+}/_{-}$ 5°C.



Notes:

Tested By	JAM	Date	9/28/22	Checked By	BRB	Date	9/29/22

 DCN: CT-S63A DATE: 6/2/14 REVISION: 1

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pH OF SOILS

AASHTO T 289-91 (2013)

Client: Triad Engineering, Inc.
Client Reference: Dogwood Solar 04-22-0345
Project No.: 2022-629-002

Lab ID: 002
Boring No.: B-35
Depth (ft): NA
Sample No.: BAG-1

Drying Tare No.: 2000
Testing Tare No.: F

Temperature (^{o}C): 21

pH of Sample: **6.31**

Meter Calibration (as used each day)		
Buffer pH	Meter Reading	Meter Model
4.00 7.00 10.00	4.00 7.00 10.04	ORION 720A

Tested By JAM Date 9/28/22 Checked By BRB Date 9/29/22

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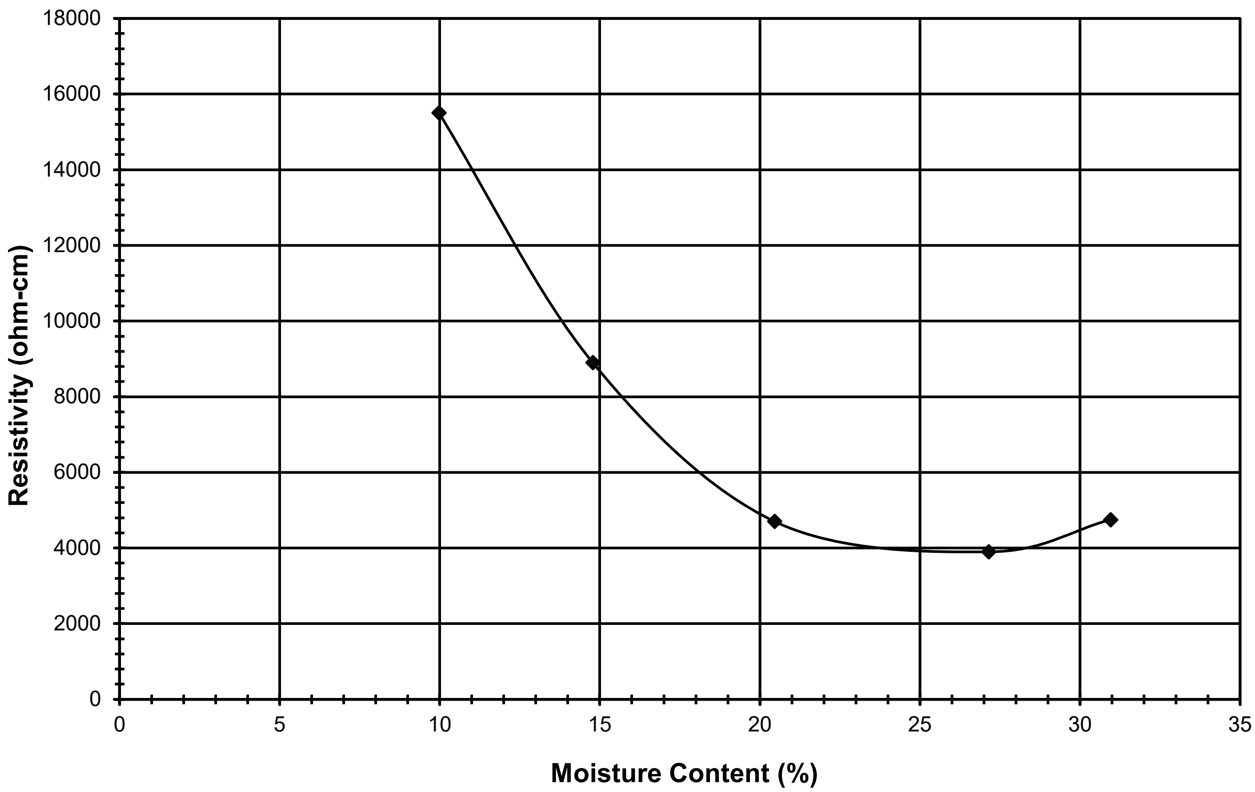
Minimum Resistivity

AASHTO T288-12

Client:	Triad Engineering, Inc.	Boring No.:	B-35
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	NA
Project No.:	2022-629-002	Sample No.:	BAG-1
Lab ID:	2022-629-002-002	Visual Description:	Brown Clay
			(- #10 Sieve material)

Tare No.:	256	326	355	454	228
Tare & Wet Specimen (g):	54.19	44.20	44.07	61.84	49.81
Tare & Dry Specimen (g):	51.49	40.96	39.67	51.81	42.44
Tare Weight (g):	24.43	19.04	18.17	14.86	18.63
Moisture Content (%):	**10.0**	**14.8**	**20.5**	**27.1**	**31.0**
Resistance (ohm):	**15500**	**8900**	**4700**	**3900**	**4750**
Resistivity (ohm-cm):	**15500**	**8900**	**4700**	**3900**	**4750**

Note: The ratio of Miller Box area versus distance between electrodes is equal to 1.



Soil Class	*Corrosion Resistance*	*Specific Resistivity (ohm-cm)*
1	Excellent	10,000 - 6,000
2	Good	6,000 - 4,500
3	Fair	4,500 - 2,000
4	Bad	2,000 - 0

Tested By JAM *Date* 10/3/2022 *Checked By* BRB *Date* 10/4/2022

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Water-Soluble Sulfate Ion Content in Soil
AASHTO T 290-95 (2020)

Client:	Triad Engineering, Inc.	Boring No.:	B-35
Client Reference:	Dogwood Solar 04-22-0345	Depth (ft):	NA
Project No.:	2022-629-002	Sample No.:	BAG-1
Lab ID:	2022-629-002-002	Soil Description:	Brown Clay

Sulfate Standard - Calibration Curve Spectrophotometer Readings

Sulfate Ion Concentrations (mg/L)								
0.0	4.0	10.0	20.0	30.0	40.0	60.0	80.0	100.0
Spectrophotometer Readings (FAU)								
Underrange	Underrange	6	22	47	68	129	179	241

Measurement of Barium Chloride Turbidity

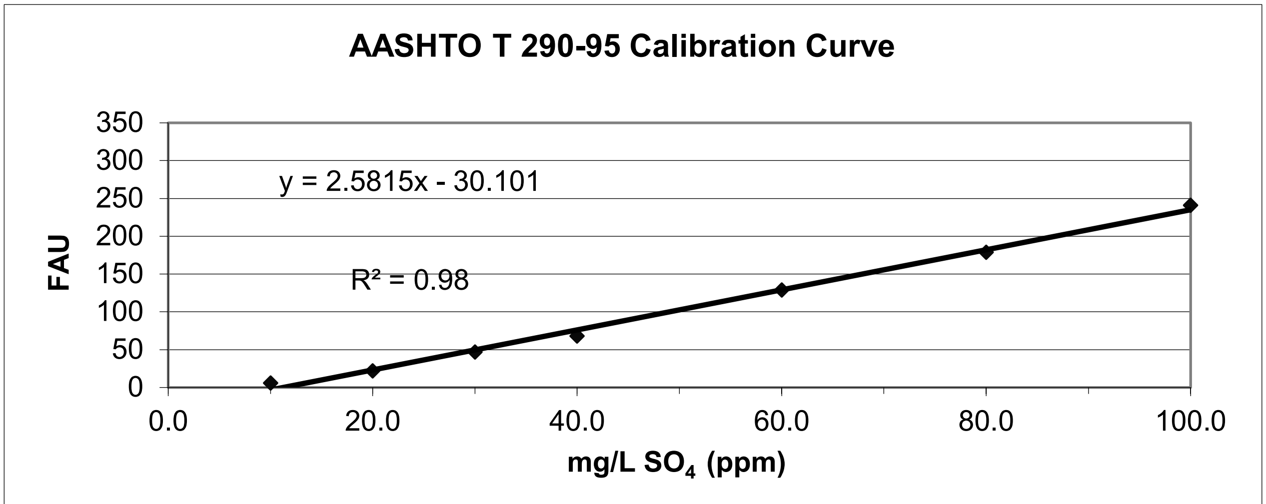
(Sample contains 5.0 mL NaCl solution and 0.3 g $BaCl_2 \cdot 2H_2O$)

Sample Weight (g):	100.0
Water added to Sample (mL):	300.0
Size of Sample Aliquot (mL):	50.0
Sample Reading (FAU):	29
Sample Diluted:	No
Sulfate Solution Added (ml):	0

Sample Moisture Content

Tare Number:	604
Weight of Tare & Wet Sample (g):	208.97
Weight of Tare & Dry Sample (g):	206.94
Weight of Tare (g):	86.54
Weight of Water (g):	2.03
Weight of Dry Sample (g):	120.40
Moisture Content (%):	1.69

Sample Sulfate Ion Concentration:	22.89	**mg/L SO_4 (ppm)**
Sample Sulfate Ion Content:	68.7	**mg/Kg SO_4 (not corrected for moisture)**
Sample Sulfate Ion Content:	69.9	**mg/Kg SO4 (corrected for moisture)**



Tested by: JAM Date: 9/29/22 Checked by: BRB Date: 10/2/2022

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ANALYTICAL REPORT

Eurofins Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238
Tel: (412)963-7058

Laboratory Job ID: 180-144444-1
Client Project/Site: Geotechnics, Triad Engineering, Inc.

For:
Geotechnics Inc.
544 Braddock Ave
East Pittsburgh, Pennsylvania 15112

Attn: Caleb Kyper

Authorized for release by:
9/27/2022 3:37:32 PM

David Dunlap, Senior Project Manager
(412)963-2432
David.Dunlap@et.eurofinsus.com

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PA Lab ID: 02-00416

1 2 3 4 5 6 7 8 9 10 11 12 13

Table of Contents

Case Narrative

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Job ID: 180-144444-1

Laboratory: Eurofins Pittsburgh

Narrative

Job Narrative
180-144444-1

Comments
The samples were received past the holding time for the sulfide analysis. At the direction of the client, the analysis was to be completed.

Receipt
The samples were received on 9/14/2022 2:45 PM. Unless otherwise noted below, the samples arrived in good condition. The temperature of the cooler at receipt was 21.1º C. The samples were not submitted on ice.

General Chemistry
Method 9034: The sulfide analysis was completed 10 and/or 14 days past the 7 day holding time.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Qualifiers

General Chemistry

Qualifier	Qualifier Description
!	Laboratory is not accredited for this parameter.
H	Sample was prepped or analyzed beyond the specified holding time
H3	Sample was received and analyzed past holding time.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Laboratory: Eurofins Pittsburgh

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Pennsylvania	NELAP	02-00416	04-30-23

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
SM 2580B		Solid	Oxidation Reduction Potential

Sample Summary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Lab Sample ID	Client Sample ID		Matrix	Collected	Received
180-144444-1	2022-629-001-001	RL-1	Solid	08/31/22 00:00	09/14/22 14:45
180-144444-2	2022-629-001-002	RL-3	Solid	08/31/22 00:00	09/14/22 14:45
180-144444-3	2022-629-001-003	RL-4	Solid	08/31/22 00:00	09/14/22 14:45
180-144444-4	2022-629-001-004	RL-5	Solid	08/31/22 00:00	09/14/22 14:45

Method Summary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Method	Method Description	Protocol	Laboratory
2540G	SM 2540G	SM22	EET PIT
EPA 9034	Sulfide, Acid soluble and Insoluble (Titrimetric)	SW846	EET PIT
SM 2580B	Reduction-Oxidation (REDOX) Potential	SM	EET PIT
9030B	Sulfide, Distillation (Acid Soluble and Insoluble)	SW846	EET PIT
DI Leach	Deionized Water Leaching Procedure	ASTM	EET PIT

Protocol References:

ASTM = ASTM International
SM = "Standard Methods For The Examination Of Water And Wastewater"
SM22 = Standard Methods For The Examination Of Water And Wastewater, 22nd Edition
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET PIT = Eurofins Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Lab Chronicle

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Client Sample ID: 2022-629-001-001 **Lab Sample ID: 180-144444-1**
Date Collected: 08/31/22 00:00 **Matrix: Solid**
Date Received: 09/14/22 14:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			412186	09/15/22 14:53	ELS	EET PIT
	Instrument ID: NOEQUIP									
Soluble	Leach	DI Leach			19.67 g	20 mL	413067	09/23/22 12:27	ELS	EET PIT
Soluble	Analysis	SM 2580B		1			413074	09/23/22 15:58	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-001-001 **Lab Sample ID: 180-144444-1**
Date Collected: 08/31/22 00:00 **Matrix: Solid**
Date Received: 09/14/22 14:45 **Percent Solids: 93.6**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9030B			5.03 mL	50 mL	412388	09/17/22 08:29	ELS	EET PIT
Total/NA	Analysis	EPA 9034		1			412413	09/17/22 14:13	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-001-002 **Lab Sample ID: 180-144444-2**
Date Collected: 08/31/22 00:00 **Matrix: Solid**
Date Received: 09/14/22 14:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			412186	09/15/22 14:53	ELS	EET PIT
	Instrument ID: NOEQUIP									
Soluble	Leach	DI Leach			20.45 g	20 mL	413067	09/23/22 12:27	ELS	EET PIT
Soluble	Analysis	SM 2580B		1			413074	09/23/22 16:03	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-001-002 **Lab Sample ID: 180-144444-2**
Date Collected: 08/31/22 00:00 **Matrix: Solid**
Date Received: 09/14/22 14:45 **Percent Solids: 90.1**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9030B			5.09 mL	50 mL	412388	09/17/22 08:29	ELS	EET PIT
Total/NA	Analysis	EPA 9034		1			412413	09/17/22 14:13	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-001-003 **Lab Sample ID: 180-144444-3**
Date Collected: 08/31/22 00:00 **Matrix: Solid**
Date Received: 09/14/22 14:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			412186	09/15/22 14:53	ELS	EET PIT
	Instrument ID: NOEQUIP									
Soluble	Leach	DI Leach			19.84 g	20 mL	413067	09/23/22 12:27	ELS	EET PIT
Soluble	Analysis	SM 2580B		1			413074	09/23/22 16:08	ELS	EET PIT
	Instrument ID: NOEQUIP									

Lab Chronicle

Client: Geotechnics Inc.
Job ID: 180-144444-1
Project/Site: Geotechnics, Triad Engineering, Inc.

Client Sample ID: 2022-629-001-003 | **Lab Sample ID: 180-144444-3**
Date Collected: 08/31/22 00:00 | **Matrix: Solid**
Date Received: 09/14/22 14:45 | **Percent Solids: 86.8**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9030B			5.06 mL	50 mL	412388	09/17/22 08:29	ELS	EET PIT
Total/NA	Analysis	EPA 9034		1			412413	09/17/22 14:13	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-001-004 | **Lab Sample ID: 180-144444-4**
Date Collected: 08/31/22 00:00 | **Matrix: Solid**
Date Received: 09/14/22 14:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			412186	09/15/22 14:53	ELS	EET PIT
	Instrument ID: NOEQUIP									
Soluble	Leach	DI Leach			19.53 g	20 mL	413067	09/23/22 12:27	ELS	EET PIT
Soluble	Analysis	SM 2580B		1			413074	09/23/22 16:13	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-001-004 | **Lab Sample ID: 180-144444-4**
Date Collected: 08/31/22 00:00 | **Matrix: Solid**
Date Received: 09/14/22 14:45 | **Percent Solids: 90.3**

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9030B			5.03 mL	50 mL	412722	09/21/22 08:56	ELS	EET PIT
Total/NA	Analysis	EPA 9034		1			412795	09/21/22 16:26	ELS	EET PIT
	Instrument ID: NOEQUIP									

[1] Completion dates and times are reported or not reported per method requirements or individual lab discretion.

Laboratory References:
EET PIT = Eurofins Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Analyst References:
Lab: EET PIT
- Batch Type: Leach
  - ELS = Edwin Shireman
- Batch Type: Prep
  - ELS = Elizabeth Sims
- Batch Type: Analysis
  - ELS = Edwin Shireman

Client Sample Results

Client: Geotechnics Inc.
Job ID: 180-144444-1
Project/Site: Geotechnics, Triad Engineering, Inc.

Client Sample ID: 2022-629-001-001
Lab Sample ID: 180-144444-1
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	6.3		0.1	0.1	%			09/15/22 14:53	1
Percent Solids	93.7		0.1	0.1	%			09/15/22 14:53	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	310	!	10	10	millivolts			09/23/22 15:58	1

Client Sample ID: 2022-629-001-001
Lab Sample ID: 180-144444-1
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45
Percent Solids: 93.6

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND	H H3	32	11	mg/Kg	☼	09/17/22 08:29	09/17/22 14:13	1

Client Sample ID: 2022-629-001-002
Lab Sample ID: 180-144444-2
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	9.9		0.1	0.1	%			09/15/22 14:53	1
Percent Solids	90.1		0.1	0.1	%			09/15/22 14:53	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	290	!	9.8	9.8	millivolts			09/23/22 16:03	1

Client Sample ID: 2022-629-001-002
Lab Sample ID: 180-144444-2
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45
Percent Solids: 90.1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	40	H H3	33	11	mg/Kg	☼	09/17/22 08:29	09/17/22 14:13	1

Client Sample ID: 2022-629-001-003
Lab Sample ID: 180-144444-3
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	13.2		0.1	0.1	%			09/15/22 14:53	1
Percent Solids	86.8		0.1	0.1	%			09/15/22 14:53	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	280	!	10	10	millivolts			09/23/22 16:08	1

Client Sample Results

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Client Sample ID: 2022-629-001-003

Lab Sample ID: 180-144444-3
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45
Percent Solids: 86.8

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	41	H H3	34	11	mg/Kg	☼	09/17/22 08:29	09/17/22 14:13	1

Client Sample ID: 2022-629-001-004

Lab Sample ID: 180-144444-4
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	9.7		0.1	0.1	%			09/15/22 14:53	1
Percent Solids	90.3		0.1	0.1	%			09/15/22 14:53	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	310	!	10	10	millivolts			09/23/22 16:13	1

Client Sample ID: 2022-629-001-004

Lab Sample ID: 180-144444-4
Date Collected: 08/31/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45
Percent Solids: 90.3

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	22	J H H3	33	11	mg/Kg	☼	09/21/22 08:56	09/21/22 16:26	1

QC Sample Results

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

Method: 2540G - SM 2540G

Lab Sample ID: 180-144444-1 DU
Matrix: Solid
Analysis Batch: 412186

Client Sample ID: 2022-629-001-001
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Moisture	6.3		6.1		%		4	10
Percent Solids	93.7		93.9		%		0.3	10

Method: EPA 9034 - Sulfide, Acid soluble and Insoluble (Titrimetric)

Lab Sample ID: MB 180-412388/2-A
Matrix: Solid
Analysis Batch: 412413

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 412388

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		30	10	mg/Kg		09/17/22 08:29	09/17/22 14:13	1

Lab Sample ID: LCS 180-412388/1-A
Matrix: Solid
Analysis Batch: 412413

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 412388

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Sulfide	137	133		mg/Kg		97	85 - 115

Lab Sample ID: 180-144444-1 MS
Matrix: Solid
Analysis Batch: 412413

Client Sample ID: 2022-629-001-001
Prep Type: Total/NA
Prep Batch: 412388

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Sulfide	ND	H H3	145	136		mg/Kg	☼	94	75 - 125

Lab Sample ID: 180-144444-1 MSD
Matrix: Solid
Analysis Batch: 412413

Client Sample ID: 2022-629-001-001
Prep Type: Total/NA
Prep Batch: 412388

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Sulfide	ND	H H3	145	138		mg/Kg	☼	95	75 - 125	1	20

Lab Sample ID: MB 180-412722/2-A
Matrix: Solid
Analysis Batch: 412795

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 412722

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		30	10	mg/Kg		09/21/22 08:56	09/21/22 16:26	1

Lab Sample ID: LCS 180-412722/1-A
Matrix: Solid
Analysis Batch: 412795

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 412722

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Sulfide	192	187		mg/Kg		97	85 - 115

QC Sample Results

Client: Geotechnics Inc.
Job ID: 180-144444-1
Project/Site: Geotechnics, Triad Engineering, Inc.

Method: EPA 9034 - Sulfide, Acid soluble and Insoluble (Titrimetric) (Continued)

Lab Sample ID: 180-144444-4 MS
Client Sample ID: 2022-629-001-004
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 412795
Prep Batch: 412722

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Sulfide	22	J H H3	211	211		mg/Kg	☼	89	75 - 125

Lab Sample ID: 180-144444-4 MSD
Client Sample ID: 2022-629-001-004
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 412795
Prep Batch: 412722

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Sulfide	22	J H H3	209	213		mg/Kg	☼	91	75 - 125	1	20

Method: SM 2580B - Reduction-Oxidation (REDOX) Potential

Lab Sample ID: LCS 180-413074/1
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 413074

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Oxidation Reduction Potential	475	456		millivolts		96	90 - 110

QC Association Summary

Client: Geotechnics Inc.
Job ID: 180-144444-1
Project/Site: Geotechnics, Triad Engineering, Inc.

General Chemistry

Analysis Batch: 412186

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144444-1	2022-629-001-001	Total/NA	Solid	2540G	
180-144444-2	2022-629-001-002	Total/NA	Solid	2540G	
180-144444-3	2022-629-001-003	Total/NA	Solid	2540G	
180-144444-4	2022-629-001-004	Total/NA	Solid	2540G	
180-144444-1 DU	2022-629-001-001	Total/NA	Solid	2540G	

Prep Batch: 412388

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144444-1	2022-629-001-001	Total/NA	Solid	9030B	
180-144444-2	2022-629-001-002	Total/NA	Solid	9030B	
180-144444-3	2022-629-001-003	Total/NA	Solid	9030B	
MB 180-412388/2-A	Method Blank	Total/NA	Solid	9030B	
LCS 180-412388/1-A	Lab Control Sample	Total/NA	Solid	9030B	
180-144444-1 MS	2022-629-001-001	Total/NA	Solid	9030B	
180-144444-1 MSD	2022-629-001-001	Total/NA	Solid	9030B	

Analysis Batch: 412413

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144444-1	2022-629-001-001	Total/NA	Solid	EPA 9034	412388
180-144444-2	2022-629-001-002	Total/NA	Solid	EPA 9034	412388
180-144444-3	2022-629-001-003	Total/NA	Solid	EPA 9034	412388
MB 180-412388/2-A	Method Blank	Total/NA	Solid	EPA 9034	412388
LCS 180-412388/1-A	Lab Control Sample	Total/NA	Solid	EPA 9034	412388
180-144444-1 MS	2022-629-001-001	Total/NA	Solid	EPA 9034	412388
180-144444-1 MSD	2022-629-001-001	Total/NA	Solid	EPA 9034	412388

Prep Batch: 412722

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144444-4	2022-629-001-004	Total/NA	Solid	9030B	
MB 180-412722/2-A	Method Blank	Total/NA	Solid	9030B	
LCS 180-412722/1-A	Lab Control Sample	Total/NA	Solid	9030B	
180-144444-4 MS	2022-629-001-004	Total/NA	Solid	9030B	
180-144444-4 MSD	2022-629-001-004	Total/NA	Solid	9030B	

Analysis Batch: 412795

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144444-4	2022-629-001-004	Total/NA	Solid	EPA 9034	412722
MB 180-412722/2-A	Method Blank	Total/NA	Solid	EPA 9034	412722
LCS 180-412722/1-A	Lab Control Sample	Total/NA	Solid	EPA 9034	412722
180-144444-4 MS	2022-629-001-004	Total/NA	Solid	EPA 9034	412722
180-144444-4 MSD	2022-629-001-004	Total/NA	Solid	EPA 9034	412722

Leach Batch: 413067

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144444-1	2022-629-001-001	Soluble	Solid	DI Leach	
180-144444-2	2022-629-001-002	Soluble	Solid	DI Leach	
180-144444-3	2022-629-001-003	Soluble	Solid	DI Leach	
180-144444-4	2022-629-001-004	Soluble	Solid	DI Leach	

QC Association Summary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144444-1

General Chemistry

Analysis Batch: 413074

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144444-1	2022-629-001-001	Soluble	Solid	SM 2580B	413067
180-144444-2	2022-629-001-002	Soluble	Solid	SM 2580B	413067
180-144444-3	2022-629-001-003	Soluble	Solid	SM 2580B	413067
180-144444-4	2022-629-001-004	Soluble	Solid	SM 2580B	413067
LCS 180-413074/1	Lab Control Sample	Total/NA	Solid	SM 2580B	

Login Sample Receipt Checklist

Client: Geotechnics Inc. Job Number: 180-144444-1

Login Number: 144444 **List Source: Eurofins Pittsburgh**
List Number: 1
Creator: Watson, Debbie

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	
Cooler Temperature is acceptable.	False	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	False	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

eurofins

Environment Testing
America

ANALYTICAL REPORT

Eurofins Pittsburgh
301 Alpha Drive
RIDC Park
Pittsburgh, PA 15238
Tel: (412)963-7058

Laboratory Job ID: 180-144443-1
Client Project/Site: Geotechnics, Triad Engineering, Inc.

