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February 24, 2022

Ms. Tanowa M. Troupe, Secretary
Public Utilities Commission of Ohio
180 East Broad Street, 11th Floor
Columbus, OH 43215

Re: Kingwood Solar I LLC
Case No. Case No. 21-0117-EL-BGN
Testimony of Lee Saunders

Dear Ms. Troupe:

Pursuant to the motion filed today in the above referenced case, Kingwood Solar I LLC is filing the full testimony of Lee Saunders. No questions or answers have been changed in the testimony as compared to the version filed on February 23, 2022. The only change is the addition of the missing attachments already referenced in the testimony.

Thank you for your attention to this matter. If you have any questions, please call me at the above direct dial number.

Very truly yours,

/s/ Anna Sanyal

Anna Sanyal
Attorney for Kingwood Solar I LLC

AS/jaw

2/24/2022 41490058

BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of Kingwood Solar I LLC for a Certificate of Environmental Compatibility and Public Need	**)** **)** **)** **)**	**Case No. 21-0117-EL-BGN**

DIRECT TESTIMONY OF LEE SAUNDERS

Q.1. Please state your name, title and business address.

A.1. My name is Lee W. Saunders. I am a professional engineer and Technical Specialist working in the Energy Market segment at Haley & Aldrich, Inc. ("Haley Aldrich"). My business address is 6500 Rockside Road, Suite 200, Cleveland, Ohio 44131.

Q.2. What are your duties as Technical Specialist at Haley Aldrich?

A.2. As a Technical Specialist at Haley Aldrich, I am responsible for supporting, managing, and serving as technical lead for projects relating to stormwater management, industrial wastewaters and waste facilities, and renewable energy projects, including feasibility studies, siting, permitting and regulatory compliance, civil engineering design, construction quality assurance, and operational support. I apply my knowledge of engineering and professional principles, standards, and practices in a broad range of assignments and related fields, and am responsible for interpreting, organizing, and coordinating all phases of projects, while upholding company and industry standards in all areas of practice. I also help develop strategy, scope of work, and budgets for projects, and manage project schedules and budgets while maintaining overall project quality consistent with company and professional standards.

Q.3. What is your educational and professional background?

A.3. I am a registered Professional Engineer in the state of Ohio. I received a Bachelor of Science in Civil Engineering in 2012 from Ohio Northern University, and a Master of Science in Renewable and Clean Energy in 2016 from the University of Dayton, and have been practicing engineering as an engineering consultant for over 9 years. I completed nearly 12 months over three calendar years of cooperative work-education as a fulltime engineering intern at the Ohio Department of Transportation District 12 (2009), Brown and Caldwell (2010), and R.E. Warner and Associates (2011) before being hired as an engineer at Hull & Associates, Inc. where I worked from May 2012 to March 2018 supporting infrastructure, energy and environmental projects. Since joining Haley & Aldrich, Inc. in March 2018, I have worked as a Senior Engineer and now Technical Specialist focusing on projects in the Energy Market segment. My work experience has spanned a wide range of projects including site civil development, stormwater and wastewater management, municipal and industrial waste management, road condition assessments in support of road use maintenance agreements (RUMAs) for the oil & gas industry in the Marcellus and Utica shale plays, and feasibility studies for solar photovoltaic and other alternative energy projects.

My resume is also attached for reference as Exhibit A.

Q.4. On whose behalf are you offering testimony?

A.4. I am testifying on behalf of the Applicant, Kingwood Solar I LLC in support of its application filed in Case No. 21-0117-EL-BGN.

Q.5. Have you reviewed the Application and the Applicant's responses to the Staff's data requests?

A.5. Yes.

Q.6. What is the purpose of your testimony?

A.6. The purpose of my testimony is to describe the potential traffic and road impacts resulting from the Kingwood Solar Project, to discuss the decommissioning plan described in the Application, and to discuss the Project's impact on stormwater flows during and after construction.

Q.7. Were any studies conducted to evaluate the potential impact of the Project on roads and bridges?

