

**Review and Evaluation of
Song Sparrow Solar, LLC
Siting Assessment Report
Case Number: 2023-00256**

REPORT

Report

December 15, 2023

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Song Sparrow Solar, LLC
Siting Assessment Report
Case Number: 2023-00256**

Prepared for

Kentucky State Board on Electrical Generation and Transmission Siting
211 Sower Blvd.
P.O. Box 615
Frankfort, Kentucky 40602

Prepared by

BBC Research & Consulting
1999 Broadway, Suite 2200
Denver, Colorado 80202-9750
303.321.2547 fax 303.399.0448
www.bbcresearch.com



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SECTION A.

General Statement

SECTION A.

General Statement

This document provides a review of the Site Assessment Report (SAR) for the proposed Song Sparrow Solar merchant electric generating facility submitted to the Kentucky State Board on Electrical Generation and Transmission Siting (the Siting Board). Song Sparrow Solar, LLC submitted an administratively complete document titled “Application of Song Sparrow Solar LLC for a Certificate of Construction for an Approximately 104 Megawatt Merchant Electric Generating Facility in Ballard County, Kentucky” (the “Application”) to the Siting Board on September 1, 2023. The Siting Board assigned the case number 2023-00256 to the Song Sparrow Solar application. The proposed generating facility is subject to review by the Siting Board under KRS 278.700 *et seq.* (the Act), passed by the General Assembly of the Commonwealth of Kentucky in 2002. Siting Board staff retained BBC Research & Consulting (BBC) to perform this review.

Provisions of the Act Establishing the SAR Review Process

The part of KRS 278 entitled “Electric Generation and Transmission Siting” defined a class of merchant power plants and required them to obtain construction certificates as a prerequisite to the commencement of actual construction activity. Those statutes also created the Siting Board and gave it the authority to grant or deny construction certificates requested by individual applicants. The Siting Board is attached to the Kentucky Public Service Commission (PSC) for administrative purposes.

The Act created the application process and, within the process, a series of steps for preparing and submitting this report:

- The applicant files for a construction certificate and pays the fees. KRS 278.706.
- The applicant submits required items, including an SAR. KRS 278.706 & KRS 278.708.
- If it wishes, the Siting Board may hire a consultant to review the SAR and provide recommendations about the adequacy of the information and proposed mitigation measures. KRS 278.708.
- The consultant must deliver the final report so the Siting Board can meet its own statutory decision deadline — 120 days or 180 days from receipt of an administratively complete application, depending upon whether the Siting Board will hold a hearing. KRS 278.710.

SAR Review Methodology

BBC undertook the following tasks to review Song Sparrow Solar's SAR and complete this report:

- Reviewed prior SAR reviews prepared for the Siting Board by BBC and others since 2020 for proposed commercial solar generating facilities;
- Reviewed the contents of Song Sparrow Solar's SAR and Application;
- Identified additional information we considered useful for a thorough review, and submitted questions to the applicant through the Siting Board Staff's requests for information;
- Conducted the required site visit, including obtaining oral information supplied by the applicant, in November 2023;
- Completed interviews and data collection with a number of outside sources as sourced in this document; and
- Compiled and incorporated all of the foregoing in the analysis.

Report Format

This report is structured to be responsive to KRS 278 and BBC's contract. It begins with this general statement that introduces the review. In Section B of the report, we present the executive summary and list all of the mitigation measures recommended by BBC. Section C offers detailed findings and conclusions of the study and provides context for BBC's recommended mitigation measures.

Certain Limitations

There are inherent limitations to any review process of documents such as the SAR. These must be understood in utilizing this report for decision-making purposes.

Based on previous experience with the SAR review process, BBC has exercised judgment in deciding what information is most relevant and what level of detail is appropriate. This relates to project components, geographic extent of impacts, and assessment methodology. Siting Board staff has previously provided review and guidance in this context.

While BBC has thoroughly reviewed the information provided in Song Sparrow Solar's Application and Site Assessment Report and raised questions with the applicant regarding some apparent inconsistencies in that information, we have not conducted an audit of the information and data provided in those documents. Information regarding the layout and features of the proposed project and the surrounding area provided by the applicant are assumed to be accurate for purposes of this review. This review is based on the best available information at this time.

SECTION B.

Executive Summary

SECTION B.

Executive Summary

This report documents the evaluation of a Site Assessment Report (SAR) in compliance with KRS 278.704 and KRS 278.708. The Kentucky State Board on Electrical Generation and Transmission Siting (the Siting Board) received an application from Song Sparrow Solar, LLC (Song Sparrow Solar) on September 1, 2023, for approval to construct a commercial, photovoltaic solar merchant electric generating facility in Ballard County, Kentucky. Siting Board staff retained BBC Research & Consulting (BBC), a Denver-based firm, to review the SAR. BBC was directed by the staff to review the SAR for adequacy, visit the site, conduct supplemental research where necessary, and provide recommendations about proposed mitigation measures.

This is the summary of BBC's final report, which encompasses the SAR review, establishes standards for evaluation, summarizes information from the applicant, notes deficiencies, offers supplemental information, and draws conclusions and recommendations related to mitigation. Issues outside the scope of KRS 278.708, including electricity market or transmission system effects and broader environmental issues, were not addressed in this engagement. This report does evaluate and consider the regional economic impacts of the proposed project and plans for future decommissioning.

Description of the Proposed Facility/Site Development Plan

The SAR provides a description of the proposed Song Sparrow Solar facility in terms of surrounding land uses, legal boundaries, access control, utility service, setback requirements, visual impacts, impacts on surrounding property owners, noise levels, and traffic impacts. Additional detail on each topic was provided in the applicant's responses to the First and Second Requests for Information (RFI) from the Siting Board Staff during the SAR review process.

The proposed Song Sparrow Solar facility would be a 104-megawatt alternating current (MWac) photovoltaic electricity generation facility situated Ballard County in the southwestern corner of the state, near the confluence of the Mississippi and Ohio Rivers and adjacent to Kentucky's borders with Illinois and Missouri. The proposed Song Sparrow Solar facility would interconnect to an on-site, existing transmission line owned by Louisville Gas & Electric and Kentucky Utilities.

The proposed facility would have a fenced footprint of approximately 655 acres out of a total 900 acres of land for which Song Sparrow Solar has secured leases. The facility would be situated in a rural area of primarily agricultural and mixed agricultural/residential use, approximately four miles south of the City of Kevil and two miles north of the unincorporated community of Gage.

Several roadways are in proximity of the proposed project site, which has a non-contiguous footprint comprising fenced sections of solar arrays. Roadways near to the proposed site include five with entrances to the project site—Mosstown Road, Davis Road, KY-473/Gage Road,

Bondurant Road, and KY-2532/County Line Road/Kevil-Lovelaceville Road. There are a total of 10 planned entrances to the project site according to the preliminary site plan.

The estimated total population within a one-mile radius of the proposed project is 53 residents, which is lower than the average population (139) within one mile for nine solar facility applications reviewed by the Siting Board since June 2022.

Conclusions with respect to other descriptive elements of the facility follow:

- **Surrounding land use** — Overall, agricultural land comprises 79 percent of adjoining acres, while 16 percent is zoned agricultural/residential, and about 5 percent is solely residential. Measured by the number of properties rather than their acreage, agricultural uses constitute 48 percent of adjoining parcels, while 8 percent of adjoining parcels are agricultural/residential, and 44 percent are residential. The composition of surrounding land uses — where residential parcels comprise the largest share of adjacent parcels but a much smaller proportion of the total adjacent land area — is typical among the proposed solar facilities that BBC has reviewed for the Siting Board.
- **Proposed access control and security** — The SAR briefly describes proposed access control measures, noting that solar modules and facility infrastructure will be enclosed by perimeter fencing and that a separate fence will enclose the substation. In addition, the applicant states that the project will comply with the requirements of the National Electric Safety Code. Song Sparrow Solar anticipates a total of 10 gated entrances to the project.
- **Utilities** — The SAR states that auxiliary electrical service, if required, will be secured from Jackson Purchase Energy Corporation and delivered to the project substation.
- **Setback requirements** — The Song Sparrow Solar project has been designed to comply with Ballard County Fiscal Court Resolution 2023-04-18, which encourages minimum setbacks for solar projects, including 250 feet from the residences of non-participating landowners; 250 feet from any church, school, schoolyard, business, or park; 50 feet and 25 feet from the centerline of primary and secondary roadways, respectively; and 100 feet from adjoining property lines.
- **Other facility site development plan descriptions provided in the SAR** — Legal boundaries; location of facility buildings, transmission lines, structures; and location of access roads, internal roads, and railways are addressed in the SAR. When considered alongside additional information supplied by Song Sparrow Solar in their RFI responses during the review process, these materials appear to meet the informational requirements identified in KRS 278.708.