For:
Geotechnics Inc.
544 Braddock Ave
East Pittsburgh, Pennsylvania 15112

Attn: Caleb Kyper

Authorized for release by:
9/27/2022 11:28:18 AM

David Dunlap, Senior Project Manager
(412)963-2432
David.Dunlap@et.eurofinsus.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

PA Lab ID: 02-00416

Table of Contents

Case Narrative

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144443-1

Job ID: 180-144443-1

Laboratory: Eurofins Pittsburgh

Narrative

Job Narrative
180-144443-1

Comments
The samples were received past the holding time for the sulfide analysis. At the direction of the client, the analysis was to be completed.

Receipt
The samples were received on 9/14/2022 2:45 PM. Unless otherwise noted below, the samples arrived in good condition. The temperature of the cooler at receipt was 21.1º C. The samples were not submitted on ice.

General Chemistry
Method 9034: The sulfide analysis was completed 9 days past the 7 day holding time.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144443-1

Qualifiers

General Chemistry

Qualifier	Qualifier Description
!	Laboratory is not accredited for this parameter.
H	Sample was prepped or analyzed beyond the specified holding time
H3	Sample was received and analyzed past holding time.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Accreditation/Certification Summary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144443-1

Laboratory: Eurofins Pittsburgh

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	Identification Number	Expiration Date
Pennsylvania	NELAP	02-00416	04-30-23

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
SM 2580B		Solid	Oxidation Reduction Potential

1 2 3 4 5 6 7 8 9 10 11 12 13

Sample Summary

Client: Geotechnics Inc.
Job ID: 180-144443-1
Project/Site: Geotechnics, Triad Engineering, Inc.

Lab Sample ID	Client Sample ID		Matrix	Collected	Received
180-144443-1	2022-629-002-001	B-7	Solid	09/01/22 00:00	09/14/22 14:45
180-144443-2	2022-629-002-002	B-35	Solid	09/01/22 00:00	09/14/22 14:45

Method Summary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144443-1

Method	Method Description	Protocol	Laboratory
2540G	SM 2540G	SM22	EET PIT
EPA 9034	Sulfide, Acid soluble and Insoluble (Titrimetric)	SW846	EET PIT
SM 2580B	Reduction-Oxidation (REDOX) Potential	SM	EET PIT
9030B	Sulfide, Distillation (Acid Soluble and Insoluble)	SW846	EET PIT
DI Leach	Deionized Water Leaching Procedure	ASTM	EET PIT

Protocol References:

ASTM = ASTM International

SM = "Standard Methods For The Examination Of Water And Wastewater"

SM22 = Standard Methods For The Examination Of Water And Wastewater, 22nd Edition

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET PIT = Eurofins Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Lab Chronicle

Client: Geotechnics Inc.
Job ID: 180-144443-1
Project/Site: Geotechnics, Triad Engineering, Inc.

Client Sample ID: 2022-629-002-001
Lab Sample ID: 180-144443-1
Date Collected: 09/01/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			412186	09/15/22 14:53	ELS	EET PIT
	Instrument ID: NOEQUIP									
Soluble	Leach	DI Leach			20.31 g	20 mL	413067	09/23/22 12:27	ELS	EET PIT
Soluble	Analysis	SM 2580B		1			413074	09/23/22 15:43	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-002-001
Lab Sample ID: 180-144443-1
Date Collected: 09/01/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45
Percent Solids: 79.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9030B			5.19 mL	50 mL	412388	09/17/22 08:29	ELS	EET PIT
Total/NA	Analysis	EPA 9034		1			412413	09/17/22 14:13	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-002-002
Lab Sample ID: 180-144443-2
Date Collected: 09/01/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	2540G		1			412186	09/15/22 14:53	ELS	EET PIT
	Instrument ID: NOEQUIP									
Soluble	Leach	DI Leach			19.95 g	20 mL	413067	09/23/22 12:27	ELS	EET PIT
Soluble	Analysis	SM 2580B		1			413074	09/23/22 15:53	ELS	EET PIT
	Instrument ID: NOEQUIP									

Client Sample ID: 2022-629-002-002
Lab Sample ID: 180-144443-2
Date Collected: 09/01/22 00:00
Matrix: Solid
Date Received: 09/14/22 14:45
Percent Solids: 81.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	9030B			5.01 mL	50 mL	412388	09/17/22 08:29	ELS	EET PIT
Total/NA	Analysis	EPA 9034		1			412413	09/17/22 14:13	ELS	EET PIT
	Instrument ID: NOEQUIP									

[1] Completion dates and times are reported or not reported per method requirements or individual lab discretion.

Laboratory References:
EET PIT = Eurofins Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Analyst References:
Lab: EET PIT
- Batch Type: Leach
  - ELS = Edwin Shireman
- Batch Type: Prep
  - ELS = Elizabeth Sims
- Batch Type: Analysis
  - ELS = Elizabeth Sims

Client Sample Results

Client: Geotechnics Inc.
Job ID: 180-144443-1
Project/Site: Geotechnics, Triad Engineering, Inc.

Client Sample ID: 2022-629-002-001 | **Lab Sample ID: 180-144443-1**
Date Collected: 09/01/22 00:00 | **Matrix: Solid**
Date Received: 09/14/22 14:45

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	20.9		0.1	0.1	%			09/15/22 14:53	1
Percent Solids	79.1		0.1	0.1	%			09/15/22 14:53	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	290	!	9.8	9.8	millivolts			09/23/22 15:43	1

Client Sample ID: 2022-629-002-001 | **Lab Sample ID: 180-144443-1**
Date Collected: 09/01/22 00:00 | **Matrix: Solid**
Date Received: 09/14/22 14:45 | **Percent Solids: 79.1**

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND	H H3	37	12	mg/Kg	☼	09/17/22 08:29	09/17/22 14:13	1

Client Sample ID: 2022-629-002-002 | **Lab Sample ID: 180-144443-2**
Date Collected: 09/01/22 00:00 | **Matrix: Solid**
Date Received: 09/14/22 14:45

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	18.2		0.1	0.1	%			09/15/22 14:53	1
Percent Solids	81.8		0.1	0.1	%			09/15/22 14:53	1

General Chemistry - Soluble

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Oxidation Reduction Potential	310	!	10	10	millivolts			09/23/22 15:53	1

Client Sample ID: 2022-629-002-002 | **Lab Sample ID: 180-144443-2**
Date Collected: 09/01/22 00:00 | **Matrix: Solid**
Date Received: 09/14/22 14:45 | **Percent Solids: 81.8**

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND	H H3	37	12	mg/Kg	☼	09/17/22 08:29	09/17/22 14:13	1

QC Sample Results

Client: Geotechnics Inc.
Job ID: 180-144443-1
Project/Site: Geotechnics, Triad Engineering, Inc.

Method: EPA 9034 - Sulfide, Acid soluble and Insoluble (Titrimetric)

Lab Sample ID: MB 180-412388/2-A
Client Sample ID: Method Blank
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 412413
Prep Batch: 412388

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		30	10	mg/Kg		09/17/22 08:29	09/17/22 14:13	1

Lab Sample ID: LCS 180-412388/1-A
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 412413
Prep Batch: 412388

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Sulfide	137	133		mg/Kg		97	85 - 115

Method: SM 2580B - Reduction-Oxidation (REDOX) Potential

Lab Sample ID: LCS 180-413074/1
Client Sample ID: Lab Control Sample
Matrix: Solid
Prep Type: Total/NA
Analysis Batch: 413074

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Oxidation Reduction Potential	475	456		millivolts		96	90 - 110

Lab Sample ID: 180-144443-1 DU
Client Sample ID: 2022-629-002-001
Matrix: Solid
Prep Type: Soluble
Analysis Batch: 413074

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Oxidation Reduction Potential	290	!	280		millivolts		3	20

QC Association Summary

Client: Geotechnics Inc.
Project/Site: Geotechnics, Triad Engineering, Inc.

Job ID: 180-144443-1

General Chemistry

Analysis Batch: 412186

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144443-1	2022-629-002-001	Total/NA	Solid	2540G	
180-144443-2	2022-629-002-002	Total/NA	Solid	2540G	

Prep Batch: 412388

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144443-1	2022-629-002-001	Total/NA	Solid	9030B	
180-144443-2	2022-629-002-002	Total/NA	Solid	9030B	
MB 180-412388/2-A	Method Blank	Total/NA	Solid	9030B	
LCS 180-412388/1-A	Lab Control Sample	Total/NA	Solid	9030B	

Analysis Batch: 412413

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144443-1	2022-629-002-001	Total/NA	Solid	EPA 9034	412388
180-144443-2	2022-629-002-002	Total/NA	Solid	EPA 9034	412388
MB 180-412388/2-A	Method Blank	Total/NA	Solid	EPA 9034	412388
LCS 180-412388/1-A	Lab Control Sample	Total/NA	Solid	EPA 9034	412388

Leach Batch: 413067

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144443-1	2022-629-002-001	Soluble	Solid	DI Leach	
180-144443-2	2022-629-002-002	Soluble	Solid	DI Leach	
180-144443-1 DU	2022-629-002-001	Soluble	Solid	DI Leach	

Analysis Batch: 413074

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-144443-1	2022-629-002-001	Soluble	Solid	SM 2580B	413067
180-144443-2	2022-629-002-002	Soluble	Solid	SM 2580B	413067
LCS 180-413074/1	Lab Control Sample	Total/NA	Solid	SM 2580B	
180-144443-1 DU	2022-629-002-001	Soluble	Solid	SM 2580B	413067

Login Sample Receipt Checklist

Client: Geotechnics Inc. | Job Number: 180-144443-1

Login Number: 144443
List Number: 1
Creator: Watson, Debbie

List Source: Eurofins Pittsburgh

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	
Cooler Temperature is acceptable.	False	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	False	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TRIAD ENGINEERING, INC.

APPENDIX D

Seismic Information

Dogwood Corners Solar Project

Latitude, Longitude: 36.94302028, -87.40937839

Date	9/23/2022, 10:13:15 AM
Design Code Reference Document	IBC-2015
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	0.499	MCE_R ground motion. (for 0.2 second period)
S_1	0.198	MCE_R ground motion. (for 1.0s period)
S_{MS}	0.599	Site-modified spectral acceleration value
S_{M1}	0.318	Site-modified spectral acceleration value
S_{DS}	0.399	Numeric seismic design value at 0.2 second SA
S_{D1}	0.212	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	1.602	Site amplification factor at 1.0 second
PGA	0.255	MCE_G peak ground acceleration
F_{PGA}	1.145	Site amplification factor at PGA
PGA_M	0.292	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	0.499	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.588	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.198	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.239	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.6	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.255	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.849	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	0.83	Mapped value of the risk coefficient at a period of 1 s
C_V		Vertical coefficient

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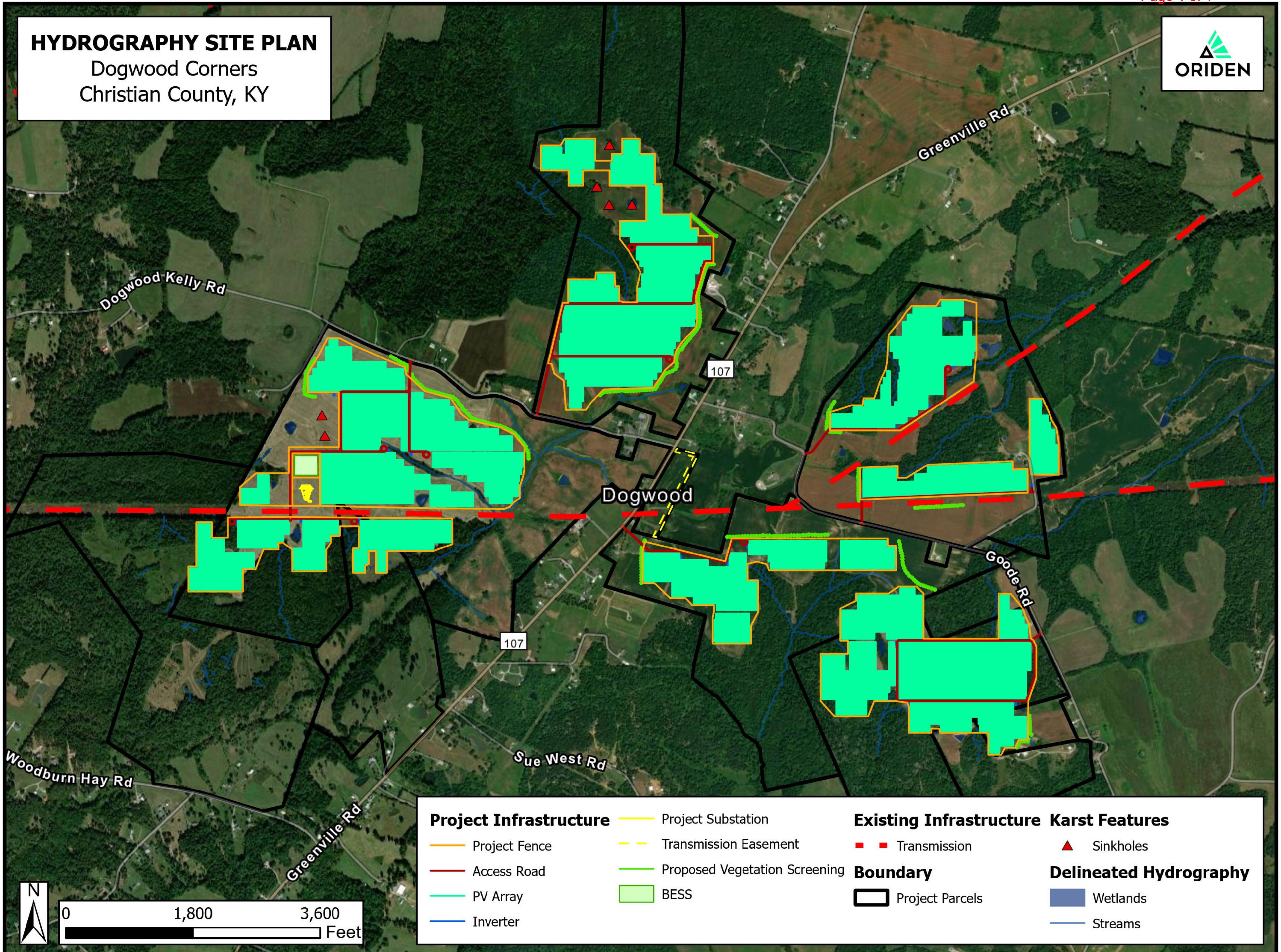
STAFF DR 1-22:

Refer to the SAR, Appendix B, Preliminary Site Layout. Provide a one-page site map that contains the locations water features, including rivers, streams, lakes, and ponds. Also include any known or suspected karst features, including sinkholes and drainage areas.

Response: Please refer to the attached Hydrography Site Plan.

Witness: Megan Stahl

HYDROGRAPHY SITE PLAN
Dogwood Corners
Christian County, KY



STAFF DR 1-23:

Provide the proposed setbacks from kart formations or sinkholes and the proposed remediation for karst formations.

Response: The proposed setback from karst formations is 200 feet. The geotechnical report prepared by Triad Engineering, Inc., dated September 28, 2022 is provided in the response to Staff DR1-21. On page 9, the report provides design recommendations and on pages 15-16 the report provides remediation recommendations.

Witness: Bradley A. Reynolds and Lee McCoy

STAFF DR 1-24:

Provide a copy of the stormwater management plan for the project.

Response: A stormwater management plan developed by a professional engineer will be submitted to the Kentucky Department for Environmental Protection, Division of Water, with the Project application for a General Permit for Stormwater Discharges Associated with Construction Activities. The plan will be in compliance with Kentucky Pollutant Discharge Elimination System KYR100000 and will be submitted for approval prior to construction.

Witness: Megan Stahl

STAFF DR 1-25:

Provide a wetland delineation report for the project.

Response: Please refer to the attached wetland and waterbody delineation reports prepared by Cardno, dated September 2021 and SWCA, dated June 2022.

Witness: Ryan Rupprecht

Wetland and Waterbody Delineation Report Dogwood Solar Project

September 2021

Cardno®

Document Information

Prepared for	Oriden, LLC
Project Name	Dogwood Solar Project
Cardno Project Number	E319302504
Cardno Project Manager	Ryan Rupprecht
Date	September 2021

Prepared for:

Oriden, LLC
106 Isabella Street, Suite 400
Pittsburgh, PA 15212

Prepared by:

Cardno
121 Continental Drive, Suite 308
Newark, DE 19713

Table of Contents

Appendices

Tables

Figures

Acronyms

CFR	Code of Federal Regulations
CWA	Clean Water Act
FAC	Facultative Plants
FACU	Facultative Upland Plants
FACW	Facultative Wetland Plants
GIS	Geographic Information Systems
GPS	Global Positioning System
HUC	Hydrologic Unit Code
JD	Jurisdictional Determination
KDOW	Kentucky Division of Water
LiDAR	Light Detection and Ranging
MRLC	Multi-Resolution Land Characteristics Consortium
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NWP	Nationwide Permit
OBL	Obligate Wetland Plants
OHWM	Ordinary High Water Mark
PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested Wetlands
Project	Dogwood Solar Project
PUB	Palustrine Unconsolidated Bottom
TNW	Traditional Navigable Waters
TVA	Tennessee Valley Authority
UNT	Unnamed Tributary
UPL	Upland Plants
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geologic Survey
WOTUS	Waters of the United States
WQC	Water Quality Certification

1 Introduction

Oriden, LLC (Oriden) is proposing to develop the Dogwood Solar Project (Project) near Hopkinsville, Christian County, Kentucky. The Project is proposed as a solar energy facility within an area of approximately 1,216 acres (1.9 square miles) on leased private lands (Project Area); **Figure 1-1**. The proposed Project infrastructure will include solar arrays and associated infrastructure such as access roads, electrical collection lines, staging area, and a Project switchyard. Project details regarding infrastructure are still being developed.

In support of planning for the Project, Cardno conducted field surveys to identify wetlands and waterbodies of the United States, in accordance with Sections 401/404 of the Clean Water Act (CWA). Cardno's field efforts focused on six (6) leased parcels within the Project Area.

The Project Area is located within the jurisdiction of the Tennessee Valley Authority (TVA), an entity that provides electricity in Tennessee and parts of six surrounding states, including Christian County, Kentucky. When considering a potential energy development project, the TVA conducts environmental reviews in accordance with the National Environmental Policy Act (NEPA) and requires specific documentation on wetlands and waterbodies, including the *Tennessee Division of Water Pollution Control Hydrologic Determination Field Data Sheet* and the *TVA Wetland Rapid Assessment Method*. Those procedures were utilized in the field survey and documentation process of the Dogwood Solar Project.

This report describes the methodology used by Cardno to complete the wetland delineation survey, and the results of a desktop assessment and field survey. Specifically, **Section 2** of the report identifies the methodology used during the identification of wetlands and surface waters within the Project Area. **Section 3** of the report outlines the findings of the desktop assessment of the Project Area. **Section 4** of the report details the results of the field surveys. **Section 5** presents the conclusions of the delineation and site survey. **Section 6** provides a list of references cited in this report.

The report is accompanied by several appendices. ***Appendix A*** contains representative photographic documentation of the delineated wetland and waterbody features. ***Appendix B*** contains maps depicting the delineated wetlands and waterbodies. ***Appendix C*** contains the completed wetland data and assessment forms from the field efforts. ***Appendix D*** contains the *TVA Rapid Assessment Method* forms and ***Appendix E*** contains the completed *Tennessee Division of Water Pollution Control Hydrologic Determination Field Data Sheet* forms.

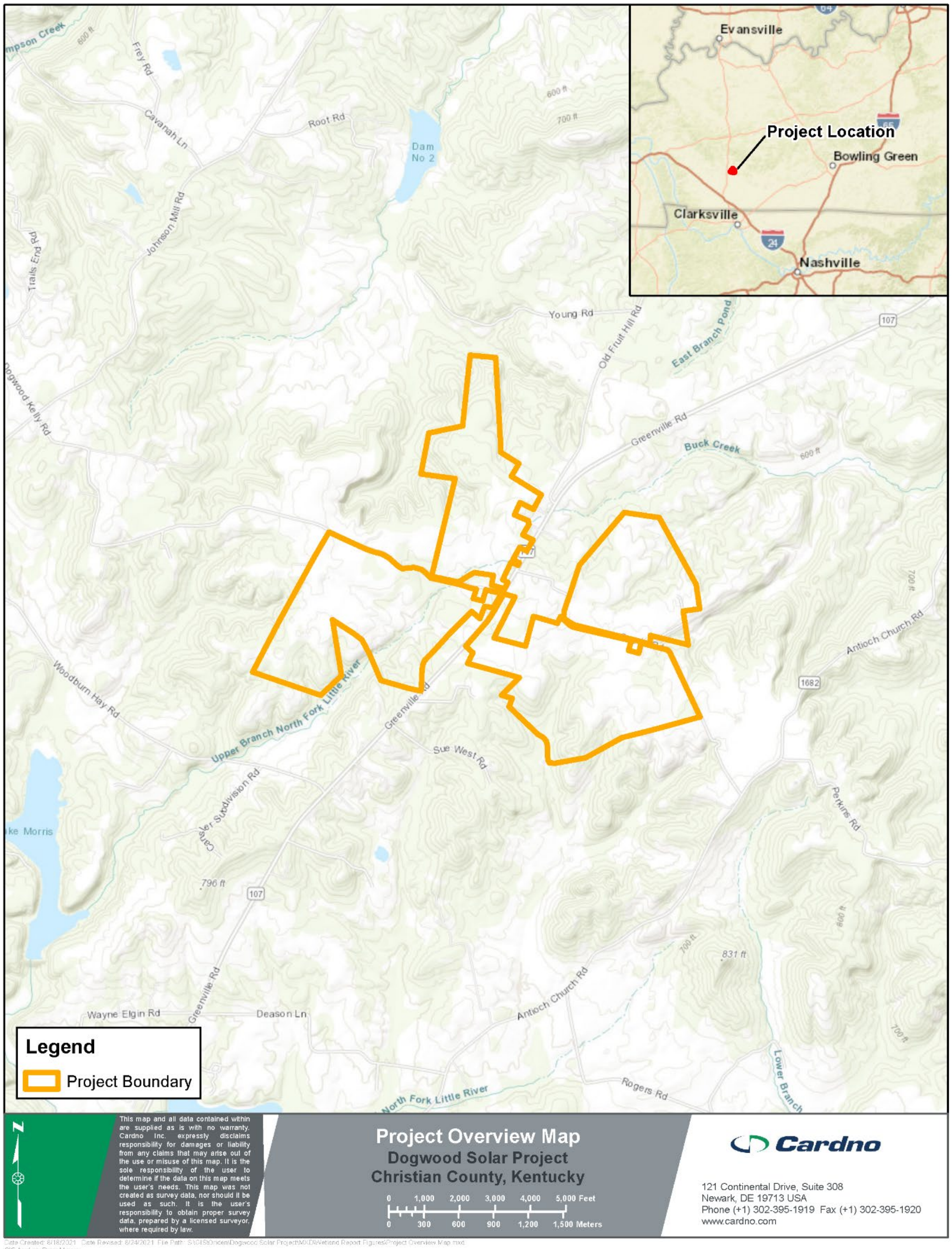


Figure 1-1 Project Overview

2 Survey Methodology

This section of the report identifies the methodologies used during the desktop review and field delineations of wetland and waterbodies within the Project Area. Cardno surveyed the Project Area in August 2021.