A.7. Yes. Haley & Aldrich conducted a preliminary review of the potential routes to be used to access the Project Area during construction, general condition of existing roadway surfaces and approximate roadway widths along these routes, and estimated truck trips during construction. Tasks included a review of publicly available information from the Ohio Department of Transportation (ODOT) GIS application Transportation Information Mapping System (TIMS) and Google Earth, as well as conducting a site visit to visually assess the general pavement condition. A summary of the findings of this preliminary review is provided in the Transportation Management Plan developed by Haley & Aldrich and attached to the Application as Appendix H. Although I was not involved in the initial development of the Transportation Management Plan, I have reviewed it and its resources in detail, visited the site to visually assess the general pavement condition in recent months (January 2022), and I agree with the findings and conclusions in the Plan.

Q.8. What were the conclusions of the studies and the Transportation Management Plan?

A.8. The Application notes that the Project is expected to have very modest impacts on roads, bridges, and traffic in the local community. The majority of the equipment to be transported to the Project Area will be on delivery vehicles that are of legal dimension and legal weight. Some oversize/overweight loads may be necessary to deliver certain pieces of equipment to be installed as part of the Project substation. To the extent an oversize/overweight delivery is required, a special hauling permit will be obtained from the Ohio Department of Transportation (ODOT) and/or local jurisdiction, as applicable. In my opinion, no special improvements to roads or bridges in the Project Area are anticipated to be required; and no delays to local traffic should be experienced, except where the delivery vehicles may need to travel on narrow roadways. Any such delays would be intermittent. The Transportation Management Plan concluded that given the current condition of all roads expected to be used and the nature of the construction traffic, no material adverse impact to the roads from construction vehicles or equipment delivery is anticipated to occur.

That said, the Applicant committed to conduct a more detailed pre-construction survey of local roads. The pre-construction road survey will create a baseline assessment for road conditions and identify any possible impacts and mitigation measures during construction activities, as well as inform the final transportation management plan. The pre-construction road survey and associated final transportation management plan will be completed in concurrence with final engineering design of the project to identify optimal access routes and ensure safe, efficient, and legal ingress to and egress from the Project

Area throughout construction while minimizing adverse impacts to traffic and roadway infrastructure in the local community.

Q.9. What is your overall assessment of the potential traffic and road impacts of the Kingwood Solar Project?

A.9. Based on my experience, I would not expect the construction or operation of the Project to have a negative effect on the travelling public. I would also not expect the construction or operation of the Project to have a negative effect on the condition of any local roadways during construction. During operation and maintenance of the facility, there will be very little increase in traffic as solar electric generating facilities are normally unmanned. There will be occasional maintenance vehicles and any additional traffic will be negligible. Further, the Applicant will coordinate with the necessary local and state officials including the County Engineer, regarding any temporary road closures, lane closures, road access restrictions, and traffic control necessary for construction and operation of the facility.

Q.10. How did the Applicant propose to decommission the Project in the Application?

A.10. The Application outlines, at pages 34-38, the plan for decommissioning that includes financial security to be in place per landowner agreements, preparation steps for decommissioning, equipment removal, access road removal, and site reclamation steps. In general, decommissioning will involve the removal of all system components and the restoration of the site to conditions similar to pre-construction (e.g., agricultural or open space; subject to landowner preference).

Prior to the start of decommissioning work, the site will be assessed for existing conditions. Decommissioning and removal of Project structures from the site is anticipated to occur

within one year following discontinuation of operations of the Project. Any necessary erosion and sediment controls will be installed on the site prior to decommissioning. Access roads and fencing will temporarily remain in place for use by the decommissioning and site restoration workers until decommissioning activities are completed.

Following preparation work, all aboveground equipment (including wiring, panels, racking, and inverters) will be removed after the Project is de-energized by disconnection from the utility power grid. In addition, any holes and/or depressions will be filled. Steel pilings which supported the module racking will be mechanically removed and any resulting holes will be backfilled. The concrete transformer and interconnection equipment pads will be broken up and removed.