Compatibility with Scenic Surroundings

The applicant did not include a formal visual assessment in the SAR. However, Section 2 of the SAR summarizes the assessment of compatibility with scenic surroundings. The SAR describes the landscape context of the proposed project as “located in agricultural land with surrounding rural low density residential development.”¹ BBC also visited the proposed Song Sparrow Solar project site in November 2023 to review the site and its surroundings.

Some of the homes near the project footprint would have relatively unobstructed views of the proposed locations for future solar panels and other equipment if the site is developed. Song Sparrow Solar project staff have developed a vegetative screening plan and met with adjoining landowners on multiple occasions to address concerns about viewshed impacts to surrounding properties. The applicant supplied visual representations of the project’s proposed vegetative screening in this area in Appendix B of the SAR (Preliminary Site Layout).

Song Sparrow Solar also commissioned a ForgeSolar glare analysis for the proposed project, which was included as Appendix G of the SAR. The results of the study were that no glare is expected to occur at any observation points near the proposed project site, including the Barkley Regional Airport, nine road segments adjacent to the project site, and 52 structures adjacent to the project.

There is no existing ordinance specifying conditions that the project must meet regarding lighting, glare, or landscaping. However, Song Sparrow Solar has designed the project to comply with the setbacks suggested by Ballard County Fiscal Court Resolution 2023-04-18-01; these setbacks from nearby properties and roadways help to mitigate the visual impacts of the proposed project. The proposed vegetative buffer, consisting of two staggered rows of shrubs and/or evergreen trees, will further alleviate visual impacts.

In general, BBC concurs with Song Sparrow Solar’s conclusion that the proposed facility would not be incompatible with its surroundings from a scenic standpoint, though our assessment is contingent on successful completion of the proposed vegetative screening plans to reduce visual impact – particularly from areas where views into the site are currently relatively unobstructed by topography or existing vegetation. This assessment reflects the topography of the site, the proposed screening plan, and recognizes that solar facilities have a relatively low profile, similar to or lower than most single-family homes.

¹ SAR, page 4.

Potential Changes in Property Values for Adjacent Property Owners

The central issue related to property values is whether or not, and to what extent, property values of other landowners will change as a result of development and operation of the proposed Song Sparrow Solar facility. Song Sparrow Solar engaged Kirkland Appraisals, LLC—which has conducted property value impact studies for several previous solar applications to the Siting Board—to examine the proposed project’s potential impact on property values.

In a summary statement, Kirkland Appraisals concludes that there will be no property value impacts from the proposed Song Sparrow Solar facility on adjoining properties and that the proposed facility will be in harmony with the area.

The matched pair analysis shows no impact on home values due to abutting or adjoining a solar farm at the distances proposed for Song Sparrow LLC with a landscaped buffer. Similarly, paired sale data has shown no impact to abutting or adjacent vacant residential or agricultural land where the solar farm is properly screened and buffered such as what is offered at Song Sparrow LLC. The criteria that typically correlates with downward adjustments on property values such as noise, odor, and traffic all indicate that a solar farm is a compatible use for rural/residential transition areas and that it would function in a harmonious manner with this area.²

To date, only a small handful of relevant property value impact studies of solar facilities have been conducted by academic researchers or other third-party analysts. Using different methods, and different data sources, recent studies by teams at the Lawrence Berkeley National Lab; the LBJ School of Public Affairs (University of Texas); and the University of Rhode Island have found that there could be small, negative impacts on property values from proximity to commercial solar facilities. Another recent econometric study (at the University of Georgia) focused on solar facilities in North Carolina found no impacts on the value of nearby agricultural land, but did find statistically significant negative effects to the value of smaller residential properties close to solar facilities.³

Given the low population density and rural setting for the proposed Song Sparrow Solar project—and acknowledging that the project’s proposed vegetative buffers will help obscure the site’s physical elements from nearby residences and neighborhoods—we conclude that the proposed solar facility is unlikely to have measurable adverse impacts on most adjacent properties, but might affect the values of some smaller lot, adjacent residential properties located in closest proximity to nearby solar panels. New or existing vegetative screening near these properties may reduce this risk.

² SAR Appendix A, page 1.

³ Abashidze, Nino. *Essays on Economic and Health Effects of Land Use Externalities*. (Under the direction of Dr. Harrison Fell). Page 71. University of Georgia, 2019.

Expected Noise from Construction and Operation

Noise levels generated by facility construction and operation are addressed in Section 4 of the SAR (Anticipated Noise Levels) and in the Acoustic Assessment, conducted by Stantec, which is included as Appendix D of the SAR. During project construction—including site preparation, excavation, and solar equipment installation—impacts on nearby noise-sensitive receptors (NSRs) will be generated by construction equipment and vehicles, particularly during pile driving for the solar panel racking. Operational sound levels are expected to be modest and non-disruptive for the operating lifetime of the project.

The setting for the Song Sparrow Solar project is a rural area with a low population density. The closest noise sensitive receptor is an estimated 256 feet from the nearest proposed solar panel location. During the construction phase, vehicles and machinery such as trucks, bulldozers, excavators, and pile drivers will generate noise onsite while preparing the site and installing the facility's panels, racking, inverters, substation, and associated structures. Maximum noise levels will occur during pile driving of the solar arrays, which is consistent with previous solar project noise impact studies reviewed by the Siting Board.

Information provided in Song Sparrow Solar's response to the Second RFI indicates that the projected construction sound level at the nearest sensitive receptor (256 feet) would be 86 dBA while a pile driver is in use. At that noise level, the NIOSH recommended exposure limit is approximately six to eight hours per day. Without pile driving activity, the projected construction noise level would be 66 dBA at the nearest receptor.

During normal operation of the proposed Song Sparrow Solar facility, noise levels from panel tracking motors, inverters, and the substation transformer are unlikely to be disruptive to local residents.

Impacts on Transportation

Section 5 of the SAR (Effect on Road and Railways) and Appendix F of the SAR (Traffic Impact Study by Stantec) provide information regarding anticipated impacts on transportation at and around the proposed project site during construction and operation.

Several roadways are in proximity to the proposed Song Sparrow Solar site, which has a non-contiguous footprint comprising fenced sections of solar arrays. Roadways near to the proposed site include five with entrances to the project site. The applicant reviewed available traffic volume data from the Kentucky Transportation Cabinet (KYTC) for seven count stations located along roadways adjacent to the proposed project site.

The Traffic Impact Study states that, during the construction phase of the project, traffic flow will be impacted by the commute of construction workers to and from the site (assumed to occur during peak AM and PM hours) as well as the frequent arrival and departure of large trucks necessary for equipment delivery. Modeling the projected peak hour two-lane traffic during the project's construction phase (and assuming that existing peak traffic volumes would increase by 50 percent), indicates that the impacted roadways would maintain a high level of service.

Song Sparrow Solar projects that up to three employees would be present at the project site for up to 40 hours per week during the operational lifetime of the project, and that this level of traffic to the project site would have no measurable impact on traffic flow on nearby roadways.

Other Considerations

Applicant economic impact study. Attachment G to the Song Sparrow Solar Application (Economic Report) contains a study of the projected economic impacts from the proposed facility. The analysis was conducted by Dr. Paul Coomes, Emeritus Professor of the University of Louisville, using IMPLAN modeling.

Key findings from the analysis include:

- There will be a one-time spike in construction-related employment over about a 14-month period. The spike will include about 298 new jobs in Ballard County in the first year, with a new payroll of \$18 million and a one-time yield of \$180,000 in occupational tax revenues for the County.
- Pursuant to an Industrial Revenue Bond agreement between Song Sparrow Solar and the County Fiscal Court, a total of approximately \$3.1 million in PILOT payments is estimated to be paid during a 40-year operational life of the project, or about \$78,000 per year.

The level of investment in Ballard County projected in the economic impact analysis appears to be roughly consistent with industry standards for a solar project of the size of the proposed Song Sparrow Solar facility. The overall conclusions that the operating phase will have very modest economic impacts, but that the proposed solar facility will enhance local government revenue while requiring very few services, are consistent with the findings of other commercial solar economic impact studies. The largest impact on employment will be felt during the initial construction period.