2.1 Desktop Review

Prior to field surveys, Cardno conducted a desktop review of the Project Area using publicly available Geographic Information Systems (GIS) data to identify and classify potential environmental resources and create field maps for use during survey. Sources of this reference material included, but were not limited to: the National Land Cover Database (NLCD); the U.S. Department of Agriculture (USDA) National Resource Conservation Service (NRCS) Soil Survey for Christian County; historic aerial photographs; Light Detection and Ranging (LiDAR) data; U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps; U.S. Geologic Service (USGS) topographic maps; and the USGS National Hydrography Dataset (NHD).

2.2 Field Delineation Methodologies

Surveys were conducted in the Project Area to determine the extent of wetlands and waterbodies in accordance with applicable Federal and State regulations and guidelines. A Trimble® Global Positioning System (GPS) with sub-meter accuracy was used to collect data points for mapping. As wetland and waterbody point features were collected, they were assigned a FEATURE_ID with the following format:

FF-XX
where: F = Feature Type WB – Stream WL – Wetland XX = Two-digit number as the unique identifier

The information collected in the field was processed real-time in the field using Satellite-based Augmentation System and verified by the field team for accuracy.

2.2.1 Wetland Delineation Methodologies

Wetland delineations were conducted according to the 1987 U.S. Army Corps of Engineers (USACE) *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the applicable regional supplements; *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont (Version 2.0)* (USACE 2012). Together, these documents are referred to as "The Manual." The methodology outlined in the Manual requires that three wetland criteria be met in order for a wetland to be determined to be present; that is, the area being evaluated must have a dominance of hydrophytic vegetation, hydric soils, and sufficient hydrology to be identified as a wetland.

Dominant vegetation is assessed for hydrophytic adaptation. The hydrophytic vegetation criterion is met when more than 50 percent of the dominant plant community is hydrophytic, as determined by species dominance and the assigned species-specific indicator status of the identified species. **Table 2-1** shows the indicator status categories for plants.

Table 2-1 Plant Indicator Categories

Indicator Category	Indicator Symbol	Definition
Obligate Wetland Plants	OBL	Plants that occur almost always (estimated probability >99 percent) in wetlands under natural conditions, but which may also occur rarely (estimated probability <1 percent) in non-wetlands.
Facultative Wetland Plants	FACW	Plants that occur usually (estimated probability >67 percent to 99 percent) in wetlands, but also occur (estimated probability 1 percent to 33 percent) in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (estimated probability 33 percent to 67 percent) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that occur sometimes (estimated probability 1 percent to <33 percent) in wetlands, but occur more often (estimated probability >67 percent to 99 percent) in non-wetlands.
Obligate Upland Plants	UPL	Plants that occur rarely (estimated probability <1 percent) in wetlands, but occur almost always (estimated probability >99 percent) in non-wetlands under natural conditions.

After identifying the plant species present within a sampling area of a potential wetland, the dominance and indicator status for each were determined. Based on the results, the vegetation community being evaluated was determined to be indicative of either a wetland or non-wetland.

Under certain circumstances, such as after disturbance from storm events or surveys occurring outside of the growing season, additional methods are employed to evaluate the vegetative communities of suspected wetlands. This can include calculating a prevalence index, which weights the absolute percent cover of a particular class of species (using its wetland indicator status) against the total coverage within the sampling area. If a sampling area passes this test (which requires the value to be less than or equal to 3), it can be considered a wetland. Another evaluation method is the presence of morphological adaptations to hydrophytic conditions. These can include root buttressing, shallow roots, or multi-stemmed trunks. The presence of such adaptations is considered evidence that the plants (even FACU species) have adapted to survive in prolonged inundation or root saturation, resulting in anaerobic soil. Another method is to report “Problematic Hydrophytic Vegetation.” This method is used sparingly, and reflects the delineator’s professional opinion that site conditions outside of those considered normal may be present, such as vegetation being bent or damaged to such a degree that identification to species level is impracticable. Under this method, the vegetation present would be treated as consistent with a wetland, but the vegetation could not be reliably identified.

The hydric soils criterion is met when the soils identified are officially listed as hydric soils or the soils demonstrate characteristics representative of soils that formed under reducing (hydric) conditions. The latter is determined in the field when the soils fall within the hydric ranges on the Munsell Color Chart, examining soil profiles for other evidence of reducing conditions, and/or observing known indicators of anaerobic soil chemical activity per the Manual.

The hydrology criterion is met when sufficient hydrologic indicators are present. The indicators must be representative of saturation or inundation occurring over the growing season sufficient to support a hydrophytic plant-dominated vegetative community. Such indicators may include evidence of standing water, saturated soils, geomorphic position within the landscape, drainage patterns, water-stained leaves, and morphologic adaptation of vegetation.

Wetland delineation data are reported on routine, region-specific wetland determination data forms. The perimeter of each wetland was mapped using the GPS systems. In addition to identifying the boundaries of wetlands, additional data points are taken with the GPS to locate delineation data collection center points.

2.2.2 Waterbody Delineation Methodologies

Linear waterbodies, such as ditches and streams, were surveyed by locating the path (typically the centerline if water depth was shallow, or the top-of-bank if the centerline was not accessible) and documenting the path of flow. Observational notes about the characteristics of each waterbody, such as the presence of Ordinary High-Water Mark (OHWM), flow regime and substrate, were recorded by the field team to enable the categorization of the types of waterbodies encountered. To be classified as a waterbody, however, each feature must have a defined bed and bank with indications of a channel flow. Erosional gullies, rills, and grassy swales are not waterbodies, and were not identified as such. **Table 2-2** identifies the definitions used in assigning waterbody flow regimes.

Table 2-2 Waterbody Flow Categories

Flow Category	Definition
Perennial	Flow is continuous and likely permanent across the seasons (although it may vary). Such flow can be surface based or occur as interstitial flow, which would include the flow driving underground for a portion of the channel.
Intermittent	Flow is present during extended periods of time during some seasons, but gradually returns to a state of isolated pools in the channel or a dry channel. There may be indications of subsurface flow.
Ephemeral	Flow is often not present during the majority of the year, and only occurs after a precipitation event. Channels of ephemeral streams will be dry with no evidence of isolated pools of water.

2.2.3 Jurisdictional Determination

While Cardno cannot formally determine the jurisdictional status of a waterbody or wetland, Cardno has evaluated features in the Project Area for potential federal jurisdiction. Any determination made by the USACE would be binding, and may vary from Cardno's interpretation. Our interpretation is made based on available documentation from the U.S. Environmental Protection Agency, including guidance on the "Current Implementation of Waters of the United States (WOTUS)" which refers to the original 1986/1988 promulgation and subsequent Supreme Court cases which further defined the term, with the most current definition determined by the 2008 ruling following the *Rapanos v. United States* case.

The agencies will assert jurisdiction over the following waters:

- Traditional navigable waters (TNW),
- Wetlands adjacent to TNWs,
- Non-navigable tributaries of TNWs that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months), and,
- Wetlands that directly abut such tributaries.

The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent,
- Wetlands adjacent to non-navigable tributaries that are not relatively permanent, and,

- Wetlands adjacent to but that do not directly abut a relatively permanent non-navigable tributary.

The agencies generally will not assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow), and
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

No TNW's were identified in the Project. However, non-navigable tributaries and wetlands were identified that are likely to be considered jurisdictional by the USACE. Final determinations of jurisdiction are the responsibility of the USACE. Any determination made by the USACE would be binding and modifications to a feature's jurisdictional status that varies from Cardno's would have to be honored. The Nashville and Louisville USACE offices split jurisdiction of the Project Area; therefore, determinations will be made by both jurisdictions based on the location of the wetland/waterbody (*see* ***Section 3.4***).

2.2.3.1 Regulatory Authorization

The USACE has authority over the discharge of fill and/or dredged material into "waters of the U.S." This includes authority over any filling, mechanical land clearing, or construction activities that occur within the boundaries of any "waters of the U.S." A permit must be obtained from the USACE under Section 404 of the CWA before any of these activities occur. Permits in the Commonwealth can be divided into two general categories: Individual Permits and Nationwide Permits. Compensatory mitigation may be required for projects that impact greater than 0.10 acre of wetlands or result in a loss of streams or open waters.

Individual Permits are required for projects that do not fall into one of the specific Nationwide Permits (NWP) categories or are deemed to have significant environmental impacts. These permits are much more difficult to obtain and receive a much higher level of regulatory agency and public scrutiny and may require several months to more than a year for processing. Nationwide Permits have been developed for projects which meet specific criteria and are deemed to have minimal impact on the aquatic environment. There are currently 54 NWP for qualifying activities with 32 NWP General Conditions and 7 Kentucky Division of Water (KDOW) Conditions that must be satisfied in order to receive NWP authorization from the Corps of Engineers. Nine of the 54 NWP are denied general use by the KDOW and always require individual 401 Water Quality Certification. Section 401 Water Quality Certification (WQC) must be obtained from KDOW before the USACE will complete their permit review. Some NWP have been categorically granted WQC with the USACE NWP issuance, as long as specific project conditions are met.

KDOW is responsible for issuing CWA Section 401 WQCs in conjunction with the USACE Section 404 permits. Individual WQC is required for most projects that occur within surface waters with a special use designation (cold-water habitat, etc.). In addition, most projects with proposed impacts greater than 300 linear feet of stream or ½ acre of wetlands require individual WQC. Individual WQC may be required for any project which the DOW determines to have more than minimal impacts to the aquatic environment. Water quality certification may be granted, without notification to the KDOW, if the project falls under NWP limitations. In order to qualify for this standing certification, all prior-authorized

General and Regional Conditions as published by the KDOW must be satisfied. Certain NWPs have specific conditions concerning project impact thresholds and notification requirements. The permitting process of the KDOW is conditional upon a permit requirement under the CWA sections 401 and 404. For this reason, permits are only processed where the USACE has assumed jurisdiction over a resource. There is currently no mechanism to permit isolated wetlands through the KDOW.

This Project would likely fall under NWP 14, 51, and/or 57. As long as the KDOW general conditions are met and impacts are less than 0.5 acres, this project would fall under the NWP program and no individual WQC would be required.

3 Desktop Assessment Results

Multiple sources were reviewed prior to field investigations to identify potential resources as part of a preliminary desktop assessment. The findings of the desktop assessment were also verified during the field surveys.

3.1 National Land Cover Database Review

Based on a review of available aerial imagery, the Project Area appeared to consist of primarily cultivated crop areas. Review of the 2019 NLCD (Multi-Resolution Land Characteristics Consortium [MRLC] 2019) confirmed this assessment, which showed that cultivated crops accounted for approximately 57% of the total acreage in the Project Area. The second most prominent land cover within the Project Area was classified as “Deciduous Forest”, which accounted for 35% of the acreage, and was easily identified in winter aerial imagery that indicated only minor instances of evergreen canopy in winter months. All other land cover accounted for 5% or less of the total acreage in the Project Area. A summary is provided in **Table 3-1**.

Table 3-1 Land Cover within the Project Area

Type	Project Area (acres)	Project Area (%)
Cultivated Crops	690.25	56.7%
Deciduous Forest	427.95	35.2%
Pasture/Hay	41.86	3.4%
Evergreen Forest	29.08	2.4%
Developed, Open Space	17.77	1.5%
Shrub/Scrub	4.67	<1%
Mixed Forest	2.89	<1%
Developed, Low Intensity	1.29	<1%
Developed, Medium Intensity	0.69	<1%
Grassland/Herbaceous	0.43	<1%
Open Water	0.22	<1%
TOTAL	***1,217.10***	***100%***

Compiled from MRLC 2019.

* The total acreage used in these calculations may differ slightly from the project area due to tiny differences inherent to the level of precision of the National Land Cover Database.

3.2 Geology

The Project is located in the Western Pennyroyal, or Mississippi Plateau, Physiographic Region of Kentucky. This region extends through a large portion of Kentucky, characterized by a limestone plain and karst terrain of springs, sink holes, and sinking streams. The Project Area sits within the Tar Springs Sandstone formation, cross bedded with grayish black to grayish green soft shaly sandstone, and medium to coarse grained light to dark gray limestone.

3.3 Soils & Hydric Ratings

Cardno reviewed soil types for the Project Area using the Web Soil Survey, an application of the USDA NRCS (2021). Twenty-four (24) described soil types were identified (**Table 3-2**). Two of these soils have a very poor Hydric Ratings of 2 and 5, and occupy less than 2% of the Project Area. Due to high prevalence of sloping terrain, heavy erosion, and bedrock lithology, a majority of the Project Area is not predisposed to prolonged inundation or hydric conditions expected to facilitate the formation of wetlands.

Table 3-2 Soils within the Project Area

Type	Map Unit Description	Hydric Rating	Project Area (acres)	Project Area (%)
ZnB	Zanesville silt loam, 2 to 6 percent slopes	0	349.28	28.70
ZnC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded		188.29	15.47
SaB	Sadler silt loam, 2 to 6 percent slopes	0	127.88	10.51
FnC	Frondorf silt loam, 6 to 12 percent slopes	0	105.49	8.67
FwF	Frondorf-Weikert complex, 20 to 40 percent slopes	0	91.27	7.50
FwD	Frondorf-Weikert complex, 12 to 20 percent slopes	0	77.98	6.41
WeC	Wellston silt loam, 6 to 12 percent slopes	0	75.09	6.17
SaA	Sadler silt loam, 0 to 2 percent slopes	0	46.59	3.83
WlD3	Wellston silty clay loam, 12 to 20 percent slopes, severely eroded	0	25.20	2.07
ZnC	Zanesville silt loam, 6 to 12 percent slopes	0	23.85	1.96
WlC3	Wellston silty clay loam, 6 to 12 percent slopes, severely eroded	0	19.67	1.62
Sk	Skidmore gravelly loam	0	16.22	1.33
St	Stendal silt loam	0	11.86	<1
No	Nolin silt loam	0	10.96	<1
Cu	Cuba silt loam	0	9.04	<1
Ss	Steff silt loam, 0 to 2 percent slopes, occasionally flooded	2	7.82	<1
Zu	Zanesville-Gullied land complex	0	6.36	<1
La	Lawrence silt loam	5	6.18	<1
CrB	Crider silt loam, 2 to 6 percent slopes	0	4.52	<1
CaC	Caneyville silt loam, 6 to 12 percent slopes	0	3.99	<1
CnD3	Caneyville silty clay, 6 to 20 percent slopes, severely eroded	0	3.63	<1
NhB	Nicholson silt loam, 2 to 6 percent slopes	0	2.96	<1
WeD	Wellston silt loam, 12 to 20 percent slopes	0	1.76	<1
CoD	Caneyville-Rock outcrop complex, 6 to 30 percent slopes	0	1.22	<1
		TOTAL	***1,217.10***	***100***

Compiled from USDA 2021.

3.4 Navigable Waters

Three watersheds occur in the Project Area: North Fork Little River (Hydrologic Unit Code [HUC] 51302050503; 58.24 mi^2 drainage area), Lower Buck Fork Pond River (HUC- 51100060202; 42.55 mi^2 drainage area) and East Branch Pond River (HUC- 51100060101; 15.34 mi^2 drainage area). The jurisdictional boundary of the Nashville USACE office is consistent with the boundary of the North Fork Little River watershed. The Louisville USACE district has jurisdiction over features within the East Branch Pond River and Lower Buck Fork Pond River watersheds. Three commercially navigable rivers are named within Kentucky – the Cumberland River, Green River and Ohio River– whose tributaries fall within Christian County, Kentucky. Tributaries themselves may not be navigable, but have a significant impact on water quality ‘downstream’ in the WOTUS.

There are no named TNWs within the Project Area. However, non-navigable tributaries to named TNWs are located within the Project Area. In Christian County, four navigable rivers are identified: The Little River and Red River, which flow directly into the Cumberland River; Tradewater River, which flows into the Ohio River; and Pond River, which flows into the Green River. The identified waterbodies within the Project Area demonstrate physical connections to the tributaries of Pond River and Little River.

3.5 Remote Wetland and Waterbody Identification

Prior to site investigations, the Project Area was screened using LiDAR, the USFWS NWI (2017) and USGS NHD (2021) remote data for potential wetlands and waterbodies in the vicinity of the Project. The LiDAR provides elevation data, while the NWI data shows remotely identified wetlands, which may be based on previous aerial imagery interpretation and soils surveys and the NHD uses digital stream information to identify potential waterways.

The majority of the wetlands remotely identified appeared to agricultural ponds in cultivated fields. The waterbodies identified included Upper Branch North Fork Little River and its tributaries; and ephemeral and intermittent tributaries to Middle Branch Pond River, Buck Creek and Middle Branch North Fork Little River.

3.6 Desktop Review Summary

The desktop review indicated potential for wetlands and streams to be located in multiple crop areas or forested areas within the Project Area. It is not uncommon for the NHD set to publish inaccurate or missing features or features that are no longer present due to landowners rerouting the channel or moving it underground via tiles. However, the LiDAR reveals the stream channels and drop in elevation effectively. Much of the Project Area, however, is cultivated crop area that limits the development of wetlands. The remotely identified features and land cover information was expected given the region’s heavy, historic manipulation of land cover to accommodate and maintain farming operations.

4 Field Survey Results

The following is a summary of the results of field surveys conducted within the Project Area. Climatic conditions were considered normal during the survey period, which was conducted during the dry season. ***Appendix A*** contains representative photographic documentation of the delineated wetland and waterbody features. ***Appendix B*** contains maps depicting the delineated wetlands and waterbodies. ***Appendix C*** contains the completed USACE wetland data and assessment forms from the field efforts. ***Appendix D*** contains the TVA Rapid Assessment Method forms and ***Appendix E*** contains the stream assessment forms.

4.1 General Habitat within the Project Area

The data obtained during the desktop review were found to be generally consistent with the results of the field survey. As identified in **Table 3-1**, the predominant land use in the Project Area is agricultural (crops).

The agricultural fields were observed to be planted entirely with soybean crops. Field edges and occasional remnants from previous year's crops contained senescent winter wheat and field corn. Fields are likely actively rotated seasonally between these crops, but the general extent of the cultivated area remains the same. Many of the cultivated fields, roadsides, and forest edges contained grassy swales and heavy erosional gullies and rills. These features help maintain proper growing conditions for crops through drainage, and are readily visible on aerial photography of the site. Fencerows and forest edges were dominated by relatively young mixed forest lots containing a variety of oaks (*Quercus* sp.), hickories (*Carya* sp.), and maples (*Acer* sp.), with a shrub understory of primarily greenbrier (*Smilax sp.)* and brambles (*Rubus spp.),* and relatively open herbaceous layers of goldenrods (*Solidago* sp.), asters (*Symphyotrichum* sp. and *Eupatorium sp.*), nettles (*Urtica sp.)* and grasses. Occasional occurrences of juniper (*Juniperus virginiana*) were found throughout the wooded lots, but primarily as emerging saplings or young tree with trunk diameters less than 10 inches. The forested patches within the Project Area were discontinuous and concentrated along stream or drainage features.

4.2 Description of the Delineated Wetlands in the Project Area

A total of seventeen (17) wetlands were delineated during field surveys, for a total of 4.26 acres within the Project Area (see **Figure 4-1**). **Table 4-1** provides a list of the delineated wetlands and associated characteristics. Wetland acreages reported in the subsections below are representative only of the portion of the wetland located within the Project Area. Representative photographs of the delineated wetlands can also be found in ***Appendix A***.

Thirteen (13) of the wetlands were identified as Palustrine Unconsolidated Bottom (PUB). While some may be naturally occurring, many of the features within this category are likely man-made or modified ponds for agricultural or recreational purposes, with nearly all located within or adjacent to cultivated fields. One wetland was identified as a Palustrine Emergent Wetland (PEM), and the remaining three delineated features were determined as Palustrine Forested Wetland (PFO). One (1) of the wetlands identified within the Project Area, WL-04, has the potential to be considered jurisdictional, due to direct connectivity to a tributary of Buck Creek. Final verification of wetland boundaries for regulatory purposes can only be completed through a Jurisdictional Determination (JD) review by the USACE or its duly appointed representative. WL-04 falls under jurisdiction of the Louisville USACE District Office.

The *Tennessee Valley Authority Rapid Assessment Method* form was completed for each wetland, and can be found in ***Appendix D***.

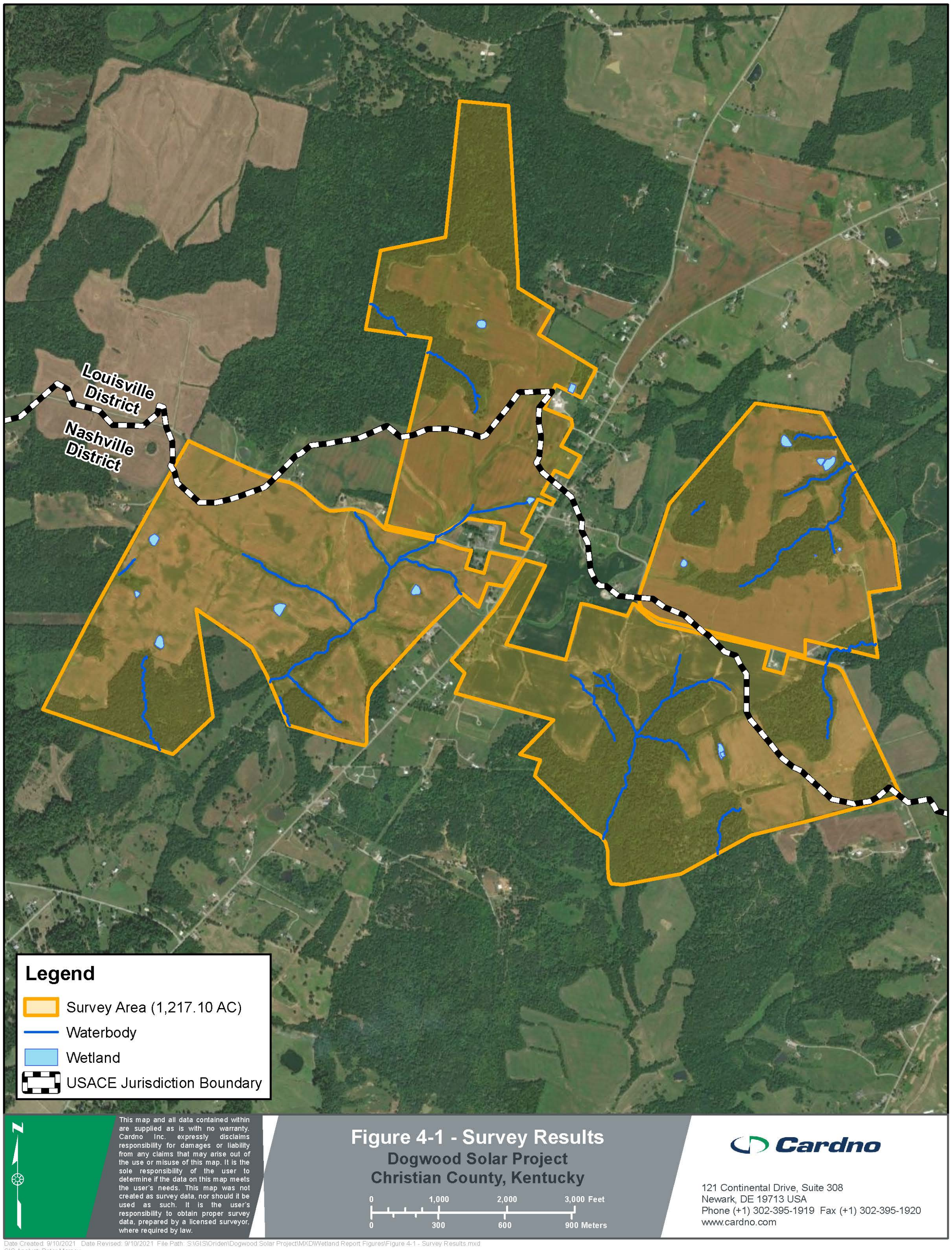


Figure 4-1 Survey Results

Table 4-1 Wetlands Delineated in the Project Area

Wetland ID	Latitude of Center Point	Longitude of Center Point	Acres within Project Area	Wetland Type[1]	Anticipated Jurisdictional	Drainage Basin
WL-01	36.941475	-87.4008000	0.27	PFO	No	North Fork Little River
WL-02	36.9514302	-87.4106195	0.19	PFO	No	North Fork Little River
WL-03	36.9476847	-87.4163291	0.33	PEM	No	North Fork Little River
WL-04	36.9542304	-87.3971799	0.03	PFO	**Yes**	Lower Buck Fork Pond River
WL-05	36.9539561	-87.397791	0.43	PUB	No	Lower Buck Fork Pond River
WL-06	36.953202	-87.3960329	0.19	PUB	No	Lower Buck Fork Pond River
WL-07	36.9530863	-87.395601	0.52	PUB	No	Lower Buck Fork Pond River
WL-08	36.9496658	-87.3949846	0.05	PUB	No	Lower Buck Fork Pond River
WL-09	36.9493856	-87.3961912	0.01	PUB	No	Lower Buck Fork Pond River
WL-10	36.948979	-87.4028154	0.19	PUB	No	Lower Buck Fork Pond River
WL-11	36.9584857	-87.4132411	0.31	PUB	No	East Branch Pond River
WL-12	36.9412427	-87.4007123	0.08	PUB	No	North Fork Little River
WL-13	36.9559708	-87.4086312	0.24	PUB	No	Lower Buck Fork Pond River
WL-14	36.9467924	-87.4231864	0.49	PUB	No	North Fork Little River
WL-15	36.9453763	-87.4291884	0.42	PUB	No	North Fork Little River
WL-16	36.9473325	-87.4303747	0.11	PUB	No	North Fork Little River
WL-17	36.9495175	-87.4295504	0.39	PUB	No	North Fork Little River
		TOTAL	4.26			

[1]Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

PEM – Palustrine Emergent Wetland
PSS – Palustrine Scrub/Shrub Wetland
PFO – Palustrine Forested Wetland
PUB – Palustrine Unconsolidated Bottom

[1]

4.3 Description of the Delineated Waterbodies in the Project Area

A total of twenty-two (22) waterbodies were delineated during field surveys (see **Figure 4-1**). The waterbody delineation results are summarized in **Table 4-2**. Representative photographs of each waterbody can also be found in ***Appendix A***. Waterbodies were delineated in the field and further categorized for the report.