The on-site access roads servicing the Project and the security fencing around the Project will remain in place during decommissioning activities to support the removal of equipment. Once removal activities are completed, discussion with the landowners will occur to determine if the roads or security fencing will be beneficial for future use of the site. If the access roads or security fencing is determined to be beneficial for future use of the site, these facilities may remain in place at the landowners' discretion. Access roads that will not be utilized to support future use of the site will be restored to pre-construction conditions.

Once all Project equipment has been removed, additional activities will occur to return the property back to conditions similar to pre-construction. Reclamation will restore vegetative cover and hydrological function consistent with pre-construction conditions after the closure of the facility. Any excavated areas remaining after the removal of

equipment pads, access road base material, or fence posts will be backfilled with locally imported soil.

Q.11. Did the Applicant propose financial security for Project decommissioning in the Application?

A.11. Yes. The Application proposed financial security for the decommissioning of the Project in the form of cash, parental guarantee, letter of credit, or performance bond. As noted in the Application, the Project currently has agreements in place with landowners that, within one year of the Project's commercial operations date, a third-party estimate will be prepared by an independent Ohio-licensed Professional Engineer that will ascertain Project decommissioning costs as well as the anticipated salvage value associated with the Project's components. These estimates would be used to determine the amount of financial security required to secure decommissioning of the Project, which would be based on the positive difference between the cost of decommissioning and the anticipated salvage value. The Applicant then, as proposed in the Application, would provide that financial security after one-year of commercial operation.

Q.12. Have you reviewed the October 29, 2021 Staff Report of Investigation issued in this proceeding?

A.12. Yes.

Q.13. Did Staff recommend any conditions related to decommissioning?

A.13. Yes. Staff's recommended Condition 33 includes some additional requirements related to decommissioning.

Q.14. Does the Applicant recommend any changes to Staff's proposed Condition 33?

A.14. Yes. The Applicant is proposing revisions to Condition 33 to incorporate the need to obtain permission from landowners to access the site for decommissioning. As explained in Mr. Stickney's testimony, the Applicant proposes the following revisions to this condition:

> (33) At least 30 days prior to the preconstruction conference, the Applicant shall submit an updated decommissioning plan and total decommissioning cost estimate without regard to salvage value on the public docket that includes: (a) a provision that the decommissioning financial assurance mechanism include a performance bond where the company is the principal, the insurance company is the surety, and the Ohio Power Siting Board is the obligee; (b) a timeline of up to one year for removal of the equipment; (c) a provision to monitor the site for at least one additional year to ensure successful revegetation and rehabilitation <u>subject to landowner permission to access the site</u>; (d) a provision where the performance bond is posted prior to the commencement of construction; (e) a provision that the performance bond is for the total decommissioning cost and excludes salvage value; (f) a provision to coordinate repair of public roads damaged or modified during the decommissioning and reclamation process; (g) a provision that the decommissioning plan be prepared by a professional engineer registered with the state board of registration for professional engineers and surveyors; (h) and a provision stating that the bond shall be recalculated every five years by an engineer retained by the Applicant.

Q.15. If the Board adopts the condition with the Applicant's proposed revisions, will that impact the Applicant's financial security for Project decommissioning as proposed in the Application?

A.15. Yes. As part of proposed Condition 33 in the Staff Report, Staff recommended that the Applicant submit an updated decommissioning plan that includes "a provision that the decommissioning financial assurance mechanism include a performance bond where the company is the principal, the insurance company is the surety, and the Ohio Power Siting Board is the obligee." The proposed condition also includes a provision that the total decommissioning cost estimate exclude the salvage value associated with the Project's components, thereby helping to secure a much more conservative financial assurance value

for project decommissioning. The Applicant will have to post the performance bond prior to construction and maintain it for the life of the project. The proposed condition both with and without the Applicant's proposed revisions ensures that the project will be decommissioned when it permanently ceases commercial operations.