Some information that would provide a more complete picture, but which is not provided in the applicant's economic study, includes the direct, indirect, and induced economic benefits from the current use of the site in agriculture; and the potential induced economic benefits from the additional income received by the participating landowner if at least a portion of that income is spent locally. The former would at least slightly reduce the projected net economic benefits from ongoing operations of the facility, while the latter would likely increase those projected net benefits. Neither of these aspects would likely result in a material change to the results of the economic impact analysis.

Facility Decommissioning. In prior solar projects reviewed by the Siting Board, plans and assurances for decommissioning the sites at the end of their functional lives have been an important issue of concern to both the Siting Board and local governments.

Attachment H of the Application (Decommissioning Plan) contains a plan for the decommissioning of the proposed facility. The plan was authored by Stantec on behalf of the applicant. Decommissioning is also addressed in Ballard County Resolution 2023-04-18, which requires decommissioning activities to occur within 12 months of the project ceasing to generate

electricity. Within the Decommissioning Plan, Song Sparrow Solar describes the sequence and project components to be decommissioned, including net decommissioning costs accounting for expenses as well as potential salvage revenue.

Summary Findings

Song Sparrow Solar has generally provided the required information for the site assessment, including responses to BBC's questions (included in the requests for information from Siting Board Staff) following our review of their SAR. The Song Sparrow Solar site appears to generally be well selected in terms of compatibility with the surrounding area and access to transmission infrastructure. The proposed setbacks and vegetative screening plan should also help the facility be compatible with the surrounding area.

Mitigation Recommendations

Including mitigation identified by Song Sparrow Solar in their Application and SAR, BBC recommends the following mitigation measures:

Regarding KRS 278.708 (3) (a)– description of the proposed facility –

1. Song Sparrow Solar should provide a final site layout plan to the Siting Board when site design is finalized. Any change in project boundaries or site layout from the information reviewed during this evaluation—including changes to the locations of solar panels, inverters, transformers, the substation, project fencing or other project facilities—should be clearly documented and submitted to the Siting Board for review.
2. Song Sparrow Solar or its contractor should control access to the site during construction and operation. All construction entrances should be gated and locked when not in use. The applicant's access control strategy should include adequate signage at all site entrances and boundaries—particularly in locations visible to the public, local residents, and business owners—to warn potential trespassers.
3. According to National Electric Code regulations, the security fence must be installed prior to any electrical installation work. Further, the substation must have its own separate security fence, with locked access.
4. Song Sparrow Solar should promptly and fully meet the suggested setback provisions and any other conditions outlined in Ballard County Resolution 2023-04-18-01.

Regarding KRS 278.708 (3) (b)– compatibility with scenic surroundings –

5. Existing vegetation between the solar arrays and nearby roadways and homes should be left in place to the extent feasible to help minimize visual impacts and screen the project from nearby homeowners and travelers.

6. Song Sparrow Solar should execute their proposed screening plan—as presented in pages 15 and 16 of Appendix B of the SAR and depicted in Appendix E of the SAR—and ensure the new vegetative buffers are successfully established and develop as expected over time. Plantings should reach eight feet high within four years. Should the vegetation intended to provide a visual buffer fail to thrive after planting, Song Sparrow Solar should replace the trees to maintain the visual buffer.
7. Song Sparrow Solar should cultivate at least two acres of native pollinator-friendly species onsite.
8. Song Sparrow Solar should use panels with anti-reflective coating to reduce glare and corresponding visual impacts.
9. Song Sparrow Solar should be open to communication with adjacent landowners regarding viewshed impacts and the implementation of strategic additional vegetative screening, if needed.
10. Communication regarding viewshed impacts and concerns should be incorporated into the Complaint Resolution Program described further in mitigation recommendation #18 later in this section.

Regarding KRS 278.708 (3) (c)– potential changes in property values and land use –

11. Song Sparrow Solar’s viewshed screening plan should incorporate particular efforts to reduce impacts on the views from the residential properties that are closest to the proposed project.

Regarding KRS 278.708 (3) (d)– noise impacts –

12. After finalizing equipment and before commencing construction, Song Sparrow Solar should confirm with the Siting Board the pile driver selected for use on site during construction and provide the manufacturer’s documentation to support the estimated sound power level of that equipment. Use of a pile driver with higher maximum noise generation than cited by Song Sparrow Solar in its Application, SAR, or RFI responses may necessitate a new Acoustic Assessment.
13. Song Sparrow Solar should conduct construction activity only between 6 AM and 7 PM, Monday through Sunday, and pile driving only between 9 AM and 5 PM, Monday through Friday.
14. Song Sparrow Solar should prioritize vegetative screen planting before commencing construction activity. This will not only mitigate noise but also allow for the growth of the tree screens during the construction phase, providing an established visual screen to protect the viewshed before the facility begins operation.
15. Song Sparrow Solar should notify residents and businesses within 2,400 feet of the project boundary about the construction plan, the noise potential, and mitigation plans one month prior to the start of construction.

16. If pile driving activity occurs within 1,500 feet of a noise sensitive receptor (e.g., residence), Song Sparrow Solar should implement a construction method that will suppress the noise generated during the pile driving process. In prior reviews of proposed solar facilities for the Siting Board, similar mitigation methods have been identified as the semi-tractor and canvas method, sound blankets on fencing surrounding the solar site, or other comparable methods.
17. During construction, Song Sparrow Solar should locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as practicable from neighboring residences.
18. Song Sparrow Solar should implement a Customer Resolution Program to address any complaints from surrounding landowners. Song Sparrow Solar should submit an annual status report on the Customer Resolution Program to the Siting Board, identifying any complaints, the steps taken to resolve those complaints, and whether the complaint was resolved to the satisfaction of the affected landowner.

Regarding KRS 278.708 (3) (e)– transportation impacts and fugitive dust –

19. Song Sparrow Solar should submit a final construction schedule, including revised estimates of on-site workers and commuter vehicle traffic, to the Siting Board prior to commencement of construction.
20. Song Sparrow Solar should develop and implement a traffic management plan for the construction phase of the project to minimize impacts on traffic flow and keep traffic safe. As part of this plan, Song Sparrow Solar should implement ridesharing between construction workers; use appropriate traffic controls; or allow flexible working hours outside of peak hours to minimize any potential delays during AM and PM peak hours.
21. Song Sparrow Solar and its construction contractors should comply with all laws and regulations regarding the use of roadways.
22. Song Sparrow Solar should obtain permits from the KYTC and local road authorities as needed for overweight and overdimensional vehicle transport to the site and comply with all permit requirements, coordinating with the KYTC Permits Engineer and the Ballard County Road Department as needed.
23. Song Sparrow Solar should determine whether shoulder stabilization and/or road widening is necessary on any local route to accommodate deliveries to the site. Song Sparrow Solar should coordinate with the Ballard County Road Department regarding any necessary improvements.
24. Song Sparrow Solar should commit to rectify any damage to public roads by fixing or fully compensating the appropriate transportation authorities for any damage or degradation to the existing road network that it causes or to which it materially contributes.

25. Song Sparrow Solar should properly maintain construction equipment and follow best management practices related to fugitive dust throughout the construction process. Dust impacts should be kept to a minimal level.

Regarding economic impacts, project decommissioning, and other issues –

26. Song Sparrow Solar should commit to prioritizing local hiring and seeking to hire Ballard County residents to fill the projected direct construction jobs.
27. Song Sparrow Solar should follow the decommissioning plan as laid out in Attachment H of the Application submitted to the Siting Board; and
28. Song Sparrow Solar should work with Ballard County to address any concerns that arise at any point regarding its proposed decommissioning plan.

Subject to the foregoing mitigation measures, BBC recommends that the Siting Board approve the application for a certificate to construct based upon the siting considerations addressed in this review. This recommendation presumes that the project is developed as described in the applicant's SAR and supplemental information, and that the mitigation measures above are implemented appropriately. If these presumptions are correct, and based upon the information available to BBC at the time of this report, there are unlikely to be significant unmitigated impacts from construction and operation of the Song Sparrow Solar generation project regarding scenic compatibility, property values, noise, or traffic.

SECTION C.

Detailed Findings and Conclusions

SECTION C.