Streams are considered natural channels if they have not had any modification or have shown indication of recovery following historic modification. Streams possess a “ordinary high water mark” as defined by the USACE 33 CFR 328.3(e) as the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. Additionally, streams are more likely to have vegetated riparian buffers along the banks, variety of substrates in the channel, and pools of water which might support aquatic species.

All waterbodies identified within the Project Area were streams**.** Eight (8) of these streams were determined to have an ephemeral flow regime, and are expected to be only wet weather conveyances. Fourteen (14) streams were evaluated as an intermittent flow regime. Most of these contained several relatively deep groundwater-fed pools and occurrences of macroinvertebrates and amphibians. A few streams within the Project Area were observed to disappear and re-emerge through underground connections and seeps.

The *Tennessee Division of Water Pollution Control Hydrologic Determination Field Data Sheet* was completed for each stream, and can be found in ***Appendix E***.

Table 4-2 Waterbodies Delineated in the Project Area

Stream ID	Type	Linear Feet in Project Area	Flow Regime	Drainage Basin	Stream Name	Potentially Jurisdictional	USACE District
WB-01	Stream	2,325	Intermittent	Lower Buck Fork Pond River	UNT to Buck Creek	**Yes**	Louisville
WB-02	Stream	978	Ephemeral	North Fork Little River	UNT to Middle Branch North Fork Little River	**Yes**	Nashville
WB-03	Stream	3,141	Intermittent	North Fork Little River	UNT to Middle Branch North Fork Little River	**Yes**	Nashville
WB-04	Stream	1,057	Ephemeral	North Fork Little River	UNT to Middle Branch North Fork Little River	**Yes**	Nashville
WB-05	Stream	165	Intermittent	North Fork Little River	UNT to Middle Branch North Fork Little River	**Yes**	Nashville
WB-06	Stream	1,272	Intermittent	North Fork Little River	UNT to Middle Branch North Fork Little River	**Yes**	Nashville
WB-07	Stream	336	Intermittent	North Fork Little River	UNT to Middle Branch North Fork Little River	**Yes**	Nashville
WB-08	Stream	1,193	Ephemeral	Lower Buck Fork Pond River	UNT to Buck Creek	**Yes**	Louisville
WB-09	Stream	405	Intermittent	Lower Buck Fork Pond River	UNT to Buck Creek	**Yes**	Louisville
WB-10	Stream	2,825	Intermittent	Lower Buck Fork Pond River	UNT to Buck Creek	**Yes**	Louisville
WB-11	Stream	1,246	Ephemeral	Lower Buck Fork Pond River	UNT to Buck Creek	**Yes**	Louisville
WB-12	Stream	2,092	Intermittent	East Branch Pond River	UNT to Middle Branch Pond River	**Yes**	Louisville
WB-13	Stream	72	Intermittent	East Branch Pond River	UNT to Middle Branch Pond River	**Yes**	Louisville
WB-14	Stream	865	Ephemeral	North Fork Little River	Upper Branch North Fork Little River	**Yes**	Nashville
WB-15	Stream	4,335	Intermittent	North Fork Little River	Upper Branch North Fork Little River	**Yes**	Nashville
WB-16	Stream	1,247	Intermittent	North Fork Little River	UNT to Upper Branch North Fork Little River	**Yes**	Nashville

Stream ID	Type	Linear Feet in Project Area	Flow Regime	Drainage Basin	Stream Name	Potentially Jurisdictional	USACE District
WB-17	Stream	992	Ephemeral	North Fork Little River	UNT to Upper Branch North Fork Little River	**Yes**	Nashville
WB-18	Stream	325	Ephemeral	North Fork Little River	UNT	No	Nashville
WB-19	Stream	2,016	Intermittent	North Fork Little River	UNT to Upper Branch North Fork Little River	**Yes**	Nashville
WB-20	Stream	691	Intermittent	Lower Buck Fork Pond River	UNT to Buck Creek	**Yes**	Louisville
WB-21	Stream	456	Ephemeral	North Fork Little River	UNT	No	Nashville
WB-22	Stream	1,104	Intermittent	North Fork Little River	UNT to Upper Branch North Fork Little River	**Yes**	Nashville
	TOTAL	29,138					

The waterbodies classified with an ephemeral flow regime are not relatively permanent, but were observed in the field to have a consistent OHWM and significant nexus to the relatively permanent (intermittent) tributaries identified within the Project Area. All but two waterbodies (WB-18 and WB-21) delineated in the Project Area have the potential to be jurisdictional based on their hydrologic connectivity to a potential WOTUS. Final determinations of jurisdiction will be completed by the USACE or its duly appointed representative.

5 Conclusions

The Project Area is dominated by agricultural land use (cultivated crops), followed by mixed forest stands. The history of land conversion for farming and other landscape manipulation to support operations has reduced the land available for wetlands to develop, in combination with fast-draining soils on sloping terrain and sandstone/limestone bedrock allowing fast groundwater movement. The quality of forested areas and streams is moderate across the parcels. The majority of wetlands identified in the Project Area occur in depressional areas, with unconsolidated bottoms adjacent to highly disturbed areas, likely impacted by the surrounding land use. Habitat development in many of the wetlands is primarily forested with limited herbaceous vegetation and low species diversity.

In summary, Cardno delineated twenty-two (22) waterbodies and seventeen (17) wetlands within the Project area. All waterbodies, with the exception of WB-18 and WB-21, are likely to be jurisdictional due to hydrologic connectivity and significant nexus to a WOTUS. One (1) wetland, WL-04, is expected to be jurisdictional due to direct hydrologic connectivity to intermittent WB-20. The Project Area is split between the Nashville and Louisville USACE Districts; therefore, features will have to be reviewed by the respective district office based on their location within the Project Area (**Table 4-2**).

The findings of this investigation represent a study of the Project Area for non-tidal wetlands and waterbodies. These findings remain dependent on the season, conditions at that time of year, site-specific influences (e.g., anthropogenic disturbance), the dynamic nature of these habitats, and individual professional judgment. This report represents a professional estimate of the wetlands and waterbodies within the area surveyed in August 2021 based upon available information and techniques. Final verification of their boundaries for regulatory purposes can only be completed through a JD review by the USACE, or its duly appointed representative.

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APPENDIX A

PHOTOGRAPHS OF PROJECT AREA AND VICINITY

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APPENDIX B

WETLAND AND WATERBODY MAPS

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WETLAND DELINEATION AND ASSESSMENT FORMS

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APPENDIX D

HYDROLOGIC DETERMINATION FIELD DATA SHEETS

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APPENDIX E

TENNESSEE DIVISION OF WATER POLLUTION CONTROL HYDROLOGIC DETERMINATION FIELD DATA SHEETS

Wetland and Waterbody Delineation Report

Dogwood Solar Project

JUNE 2022

PREPARED FOR

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WETLAND AND WATERBODY DELINEATION REPORT
DOGWOOD SOLAR PROJECT

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Acronyms

CFR	Code of Federal Regulations
CWA	Clean Water Act
FAC	Facultative Plants
FACU	Facultative Upland Plants
FACW	Facultative Wetland Plants
GIS	Geographic Information Systems
GPS	Global Positioning System
HUC	Hydrologic Unit Code
JD	Jurisdictional Determination
KDOW	Kentucky Division of Water
LiDAR	Light Detection and Ranging
MRLC	Multi-Resolution Land Characteristics Consortium
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NWP	Nationwide Permit
OBL	Obligate Wetland Plants
OHWM	Ordinary High Water Mark
PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested Wetlands
Project	Dogwood Solar Project
PUB	Palustrine Unconsolidated Bottom
TNW	Traditional Navigable Waters
TVA	Tennessee Valley Authority

UNT	Unnamed Tributary
UPL	Upland Plants
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geologic Survey
WOTUS	Waters of the United States
WQC	Water Quality Certification

1 INTRODUCTION

Oriden, LLC (Oriden) is proposing to develop the Dogwood Solar Project (Project) near Hopkinsville, Christian County, Kentucky. The Project is proposed as a solar energy facility within an area of approximately 1,647 acres (2.6 square miles) on leased private lands (Project Area); Figure 1. The proposed Project infrastructure will include solar arrays and associated infrastructure such as access roads, electrical collection lines, staging area, and a Project switchyard. Project details regarding infrastructure are still being developed.

In support of planning for the Project, SWCA Environmental Consultants (SWCA) conducted field surveys in May and June 2022 to identify wetlands and waterbodies of the United States, in accordance with Sections 401/404 of the Clean Water Act (CWA). SWCA's efforts built on work previously conducted by Cardno, Inc. in August 2021.

The Project Area is located within the jurisdiction of the Tennessee Valley Authority (TVA), an entity that provides electricity in Tennessee and parts of six surrounding states, including Christian County, Kentucky. When considering a potential energy development project, the TVA conducts environmental reviews in accordance with the National Environmental Policy Act (NEPA) and requires specific documentation on wetlands and waterbodies, including the Tennessee Division of Water Pollution Control Hydrologic Determination Field Data Sheet and the TVA Wetland Rapid Assessment Method. Those procedures were utilized in the field survey and documentation process of the Dogwood Solar Project.

This report describes the methodology used by SWCA and Cardno to complete the wetland delineation surveys, and the results of a desktop assessment and field surveys. Specifically, Section 2 of the report identifies the methodology used during the identification of wetlands and surface waters within the Project Area. Section 3 of the report outlines the findings of the desktop assessment of the Project Area. Section 4 of the report details the results of the field surveys. Section 5 presents the conclusions of the delineation and site survey. Section 6 provides a list of references cited in this report.

The report is accompanied by several appendices. Appendix A contains representative photographic documentation of the delineated wetland and waterbody features. Appendix B contains maps depicting the delineated wetlands and waterbodies. Appendix C contains the completed wetland data and assessment forms from the field efforts. Appendix D contains the TVA Rapid Assessment Method forms and Appendix E contains the completed Tennessee Division of Water Pollution Control Hydrologic Determination Field Data Sheet forms.

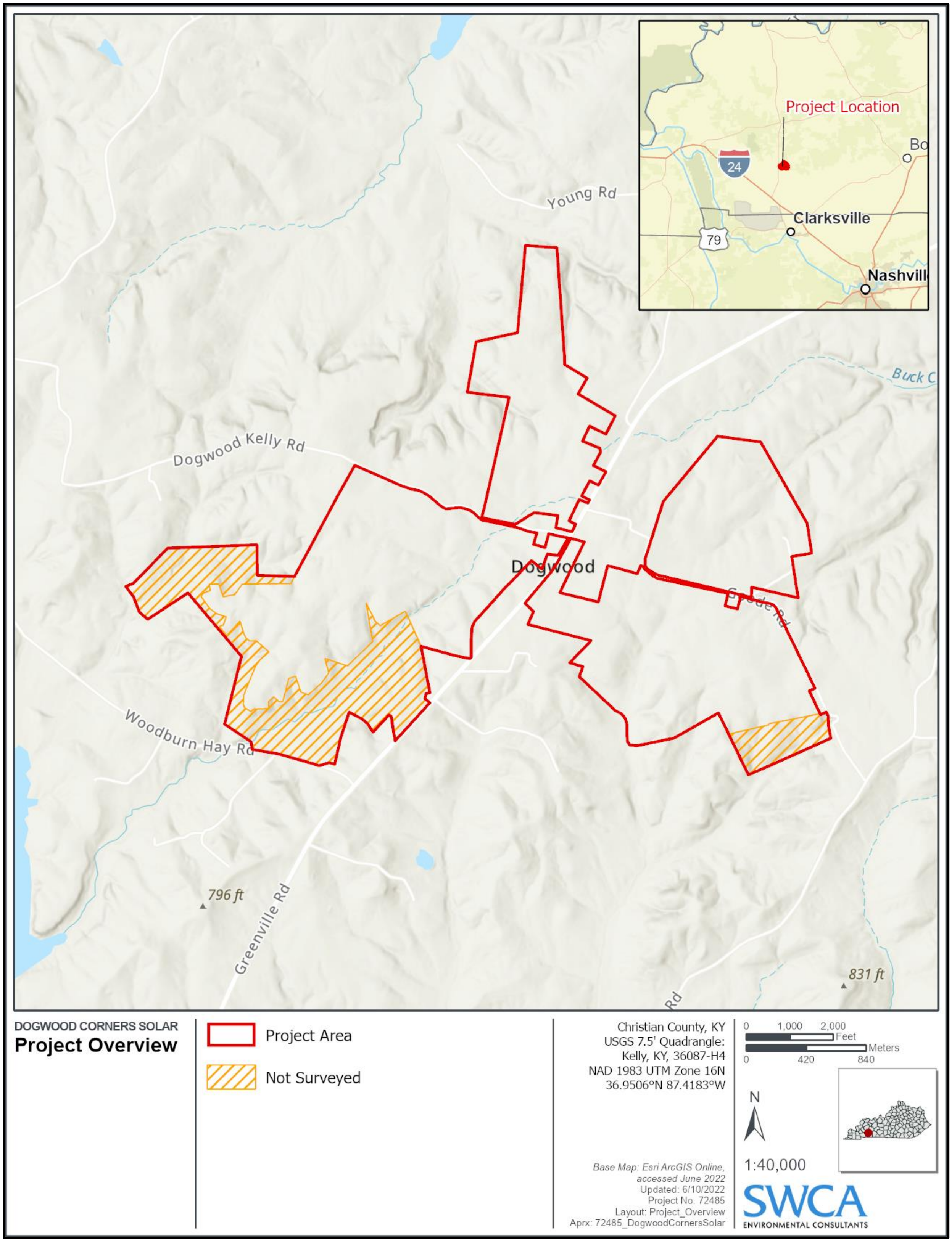

Figure 1. Project Overview.

2 SURVEY METHODOLOGY

This section of the report identifies the methodologies used during the desktop review and field delineations of wetland and waterbodies within the Project Area. Roughly 1,065 acres of the Project Area were surveyed in August 2021 and an additional 119 acres were surveyed in May and June 2022.

2.1 Desktop Review

Prior to field surveys, a desktop review of the Project Area was conducted using publicly available Geographic Information Systems (GIS) data to identify and classify potential environmental resources and create field maps for use during survey. Sources of this reference material included but were not limited to: the National Land Cover Database (NLCD); the U.S. Department of Agriculture (USDA) National Resource Conservation Service (NRCS) Soil Survey for Christian County; historic aerial photographs; Light Detection and Ranging (LiDAR) data; U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps; U.S. Geologic Service (USGS) topographic maps; and the USGS National Hydrography Dataset (NHD).

2.2 Field Delineation Methodologies

Surveys were conducted in the Project Area to determine the extent of wetlands and waterbodies in accordance with applicable Federal and State regulations and guidelines. A Trimble® Global Positioning System (GPS) with sub-meter accuracy was used to collect data points for mapping. As wetland and waterbody point features were collected, they were assigned a FEATURE_ID with the following format:

FF-XX
where: F = Feature Type
WB – Stream
WL – Wetland
XX = Two-digit number as the unique identifier

The information collected in the field was processed real-time in the field using Satellite-based Augmentation System and verified by the field team for accuracy.

2.2.1 Wetland Delineation Methodologies

Wetland delineations were conducted according to the 1987 U.S. Army Corps of Engineers (USACE) Corps of Engineers Wetlands Delineation Manual (USACE 1987) and the applicable regional supplements; Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont (Version 2.0) (USACE 2012). Together, these documents are referred to as "The Manual." The methodology outlined in the Manual requires that three wetland criteria be met in order for a wetland to be determined to be present; that is, the area being evaluated must have a dominance of hydrophytic vegetation, hydric soils, and sufficient hydrology to be identified as a wetland.

Dominant vegetation is assessed for hydrophytic adaptation. The hydrophytic vegetation criterion is met when more than 50 percent of the dominant plant community is hydrophytic, as determined by species dominance and the assigned species-specific indicator status of the identified species. Table 1 shows the indicator status categories for plants.

Table 1. Plant Indicator Categories

Indicator Category	Indicator Symbol	Definition
Obligate Wetland Plants	OBL	Plants that occur almost always (estimated probability >99 percent) in wetlands under natural conditions, but which may also occur rarely (estimated probability <1 percent) in non-wetlands.
Facultative Wetland Plants	FACW	Plants that occur usually (estimated probability >67 percent to 99 percent) in wetlands, but also occur (estimated probability 1 percent to 33 percent) in non-wetlands.
Facultative Plants	FAC	Plants with a similar likelihood (estimated probability 33 percent to 67 percent) of occurring in both wetlands and non-wetlands.
Facultative Upland Plants	FACU	Plants that occur sometimes (estimated probability 1 percent to <33 percent) in wetlands, but occur more often (estimated probability >67 percent to 99 percent) in non wetlands.
Obligate Upland Plants	UPL	Plants that occur rarely (estimated probability <1 percent) in wetlands, but occur almost always (estimated probability >99 percent) in non-wetlands under natural conditions.

After identifying the plant species present within a sampling area of a potential wetland, the dominance and indicator status for each were determined. Based on the results, the vegetation community being evaluated was determined to be indicative of either a wetland or non-wetland.

Under certain circumstances, such as after disturbance from storm events or surveys occurring outside of the growing season, additional methods are employed to evaluate the vegetative communities of suspected wetlands. This can include calculating a prevalence index, which weights the absolute percent cover of a particular class of species (using its wetland indicator status) against the total coverage within the sampling area. If a sampling area passes this test (which requires the value to be less than or equal to 3), it can be considered a wetland. Another evaluation method is the presence of morphological adaptations to hydrophytic conditions. These can include root buttressing, shallow roots, or multi-stemmed trunks. The presence of such adaptations is considered evidence that the plants (even FACU species) have adapted to survive in prolonged inundation or root saturation, resulting in anaerobic soil. Another method is to report “Problematic Hydrophytic Vegetation.” This method is used sparingly and reflects the delineator’s professional opinion that site conditions outside of those considered normal may be present, such as vegetation being bent or damaged to such a degree that identification to species level is impracticable. Under this method, the vegetation present would be treated as consistent with a wetland, but the vegetation could not be reliably identified.

The hydric soils criterion is met when the soils identified are officially listed as hydric soils or the soils demonstrate characteristics representative of soils that formed under reducing (hydric) conditions. The latter is determined in the field when the soils fall within the hydric ranges on the Munsell Color Chart, examining soil profiles for other evidence of reducing conditions, and/or observing known indicators of anaerobic soil chemical activity per the Manual.

The hydrology criterion is met when sufficient hydrologic indicators are present. The indicators must be representative of saturation or inundation occurring over the growing season sufficient to support a hydrophytic plant-dominated vegetative community. Such indicators may include evidence of standing water, saturated soils, geomorphic position within the landscape, drainage patterns, water-stained leaves, and morphologic adaptation of vegetation.

Wetland delineation data are reported on routine, region-specific wetland determination data forms. The perimeter of each wetland was mapped using the GPS systems. In addition to identifying the boundaries of wetlands, additional data points are taken with the GPS to locate delineation data collection center points.

2.2.2 Waterbody Delineation Methodologies

Linear waterbodies, such as ditches and streams, were surveyed by locating the path (typically the centerline if water depth was shallow, or the top-of-bank if the centerline was not accessible) and documenting the path of flow. Observational notes about the characteristics of each waterbody, such as the presence of Ordinary High-Water Mark (OHWM), flow regime and substrate, were recorded by the field team to enable the categorization of the types of waterbodies encountered. To be classified as a waterbody, however, each feature must have a defined bed and bank with indications of a channel flow. Erosional gullies, rills, and grassy swales are not waterbodies, and were not identified as such. Table 2 identifies the definitions used in assigning waterbody flow regimes.

Table 2. Waterbody Flow Categories

Flow Category	Definition
Perennial	Flow is continuous and likely permanent across the seasons (although it may vary). Such flow can be surface based or occur as interstitial flow, which would include the flow driving underground for a portion of the channel.
Intermittent	Flow is present during extended periods of time during some seasons, but gradually returns to a state of isolated pools in the channel or a dry channel. There may be indications of subsurface flow.
Ephemeral	Flow is often not present during the majority of the year, and only occurs after a precipitation event. Channels of ephemeral streams will be dry with no evidence of isolated pools of water.

2.2.3 Jurisdictional Determination

While SWCA cannot formally determine the jurisdictional status of a waterbody or wetland, SWCA has evaluated features in the Project Area for potential federal jurisdiction. Any determination made by the USACE would be binding and may vary from SWCA's interpretation. Our interpretation is made based on available documentation from the U.S. Environmental Protection Agency, including guidance on the "Current Implementation of Waters of the United States (WOTUS)" which refers to the original 1986/1988 promulgation and subsequent Supreme Court cases which further defined the term, with the most current definition determined by the 2008 ruling following the Rapanos v. United States case.

The agencies will assert jurisdiction over the following waters:

- Traditional navigable waters (TNW),
- Wetlands adjacent to TNWs,
- Non-navigable tributaries of TNWs that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months), and,
- Wetlands that directly abut such tributaries.

The agencies will decide jurisdiction over the following waters based on a fact-specific analysis to determine whether they have a significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent,
- Wetlands adjacent to non-navigable tributaries that are not relatively permanent, and,
- Wetlands adjacent to but that do not directly abut a relatively permanent non-navigable tributary.

The agencies generally will not assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow), and
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

No TNW's were identified in the Project. However, non-navigable tributaries and wetlands were identified that are likely to be considered jurisdictional by the USACE. Final determinations of jurisdiction are the responsibility of the USACE. Any determination made by the USACE would be binding and modifications to a feature's jurisdictional status that varies from SWCA's would have to be honored. The Nashville and Louisville USACE offices split jurisdiction of the Project Area; therefore, determinations will be made by both jurisdictions based on the location of the wetland/waterbody (see Section 3.4).