Q.16. Do you believe the decommissioning plan as proposed in the Application and as modified by the revised Condition 33 is acceptable?

A.16. Yes. The plan, as outlined in the Application and with the provisions in the revised Condition 33, will ensure appropriate decommissioning of the Project so that the Project Area can be returned to another use after the end of the Project's useful life. Given the relatively low impact of a solar farm, decommissioning of the Project should not be a significant impediment to future uses of the Project Area, including a potential return to agricultural use.

Q.17. Are you familiar with the techniques and methods used to construct a solar facility like the Project?

A.17. Yes. I have experience and familiarity with the components and associated construction techniques and methods for solar PV projects from the numerous solar energy feasibility studies and siting assessments I've supported during my career, as well as my relevant work experience in the energy, infrastructure, and environmental market segments. Examples of relevant work experience include coordinating and incorporating siting criteria and constraints (e.g., wetland delineations, utility locations and avoidance, subsurface conditions/ geotechnical characteristics, etc.), designing stormwater management features including subsurface drainage components and developing erosion and sediment control plans, conducting roadway assessments for oil & gas projects, and

performing general site civil and earthwork grading design. My work with solar energy feasibility studies and siting assessments has included preliminary selection of appropriate system component types and size (e.g., modules, racking, inverters), system layout and orientation, energy production modeling and budgetary engineering cost estimates.

Q.18. Can you please describe the techniques and methods used to construct a solar facility like the Project?

A.18. Yes. In general, in contrast to other forms of power generation, construction of a solar facility is relatively less intensive, less invasive, utilizes smaller construction equipment, and is less complex and more repetitive. Construction of panel arrays may be sequenced or may be constructed concurrently, but in any event will follow the same general procedures as outlined in the Application.

Construction will begin with site preparation that can include tree clearing (within the appropriate season to avoid potential impact to summer-roosting bats) and installation of erosion control best management practices (BMPs), such as silt fence, construction entrances, temporary sediment traps, and temporary or permanent seeding, as applicable and needed. Where natural resource areas such as wetlands and streams are proximate to construction activities, they will be staked to ensure appropriate avoidance. In general, no substantial site grading is required for solar energy projects due to the site selection process, with limited grading tending to be localized to private access roads, laydown area, and substation locations. The racking and panels for solar facilities can generally follow existing ground contours, thereby minimizing surface disturbance. Most of the cabling can be rack-mounted with some collector cables between inverter pads and the substation being buried in trenches or using horizontal directional drilling (HDD) methods, where

applicable. Access roads and temporary laydown areas will be constructed to support construction, followed by delivery of racking, solar panels and electrical equipment. Foundations will be installed to support the inverter/transformer installations, and piles (posts) will be driven to support the steel racks. Steel frames will be attached to the racks to support the solar panels. The racks for this project will be single-axis tracking racks oriented in a north-south direction. The racks will follow the sun from the east to the west on a daily basis. Solar panels will be attached to the racks and the panels will be connected together with cabling that can be either attached to the racks or buried in the ground. The individual solar panel cables are connected to combiner boxes. The combiner boxes are connected to inverter/transformer locations where the electricity is converted from direct current (DC) to alternating current (AC) for compatibility with the existing electrical grid. The inverter/transformers are then connected to the Project substation where the generated electricity is then stepped up and connected to the high-voltage utility lines.

For this project, no substantial grading is anticipated. As each portion of installation is completed, the ground surface will be stabilized, although BMPs will remain in place until final stabilization of the Project Area occurs. Upon final installation of the arrays, security fencing and gates will be installed, signage established, and final site stabilization, testing, and commissioning will be completed.

Q.19. In your opinion and based upon your experience, what will be the impact of the Project on stormwater flows during construction?