Detailed Findings and Conclusions

This section provides detailed review and evaluation of each element of the Song Sparrow Solar Site Assessment Report (SAR) as prescribed in Section 5 of KRS 278.708. It is organized into six subsections:

1. Description of Proposed Facility/Site Development Plan;
2. Compatibility with Scenic Surroundings;
3. Potential Changes in Property Values for Adjacent Property Owners;
4. Expected Noise from Construction and Operation;
5. Impacts on Transportation; and
6. Other Issues – Economic Impacts, Project Decommissioning, and Site-Specific Considerations

Although the Siting Board will likely consider other issues in making its decision, these are beyond the present scope of our inquiry and so are not addressed here.

In evaluating these components of the SAR, BBC has followed a consistent pattern:

- First, BBC describes the generally accepted assessment criteria or methodology necessary to evaluate impacts of a project of this nature (**Potential Issues and Standard Assessment Approaches**).
- Secondly, we summarize relevant information included in the initial SAR (**Information Provided in the Applicant's SAR**).
- Thirdly, we describe supplemental information about the proposed Song Sparrow Solar project facility, along with other information BBC was able to gather about the project and its impacts (**Supplemental Investigations, Research, and Analysis**).
- Finally, BBC draws its own conclusions about the project's potential impacts and recommended mitigation (**Conclusions and Recommendations**).

We believe that this format transparently presents the basis for our conclusions and recommendations.

Description of Proposed Facility/Site Development Plan

Potential Issues and Standard Assessment Approaches

As required by KRS 278.708(3)(a), the SAR must contain the following information:

- Subsection 1—surrounding land uses for residential, commercial, agricultural, and recreational purposes;
- Subsection 2—the legal boundaries of the proposed site;
- Subsection 3—proposed access control to the site;
- Subsection 4—the location of facility buildings, transmission lines, and other structures;
- Subsection 5—location and use of access ways, internal roads, and railways;
- Subsection 6—existing or proposed utilities to service the facility;
- Subsection 7—compliance with applicable setback requirements as provided under KRS 278.704(2), (3), or (4); and
- Subsection 8—evaluation of the noise levels expected to be produced by the facility.

BBC found each of these required information items in the SAR and examined them. To some extent, the required elements of the description of the facility and site development plan specified in the legislation overlap with topic-specific evaluations also required in the statute. In particular, the statute calls for specific evaluations of impacts on nearby property values, traffic, and noise levels. Both the applicant's SAR and the BBC team's evaluation provide further detail on these topics in subsequent sections.

Information Provided in the Applicant's SAR

The required description of the proposed Song Sparrow Solar facility and the site development plan is mainly set forth in Section 2 of the Application (Description of Proposed Site), Appendix A of the SAR (Property Value Impact Report), and Appendix B of the SAR (Preliminary Site Layout). Other related or supplementary information comes from various other sections and appendices of the SAR as well as other attachments included with the Application.

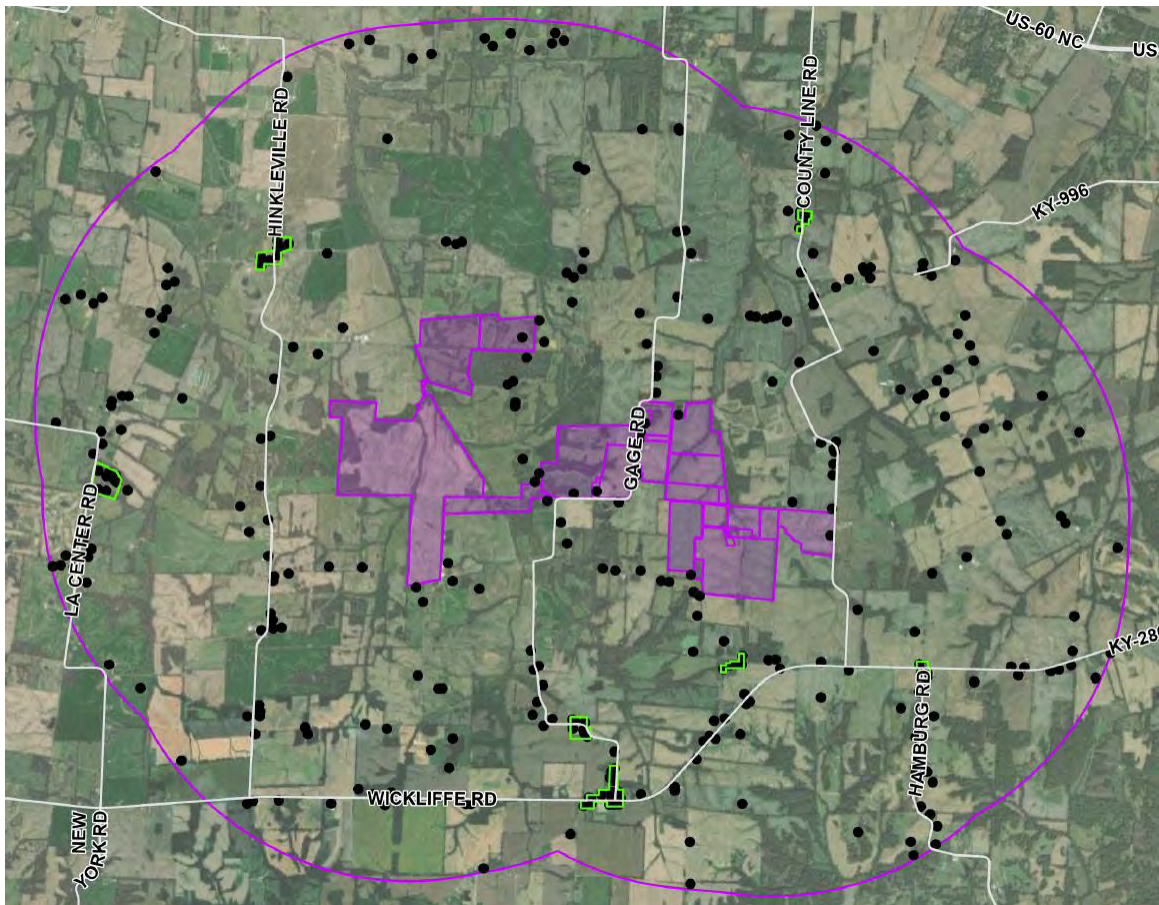
Overview of proposed facility. The proposed Song Sparrow Solar facility would be a 104-megawatt alternating current (MWac) photovoltaic electricity generation facility situated in Ballard County in the southwestern corner of Kentucky. Ballard County sits at the confluence of the Mississippi and Ohio Rivers and is directly adjacent to the state's borders with Illinois and Missouri. The proposed project is approximately 20 miles west of Paducah, the largest city in the area and the seat of neighboring McCracken County.

Section 2 of the Application (Description of Proposed Site) supplies an overview of the project. Based on the information provided in the SAR and Application, the proposed facility would have a fenced

footprint of approximately 655 acres¹ out of a total 900 acres of land² for which Song Sparrow Solar has secured leases with eight landowners. Facility equipment would include approximately 246,000 solar modules, 3,100 trackers, 27 inverter stations, one project substation, and a 200-foot overhead transmission line, in addition to ancillary components associated with the project such as steel piles, cabling, and perimeter fencing.³

Figure C-1, excerpted from Attachment A to the Application (Context Map), shows the proposed project footprint shaded in purple, as well as individual residences (black dots) and residential neighborhoods (green outlines) within a two-mile radius (purple outer boundary).

Figure C-1.
Context Map for Song Sparrow Solar



The applicant stated there are no schools, parks, or healthcare facilities within two miles of the project's boundary and no residential neighborhoods (as defined by KRS 278.700(6)) or nursing

¹ Application, page 4.

² Application Attachment G, page 15.

³ Application Attachment H, page 4.