2.2.3.1 REGULATORY AUTHORIZATION

The USACE has authority over the discharge of fill and/or dredged material into "waters of the U.S." This includes authority over any filling, mechanical land clearing, or construction activities that occur within the boundaries of any "waters of the U.S." A permit must be obtained from the USACE under Section 404 of the CWA before any of these activities occur. Permits in the Commonwealth can be divided into two general categories: Individual Permits and Nationwide Permits. Compensatory mitigation may be required for projects that impact greater than 0.10 acre of wetlands or result in a loss of streams or open waters.

Individual Permits are required for projects that do not fall into one of the specific Nationwide Permits (NWP) categories or are deemed to have significant environmental impacts. These permits are much more difficult to obtain and receive a much higher level of regulatory agency and public scrutiny and may require several months to more than a year for processing. Nationwide Permits have been developed for projects which meet specific criteria and are deemed to have minimal impact on the aquatic environment. There are currently 54 NWP for qualifying activities with 32 NWP General Conditions and 7 Kentucky Division of Water (KDOW) Conditions that must be satisfied in order to receive NWP authorization from the Corps of Engineers. Nine of the 54 NWP are denied general use by the KDOW and always require individual 401 Water Quality Certification. Section 401 Water Quality Certification (WQC) must be obtained from KDOW before the USACE will complete their permit review. Some NWP have been categorically granted WQC with the USACE NWP issuance, as long as specific project conditions are met.

KDOW is responsible for issuing CWA Section 401 WQCs in conjunction with the USACE Section 404 permits. Individual WQC is required for most projects that occur within surface waters with a special use designation (cold-water habitat, etc.). In addition, most projects with proposed impacts greater than 300 linear feet of stream or ½ acre of wetlands require individual WQC. Individual WQC may be required for any project which the DOW determines to have more than minimal impacts to the aquatic environment. Water quality certification may be granted, without notification to the KDOW, if the project falls under NWP limitations. In order to qualify for this standing certification, all prior-authorized

General and Regional Conditions as published by the KDOW must be satisfied. Certain NWPs have specific conditions concerning project impact thresholds and notification requirements. The permitting process of the KDOW is conditional upon a permit requirement under the CWA sections 401 and 404. For this reason, permits are only processed where the USACE has assumed jurisdiction over a resource. There is currently no mechanism to permit isolated wetlands through the KDOW.

This Project would likely fall under NWP 14, 51, and/or 57. As long as the KDOW general conditions are met and impacts are less than 0.5 acres, this project would fall under the NWP program and no individual WQC would be required.

3 DESKTOP ASSESSMENT RESULTS

Multiple sources were reviewed prior to field investigations to identify potential resources as part of a preliminary desktop assessment. The findings of the desktop assessment were also verified during the field surveys.

3.1 National Land Cover Database Review

Based on a review of available aerial imagery, the Project Area appeared to consist primarily of deciduous forest and cultivated crop areas. Review of the 2019 NLCD (Multi-Resolution Land Characteristics Consortium [MRLC] 2019) confirmed this assessment, which showed that deciduous forests and cultivated crops accounted for approximately 43% and 42% of the total acreage in the Project Area, respectively. The third most prominent land cover within the Project Area was classified as pasture or hay, which accounted for roughly 8% of the acreage. All other land cover accounted for 5% or less of the total acreage in the Project Area. A summary is provided in Table 3 and Figure 2.

The land use categories within the Project Area are classified according to the predominant land use, as follows:

- **Deciduous Forest** – areas dominated by trees generally greater than 5 meters tall and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.
- **Cultivated Crops** – areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, cotton, and also perennial woody crops such as orchards and vineyards. Crop vegetation accounts for greater than 20% of total vegetation. This class also includes all land being actively tilled.
- **Pasture/Hay** – areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation.
- **Mixed Forest** – areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of total tree cover.
- **Developed, Open Space** – areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of total cover. These areas most commonly include large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
- **Grassland/Herbaceous-** areas dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling but can be utilized for grazing.

- **Shrub/Scrub-** areas dominated by shrubs; less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.
- **Evergreen Forest-** areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
- **Developed, Low Intensity** – areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% percent of total cover. These areas most commonly include single-family housing units.
- **Open Water** – areas of open water, generally with less than 25% cover of vegetation or soil.
- **Developed, Medium Intensity** – areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.

Table 3. Land Cover within the Project Area

Type	Project Area (acres)	Type (%)
Deciduous Forest	712.14	43.2%
Cultivated crops	696.79	42.3%
Pasture/Hay	128.57	7.8%
Mixed Forest	67.00	4.1%
Developed, Open Space	23.51	1.4%
Grassland/Herbaceous	6.88	<1%
Shrub/Scrub	4.67	<1%
Evergreen Forest	4.22	<1%
Developed, Low Intensity	1.25	<1%
Open Water	1.11	<1%
Developed, Medium Intensity	0.75	<1%
Total	**1,646.90**	**100%**

Compiled from MRLC 2019.

* The total acreage used in these calculations may differ slightly from the project area due to tiny differences inherent to the level of precision of the National Land Cover Database.

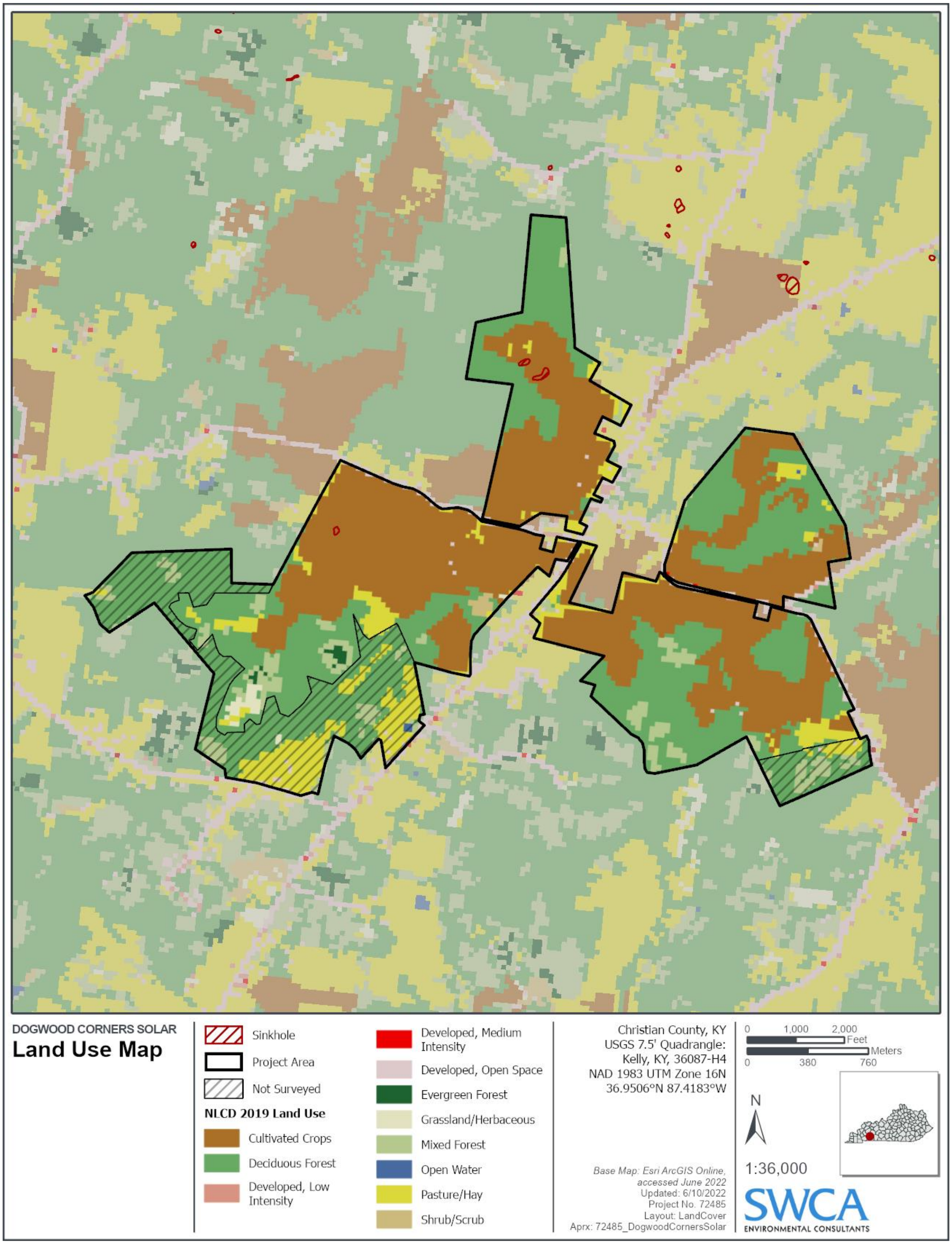

Figure 2. Land use within the Project Area

3.2 Geology

The Project is located in the Western Pennyroyal, or Mississippi Plateau, Physiographic Region of Kentucky. This region extends through a large portion of Kentucky, characterized by a limestone plain and karst terrain of springs, sink holes, and sinking streams. The Project Area sits within the Tar Springs Sandstone formation, cross bedded with grayish black to grayish green soft shaly sandstone, and medium to coarse grained light to dark gray limestone.

3.3 Soils, Hydric Ratings, and Farmland Classification

SWCA reviewed soil types for the Project Area using the Web Soil Survey, an application of the USDA NRCS. Twenty-five (25) described soil types were identified (Table 4, Figure 3).

Table 4. Soils within the Project Area

Type	Map Unit Description	Hydric Rating	Farmland Class	Project Area (acres)	Project Area (%)
ZnB	Zanesville silt loam, 2 to 6 percent slopes	No	All areas are prime farmland	392.85	23.85
ZnC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded	No	Not prime farmland	241.53	14.66
FwF	Frondorf-Weikert complex, 20 to 40 percent slopes	No	Not prime farmland	197.63	12.00
FnC	Frondorf silt loam, 6 to 12 percent slopes	No	Farmland of statewide importance	148.79	9.03
FwD	Frondorf-Weikert complex, 12 to 20 percent slopes	No	Not prime farmland	148.42	9.01
SaB	Sadler silt loam, 2 to 6 percent slopes	No	All areas are prime farmland	140.64	8.54
WeC	Wellston silt loam, 6 to 12 percent slopes	No	Farmland of statewide importance	86.82	5.27
SaA	Sadler silt loam, 0 to 2 percent slopes	No	All areas are prime farmland	47.91	2.91
WlC3	Wellston silty clay loam, 6 to 12 percent slopes, severely eroded	No	Not prime farmland	34.54	2.10
Ss	Steff silt loam, 0 to 2 percent slopes, occasionally flooded	No	All areas are prime farmland	34.12	2.07
WlD3	Wellston silty clay loam, 12 to 20 percent slopes, severely eroded	No	Not prime farmland	26.54	1.61
ZnC	Zanesville silt loam, 6 to 12 percent slopes	No	Farmland of statewide importance	23.69	1.44
CnD3	Caneyville silty clay, 6 to 20 percent slopes, severely eroded	No	Not prime farmland	19.76	1.20
Cu	Cuba silt loam	No	All areas are prime farmland	18.25	1.11
No	Nolin silt loam	No	All areas are prime farmland	17.91	1.09
Sk	Skidmore gravelly loam	No	All areas are prime farmland	16.19	<1
St	Stendal silt loam	No	Prime farmland if drained	11.95	<1
Zu	Zanesville-Gullied land complex	No	Not prime farmland	11.28	<1
Ln	Lindside silt loam	No	All areas are prime farmland	7.93	<1
La	Lawrence silt loam	No	Prime farmland if drained	6.18	<1
CrB	Crider silt loam, 2 to 6 percent slopes	No	All areas are prime farmland	4.52	<1
CaC	Caneyville silt loam, 6 to 12 percent slopes	No	Farmland of statewide importance	4.05	<1

NhB	Nicholson silt loam, 2 to 6 percent slopes	No	All areas are prime farmland	2.95	<1
WeD	Wellston silt loam, 12 to 20 percent slopes	No	Not prime farmland	1.76	<1
CoD	Caneyville-Rock outcrop complex, 6 to 30 percent slopes	No	Not prime farmland	1.20	<1
		Total		**1,647.41**	**100**

Compiled from USDA 2021.

Hydric soils are known for their poor draining qualities and combined with local flat or bowl-shaped topography, are predisposed to containing wetland areas. No soil types within the Project Area were classified as hydric. Due to high prevalence of sloping terrain, heavy erosion, and bedrock lithology, a majority of the Project Area is not predisposed to prolonged inundation or hydric conditions expected to facilitate the formation of wetlands.

As defined by the USDA NRCS, prime farmland has a combination of physical and chemical characteristics that best support the production of food, feed, fiber, forage, and oilseed crops and which currently is not highly developed or considered urban land. Generally, prime farmland has a favorable climate and growing season, adequate precipitation, acceptable acidity and salt content, and has few to no rocks. Additional criteria for prime farmland are that the land is not easily erodible, is not saturated or flooded for long periods during the growing season or is protected from flooding.

Ten (10) soils within the Project Area are considered prime farmland (683.27 acres, 41.48%), two (2) soils are considered prime farmland if drained (18.13 acres, 1.10%), and four (4) are classified as farmland of statewide importance (263.36 acres, 16.00%).

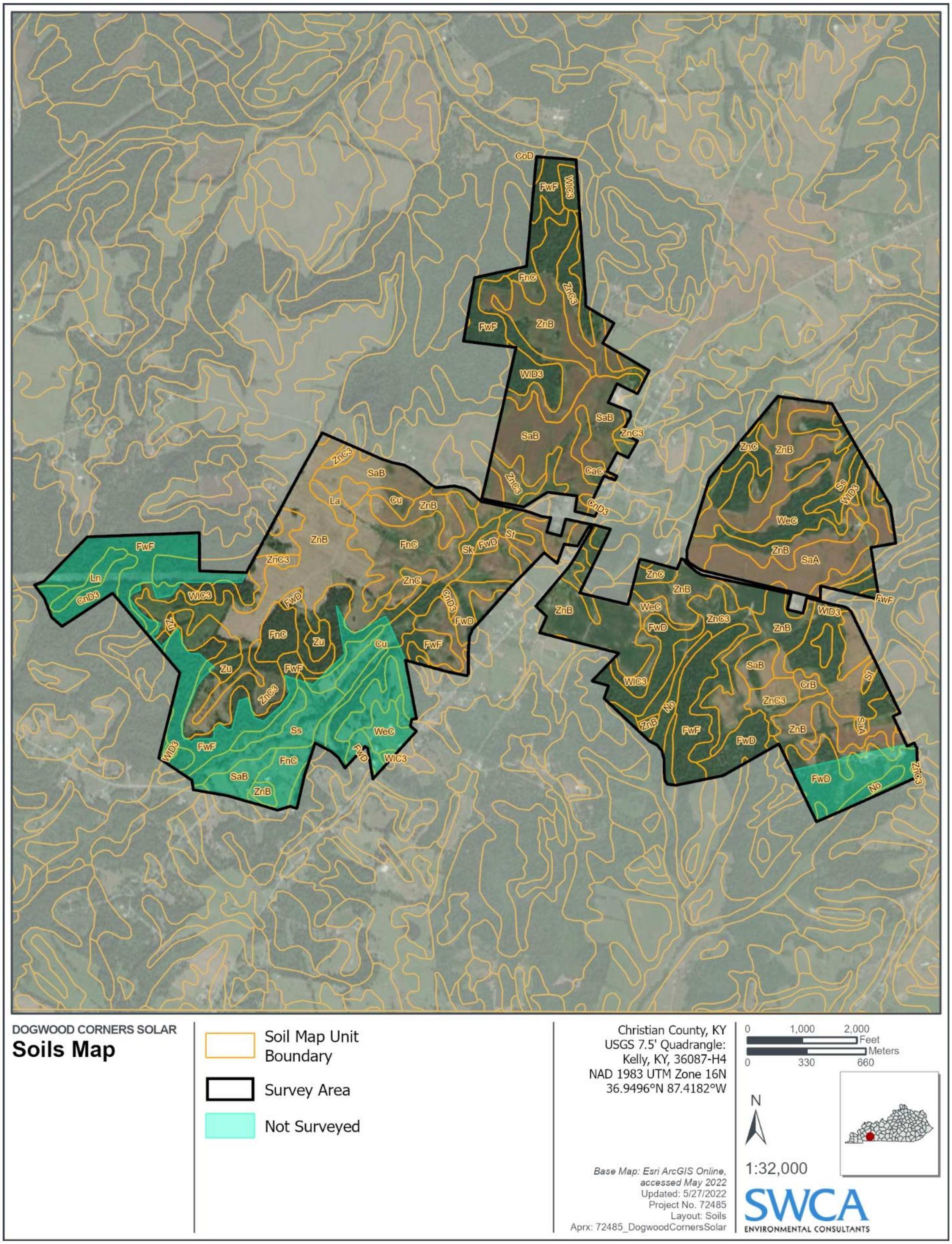

Figure 3. Soil types within the Project Area.

3.4 Navigable Waters

Three watersheds occur in the Project Area: North Fork Little River (Hydrologic Unit Code [HUC] 51302050503; 58.24 mi2 drainage area), Lower Buck Fork Pond River (HUC- 51100060202; 42.55 mi2 drainage area) and East Branch Pond River (HUC- 51100060101; 15.34 mi2 drainage area). The jurisdictional boundary of the Nashville USACE office is consistent with the boundary of the North Fork Little River watershed. The Louisville USACE district has jurisdiction over features within the East Branch Pond River and Lower Buck Fork Pond River watersheds. Three commercially navigable rivers are named within Kentucky – the Cumberland River, Green River and Ohio River– whose tributaries fall within Christian County, Kentucky. Tributaries themselves may not be navigable but have a significant impact on water quality 'downstream' in the WOTUS.

There are no named TNWs within the Project Area. However, non-navigable tributaries to named TNWs are located within the Project Area. In Christian County, four navigable rivers are identified: The Little River and Red River, which flow directly into the Cumberland River; Tradewater River, which flows into the Ohio River; and Pond River, which flows into the Green River. The identified waterbodies within the Project Area demonstrate physical connections to the tributaries of Pond River and Little River.

3.5 Remote Wetland and Waterbody Identification

Prior to site investigations, the Project Area was screened using LiDAR, the USFWS NWI (2017) and USGS NHD (2021) remote data for potential wetlands and waterbodies in the vicinity of the Project. The LiDAR provides elevation data, while the NWI data shows remotely identified wetlands, which may be based on previous aerial imagery interpretation and soils surveys and the NHD uses digital stream information to identify potential waterways.

The majority of the wetlands remotely identified appeared as agricultural ponds in cultivated fields. The waterbodies identified included Upper Branch North Fork Little River and its tributaries; and ephemeral and intermittent tributaries to Middle Branch Pond River, Buck Creek and Middle Branch North Fork Little River.

3.6 Desktop Review Summary

The desktop review indicated potential for wetlands and streams to be located in multiple crop areas or forested areas within the Project Area (Figure 4). It is not uncommon for the NHD set to publish inaccurate or missing features or features that are no longer present due to landowners rerouting the channel or moving it underground via tiles. However, the LiDAR reveals the stream channels and drop in elevation effectively. Much of the Project Area, however, is cultivated crop area that limits the development of wetlands. The remotely identified features and land cover information was expected given the region's heavy, historic manipulation of land cover to accommodate and maintain farming operations.

4 FIELD SURVEY RESULTS

The following is a summary of the results of field surveys conducted within the Project Area. Climatic conditions were considered normal during the survey periods. Appendix A contains representative photographic documentation of the delineated wetland and waterbody features. Appendix B contains maps depicting the delineated wetlands and waterbodies. Appendix C contains the completed USACE wetland data and assessment forms from the field efforts. Appendix D contains the TVA Rapid Assessment Method forms and Appendix E contains the stream assessment forms.

4.1 General Habitat within the Project Area

The data obtained during the desktop review were found to be generally consistent with the results of the field survey. As identified in Table 3, the predominant land use in the Project Area is deciduous forests and agricultural (crops).

The agricultural fields were observed to be planted entirely with soybean crops. Field edges and occasional remnants from previous year's crops contained senescent winter wheat and field corn. Fields are likely actively rotated seasonally between these crops, but the general extent of the cultivated area remains the same. Many of the cultivated fields, roadsides, and forest edges contained grassy swales and heavy erosional gullies and rills. These features help maintain proper growing conditions for crops through drainage and are readily visible on aerial photography of the site. Fencerows and forest edges were dominated by relatively young mixed forest lots containing a variety of oaks (*Quercus* sp.), hickories (*Carya* sp.), and maples (*Acer* sp.), with a shrub understory of primarily greenbrier (*Smilax* sp.) and brambles (*Rubus* spp.), and relatively open herbaceous layers of goldenrods (*Solidago* sp.), asters (*Symphyotrichum* sp. and *Eupatorium* sp.), nettles (*Urtica* sp.) and grasses. Occasional occurrences of juniper (*Juniperus virginiana*) were found throughout the wooded lots, but primarily as emerging saplings or young tree with trunk diameters less than 10 inches. The forested patches within the Project Area were discontinuous and concentrated along stream or drainage features.

4.2 Description of the Delineated Wetlands in the Project Area

A total of twenty-three (23) wetlands and ponds were delineated during field surveys, for a total of 4.72 acres within the surveyed portion of the Project Area (see Figure 4 and Appendix B). Table 5 provides a list of the delineated wetlands and ponds and their associated characteristics. Acreages reported in the subsections below are representative only of the portion of the wetland located within the Project Area. Representative photographs of the delineated wetlands and ponds can also be found in Appendix A.

Eight (8) wetlands were identified in the Project Area. Five (5) wetlands were identified as Palustrine Emergent Wetlands (PEM), and the remaining three delineated features were determined as Palustrine Forested Wetland (PFO). One (1) of the wetlands identified within the Project Area, WL-04, has the potential to be considered jurisdictional, due to direct connectivity to a tributary of Buck Creek. Fifteen (15) ponds were identified in the surveyed portion of the Project Area and are classified as Palustrine Unconsolidated Bottom (PUB). While some may be naturally occurring, many of the features within this category are likely man-made or modified ponds for agricultural or recreational purposes, with nearly all located within or adjacent to cultivated fields. Final verification of wetland boundaries for regulatory purposes can only be completed through a Jurisdictional Determination (JD) review by the USACE or its duly appointed representative. WL-04 would fall under jurisdiction of the Louisville USACE District Office.

The Tennessee Valley Authority Rapid Assessment Method form was completed for each wetland, and can be found in Appendix D.