A.19. The Project is not anticipated to require substantial grading or ground disturbance, and therefore, in my experience, I would not expect significant changes in stormwater flows during construction. As outlined in the Application, and as is typical of similar land

development projects, erosion and sediment control BMPs will be installed and maintained throughout construction to minimize any potential detrimental effects due to stormwater runoff from the site. Erosion and sediment control BMPs implemented during initial site preparation activities and throughout construction, such as silt fence, construction entrances, temporary sediment traps, and temporary or permanent seeding, as applicable and needed, will help stabilize soils, reduce stormwater runoff rates and volumes, and improve water quality by increasing infiltration at the site.

Q.20. Do you believe there is a risk of surface water contamination as a result of the Project's construction and operation?

A.20. No. During construction, any stormwater pollution from erosion and sediment transport can be mitigated through implementation of a Storm Water Pollution Prevention Plan (SWP3) and associated BMPs (such as silt fence, construction entrances, temporary sediment traps, and temporary or permanent seeding, as applicable and needed). Fuel, oil and grease, or other chemical spills or leaks from construction equipment can be mitigated through implementation of a SWP3, spill prevention control and countermeasures (SPCC) plan as applicable, and BMPs such as proper equipment and vehicle maintenance, good housekeeping, and designated areas for fueling. Contamination by project waste or debris can be mitigated through implementation of a SWP3 and good housekeeping BMPs.

The risk of surface-water contamination is significantly reduced or eliminated following completion of construction activities. Any risk of contamination from oil-filled operational equipment (e.g., in the transformers and inverters) will be mitigated by following SPCC regulatory requirements and implementing appropriate spill prevention measures. While the use of herbicides to manage vegetation can be considered as a potential source of

contamination (and likely exists today due to the agricultural use of the fields), the Applicant does not anticipate using any herbicides for regular maintenance as explained in the Vegetation Management Plan in Appendix O of the Application. If herbicides were used, such as in the control of any noxious weeds, the risk of herbicide contamination can be mitigated through the controlled and focused use of herbicides where needed. The establishment of native grasses and pollinator-friendly species that will be used for this Project can prevent the spread of invasive species and further reduce the need for herbicides. The Applicant will be using all of these mitigation strategies for the Project. Overall, this Project should not result in surface water contamination.

Q.21. What permits will the Applicant be required to obtain related to stormwater management during construction?

A.21. In compliance with the Ohio Water Pollution Control Act (Ohio Revised Code Chapter 6111), dischargers of stormwater from construction activities are authorized by the Ohio Environmental Protection Agency ("OEPA") to discharge stormwater from the site to surface waters of the state in accordance with the General Permit Authorization for Storm Water Discharges Associated with Construction Activity Under the National Pollutant Discharge Elimination System ("NPDES"), OEPA Permit No. OHC000005, effective April 23, 2018 ("General Permit"). Construction projects disturbing one or more acres of land need to apply for coverage under the General Permit.

To meet NPDES requirements, a qualified professional experienced in the design and implementation of standard erosion and sediment controls, and a stormwater management design engineer will utilize the final Project layout to develop a SWP3. The SWP3 will identify potential sources of pollution that may reasonably be expected to affect the quality

of stormwater discharges associated with construction activities. The SWP3 will also describe and ensure the implementation of BMPs that reduce pollutants in stormwater discharges during construction and pollutants associated with the post-construction land use. Examples of BMPs that may be implemented include silt fence, construction entrances, temporary sediment traps, and temporary or permanent seeding, as applicable and needed.

Q.22. In your opinion, will the construction and operation of the Project result in any form of contamination to receiving streams of the Project Area or the Little Miami River?

A.22. No. It is important to understand that the sources of possible contamination for this Project are very limited. During construction, the primary source of contamination to control is sediment with attention also given toward the use of fuel and equipment by contractors. During operation, there are not anticipated to be any pollutant discharges from the Project and the Applicant does not anticipate using herbicides. Transformers and inverters will contain oils, but any potential spills will be controlled through proper design that incorporates secondary containment as needed and implementation of appropriate spill prevention measures. With that understanding, the stormwater pollution prevention BMPs and procedures to be implemented by the Applicant, as discussed in the Application and to be detailed in a project SWP3, will help to adequately prevent pollution and contamination from stormwater runoff discharging from the site to downstream areas during construction. Erosion and sediment control BMPs to take place during initial site preparation activities and throughout construction, such as silt fence, construction entrances, temporary sediment traps, and temporary or permanent seeding, as applicable and needed, will help stabilize soils, reduce stormwater runoff rates and volumes, and improve water quality by increasing