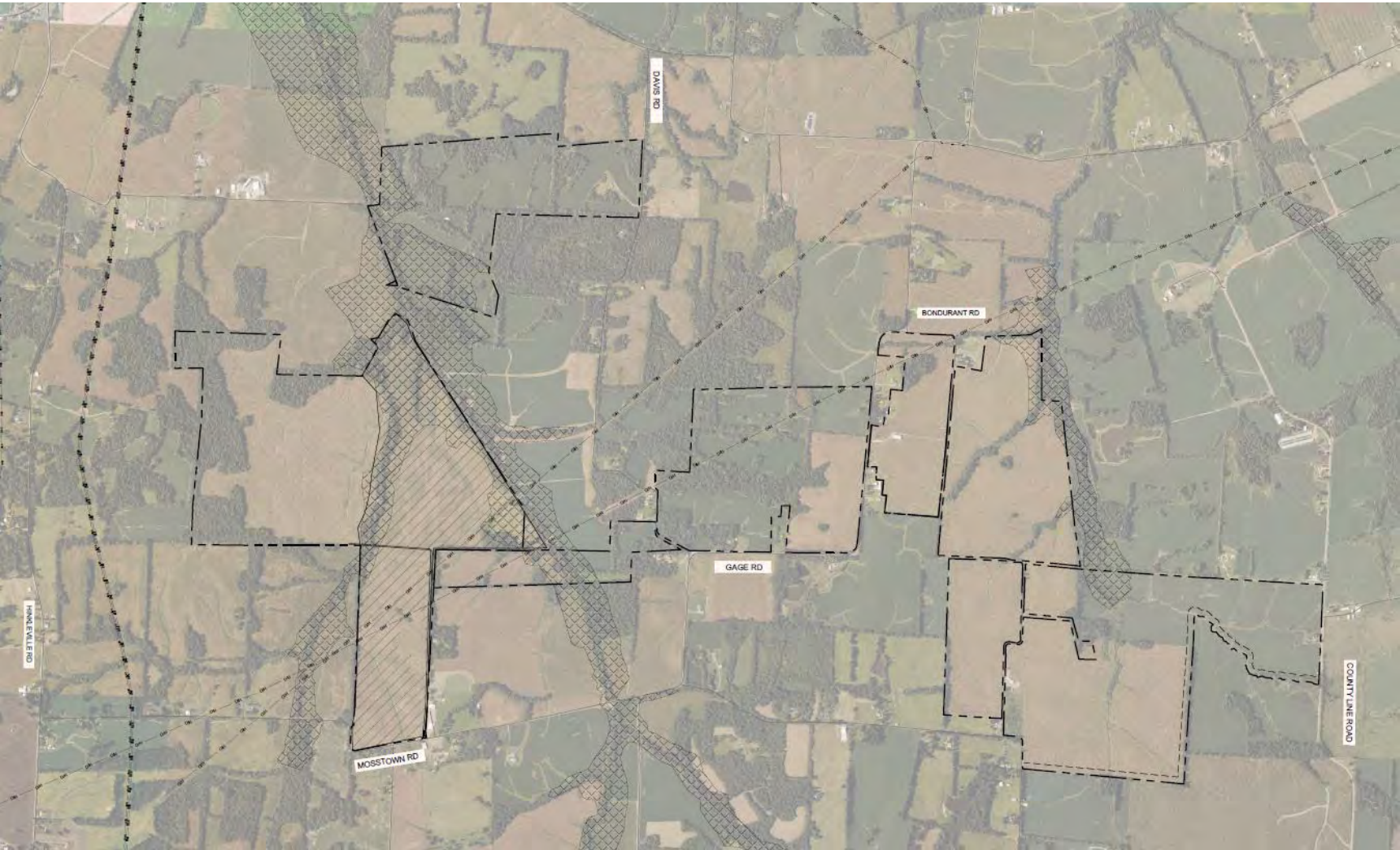
homes within 2,000 feet.⁴ The applicant stated that no railways are present within the proposed site,⁵ and BBC determined that there are no railway lines in the vicinity of the project. In the Siting Board's First Request for Information, BBC asked the applicant to provide an updated context map to include a 2,000-foot project radius and to include the location of any notable community structures (aside from schools and churches) within that radius.

Several roadways are in proximity to the proposed Song Sparrow Solar site, which has a non-contiguous footprint comprising fenced sections of solar arrays. Roadways near to the proposed site include five with entrances to the project site—Mosstown Road, Davis Road, KY-473/Gage Road, Bondurant Road, and KY-2532/County Line Road/Kevil-Lovelaceville Road. Three other roads likely to be used during the construction process, but without planned entrances to the site, include KY-358/Hinkelville Road, Steel Road, and Buchanan Lane. Figure C-2 is excerpted from Appendix B of the SAR (Preliminary Site Layout) and shows a high-level view of the proposed Song Sparrow Solar project (footprint outlined in black) with labels on adjacent roads: from west to east, Hinkelville Road, Mosstown road, Davis Road, Gage Road, Bondurant Road, and County Line Road.

⁴ Application, pages 4 and 7.

⁵ SAR, page 3.

Figure C-2.
Song Sparrow Solar Preliminary Site Layout



The applicant stated that the equipment onsite at the Song Sparrow Solar facility will consist of solar modules, tracking system, inverters, cables and conduits, one substation transformer, an overhead transmission line, and perimeter fencing.⁶

*Arrays of photovoltaic modules will be mounted on single access trackers arranged in rows. Power conversion systems will be distributed throughout the Project. The equipment will connect via underground electrical wiring to a Project substation and switchyard proposing to interconnect to the existing Grahamville-to-Wickliffe 161kV transmission line located in the southwest corner of the Project area north of Mosstown Road. Perimeter fencing will enclose the modules and associated infrastructure and a separate fence will enclose the substation.*⁷

Surrounding land uses. Appendix A of the SAR (Property Value Impact Report) provides some detail on the composition of the surrounding land. Figure C-3, excerpted from Appendix A, summarizes the use of land adjoining the proposed project.

Figure C-3.

Adjoining Parcel Land Use for Proposed Song Sparrow Solar Project

| | Acreage | Parcels |
|--------------|----------------|----------------|
| Residential | 4.58% | 43.75% |
| Agricultural | 79.19% | 48.44% |
| Agri/Res | 16.23% | 7.81% |
| Total | 100.00% | 100.00% |

Overall, agricultural land comprises 79 percent of adjoining acres, while 16 percent is zoned agricultural/residential, and about 5 percent is solely residential. Measured by the number of properties rather than their acreage, agricultural uses constitute 48 percent of adjoining parcels, while 8 percent of adjoining parcels are agricultural/residential, and 44 percent are residential.

Appendix A also provides 2023 population estimates for the surrounding area.⁸ In 2023, an estimated 55 people lived within a one-mile radius of the project area; 581 within a three-mile radius; and 3,837 within a five-mile radius.

Legal boundaries. Page 2 of the SAR noted that Appendix C of the SAR (Property Legal Boundaries) contains the legal descriptions of participating properties for the proposed project site. BBC’s review of Appendix C found that deed information was supplied for seven distinct landowners, each leasing one or more parcels to the proposed project. In the Siting Board’s First Request for Information (RFI), Song Sparrow Solar was asked to provide copies of the lease agreements for all participating properties.

Access control. The Song Sparrow Solar SAR briefly describes proposed security measures:

As described in the Application, Section 2, “A Perimeter fencing will enclose the modules and associated infrastructure and a separate fence will enclose the substation. The Project will comply with the National Electric Safety Code (“NESC”) and American National Standards Institute (“ANSI”) Z535

⁶ Application Attachment H, page 4.

⁷ Application, page 4.

⁸ SAR Appendix A, ESRI Housing Profiles, pages 10-12.

Safety Sign Standards for Electric Utility Power Plants and Substations to guide the placement of safety signage around the facility.” In addition, Song Sparrow or its contractor will control access to the site during construction and operation. All construction entrances will be gated and locked when not in use.⁹

Appendix B to the SAR (Preliminary Site Layout) depicts ten site entrances located on multiple roads adjacent to the proposed project footprint, including Mosstown, Davis, Gage, Bondurant, and County Line Roads.

Location of buildings, transmission lines, and other structures. Page 2 of the SAR states that the location of transmission lines and project structures are depicted in Appendix B of the SAR (Preliminary Site Layout).

BBC examined Appendix B. These plans depict the proposed substation, switchyard, overhead electrical lines, and locations of project components such as security fencing, entrance gates, inverters, and solar panels. In the Siting Board’s First RFI, the applicant was requested to provide an updated site layout map to also include any meteorological station, operations and maintenance area, and laydown areas.

Location and use of access ways, internal roads, and railways. Page 3 of the SAR states that the location of access control points and internal roads are depicted in Appendix B of the SAR (Preliminary Site Layout). There are no railways present at the proposed site.

BBC examined Appendix B. The preliminary site layout depicts ten site entrances along multiple adjacent roadways, as described above, as well as internal roads to provide access to project components such as the solar modules.

Existing or proposed utilities. Page 3 of the SAR states that auxiliary electrical service, if required, will be secured from certified electric provider Jackson Purchase Energy Corporation and delivered to the project substation.