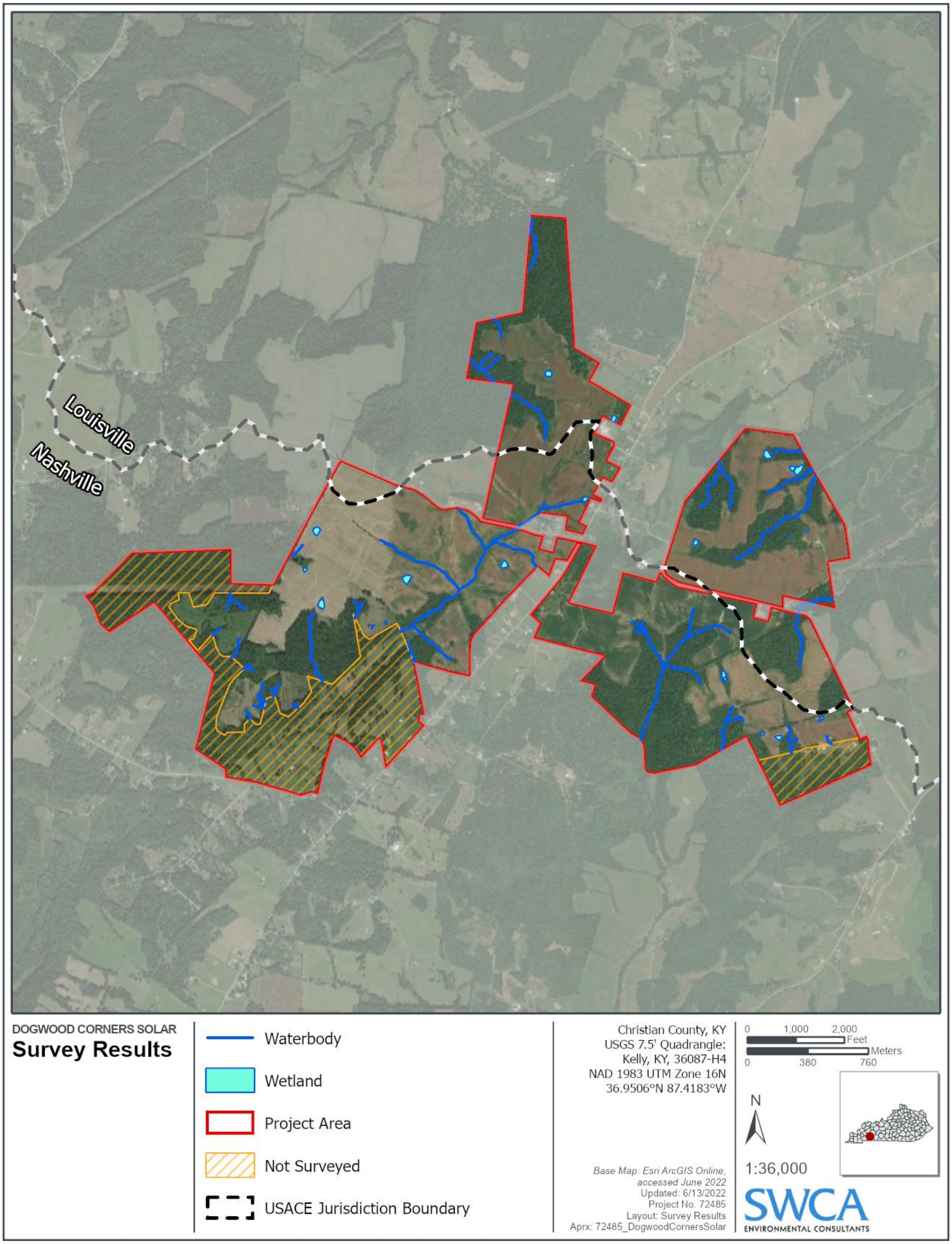

Figure 4. Survey Results.

Table 5. Wetlands Delineated in the Project Area

Wetland ID[a]	Latitude of Center Point	Longitude of Center Point	Acres within Project Area	Wetland Type[b]	Anticipated Jurisdictional	Drainage Basin
WL-01	36.941475	-87.4008000	0.27	PFO	No	North Fork Little River
WL-02	36.9514302	-87.4106195	0.19	PFO	No	North Fork Little River
WL-03	36.9476847	-87.4163291	0.33	PEM	No	North Fork Little River
WL-04	36.9542304	-87.3971799	0.03	PFO	Yes	Lower Buck Fork Pond River
WL-05	36.9539561	-87.397791	0.43	PUB	No	Lower Buck Fork Pond River
WL-06	36.953202	-87.3960329	0.19	PUB	No	Lower Buck Fork Pond River
WL-07	36.9530863	-87.395601	0.52	PUB	No	Lower Buck Fork Pond River
WL-08	36.9496658	-87.3949846	0.05	PUB	No	Lower Buck Fork Pond River
WL-09	36.9493856	-87.3961912	0.01	PUB	No	Lower Buck Fork Pond River
WL-10	36.948979	-87.4028154	0.19	PUB	No	Lower Buck Fork Pond River
WL-11	36.9584857	-87.4132411	0.31	PUB	No	East Branch Pond River
WL-12	36.9412427	-87.4007123	0.08	PUB	No	North Fork Little River
WL-13	36.9559708	-87.4086312	0.24	PUB	No	Lower Buck Fork Pond River
WL-14	36.9467924	-87.4231864	0.49	PUB	No	North Fork Little River
WL-15	36.9453763	-87.4291884	0.42	PUB	No	North Fork Little River

Wetland ID[a]	Latitude of Center Point	Longitude of Center Point	Acres within Project Area	Wetland Type[b]	Anticipated Jurisdictional	Drainage Basin
WL-16	36.9473325	-87.4303747	0.11	PUB	No	North Fork Little River
WL-17	36.9495175	-87.4295504	0.39	PUB	No	North Fork Little River
WB001	36.944179	-87.425526	0.056	PEM	Yes	North Fork Little River
WB003	36.938185	-87.398025	0.040	PEM	No	North Fork Little River
WB004	36.938919	-87.394035	0.017	PEM	No	North Fork Little River
WB006	36.944435	-87.424599	0.069	PEM	Yes	North Fork Little River
PB001	36.939121	-87.393746	0.073	PUB	No	North Fork Little River
PB002	36.937995	-87.397177	0.219	PUB	No	North Fork Little River
		Total	**4.72**			

[a]Wetland ID nomenclature differs between Cardno (August 2021) and SWCA (May 2022) but does not indicate differences in survey methodologies.
[b]Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979): PEM – Palustrine Emergent Wetland; PSS – Palustrine Scrub/Shrub Wetland; PFO – Palustrine Forested Wetland; PUB – Palustrine Unconsolidated Bottom.

4.3 Description of the Delineated Waterbodies in the Project Area

A total of fifty-one (51) waterbodies were delineated during field surveys (see Figure 4 and Appendix B). The waterbody delineation results are summarized in Table 6. Representative photographs of each waterbody can also be found in Appendix A. Waterbodies were delineated in the field and further categorized for the report.

Streams are considered natural channels if they have not had any modification or have shown indication of recovery following historic modification. Streams possess a “ordinary high-water mark” as defined by the USACE 33 CFR 328.3(e) as the line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. Additionally, streams are more likely to have vegetated riparian buffers along the banks, variety of substrates in the channel, and pools of water which might support aquatic species.

All waterbodies identified within the surveyed portion of the Project Area were streams or swales. Thirty-six (36) of these waterbodies were determined to have an ephemeral flow regime and are expected to be only wet weather conveyances. Eleven (11) waterbodies were evaluated as an intermittent flow regime. Most of these contained several relatively deep groundwater-fed pools and occurrences of macroinvertebrates and amphibians. A few streams within the surveyed portion of the Project Area were observed to disappear and re-emerge through underground connections and seeps. Four (4) streams were observed to be perennial.

The Tennessee Division of Water Pollution Control Hydrologic Determination Field Data Sheet was completed for each stream, and can be found in Appendix E.

Table 6. Waterbodies Delineated in the Project Area

Stream ID[a]	Type	Linear Feet in Project Area	Flow Regime	Flow Direction	Stream Name	Potentially Jurisdictional	USACE District
WB-01	Stream	2,326	Perennial	Lower Buck Fork Pond River	UNT to Buck Creek	Yes	Louisville
WB-02	Stream	978	Intermittent	North Fork Little River	UNT to Middle Branch North Fork Little River	Yes	Nashville
WB-03	Stream	3,142	Ephemeral	North Fork Little River	UNT to Middle Branch North Fork Little River	Yes	Nashville
WB-04	Stream	1,059	Ephemeral	North Fork Little River	UNT to Middle Branch North Fork Little River	Yes	Nashville
WB-05	Stream	165	Ephemeral	North Fork Little River	UNT to Middle Branch North Fork Little River	Yes	Nashville
WB-06	Stream	1,222	Intermittent	North Fork Little River	UNT to Middle Branch North Fork Little River	Yes	Nashville
WB-07	Stream	334	Intermittent	North Fork Little River	UNT to Middle Branch North Fork Little River	Yes	Nashville
WB-08	Stream	1,158	Ephemeral	Lower Buck Fork Pond River	UNT to Buck Creek	Yes	Louisville
WB-10	Stream	2,826	Ephemeral	Lower Buck Fork Pond River	UNT to Buck Creek	Yes	Louisville
WB-11	Stream	1,272	Ephemeral	Lower Buck Fork Pond River	UNT to Buck Creek	Yes	Louisville
WB-12	Stream	2,169	Ephemeral	East Branch Pond River	UNT to Middle Branch Pond River	Yes	Louisville
WB-13	Stream	72	Intermittent	East Branch Pond River	UNT to Middle Branch Pond River	Yes	Louisville
WB-14	Stream	865	Perennial	North Fork Little River	Upper Branch North Fork Little River	Yes	Nashville
WB-15	Stream	4,339	Intermittent	North Fork Little River	Upper Branch North Fork Little River	Yes	Nashville
WB-16	Stream	1,248	Intermittent	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WB-17	Stream	990	Perennial	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WB-18	Stream	325	Perennial	North Fork Little River	UNT	Yes	Nashville
WB-19	Stream	2,013	Intermittent	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WB-20	Stream	692	Intermittent	Lower Buck Fork Pond River	UNT to Buck Creek	Yes	Louisville

Stream ID[a]	Type	Linear Feet in Project Area	Flow Regime	Flow Direction	Stream Name	Potentially Jurisdictional	USACE District
WB-21	Stream	456	Intermittent	North Fork Little River	UNT	Yes	Nashville
WB-22	Stream	1,105	Intermittent	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WB-23	Stream	995	Intermittent	North Fork Little River	UNT	Yes	Nashville
WB-24	Stream	1742	Ephemeral	North Fork Little River	UNT	Yes	Nashville
WCB001	Swale	221	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB002	Stream	356	Ephemeral	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WCB003	Stream	401	Ephemeral	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WCB004	Stream	470	Ephemeral	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WCB005	Stream	180	Ephemeral	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WCB006	Swale	227	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB007	Swale	224	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB008	Swale	202	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB009	Stream	45	Ephemeral	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WCB010	Swale	259	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB011	Swale	211	Ephemeral		UNT	No	Nashville
WCB012	Swale	81	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB013	Swale	291	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB014	Swale	93	Ephemeral		UNT	No	Nashville
WCB015	Swale	114	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB016	Swale	226	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB017	Stream	359	Ephemeral	North Fork Little River	UNT to Upper Branch North Fork Little River	Yes	Nashville
WCB018	Swale	131	Ephemeral	North Fork Little River	UNT	No	Nashville

Stream ID[a]	Type	Linear Feet in Project Area	Flow Regime	Flow Direction	Stream Name	Potentially Jurisdictional	USACE District
WCB019	Swale	170	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB020	Swale	644	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB021	Swale	172	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB022	Swale	213	Ephemeral	North Fork Little River	UNT	No	Nashville
WCB023	Stream	456	Ephemeral	North Fork Little River	UNT	Yes	Nashville
WCB024	Stream	942	Ephemeral	Lower Buck Fork Pond River	UNT	Yes	Louisville
WCB025	Swale	405	Ephemeral	East Branch Pond River	UNT	No	Louisville
WCB026	Swale	475	Ephemeral	East Branch Pond River	UNT	No	Louisville
WCB027	Swale	428	Ephemeral	East Branch Pond River	UNT	No	Louisville
WCB028	Stream	1202	Ephemeral	East Branch Pond River	UNT	Yes	Louisville
	Total	**40,690**					

[a]Stream ID nomenclature differs between Cardno (August 2021) and SWCA (May/June 2022) but does not indicate differences in survey methodologies.

Note that there is no Stream WB-09; it was originally classified as a waterbody, then later determined to be a gravel ditch.

The streams classified with an ephemeral flow regime are not relatively permanent but were observed in the field to have a consistent OHWM and significant nexus to the relatively permanent (intermittent) tributaries identified within the Project Area. Thirty-two (32) of the waterbodies delineated in the Project Area have the potential to be jurisdictional based on their hydrologic connectivity to a potential WOTUS. Final verification for regulatory purposes can only be completed through a Jurisdictional Determination review by the USACE or its duly appointed representative. The corresponding USACE District is provided for each stream in Table 6.

5 CONCLUSIONS

The Project Area is dominated by deciduous forest and agricultural land use (cultivated crops), followed by pasture and mixed forest stands. The history of land conversion for farming and other landscape manipulation to support operations has reduced the land available for wetlands to develop, in combination with fast-draining soils on sloping terrain and sandstone/limestone bedrock allowing fast groundwater movement. The quality of forested areas and streams is moderate across the parcels. The majority of wetlands identified in the Project Area occur in depressional areas, with unconsolidated bottoms adjacent to highly disturbed areas, likely impacted by the surrounding land use. Habitat development in many of the wetlands is primarily forested with limited herbaceous vegetation and low species diversity.

In summary, fifty-one (51) waterbodies, eight (8) wetlands, and fifteen (15) ponds were delineated within the Project Area. Thirty-two (32) waterbodies are likely to be jurisdictional due to hydrologic connectivity and significant nexus to a WOTUS. One (1) wetland, WL-04, is expected to be jurisdictional due to direct hydrologic connectivity to intermittent WB-20. The Project Area is split between the

Nashville and Louisville USACE Districts; therefore, features will have to be reviewed by the respective district office based on their location within the Project Area (Table 6).

The findings of this investigation represent a study of the Project Area for non-tidal wetlands and waterbodies. These findings remain dependent on the season, conditions at that time of year, site-specific influences (e.g., anthropogenic disturbance), the dynamic nature of these habitats, and individual professional judgment. This report represents a professional estimate of the wetlands and waterbodies within the area surveyed in August 2021 and May and June 2022 based upon available information and techniques. Final verification of their boundaries for regulatory purposes can only be completed through a JD review by the USACE, or its duly appointed representative.

6 LITERATURE CITED

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APPENDIX A

Photographs of Project Area and Vicinity

APPENDIX B

Wetland and Waterbody Maps

APPENDIX C

Wetland Delineation and Assessment Forms

APPENDIX D

TVA Rapid Assessment Forms

APPENDIX E

Tennessee Division of Water Pollution Control Hydrologic Determination Field Data Sheets

STAFF DR 1-26:

Provide where the Point of Interconnection (POI) will be located along the existing 161kV Hopkinsville-Lost City transmission line. Include in the response, whether the POI is on land leased or owned by Dogwood Corners.

Response: Dogwood Corners is evaluating a new POI that would move the facility away from Dogwood Kelly Road to a less visible location. The land is currently secured by an Option for Lease but will eventually be purchased and transferred to TVA. As soon as the exact POI location is confirmed, Dogwood Corners will submit updated information to the Siting Board.

Witness: Megan Stahl

STAFF DR 1-27:

Refer to the SAR, Appendix B, Preliminary Site Layout, and Appendix E, Visual Impact Assessment. Provide an explanation of the proposed vegetative screening. Include in the response the types of vegetation that will be used.

Response: As stated in the Dogwood Corners' Site Assessment Report, Section 2: Compatibility with Scenic Surroundings (page 4): "Based on community feedback, Dogwood Corners is proposing a double row of staggered evergreen trees a minimum of five feet in height at planting and maturing to a minimum of 15 feet. The trees shall achieve opacity of 90% to a height of no less than eight feet within three years of planting."

Witness: Megan Stahl

STAFF DR 1-28:

Refer to the SAR, Mitigation Measures at 8. Confirm that Dogwood Corners will be prioritizing vegetative planting during all periods of construction.

Response: The proposed mitigation measure should state that "Dogwood Corners will prioritize vegetative planting at all periods of construction to reduce viewshed impacts." Dogwood Corners notes that it may be imprudent and not beneficial to plant all of the planned vegetative buffers prior to any construction activities onsite. Parts of the planned vegetative buffer may not provide any benefit to construction work being performed. For example, if construction is phased across the site, planting a vegetative buffer prior to any construction on land that would not have construction until a later phase would be unnecessary. In addition, planting of vegetation buffers is reliant on seasonal weather. Vegetation must be planted at the appropriate time in order to promote viability of the plants.

Witness: Megan Stahl

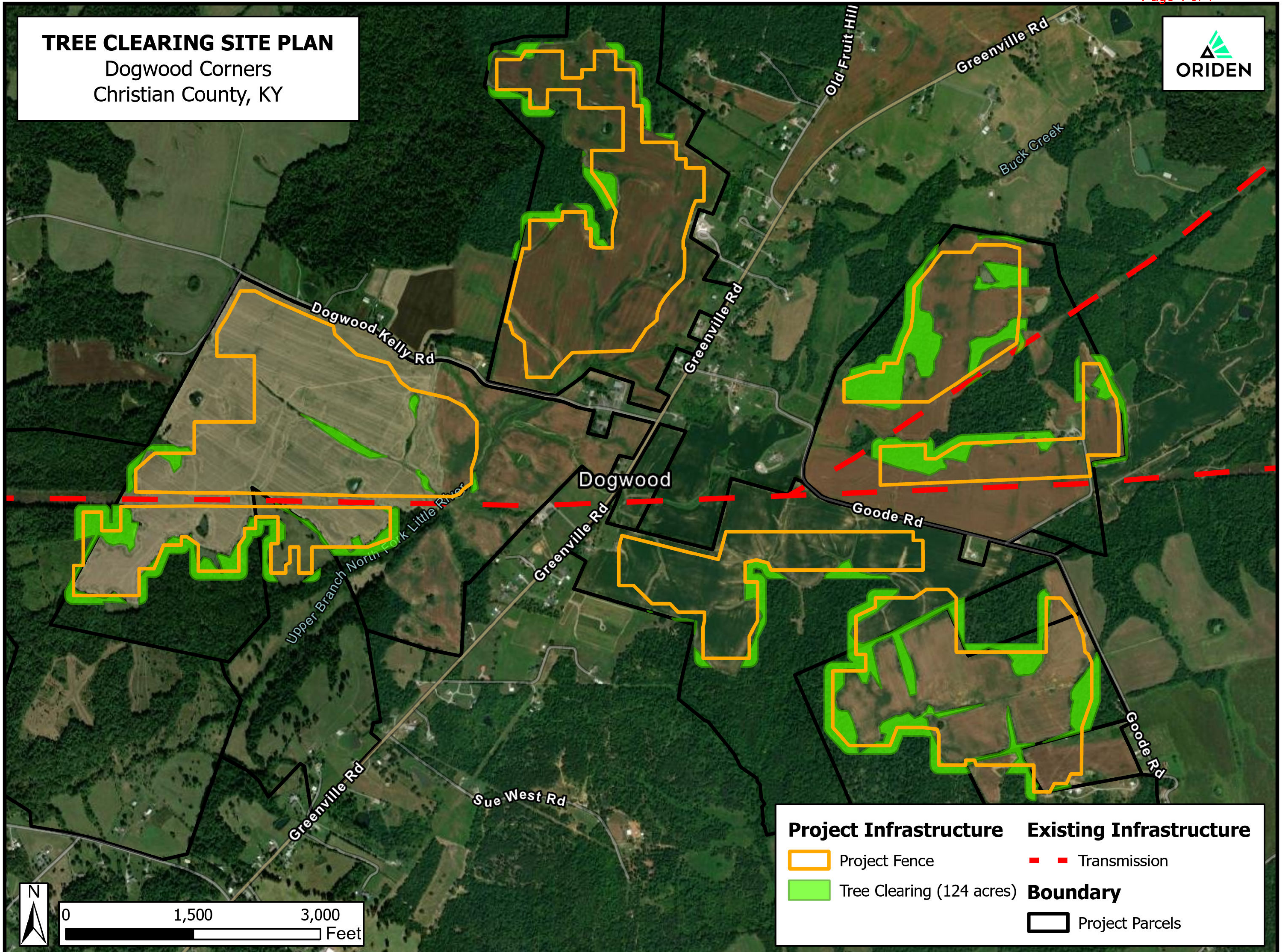
STAFF DR 1-29:

Refer to the SAR, Appendix B, Preliminary Site Layout. Explain whether there will be vegetation clearing for construction. Provide in the response the number of acres that will be cleared and any permits that will be required.

Response: Please refer to the attached Tree Clearing Site Plan which shows approximately 124 acres of vegetation clearing for construction. This estimate will be confirmed with the final site plan and further analysis of shading considerations. Once the area is finalized Dogwood Corners will pursue necessary permits and agency approvals required for vegetation clearing and associated impacts, which may include consultation with U.S. Fish and Wildlife Service and Kentucky Department of Fish and Wildlife Resources for potential species impacts, U.S. Army Corps of Engineers and Kentucky Department for Environmental Protection, Division of Water (KDOW) for potential impacts to aquatic resources, and KDOW for potential stormwater management requirements.

Witness: Megan Stahl

TREE CLEARING SITE PLAN
Dogwood Corners
Christian County, KY



Name of Map: Dogwood_TreeClearing

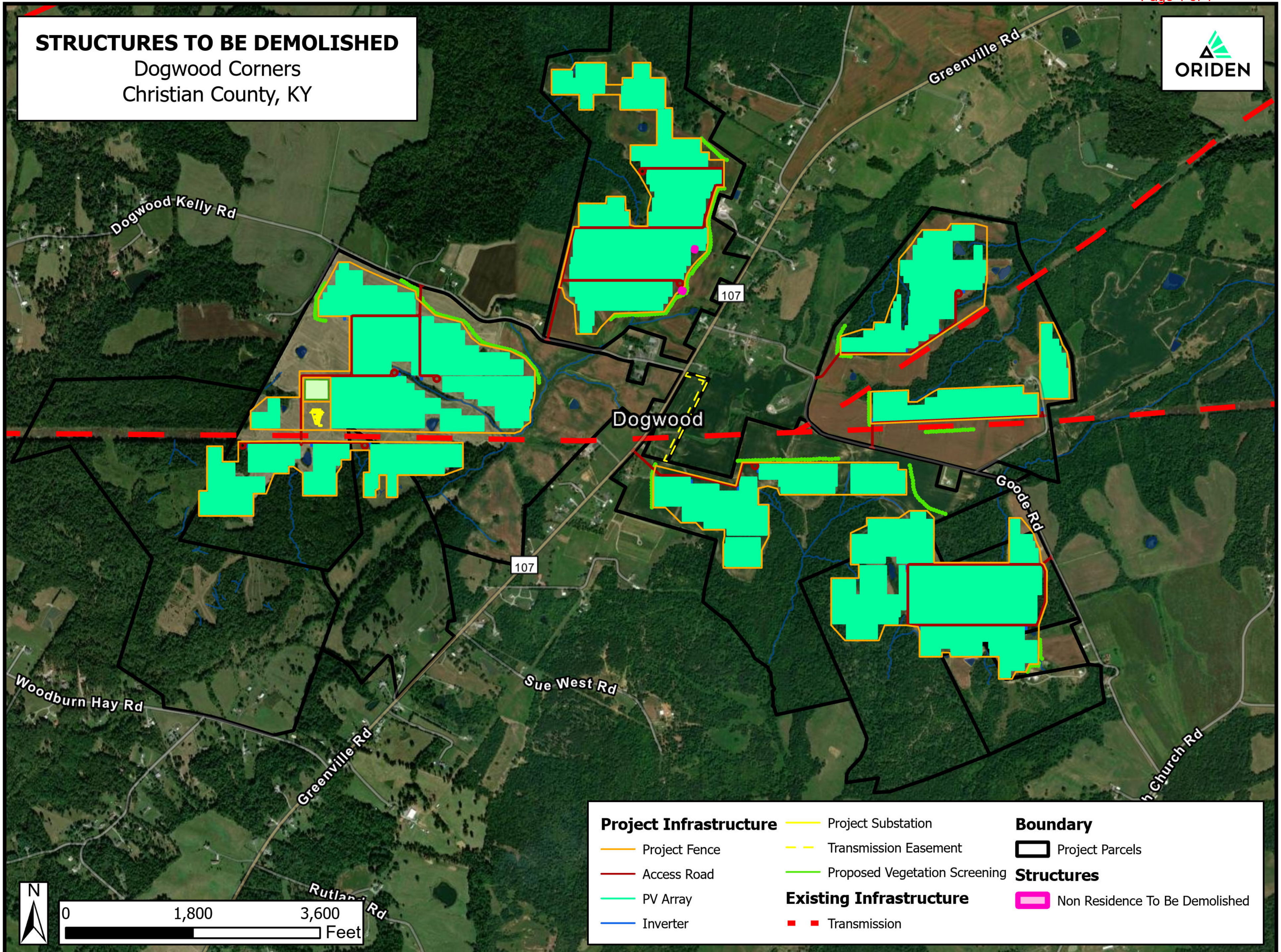
10/30/2023

STAFF DR 1-30:

Explain if any existing structures on a parcel of land leased by Dogwood Corners will be demolished or removed during construction.