infiltration at the site. Similarly, good housekeeping, equipment maintenance, and SPCC BMPs will adequately prevent oil and grease, fuel, debris and trash, and other chemical contamination discharging from the site to downstream areas. The BMPs that will prevent contamination of any streams immediately downstream of the Project Area will also prevent contamination of the Little Miami River, but the travel distance from the Project Area to the Little Miami River provides more than an adequate buffer.

Q.23. Will there be an adverse impact to stormwater flows after the Project is constructed?

A.23. In my opinion, no. The measures discussed in the Application should adequately manage post-construction stormwater flows, including the stabilization of the ground surfaces by establishing and maintaining vegetation amongst and around the panel arrays utilizing native plant species, as well as pollinator-friendly plantings. I would expect post-construction stormwater flows to have superior drainage and runoff characteristics (i.e., less volume, less flow rate, and less contamination) when compared to an agricultural field (similar to pre-construction conditions) due to year-round vegetation maintained in and around the Project Area. Although the solar panels are impervious, the areas between and under the panel arrays will remain largely pervious and vegetated. Only very small areas for the ancillary equipment (e.g., inverters and substation pads) and access roads are anticipated to add areas of imperviousness. In my opinion, I expect the Project to have less stormwater runoff from the Project Area and increased infiltration after the Project is constructed than the current agricultural land uses in the Project Area.

Q.24. In your opinion, after construction is complete, will the Project have an adverse impact on the receiving streams or the Little Miami River?

A.24. In my opinion, no, the Project will not adversely impact the receiving streams of the Project Area. As discussed previously, the measures discussed in the Application for post-construction stormwater management are adequate to control stormwater flows and prevent stormwater pollution following the completion of construction and throughout the operation of the Project. The Project will also not have any impact on the Little Miami River. The Little Miami River is more than 1,000 feet from the Project Area at its closest location (i.e., in the northeast area of the site) and more than 2,000 feet in the northwest area of the site, and is separated by Clifton Road. The Project Area (approximately 1,500 acres, or 2.3 sq. mi.) comprises approximately 0.13% (i.e., less than 1%) of the 1,756 sq. mi. Little Miami River watershed.

Q.25. Do any of the conditions listed in the Staff Report of Investigation relate to stormwater measures?

A.25. Yes. Condition 19 relates to the Applicant's stormwater protection measures.

Q.26. Do you have observations or responses to Condition 19 from the Staff Report of Investigation?

A.26. Yes. As Mr. Stickney testified, the Applicant proposes to revise Condition 19 as follows:

(19) The Applicant shall ~~construct the facility in a manner that~~ incorporate~~s~~ post construction stormwater management under OHC00000<u>0</u>5 (Part III.G.2.e, pp. 19-27) ~~in accordance with~~ <u>as applicable and will also incorporate applicable guidance from</u> the Ohio Environmental Protection Agency's Guidance on Post-Construction Storm Water Controls for Solar Panel Arrays <u>(dated October 2019)</u>.

The proposed revisions clarify that the Applicant will incorporate the applicable post-construction stormwater management controls from both the NPDES General Permit and the Ohio Environmental Protection Agency's Guidance on Post-Construction Storm Water

Controls for Solar Panel Arrays. While the Applicant must apply for and comply with the General Permit, OEPA has also issued guidance on best practices for solar panel arrays. In some cases, the guidance provides that a project's stormwater can be managed through the standard post-construction practices in the General Permit.

Q.27. Does this conclude your direct testimony?

A.27. Yes, it does.

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing was served upon the following via email on this 23rd day of February, 2022.