Song Sparrow Solar also stated that retail water service, if required, will be obtained from the nearest provider with adequate service. In the Siting Board’s First Request for Information (RFI), BBC asked the applicant to identify the nearest provider with adequate service given that water will be required in order to perform the dust mitigation and suppression activities identified in Section 6 of the SAR (Mitigation Measures), page 10, item 26.

Compliance with applicable setback requirements. Kentucky statute 278.704(2) states that “... If the facility is not proposed to be located on a site of a former coal processing plant and the facility will use on-site waste coal as a fuel source or in an area where a planning and zoning commission has established a setback requirement pursuant to KRS 278.704(3), a statement that the exhaust stack of the proposed facility and any wind turbine is at least one thousand (1,000) feet from the property boundary of any adjoining property owner and all proposed structures or facilities used for generation of electricity are two thousand (2,000) feet from any residential neighborhood, school, hospital, or nursing home facility, unless facilities capable of generating ten megawatts (10MW) or more currently exist on the site. [...] If the facility is proposed to be located in a jurisdiction that has

⁹ SAR, page 2.

established setback requirements pursuant to KRS 278.704(3), a statement that the proposed site is in compliance with those established setback requirements.”

Ballard County does not have any ordinance establishing setback requirements, however, a resolution adopted by the Ballard County Fiscal Court in April 2023 (regarding commercial solar energy systems developed in the County) encourages minimum setbacks for solar projects, including: 250 feet from the residences of non-participating landowners; 250 feet from any church, school, schoolyard, business, or park; 50 feet and 25 feet from the centerline of primary and secondary roadways, respectively; and 100 feet from adjoining property lines.¹⁰

Song Sparrow Solar stated that the proposed project complies with the suggested setbacks as laid out in the resolution.

Evaluation of noise levels. Appendix D of the SAR (Noise Analysis Report) provides the assessment of the noise levels that will be generated during the construction and operation of the Song Sparrow Solar facility. During the construction phase of the project, activities on site will generate intermittent noise at the nearest receptors (nearby residences). The construction phase is expected to last approximately 12 to 14 months and the operation phase between 30 and 40 years.

During construction, the applicant estimated a maximum noise level of 70 dBA at the nearest sensitive receptor. During the operational life of the project, Song Sparrow Solar anticipated a maximum daytime noise level 46 dBA when measured at the nearest residence.

Noise levels and the details of Appendix D are discussed in greater depth and detail on page 35 of this report section (Expected Noise from Construction and Operation).

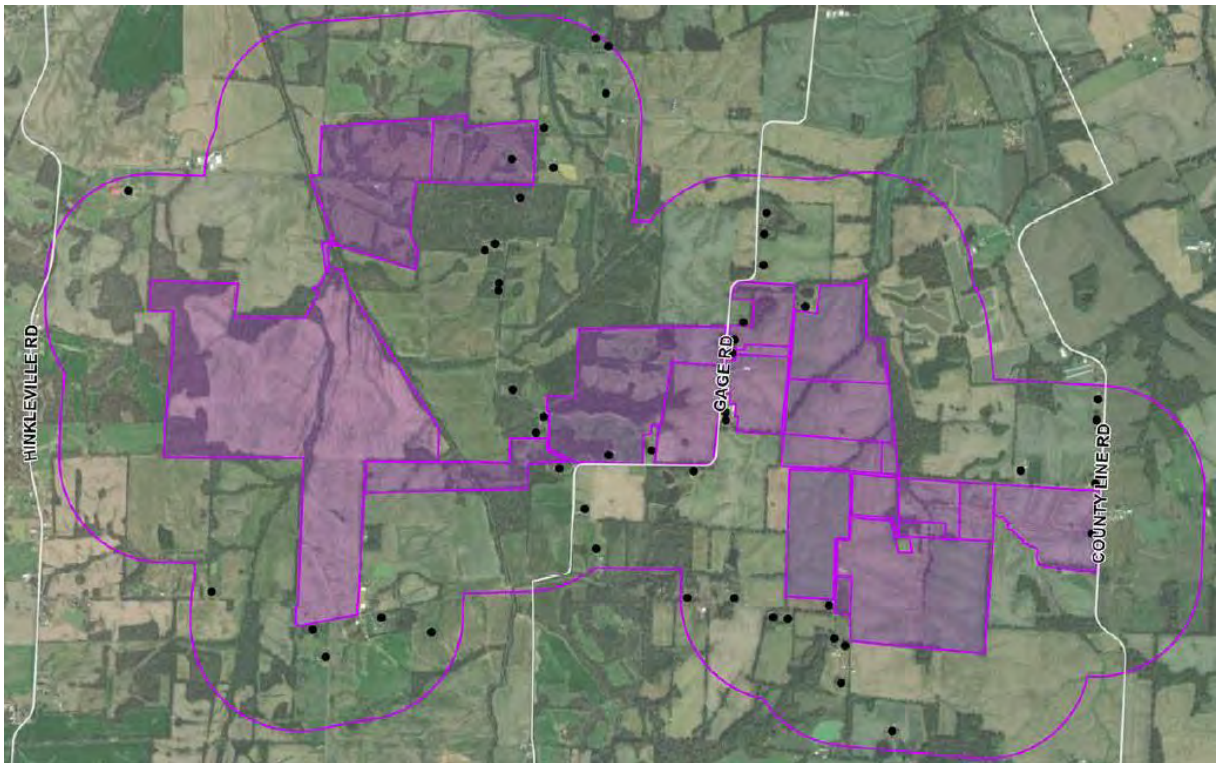
¹⁰ Application Attachment C, pages 5 and 6.

Supplemental Investigations, Research, and Analysis

After reviewing the applicant's SAR, the BBC team sought to supplement the information provided in the SAR where necessary to describe the proposed facility and site development plan more fully.

Overview of proposed facility. In the First RFI, BBC asked Song Sparrow Solar to provide an updated context map including a 2,000-foot radius around the proposed project boundary as well as depicting all residences within that radius. The applicant's updated map is excerpted as Figure C-4, showing the footprint and radius in purple, while residences are depicted with black dots.

Figure C-4.
Song Sparrow Solar Context Map with 2,000-ft Radius and Nearby Residences



Surrounding land uses. The composition of surrounding land uses — where residential parcels comprise the majority of adjacent parcels but a small proportion of the total adjacent land area — is typical among the proposed solar facilities that BBC has reviewed for the Siting Board. Among the facilities BBC has reviewed for the Siting Board since early 2020¹¹, residential land uses have averaged 58 percent of the surrounding parcels, and 8 percent of the surrounding acreage (compared to 44 percent and 5 percent, respectively, for the proposed Song Sparrow Solar site).

Apart from just the immediately adjacent properties, the information provided in Appendix A (Property Value Impact analysis) also indicates the low population density surrounding the site up to a radius of five miles. Since June of 2022, the two consulting firms used by most applicants to the

¹¹ Prior BBC reviews include Turkey Creek Solar, Unbridled Solar, Ashwood Solar, Flat Run Solar, Martin County Solar, Green River Solar, Rhudes Creek Solar, Russellville Solar, Telesto Energy, and Pine Grove Solar projects.

Siting Board to evaluate potential impacts on property values—Kirkland Appraisals, LLC and CohnReznick LLP—have also typically provided information obtained from ESRI regarding the estimated number of residents living within a three-mile radius of the proposed facilities. Kirkland Appraisals has also been providing information regarding the number of residents within a one-mile and a five-mile radius of the proposed facilities they have evaluated.

As shown in Figure C-5, eight of the nine facilities reviewed by the Siting Board since June 2022 have provided estimated population densities for a three-mile surrounding radius. The average population estimate for the surrounding three miles among these eight facilities is 2,089 residents, while the median population estimate for the same radius is 1,528 residents. The proposed Song Sparrow Solar facility has the second lowest population density within three miles among the eight facilities, with an estimated 562 residents (only the Golden Solar facility has fewer residents within three miles.) Five of the nine facilities have also provided estimates of the population living within one mile and within five miles. Among those five facilities, Song Sparrow Solar has the lowest estimated population within one mile and the second lowest estimated population living within five miles (the proposed Dogwood Corners solar facility has a slightly smaller estimated number of residents within a five-mile radius).