Response: Please refer to the attached Structures to be Demolished document, which shows there are two structures to be demolished during construction. Prior to any planned demolition, owners of parcel of land will be notified.

Witness: Megan Stahl


STRUCTURES TO BE DEMOLISHED
Dogwood Corners
Christian County, KY
ORIDEN
Greenville Rd
Dogwood Kelly Rd
107
Dogwood
107
Goode Rd
Sue West Rd
Woodburn Hay Rd
Greenville Rd
Rutland Rd
Church Rd
N
0
1,800
3,600
Feet
Project Infrastructure
Project Fence
Access Road
PV Array
Inverter
Project Substation
Transmission Easement
Proposed Vegetation Screening
Existing Infrastructure
Transmission
Boundary
Project Parcels
Structures
Non Residence To Be Demolished

STAFF DR 1-31:

Refer to the SAR, Mitigation Measures at 8. Dogwood Corners stated it will implement a construction method that will suppress noise generated during pile driving if the pile driving occurs within 500 feet of a noise-sensitive receptor.

a. Explain whether the 500 feet distance includes residences on participating properties.

Response:

No, noise suppression methods will not apply to participating properties.

b. Identify the construction method that will be used to suppress noise generated during pile driving.

Response: If needed, pile driving noise will be mitigated by placing temporary noise barriers near the perimeter of areas where there is active pile driving. The noise barriers will then be moved as work progresses to different areas of the site. Dogwood Corners has not determined the specific method but will evaluate typical measures such as mass loaded vinyl noise barrier panels or blankets secured to fencing that is anchored to roadway crash (jersey) barriers, or similar methods.

Witness: Megan Stahl

STAFF DR 1-32:

Refer to the SAR, Compatibility with Scenic Surroundings at 4. Explain if Dogwood Corners has conducted a glare study. If it has been done, provide the study.

Response: A glare study has not been conducted at the time of this response.

Witness: Megan Stahl

STAFF DR 1-33:

Refer to the SAR Appendix D, Noise Analysis Report. Provide a chart that contains the expected noise level during construction at each noise sensitive receptor within 1,000 feet of the project boundary. Include, and notate, participating residences.

Response:

The Noise Analysis Report provided a worst-case estimate of maximum (Lmax) and average (Leq) construction noise levels at the nearest non-participating receptor to construction activities. We view this approach for construction noise assessment as being consistent with the requirements for the noise study to include an "evaluation of anticipated peak and average noise levels associated with the facility's construction and operation at the property boundary." (KRS 278.708(3)(d)).

Witness: Shane Kelley

STAFF DR 1-34:

Provide a detailed table listing all residential structures located within 2,000 feet of the Project boundary line. For each structure, provide:

a. The distance to the project boundary.

b. The distance to the closest solar panel.

c. The distance to the nearest inverter.

d. The distance to the substation.

Response: Please refer to the attached spreadsheet for all residential structures located within 2,000 feet of the Project boundary line.

Witness: Megan Stahl

Number	Structure Type	Landowner	Parcel ID	Address	Distance to Closest Project Fence (ft)	Distance to Closest Panel (ft)	Distance to Closest Inverter (ft)	Distance to Substation (ft)
1	Non - Participating	SUTTON, JAMES	136-00 00 001.00	7335 GREENVILLE RD	1,957.58	1,990.83	2,776.65	3,367.50
2	Non - Participating	HUMPHRIES, KENNETH W	135-00 00 050.00	7495 GREENVILLE RD	1,628.99	1,652.77	2,526.67	3,205.30
3	Non - Participating	WEST, HELEN S	135-00 00 051.01	7490 GREENVILLE RD	1,893.78	1,926.11	2,868.54	3,557.26
4	Non - Participating	WALKER, DENNIS J	135-00 00 046.00	7610 GREENVILLE RD	1,843.17	1,878.13	2,481.11	3,711.83
5	Non - Participating	ARMSTRONG, MARGARET J	135-00 00 048.00	7520 GREENVILLE RD	1,730.31	1,765.66	2,356.33	4,137.51
6	Non - Participating	MONDAY, ROY R	135-00 00 044.00	7625 GREENVILLE RD	1,468.60	1,503.77	2,464.10	3,387.30
7	Non - Participating	JOHNSON, RUSSELL C	135-00 00 043.00	7705 GREENVILLE RD	1,408.26	1,451.51	2,095.16	3,496.27
8	Non - Participating	ROECKER, CAROLYN L	135-00 00 040.00	7745 GREENVILLE RD	1,286.82	1,322.22	1,925.59	3,532.77
9	Non - Participating	POWERS, WILLIAM T	135-00 00 039.00	7765 GREENVILLE RD	1,190.37	1,216.09	1,759.21	3,634.25
10	Non - Participating	RAGER, GORDON B	135-00 00 038.00	7785 GREENVILLE RD	1,134.89	1,159.89	1,692.16	3,658.11
11	Non - Participating	NOEL, JERRY L	135-00 00 034.01	7802 GREENVILLE RD	731.11	758.59	1,324.11	4,065.88
12	Non - Participating	FARMER, SHIRLEY S	135-00 00 037.00	7860 GREENVILLE RD	610.71	635.71	1,154.55	4,112.94
13	Participating	SCHAMP, ALAN C	153-00 00 033.00	7960 GREENVILLE RD	302.06	333.72	832.99	4,346.65
14	Non - Participating	PETERS, DANIEL J & VICKI L	135-00 00 035.00	7965 GREENVILLE RD	851.37	916.30	1,386.26	3,831.61
15	Non - Participating	TUCKER, PAUL K	135-00 00 033.00	8155 GREENVILLE RD	688.09	851.03	1,063.05	4,557.38
16	Non - Participating	TUCKER, PAUL K	135-00 00 033.00	8155 GREENVILLE RD	836.77	1,001.52	1,140.78	4,693.42
17	Non - Participating	BOYD, MARK E	153-00 00 032.00	8295 GREENVILLE RD	918.25	951.56	1,284.86	5,326.70
18	Non - Participating	HENDERSON, ZONA & HENDERSON, TONY	153-00 00 039.00	8390 GREENVILLE RD	964.53	1,012.71	1,236.19	5,825.78
19	Non - Participating	EDWARDS, DEBORAH; HOUCHENS, SANDRA; EDWARDS, BILLIE JO	153-00 00 027.00	8490 GREENVILLE RD	1,155.54	1,204.21	1,465.88	6,189.37
20	Non - Participating	DELUGA, MATTHEW E	153-00 00 040.02	8215 GOODE RD	1,220.35	1,270.47	1,508.05	6,094.03
21	Non - Participating	BURKHEAD BRIAN K 2022 LIVING TRUST	153-00 00 028.00	8980 Greenville Rd	714.88	739.88	1,588.61	6,656.95
22	Non - Participating	KIRKMAN, DOUGLAS W	153-00 00 040.03	7969 GOODE RD	838.96	868.27	1,005.89	6,489.08
23	Non - Participating	KIRKMAN, DOUGLAS W	153-00 00 040.00	8233 GOODE RD	1,234.78	1,261.34	1,519.97	6,058.00
24	Non - Participating	REAGAN, BOBBY JR	153-00 00 038.00	8484 GOODE RD	776.43	853.22	1,069.38	5,801.79
25	Non - Participating	KIRKMAN, DOUGLAS W	153-00 00 040.00	8233 GOODE RD	1,092.14	1,154.14	1,375.47	5,994.69
26	Non - Participating	LIVINGSTON, WILLIAM J	153-00 00 029.00	8485 GREENVILLE RD	503.78	539.28	786.31	5,404.33
27	Non - Participating	LIVINGSTON, PHILLIP	153-00 00 029.01	8485 GREENVILLE RD	498.50	533.77	759.10	5,518.44
28	Non - Participating	LANCASTER, CHERI L	153-00 00 026.00	8487 GREENVILLE RD	506.34	550.78	847.77	5,868.96
29	Non - Participating	EDWARDS, DEBORAH; HOUCHENS, SANDRA; EDWARDS, BILLIE JO	153-00 00 027.00	8490 GREENVILLE RD	778.62	838.56	1,110.72	6,032.55
30	Non - Participating	DAWSON, DILLON C & MALLORY	153-00 00 025.00	8560 GREENVILLE RD	743.80	775.38	1,236.56	6,269.85
31	Non - Participating	GAGNON, CHARLOTTE	153-00 00 022.00	8625 GREENVILLE RD	529.83	555.07	1,200.75	6,386.35
32	Non - Participating	PACE, JOSHUA ALBERT	153-00 00 028.01	8494 GREENVILLE RD	1,180.32	1,214.75	1,754.64	6,983.43
33	Non - Participating	LIVINGSTON, JEFF	153-00 00 021.00	8655 GREENVILLE RD	655.03	680.03	1,123.96	6,564.33
34	Non - Participating	MCGHEE, TERRY	153-00 00 016.00	8710 GREENVILLE RD	991.53	1,016.53	1,331.94	6,891.63
35	Non - Participating	DELANEY, CHARLES B	153-00 00 014.00	8715 GREENVILLE RD	707.45	755.47	992.11	6,806.55
36	Non - Participating	RAGER, GORDON T	153-00 00 013.00	8735 GREENVILLE RD	703.75	747.07	977.15	6,945.97
37	Non - Participating	DICKERSON, PHYLLIS G	153-00 00 015.00	8725 GREENVILLE RD	486.82	526.99	754.01	6,842.62
38	Non - Participating	ALDRIDGE, GERALD	153-00 00 019.01	8845 OLD FRUIT HILL RD	518.57	543.57	721.46	6,984.46
39	Non - Participating	DWIRE, JOSHUA	153-00 00 011.00	8830 GREENVILLE RD	1,173.53	1,199.78	1,388.24	7,535.98
40	Non - Participating	LEWIS, MARY P	153-00 00 010.00	8900 GREENVILLE RD	1,448.59	1,479.82	1,651.32	7,966.14
41	Non - Participating	BRIAN K BURKHEAD LT	153-00 00 009.00	8980 GREENVILLE RD	1,644.26	1,679.58	1,908.91	8,277.12
42	Non - Participating	SUTTON, ALISHA D	153-00 00 008.00	9180 GREENVILLE RD	1,767.13	1,796.05	2,729.85	9,252.57
43	Non - Participating	COX, HOPE	153-00 00 007.00	9190 GREENVILLE RD	1,832.13	1,863.33	2,776.48	9,406.12
44	Non - Participating	GEE, MARK A	153-00 00 012.00	8855 OLD FRUIT HILL RD	585.76	613.73	785.23	7,168.64
45	Non - Participating	PHIPPS, WANDA K	152-00 00 018.00	8933 OLD FRUIT HILL RD	918.87	983.49	1,145.42	7,581.63
46	Non - Participating	PHIPPS, CHRIS A	152-00 00 017.01	8995 OLD FRUIT HILL RD	1,232.78	1,320.53	1,469.04	7,931.36
47	Non - Participating	WESTERFIELD, EUGENIA H	152-00 00 016.00	9047 OLD FRUIT HILL RD	1,251.03	1,276.25	1,508.94	7,848.34
48	Non - Participating	WEBB, WILLIAM & THERESA	152-00 00 017.00	8963 OLD FRUIT HILL RD	693.32	722.92	1,380.67	7,349.89
49	Non - Participating	CUMMINGS, WALTER G SR	135-00 00 030.01	4354 DOGWOOD KELLY RD	684.71	725.59	1,327.49	2,748.86
50	Non - Participating	COLWELL, GLENNIS	135-00 00 030.00	4460 DOGWOOD KELLY RD	490.60	542.62	633.91	2,574.31
51	Non - Participating	BARRETT	135-00 00 031.00	DOGWOOD KELLY RD	483.95	518.44	1,035.51	2,820.66
52	Non - Participating	PAYNE, BARRY	135-00 00 031.01	DOGWOOD KELLY RD	513.85	543.90	1,267.58	3,008.78
53	Non - Participating	PELLETIER, DONALD J. III	135-00 00 031.02	DOGWOOD KELLY RD	507.67	540.73	1,173.71	3,139.44
54	Non - Participating	PELLETIER, DONALD J. III	135-00 00 031.03	DOGWOOD KELLY RD	471.32	539.86	1,059.15	3,284.35
55	Non - Participating	GAMBLE, KENNETH N	153-00 00 031.00	5010 DOGWOOD KELLY RD	473.51	550.81	963.44	4,356.68
56	Non - Participating	CUMMINGS, WALTER G JR & TIFFANY S	135-00 00 027.00	4105 DOGWOOD KELLY RD	593.44	619.91	953.05	1,354.72
57	Non - Participating	HUMPHRIES, KENNETH W	135-00 00 047.00	7510 OLD GREENVILLE RD	1,368.81	1,404.17	1,994.23	4,247.20
58	Non - Participating	TIPTON W DARREL	135-00 00 045.00	7500 GREENVILLE RD	964.42	995.87	1,509.50	4,850.84
59	Non - Participating	WEST, ELWANDA	153-00 00 034.00	7480 GREENVILLE RD	1,646.18	1,680.94	2,246.05	4,465.90
60	Non - Participating	HERRINGTON, BARBARA J	153-00 00 046.00	6505 GOODE RD	1,055.35	1,088.56	1,460.31	11,738.62
61	Non - Participating	HERRINGTON, BARBARA J	153-00 00 046.00	6505 GOODE RD	956.95	987.91	1,320.35	11,644.78
62	Non - Participating	GOODE, RONALD	153-00 00 045.00	6590 GOODE RD	921.68	947.24	1,165.57	11,546.70
63	Non - Participating	HODGE, MATTHEW E	153-00 00 045.05	6645 GOODE RD	659.27	686.74	869.21	11,253.75
64	Non - Participating	GREENFIELD, MARY	153-00 00 045.04	6697 GOODE RD	535.30	582.93	717.14	11,076.31
65	Non - Participating	COOK, DANNY JR	153-00 00 033.01	7455 GOODE RD	521.58	556.15	1,234.96	8,873.06
66	Participating	SCHAMP, ALAN C	153-00 00 041.01	7202 GOODE RD	666.24	687.98	1,046.10	9,413.84
67	Participating	SCHAMP, ALAN C	153-00 00 041.01	7202 GOODE RD	524.07	547.35	992.28	9,853.72
68	Non - Participating	MCGEE, JOSEPH & CHRISTINA	153-00 00 041.02	7370 GOODE RD	524.07	547.35	1,001.60	9,864.58
69	Participating	PANAROYAL LLC	153-00 00 045.02	6599 GOODE RD	110.92	146.25	660.11	10,657.24
70	Participating	SCHAMP, ALAN C	153-00 00 041.00	7400 GOODE RD	49.26	80.04	371.28	9,951.55
71	Non - Participating	COTTON OSCAR A & SHARON M	135-00 00 030.02	4362 DOGWOOD KELLY RD	777.89	811.76	1,083.84	2,903.42
72	Non - Participating	GOODE, TIMOTHY J	153-00 00 006.00	9230 GREENVILLE RD	1,762.80	1,787.80	2,695.53	10,073.56
73	Non - Participating	SCOTT, MELISSA L	135-00 00 034.02	7845 GREENVILLE RD	1,003.79	1,028.79	1,533.36	3,701.20

STAFF DR 1-35:

Provide a detailed table listing all non-residential structures located within 2,000 feet of the Project boundary line. For each structure, provide:

a. A description of the structure.

b. The distance to the project boundary.

c. The distance to the closest solar panel.

d. The distance to the nearest inverter.

e. The distance to the substation.

Response: Please refer to the attached spreadsheet for all non-residential structures located within 2,000 feet of the Project boundary line.

Witness: Megan Stahl

Number	Structure Type	Landowner	Parcel ID	Address	Distance to Closest Project Fence (ft)	Distance to Closest Panel (ft)	Distance to Closest Inverter (ft)	Distance to Substation (ft)
1	Church	New Zion Baptist Church	135-00 00 054.00		1,904.65	1,938.78	2,724.12	3,338.64
2	Church	NEW, BARREN CHURCH	135-00 00 032.00		784.17	851.27	1,300.23	4,406.63
3	Church	NEW, BARREN CHURCH	153-00 00 030.00	5012 DOGWOOD KELLY RD	505.78	541.44	930.44	4,566.49
4	Business	LIVINGSTON, WILLIAM J	153-00 00 020.00	8485 GREENVILLE RD	74.95	140.08	468.07	6,275.34

STAFF DR 1-36:

Refer to the SAR, Appendix F, Traffic Impact Study.

a. Provide the maximum expected load weights for each type of delivery truck, including cement and water trucks, heavy equipment, gravel for access roads, panels, inverters, and the transformer.

Response: The maximum expected load weights for each type of delivery truck is not known at this time. Standard-sized concrete water and dump trucks typically weigh around 20,000 to 30,000 pounds when empty. The weight may double when fully loaded. It is the responsibility of the driver/supplier to be compliant with KY weight limits.

b. Provide the number and approximate weight classes of the heavy and light duty trucks anticipated on site per day during the construction phase.

Response: The quantity and weight classes of heavy duty and light duty trucks is not known at the time of this response.

c. Provide the weight limits of each local roadway to be used for construction traffic.

Response: Weight Limits are based highway designations as established in KRS 189.221.
KY 107, KY 189, KY 1682 (A highways): 44,000 lbs. weight limit
CR 1015 (Deason Lane), CR 1111 (Woodburn Hay Road), CR 1118 (Old Fruitville Road):
36,000 lbs. weight limit for any truck, semitrailer, truck / trailer unit (including load)

Regular Operations

The gross weight of vehicles in regular operations (operating without a special permit) is governed by two sections of State law. Ky. Rev. Stat. §189.222 authorizes the Secretary of the State Transportation Cabinet to officially increase size and weight limits on designated State-maintained highways or portions thereof, up to the maximums shown in Exhibit 27, if, in the Secretary's opinion, these higher limits are justified by the highway's strength, safety, and durability. On all other highways, the lower limits in Ky. Rev. Stat. §189.221 apply. See Exhibit 27 for a summary of Kentucky's weight provisions under regular operations (Ky. Rev. Stat. §189.221, §189.222, and §189.2301).

Exhibit 27: Summary of Kentucky Truck Weight Limits for Vehicles in Regular Operations

Single Axle	20,000 lbs.
Tandem Axle	34,000 lbs.
Tridem Axle	48,000 lbs.
Gross Weight*	Designated highways: As determined by the Secretary of the Transportation Cabinet, up to 80,000 lbs. All other highways: 36,000 lbs. 80,000 lbs. on class AAA highways 62,000 lbs. on class AA highways 44,000 lbs. on class A highways
Other	Class AAA highways: No axle weight limits for vehicles hauling 79,999 lbs. or less** Designated highways: 700 lbs. per inch of the aggregate width of all the tires on a single axle (or 20,000 lbs. GVW, whichever is less) All other highways: 600 lbs. per inch of the combined width of the tires Non-Interstate highways: 5 percent tolerance per axle load (under 80,000 lbs. GVW)

* Weight limits for Class A, AA, and AAA highways are found in administrative regulations at 603 KAR 5:066. See Exhibit 29 for a map of the Kentucky highway system by class.
** A vehicle that has a valid registration of a declared gross vehicle weight, including any towed unit, of 80,000 lbs. or less is exempt from axle weight limits when operating on any State-maintained highway that is classified as a AAA highway, if the vehicle is hauling 79,999 lbs. or less and has written verification of the weight of the load (Ky. Rev. Stat. §189.2301).

d. Identify the specific roadways used by heavy trucks, including for delivery of the transformer.

Response: Specific details regarding the use of roadways by heavy trucks, including delivery of transformer are not currently known.

e. A summary of any contact that Dogwood Corners has had with the Kentucky Transportation Cabinet District Engineer regarding road weight ratings for heavy deliveries to the stie and any anticipated road/shoulder damage or mitigation measures.

Response: At the time of this response, no contact with KYTC District Engineer has been made about the Project.

f. A summary of any contact that Dogwood Corners has had with the Christian County Road Department regarding the proposed project, traffic impacts and heavy deliveries to the site.

Response: At the time of this response, no contact with Christian County Road Department has been made about the Project.

Witness: Shane Kelley

STAFF DR 1-37:

Provide the weight limit rating and the width for the bridge on Goode Road, located at the eastern boundary of the project.

Response: There are no posted restrictions on the bridge approaches on Goode Road so the weight limit is the same as the roadway which is 36,000 lbs. for any truck / trailer unit (including load). The width of the bridge is 34 feet. If the Project requires a truck that would exceed weight limitations (per above) and/or size (> 8' width, > 13' 6" height, > 53' length for semitrailers) limits, Dogwood Corners would apply for a permit from Kentucky Transportation Cabinet.

Witness: Shane Kelley

STAFF DR 1-38:

Provide the following information regarding the battery storage system:

a. Safety data sheets for the energy storage system.

b. The environmental impact of the batter storage system.

c. Expected life of the batteries.

d. Method to dispose of batteries at the end of the useful life.

e. How the battery storage system installation will comply with National Fire Protection Association Standard 855.

Response:

a. Safety data sheets for the energy storage system.

Response: Design is ongoing and specific equipment and material suppliers have not been identified. However, example safety information is attached below.

b. The environmental impact of the battery storage system.

Response: The Project is in the process of completing environmental diligence to inform development of the site, including placement of batteries. Environmental impacts of the battery energy storage system are not anticipated.

c. Expected life of the batteries.

Response: The Battery Energy Storage System (including planned augmentations) is designed to provide 25 MW peak capacity for a duration of 4 hours for the entire 30-40 year life of the Dogwood project. As discussed in section 2.6 of the submitted Attachment J / Decommissioning

Plan, the individual modules will be assessed as to economic value at the time, and may have life beyond that of the project.

d. Method to dispose of batteries at the end of the useful life.

Response: As discussed in section 2.6 of the decommissioning plan, individual modules may have economic value at the end the project. Those modules (containers) will be sold intact. For battery cells or modules that do not have any economic value (as complete units) and therefore must be recycled, Dogwood Corners will work with certified recyclers capable of receiving and processing the spent batteries to recover valuable raw materials (lithium, iron, cobalt, and copper) as well as do properly dispose of non-recoverable materials. Dogwood Corners is tracking the USEPA evolving requirements carefully and incorporating them into Project planning as these requirements are promulgated.

e. How the battery storage system installation will comply with National Fire Protection Association Standard 855.

Response: Dogwood Corners will comply with NFPA 855, Standard for the Installation of Stationary Energy Storage Systems, through a combination of the following:

1. Selected equipment suppliers will be required to comply with or be certified under NFPA 855 to the extent applicable.

2. EPC contractor will be required to design, construct and commission in accordance with all NFPA 855 (and related) requirements.

3. Project system commissioning plans will require certification of compliance with all NFPA 855 requirements applicable to battery-based installations.

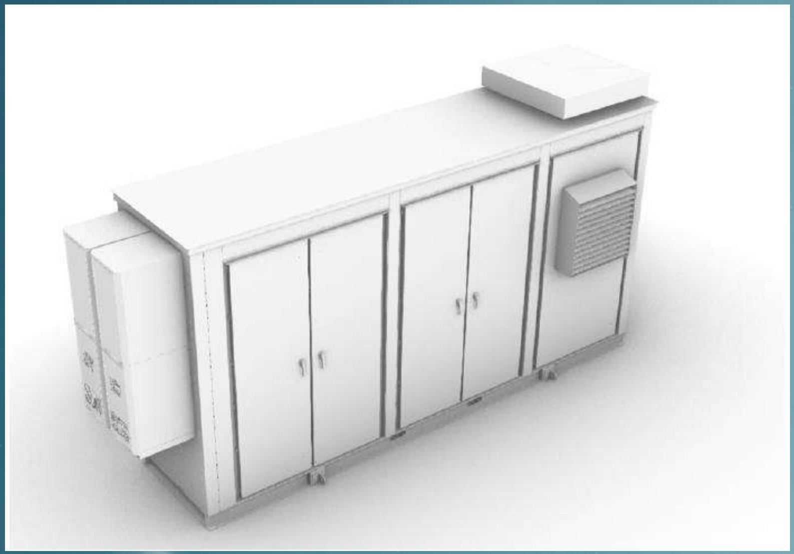
4. The Project will coordinate with local AHJ and fire chief to prepare a site-specific Emergency Response Plan (ERP) will address aspects of first-responder training, incident response procedures and firefighting techniques specifically related to fire response for lithium-based batteries.