Jodi J. Bair Werner L. Margard *Attorneys for Ohio Power Siting Board Staff*	Jodi.bair@ohioattorneygeneral.gov Werner.margard@ohioattorneygeneral.gov
Daniel A. Brown *Attorney for Cedarville Township Trustees*	dbrown@brownlawdayton.com
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/s/ Michael J. Settineri
Michael J. Settineri

Attachment A

LEE SAUNDERS, P.E.

Technical Specialist, Civil Engineer

EDUCATION

M.S., Renewable and Clean Energy, University of Dayton, 2016
B.S., Civil Engineering, Ohio Northern University, 2012

PROFESSIONAL REGISTRATIONS

OH/2017: Professional Engineer (Reg. No.:82393)

PROFESSIONAL SOCIETIES

American Society of Civil Engineers, member

SPECIAL STUDIES AND COURSES

40-Hour OSHA Hazardous Waste Operations Training (29 CFR 1910.120)

Mr. Saunders is a professional engineer with experience in a wide range of project types and scopes, including alternative energy, waste management, environmental regulatory compliance, environmental remediation, and site development, and has spent his time at Haley & Aldrich serving the Energy market. Mr. Saunders is well versed in project design and management, plan development, cost estimates, bid specifications, and construction observation and QA/QC for waste management sites, stormwater management plans and features, erosion and sediment control plans, SPCC plans and SWP3s, and road condition evaluations. He also has experience supporting siting criteria evaluations for renewable energy projects and performing feasibility studies for solar PV.

RELEVANT PROJECT EXPERIENCE

Alternative and Renewable Energy Projects

Critical Issues Assessments – Confidential Utility Client, Illinois. Supported review of siting concerns and evaluations for utility-scale battery storage and solar PV projects proposed at multiple facilities across the state. Reviewed local governmental jurisdictions and compliance of proposed projects with appropriate county and municipal zoning ordinances and comprehensive plans, as well as state and federal permitting programs.

Transportation Management Plan – Confidential Wind Farm Development, Ohio. Supported evaluation of proposed routes and roadway conditions for proposed wind farm in southwest Ohio.

Solar PV Feasibility Studies – Confidential Industrial, Municipal, and Governmental Clients, nationwide. Developed feasibility studies for numerous clients at multiple facilities to determine appropriate system capacity, constructability, and budgetary capital cost estimates for behind-the-meter solar photovoltaic energy projects based on client needs. Responsibilities included system layout, consideration of transportation needs, determination of system components and orientation, energy production modeling, capital cost estimates, and assisting with financial modelling for Power Purchase Agreements. Systems generally ranged from 50 kW to 1 MW DC.

Akron Water Reclamation Facility – Hardy Road Landfill Gas to Energy Project, Akron, OH. Served as assistant project manager for operation, maintenance, and monitoring of 1.1 MW Waukesha APG1000 genset and landfill gas conditioning equipment, providing a third of electrical power needs to the Akron Water Reclamation Facility. Responsibilities included daily monitoring of system performance and adjusting baseload set point to meet plant needs and landfill/atmospheric limitations; tracking, coordinating, and performing regular planned maintenance activities; purchasing necessary parts and supplies; assisting in setting and tracking project budget; and performing troubleshooting by reviewing performance data and operation and maintenance manuals.

Shale Oil and Gas Projects

Road Assessments, Major and Local O&G Companies, Appalachian Basin, OH. Provided roadway assessments in conjunction with road use maintenance agreements (RUMAs) for local and major oil and gas companies along designated routes used during well pad construction, drilling and completions operations, and midstream pipelines and hydrocarbon processing facility construction. Assessments included photographic and video documentation, pavement condition rating, culvert inventory and assessment, overhead obstruction identification and measurement, identification of underground utility lines, pavement coring for roadway section observation, and subgrade compaction assessment. Responsibilities included coordinating and performing field work, generating reports, and providing recommendations used to negotiate with counties and/or townships regarding road maintenance and repair by user.