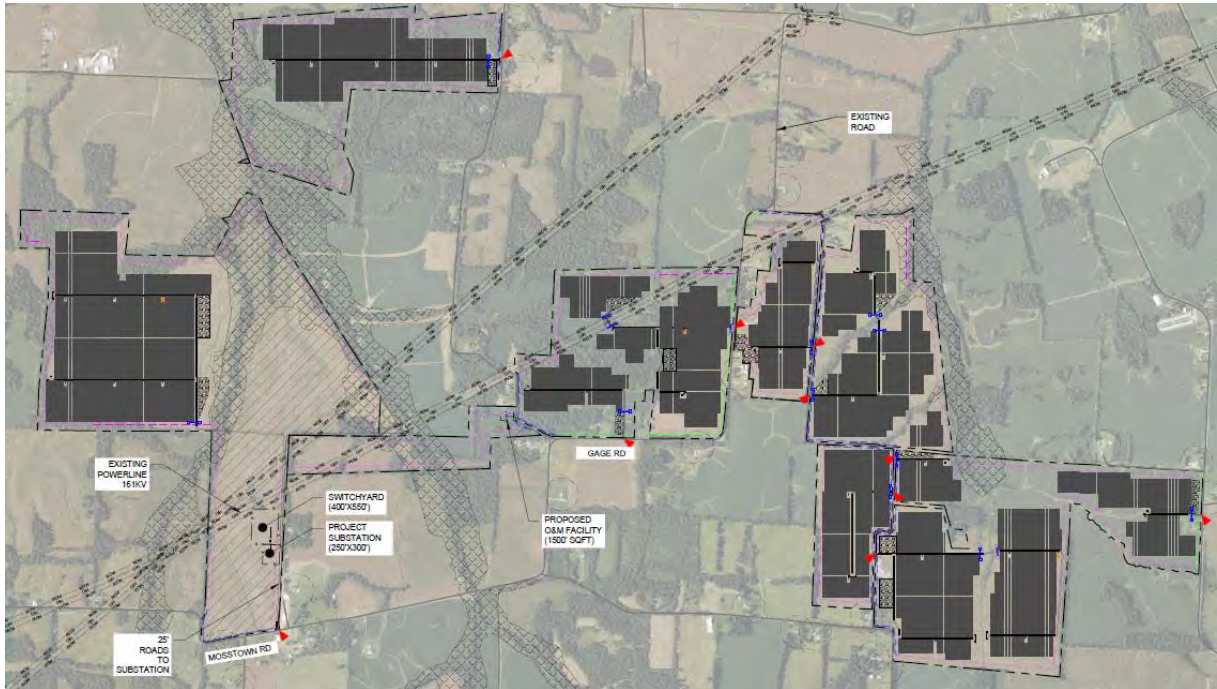
Figure C-5.
Estimated Population Totals within 5 miles of Proposed Solar Facilities Reviewed by the Siting Board Since June 2022

| Case Number | Filing Date | Facility Name | Radius from Project | | | County |
|---------------------------|-----------------------|---------------------------|---------------------|------------|--------------|----------------|
| | | | 1 Mile | 3 Miles | 5 Miles | |
| 2022-00096 | June 2022 | Telesto Energy Project | 203 | 6,457 | 31,123 | Hardin |
| 2020-00243 | August 2022 | Golden Solar | NA | 376 | NA | Caldwell |
| 2022-00115 | October 2022 | Thoroughbred Solar | NA | 1,924 | NA | Hart |
| 2022-00262 | November 2022 | Pine Grove Solar | 232 | 2,528 | 7,509 | Madison |
| 2022-00131 | April 2023 | Seebree Solar II | NA | NA | NA | Henderson |
| 2022-00272 | June 2023 | Hummingbird Energy | 109 | 1,088 | 4,181 | Fleming |
| 2022-00274 | September 2023 | Bright Mountain Solar | NA | 2,647 | NA | Perry |
| 2023-00256 | September 2023 | Song Sparrow Solar | 53 | 562 | 3,761 | Ballard |
| 2023-00246 | September 2023 | Dogwood Corners LLC | 98 | 1,131 | 3,589 | Christian |
| Average population | | | 139 | 2,089 | 10,033 | |
| Median population | | | 109 | 1,528 | 4,181 | |

Legal boundaries. In response to questions posed by the Siting Board and BBC in the Siting Board’s First RFI, Song Sparrow Solar submitted redacted copies of the confidential lease agreements for parcels in the proposed project to supplement the legal descriptions provided in Section C of the SAR.

Location of buildings, transmission lines, and other structures. In response to the request in the Siting Board’s First RFI, Song Sparrow Solar provided a detailed map of the overall site layout including additional structures and components of the project. This is excerpted below as Figure C-6. Specific details of the map are not able to be examined in Figure C-6 because BBC has scaled it to fit this page size, however BBC examined the full image and found it does clearly show the locations of relevant project features.

Figure C-6.
Song Sparrow Solar Overall Site Layout



Existing or proposed utilities. In response to BBC’s question in the Siting Board’s First Request for Information regarding retail water service required to perform dust mitigation, Song Sparrow Solar stated:

If water service is required during construction and operations, we understand that groundwater well resource is common in Ballard County, and anticipate the Project will use existing onsite wells, install new wells, or transport water to the Project site via water trucks. If retail water service is needed, it will be requested from the nearest provider with adequate service. Song Sparrow Solar acknowledges that the following utilities may provide water service in the area: La Center Municipal Water Co, Wickliffe Municipal Water System, and Kevil Water Department.¹²

Evaluation of noise levels. BBC’s investigation of the proposed project’s expected noise levels is addressed in full in a subsequent section of our report (Expected Noise from Construction and Operation) which begins on page C-35.

Conclusions and Recommendations Regarding the Description of the Proposed Facility and Site Development Plan

Based upon review of the applicant’s SAR, subsequent information gathered from the applicant, and additional data collected by the BBC team, we reach the following conclusion concerning the description of the facility and the proposed site development plan:

¹² Song Sparrow Solar Responses to the First RFI, Siting Board 1-28.

- The applicant has generally complied with the legislative requirements for describing the facility and site development plan.

Recommended mitigation. Based on our review of the SAR and Application, the applicant's responses to the RFIs from the Siting Board and BBC, and our visit to site—as well as recent Siting Board orders in other solar cases—BBC recommends the following mitigation measures regarding this portion of the Kentucky statutory requirements (KRS 278.708(3)(a)):

- Song Sparrow Solar should provide a final site layout plan to the Siting Board when site design is finalized. Any change in project boundaries or site layout from the information reviewed during this evaluation—including changes to the locations of solar panels, inverters, transformers, the substation, project fencing or other project facilities—should be clearly documented and submitted to the Siting Board for review.
- Song Sparrow Solar or its contractor should control access to the site during construction and operation. All construction entrances should be gated and locked when not in use. The applicant's access control strategy should include adequate signage at all site entrances and boundaries—particularly in locations visible to the public, local residents, and business owners—to warn potential trespassers.
- According to National Electric Code regulations, the security fence must be installed prior to any electrical installation work. Further, the substation must have its own separate security fence, with locked access.
- Song Sparrow Solar should promptly and fully meet the suggested setback provisions and any other conditions outlined in Ballard County Resolution 2023-04-18-01.

Compatibility with Scenic Surroundings

This section of the SAR review addresses the compatibility of the proposed Song Sparrow Solar facility with the scenic surroundings. This component of the SAR is identified in KRS 278.708(3)(b).

Potential Issues and Standard Assessment Approaches

Various government agencies throughout the country employ visual assessment methodologies based on professionally accepted techniques. These techniques are fundamentally consistent in their approach to evaluating the elements of a project and its compatibility with existing landscapes and other surroundings.

An example of a visual assessment methodology in use by a state power plant siting agency is the methodology employed by the staff of the California Energy Commission. In California siting assessments, the assessment of potential incompatibility between a project and its scenic surroundings focuses on project structures, such as smokestacks. Typically, the assessment also addresses project lighting and the potential for visible cooling tower plumes.

A standard visual analysis generally proceeds in this sequence:

- Analysis of the project's visual setting;
- Identification of key observation points (KOP);
- Descriptions of visual characteristics of the project; and
- Evaluation of impacts to KOPs.

A KOP is a location where people may periodically or regularly visit, reside, or work within the viewshed of the project's structures or emissions.¹³

In general practice, visual impact evaluations are conducted within one of three general frameworks, depending upon the relevant jurisdiction and its level of involvement at the project site. These are listed in order of structural formality:

- A formal visual resource or scenery management system, typically in effect only on federal lands, such as the U.S. Forest Service Scenery Management System or the U.S. Bureau of Land Management Visual Resource Management System;
- Locally applicable laws, ordinances, regulations, or standards, where imposed by state or local governments; and
- The cultural context, including the influence of previous uses on the landscape and public attitudes toward the compatibility of various types of land use.