Witness: Megan Stahl

LS Energy Solutions

PIONEERING THE FUTURE OF ENERGY STORAGE

AiON-ESS Safety Features



Designed for Safety

Key aspects for a safe energy storage system design in the LS Energy Solutions' AiON-ESS product

- Battery racks tested according to UL9540A
- Design the Energy Storage System (ESS) to comply the UL9540 standard
- Design the system to comply with NFPA855 - Code for the Installation of Stationary Energy Storage Systems
- Continuous monitoring of battery performance - Control logic shall have an active prevention mechanism such as an emergency shutdown if an abnormal condition is detected.
- Short Circuit protection inside the energy storage container - The design is a "no-walk in" therefore reducing the risk hazard conditions during installation and maintenance.

UL 9540A Battery Test

"UL 9540A Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, to help manufacturers have a means of proving compliance to the new regulations. Leveraging our long practice of developing standards with vast experience in similar industries, we worked with regulators to understand concerns and deliver a viable test method to accelerate adoption of innovative technology"

- UL 9540A - determines the capability of a battery technology to undergo thermal runaway and then evaluates the fire and explosion hazard characteristics of those battery energy storage systems that have demonstrated a capability to undergo thermal runaway.

- UL 9540A test results are used in the design of mitigation strategies. UL 9540A provides a test standard to assess the hazard of battery systems with cells undergoing thermal runaway at each relevant scale (Cells, modules, racks).

- Thermal runaway is a thermal management issue.- If the cause of excessive battery heat creation is not remedied, the condition will worsen. Internal battery temperature will continue to rise, causing battery current to rise, creating a domino effect. The rise in temperature in a single battery will begin to affect other batteries in close proximity, and the pattern will continue, thus the term "runaway."

- Thermal runaway is a low probability event, but it shall be addressed in the design stage to prevent the effects.

UL 9540A Battery Test

- A safer design starts with the selection of a battery with high performance on the UL9540A test
- Results of the UL9540A test for battery racks inside the AiON-ESS - These results were evaluated by an independent contractor and drive the design of the explosion prevention system

  - Thermal Runaway Propagation: No propagation was observed
  - External Flaming: Flaming occurred and was observed outside the unit enclosure (flaming of initiating cell vent gases and combustibles)
  - Locations of Flame Venting: Flaming occurred from the initiating module
  - Flying Debris: No flying debris observed
  - Re-ignitions: No re-ignitions
  - Maximum Target BESS Temperature: 212C
  - Maximum Wall Surface Temperature: 26C
  - Gas Composition Pre-Flaming: CO_2 (Below the detectable limit), CO (Below the detectable limit), THC (68 L);
  - H_2 : Below the detectable limit
  - Gas Composition After Flaming: CO_2 (Below the detectable limit) CO (Below the detectable limit) THC (108 L);
  - H_2 : Below the detectable limit

UL 9540

- UL 9540 is the safety standard for energy storage systems (ESS) and equipment.
- It addresses the safety of an ESS intended to store energy from grid, renewable, or other power sources and provide electrical or other types of energy to loads or power conversion equipment.
- The standard's goal is to ensure that electrical, electro-chemical, mechanical, and thermal elements of the ESS operate at an optimal level of safety for both residential and industrial energy users.
- LS Energy Solutions tests the AiON-ESS container to certify the design and product under UL9540.
- LS Energy Solutions hired TUV to independently certify the design and test.

NFPA 855

- Installation of Stationary Battery Energy Storage Systems

- This standard applies to the design, construction, installation, commissioning, operation, maintenance, and decommissioning of stationary energy storage systems (ESS), including mobile and portable ESS installed in a stationary situation and the storage of lithium metal or lithium-ion batteries.

- LS Energy Solutions hired an independent consulting company to review the AiON-ESS container design and its compliance with the NFPA855 code.

AiON-ESS - Safety Operational Features

- The best fire protection is prevention, and many key fire protection features are intrinsic elements of the LS Energy Solutions safety-centered design.

- The design includes the selection of appropriately certified and tested equipment such as:
  - battery cells and modules
  - battery management system
  - short circuit protection
  - ground fault detection systems
  - surge protection devices
  - emergency stop
  - comprehensive control system which continuously supervises the operation of the equipment in the AiON-ESS container providing remote monitoring and system shutdown capabilities.

- The battery racks in the container are tested under UL 9540A standards to verify that there is no thermal runaway propagation and its gas off composition is minimal. LS Energy Solutions designs safety systems for the AiON-ESS based on UL9540A test results of specific battery system installed in the container.

- Safety systems includes a fire suppression and explosion prevention system according to NFPA855 and other relevant codes.

AiON-ESS - Safety Operational Features

- The AiON-ESS is equipped **with heat, smoke and gas sensors**.

- The sensors continuously monitor the specific condition of the AiON-ESS, which in the case of a hazard event, sends a signal to release the fire suppression agent. Horn/strobe provides audio and visual indication of fire detection and release of suppression agent.

- The fire suppression agent is aerosol based, which has demonstrated excellent results in minimizing the thermal runaway propagation and suppression of resultant fires.

- The gas sensors monitor lithium-ion batteries for explosion prevention in case flammable gas has been detected.

- The explosion prevention system includes a gas venting system which keeps the flammable gas composition inside the container lower than 0.25 LFL (Lower Flammability Limit)

- In case of abnormal condition the AiON-ESS control system will shut down the entire system, interrupting the power flow to/from the battery racks. All events will be logged into AiON-ESS control system to send alarms to the SCADA (customer monitoring system).

AiON-ESS SDI M3 Version Explosion Prevention System

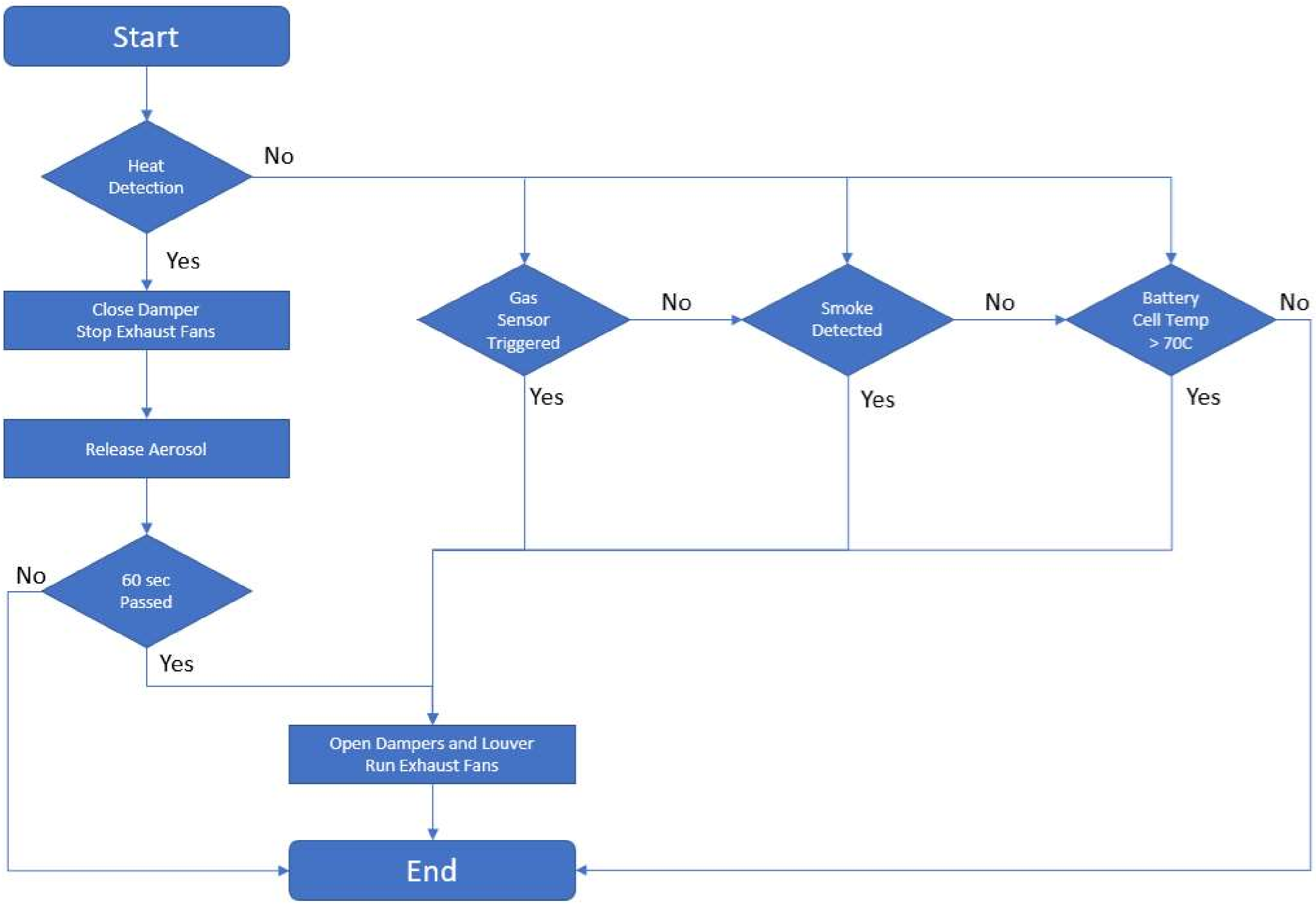
- An explosion hazard mitigation strategy to satisfy the requirements for explosion prevention per NFPA 855 was analyzed for the LSES AiON-ESS container. The explosion prevention solution, which was developed in general accordance with NFPA 69, was analyzed using CFD (Computational Fluid Dynamic) methods.
- CFD analysis of the proposed exhaust ventilation system demonstrated that the global concentration of the battery gas was maintained below the NFPA 69 design threshold of 25% of the LFL once the exhaust system was fully operational and at a steady state.
- The local concentrations were above 25% of the LFL at the ceiling level and close to the release location before the activation of the ventilation system. Once the exhaust system was activated, it effectively removed flammable gases and reduced the size of high-concentration regions inside the container for the duration of the module gas release event.
- Control dampers installed on the partition in the middle of the racks provided an effective airflow path from the cold aisle to the hot aisle.

In summary, the design of the explosion prevention system mitigates the explosion hazard. Considering the established thermal runaway design basis event, flammable gas concentrations can be maintained at satisfactory levels during steady state exhaust operation. The evaluated ventilation system in combination with early detection can maintain satisfactory levels of flammable gas concentrations at all times.

Fire Control Logic

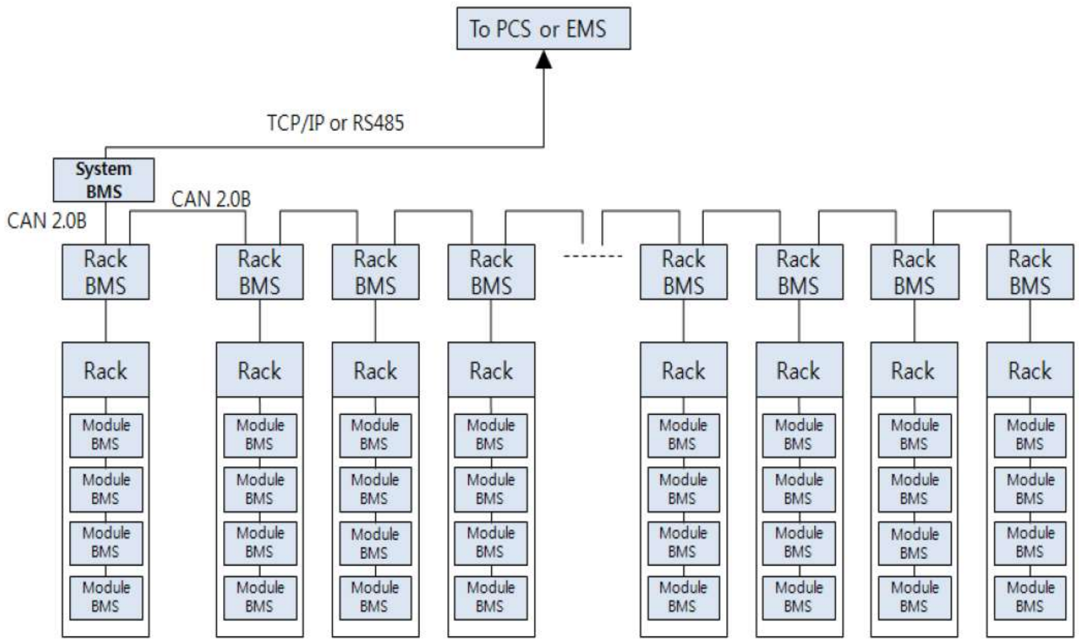
StatX Heat/Fire Sensor	Smoke Detector	Gas Sensor	Damper Louver Exhaust Fan	E Stop Open Battery Contactor/ Open Inverter Contactor	HVAC Compressor External Fan	HVAC Internal Fan	StatX Aerosol Discharge (Hardwired Only)
Not Detected	Not Detected	Not Detected	No Action	Control/Control	Control	Control	No Action
Not Detected	Not Detected	Gas Detected	Dampers and Louver Open Run Exhaust Fan	Open/Open	Off	Off	No Action
Not Detected	Smoke Detected	Not Detected	Dampers and Louver Open Run Exhaust Fan	Open/Open	Off	Off	No Action
Not Detected	Smoke Detected	Gas Detected	Dampers and Louver Open Run Exhaust Fan	Open/Open	Off	Off	No Action
Fire Detected	Not Detected	Not Detected	No Action	Open/Open	Off	On	Discharge Aerosol
Fire Detected	Not Detected	Gas Detected	Dampers and Louver Open and Exhaust Fan Runs (60 sec delay)	Open/Open	Off	On for 60 sec, then turn off	Discharge Aerosol
Fire Detected	Smoke Detected	Not Detected	Dampers and Louver Open and Exhaust Fan Runs (60 sec delay)	Open/Open	Off	On for 60 sec, then turn off	Discharge Aerosol
Fire Detected	Smoke Detected	Gas Detected	Dampers and Louver Open and Exhaust Fan Runs (60 sec delay)	Open/Open	Off	On for 60 sec, then turn off	Discharge Aerosol

AiON-ESS SDI M3 Sequence of Events for abnormal condition detected by sensors



AiON-ESS SDI M3 Battery Management System (BMS)

- BMS is the first layer of prevention
- The BMS is equipped with fuses to prevent cell damage resulting from external short circuits.
- BMS is equipped with DC contactors in order to control the connection between racks and main DC buses in abnormal operation. DC-contactors are controlled by the rack BMS.
- Rack BMS collects all of the module BMS data, and delivers this data to the system BMS.
- The rack BMS calculates the rack SOC (State of Charge) and SOH (State of Health).
- Rack BMS is continuously monitoring every module BMS. In case of abnormal condition (such as high temperature or current) then the rack contactors will open interrupting the flow of energy to/from the battery rack.



[Fig 14] Communication Block Diagram

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THANKS

STAFF DR 1-39:

Refer to SAR, Appendix B, Preliminary Site Layout.

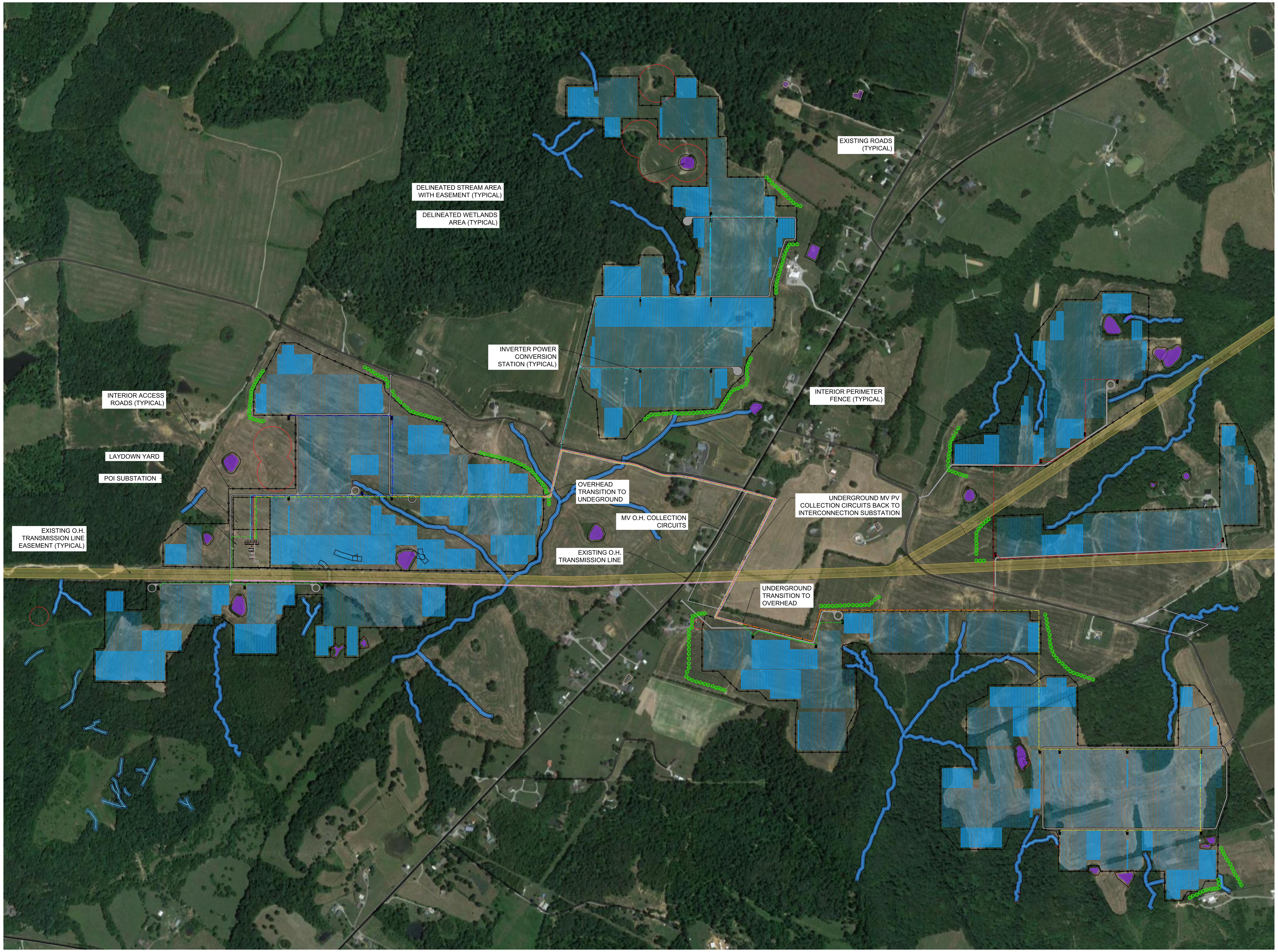
a. Explain if an AC collection system be utilized within the project.

b. If yes, explain if the AC collection system will be underground, aboveground, or both. If the AC collection system will be underground and above ground, provide a map that shows which segments are above ground and which segments are above ground.

Response:

Yes, an AC collection system will be utilized, and it will be a combination of underground and aboveground collection. The map shown below shows the current proposed routing for underground and aboveground collection. Dogwood Corners may modify this as design progresses and based on coordination with regulatory agencies for necessary approvals.

Witness: Megan Stahl



OVERALL MV ROUTING SITE PLAN

SCALE: NTS

ORIDEN

ORIDEN POWER
106 Isabella Street, Suite 400
Pittsburgh, PA 15212
www.OridenPower.com

OVERALL SYSTEM SUMMARY

AC SYSTEM SIZE (MW):	121.7 MW
DC SYSTEM SIZE (MW):	158.0 MW
POI AC CAPACITY (POWER LIMITATION):	125 MW

SUB ARRAY SUMMARY

PARCEL INFORMATION

AREA WITH-IN FENCE (ACRES):	668.38
LINEAR INTERNAL ACCESS ROADS (LN. FT.):	43,787
LINEAR PERIMETER FENNCE (LN. FT):	68,275

LEGEND

- STREAMS AND WATERWAYS
- WETLANDS
- OVERHEAD UTILITY EASEMENT
- EXISTING OVERHEAD TRANSMISSION LINE
- OVERHEAD UTILITY EASEMENT
- PARCEL BOUNDARY
- INTERIOR ACCESS ROADS
- EXISTING NON-ESTABLISHED ROADS
- PERIMETER FENCE
- PROPOSED VEGETATION SCREENING
- SOLAR MODULE ROWS

REVISIONS:

REV	DATE	DESCRIPTION	BY	CHK	APR
X	-				
X	-				
X	-				
X	-				

ISSUED FOR:

PRELIMINARY DESIGN
NOT FOR CONSTRUCTION

FACILITY NAME: DOGWOOD CORNERS SOLAR
FACILITY LOCATION: LAT: 36.9465 / LONG: -87.4076
PROJECT NO. --
SHEET TITLE: OVERALL SITE PLAN

DOGWOOD CORNERS
SOLAR GENERATING FACILITY
PRELIMINARY MV COLLECTION PLAN

SIZE: D
DRAWING NO. E-001
REV. 4
FILENAME: -
SCALE: 1" = 50' - 0"

STAFF DR 1-40:

Provide any communication with the Hopkinsville-Christian City Airport regarding the project.

Response: There has not been any communication with the Hopkinsville-Christian City Airport at the time of this response. The distance between the site and the Hopkinsville-Christian City Airport is approximately 6.5 miles.

Witness: Megan Stahl

STAFF DR 1-41:

Explain whether Dogwood Corners will pursue an Industrial Revenue Bond and Payment In Lieu of Taxes agreement with Christian County. If so, explain how that might change the cumulative tax revenues of the Project.

Response: At this time, Dogwood Corners has not determined if it will pursue an Industrial Revenue Bond and Payment In Lieu of Taxes.

Witness: Megan Stahl

STAFF DR 1-42: Explain whether Dogwood Corners intends to hire as many local workers for the construction and operations phases of the project as possible, all other qualifications for the positions being equal.

Response: Dogwood Corners will hire as many qualified local workers as possible to perform work during the construction and operational phases of the project.

Witness: Megan Stahl

STAFF DR 1-43:

State the expected operational life of the Project.

Response:

Dogwood Corners expects the operational life of the project to be 30 to 40 years.

Witness: Megan Stahl

STAFF DR 1-44:

Refer to the Application, Attachment G, Economic Impact Report, page 11. Provide the estimated payroll and local economic impact (broken down like the numbers provide for the construction phases) for the four permanent jobs for the operations phase of the Project.

Response: As indicated on page 11 of the Economic Impact Report there is no empirical basis to estimate the economic impact of the operations phase. Unfortunately, for the operations phase, the relevant IMPLAN sector, number 42, "Electric Power Generation – Solar", is empty of data and results for Christian County. This is because there is no history of solar electricity generation and therefore no basic economic data to construct industry relationships. The sector is also empty of data for the statewide model, for the same reason.

The impacts are likely to be very small. Using ancillary data to construct an estimate, the Berkeley study mentioned in footnote 3 provides a basis for estimating the direct employment and payroll from the ongoing operations phase. Applied to the Christian County project, their findings suggest there will be four operations and maintenance jobs that will be supported for the life of the project. The author found that the average annual wage across six solar projects was $69,250. Adding in fringe benefits yields average annual compensation of $102,464.

It is valid to apply economic multipliers to these direct impacts, given that the electricity is expected to be sold to customers outside the region, and thus the revenues and labor compensation will be new to Christian County. The IMPLAN model is empty of results for the appropriate sectors, as pointed out above. However, a related sector, 515 "Commercial and industrial machinery and equipment repair and maintenance" does have activity. The employment multiplier for that sector is 1.181 and the labor income multiplier is 1.136.

Applying these multipliers yields a total annual impact of 4.7 jobs and $466,000 in labor compensation.

Witness: Paul Coomes

STAFF DR 1-45:

Refer to the Application, Attachment G, Economic Impact Report, page 12. Provide the occupational taxes generated by the operations phase of the Project.

Response: Christian County does not levy an occupational tax, as discussed on page 12 of the Economic Impact Report. The operations phase is not likely to produce any additional taxes for the County.

Witness: Paul Coomes