Brine Recycling Facility, Confidential Client, northeastern Pennsylvania. Lead design engineer for erosion and sediment control plan, and post-construction stormwater management plan for 10-acre site with limited available space for water storage and management. Successfully coordinated and negotiated with local county conservation district to obtain PAG-02 permit. Responsibilities included delineating drainage areas, flow paths, and design of water conveyance structures (channels, basins, culverts, etc.) and erosion and sediment control BMPs using Hydraflow Hydrographs modeling software and calculation spreadsheets.

CCR & Industrial Waste Management Projects

Associated Electric Cooperative, Inc. – New Madrid Power Plant, MO. Served as technical lead on the closure of a 12-acre portion of the plant's utility waste landfill. Responsibilities included coordination of a permit modification request; ensuring compliance with state and federal CCR Rule regulations; design of waste mass grading, final cover system with geosynthetics, and stormwater management features; and development of design drawings, engineering cost estimate, technical specifications, and updated Construction Quality Assurance (CQA) Plan.

Associated Electric Cooperative, Inc. – Thomas Hill Energy Center, MO. Served as technical lead on the closure of a 2-acre CCR surface impoundment, and reconfiguration of multiple surface impoundments totaling approximately 38 acres for the continued management of stormwater runoff and non-CCR wastestream flows, including RCRA-compliant composite liners, surface wearing layers and riprap slope protection, water control and conveyance features (e.g., outlet pipes, weirs, skimmers, floating baffles, fabric-formed concrete channel lining, and other erosion control measures), and ancillary dewatering pads and access roads. Managed construction CQA responsibilities including submittal review and approval, and responses to requests for information throughout project completion.

Westar Energy – Jeffrey Energy Center, St. Marys, KS. Aided in the design of the proposed FGD Landfill lateral expansion by completing performance calculations on geosynthetic materials, leachate collection piping, and storm water and contact water conveyance. Provided stormwater management design support using HydroCAD modelling software and AutoCAD Civil 3D. Responsibilities also included updating CCR Rule compliance documentation, such as Closure Plan, Post-Closure Plan, and Run-On and Run-Off Control System Plan.

Ameren – Rush Island Energy Center, Festus, MO. Assisted in evaluation of qualifying bids for 125-acre ash pond closure project, providing valuable insights and recommendations for the client's consideration in awarding a contract.

Salt River Project – Coronado Generating Station, St. Johns, AZ. Reviewed submittals for the Inactive Ash Settling Pond Closure in a timely manner to ensure construction adhered to project specifications. Assisted in communicating and coordinating resolution to issues related to materials and as-built surveys with contractor and client.

Coal Ash Landfill Reclamation Project – Confidential Pennsylvania Utility Client. Provided design support for stormwater and contact water management for project to reclaim coal combustions byproducts from a closed landfill for beneficial use in cement production. Responsibilities included delineating subcatchment areas and flow paths and completing design of sedimentation basin and contact water basin within tight project site constraints and extensive

Pennsylvania DEP compliance requirements, with the use of Hydraflow Hydrographs modeling software and calculation spreadsheets.

Municipal Solid Waste Management Projects

Richland County Solid Waste Management Authority, Closed Richland County Landfill, Mansfield, OH. Assisted in design and implementation of corrective measures activities from 2012 through 2016 at the closed, unlined 130-acre MSW landfill, including an automated leachate collection and conveyance system (LCCS) and subsequent expansion in the southern portion of the landfill, and explosive gas migration mitigation system along the northeastern limits of waste placement. Responsibilities included design and engineer's cost estimate of LCCS forcemain, pneumatic pumps, and new air compressor to combat groundwater contamination in southern portion, and explosive gas blower system to mitigate migration of landfill gases across northern limits of waste placement. Also provided construction oversight, served as assistant project manager for construction projects, and performed troubleshooting on system components, as needed.

City of Greenville, Closed Greenville Landfill, Greenville, OH. Assisted in design of fixed explosive gas blower system along western limits of waste at 60-acre closed MSW landfill, including blower selection and HDPE piping layout. Also developed engineer's cost estimate for comparison against received bids.