¹³ The viewshed is defined as an area of land, water, or other part of the environment visible to the eye from a vantage point. Conversely, the vantage point is presumed to be visible from locations within the viewshed.

Each framework, in its own way, embodies explicit or implicit consideration of some or all of the standard measures of visual impact: viewer exposure and sensitivity; relative project size, quality, visibility, exposure, contrast and dominance; and prevailing environmental characteristics, such as season and light conditions. Local regulations especially focus on screening of facilities from public view and the effects of glare from outdoor lighting upon adjacent property.

In this instance, the visual impact evaluation followed the final of the three approaches listed above. The selected approach is appropriate as there is no ordinance specifying conditions relating to scenic compatibility. However, the Application and SAR materials do provide information about visual impacts, a vegetative screening plan, and glare.

Information Provided in the Applicant's SAR

In compliance with KRS 278.708, Section 2 of the SAR summarizes the assessment of compatibility with scenic surroundings. The SAR describes the landscape context of the proposed project as "agricultural land with surrounding low density residential development intermixed with forested land of western Ballard County."¹⁴

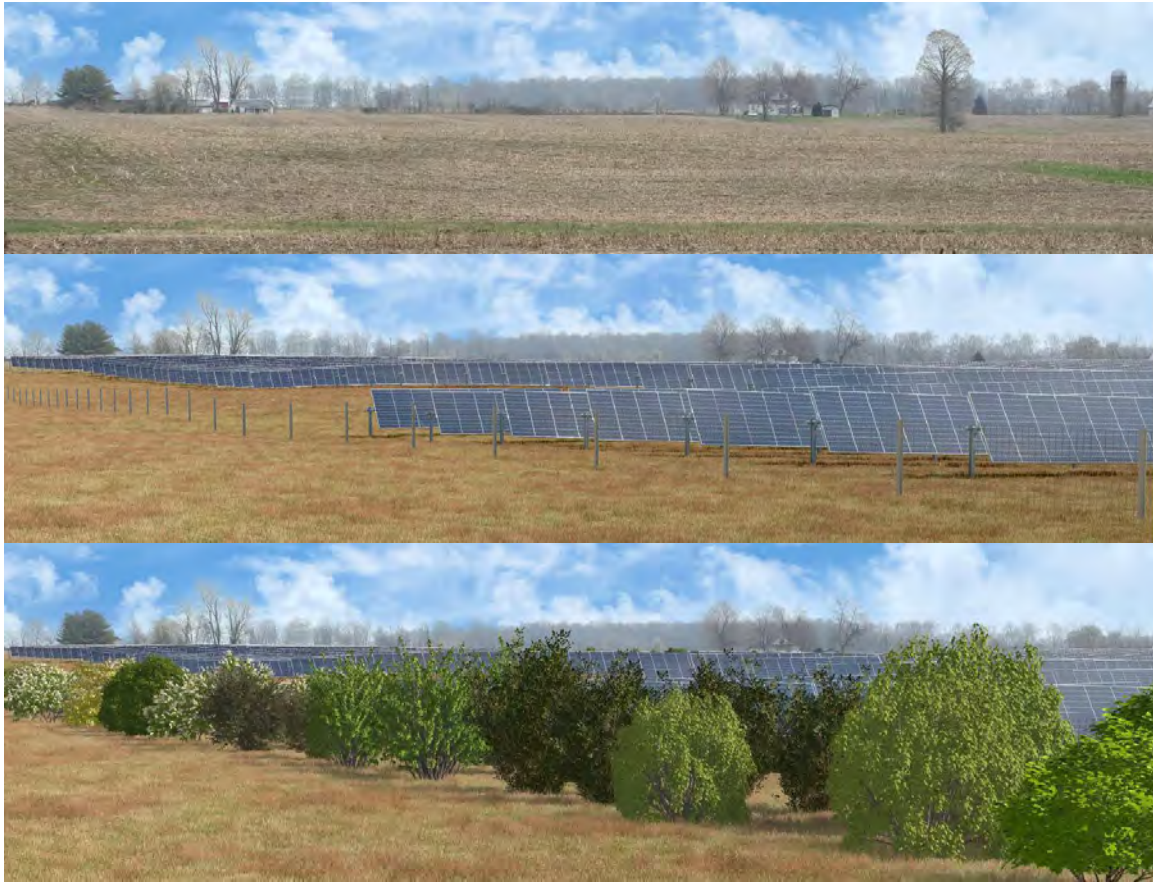
Section 2 cites the findings from the Property Value Impact Report, which concludes that a solar farm is a compatible and harmonious use for rural agricultural/residential areas such as the proposed Song Sparrow Solar project site.

The proposed Song Sparrow Solar project would be a large, commercial solar facility similar in size to several previous solar projects reviewed by BBC and other consultants for the Siting Board. As with those similar projects, much of the project's compatibility with the scenic surroundings will depend on site topography and a strategic and well-executed vegetative screening plan.

In addition to the vegetative screening plan on pages 15 and 16 of Appendix B of the SAR (Preliminary Site Layout), Song Sparrow Solar supplied six visual representations of the project's proposed vegetative screening in Appendix E of the SAR (Visual Impact Illustrations). One of these illustrations is excerpted as Figure C-7, and depicts the current site, the site with installed solar arrays, and the site with proposed vegetative screening after five years' growth.

¹⁴ SAR, page 4.

Figure C-7.
Song Sparrow Solar Visual Impact Illustration, Example 1



The visual impact of the facility components on the landscape, as seen in the illustration, is typical of other proposed solar projects that BBC has reviewed for the Siting Board. The vegetative screen can require a few years to fully establish, but from that point offers substantial mitigation for visual impact.

Mitigation measures for visual impacts of the proposed facility are presented in Section 6 of the SAR:

[...] Existing vegetation between solar arrays and nearby roadways and homes will be left in place to the extent feasible to help minimize visual impacts and screen the Project from nearby homeowners and travelers. Song Sparrow Solar will not remove any existing vegetation except to the extent it must remove such vegetation for the construction and operation of Project components.

[...] To mitigate viewshed impacts, Song Sparrow shall place vegetative buffers in specific locations as shown in the preliminary site plan filed with the Siting Board application. This buffer will consist of two staggered rows of either just shrubs or a combination of shrubs and evergreen trees, approximately 15 feet wide and at least three feet in height at time of planting. The development of Song Sparrow's proposed screening plan included consideration of potentially affected property owners, this is also reflected in the preliminary site plan.

[...] Song Sparrow Solar will carry out visual screening consistent with the plan proposed in its application, SAR, and the maps included, and ensure that the proposed new vegetative buffers are successfully established and developed as expected over time.¹⁵

Song Sparrow Solar also commissioned a ForgeSolar glare analysis for the proposed project, which was included as Appendix G of the SAR. The results of the study were that no glare is expected to occur at any observation points near the proposed project site, including the Barkley Regional Airport, nine road segments adjacent to the project site, and 52 structures adjacent to the project.

¹⁵ SAR, page 9.

Supplemental Investigations, Research, and Analysis

Visual assessment. BBC visited the proposed Song Sparrow Solar project site in November 2023 to review the site and its surroundings. The agricultural and agricultural/residential setting for the Song Sparrow Solar project—in rural Ballard County where population density is low—is similar to many other proposed solar projects that have come before the Siting Board.

The surrounding area is home to a few isolated residences. Existing vegetation along nearby roads will provide good screening in many areas, though in a few locations the applicant will need to establish a new vegetative buffer to minimize viewshed impacts.

Figure C-8.
Southwestern View of Future Substation Area and Existing Transmission Line



Figure C-8 is a photo taken looking southwest towards the proposed location of the project's substation and switchyard. Overhead is the existing transmission line headed southwest from the future substation location.

Figure C-9.
Future Substation Access Road Heading South towards Mosstown Road



Figure C-9 is a photo taken looking southward from the future substation location towards a proposed site access point on Mosstown Road.

Figure C-10.
Future Panel Areas in Distance, Northwest of Proposed Substation



Figure C-10 is a photo taken looking northwest from the future substation location toward a field designated in the preliminary site plan as a location for solar arrays.

Figure C-11.
Gage Road, Looking East Near Central Access Point



Figure C-11 is a photo taken looking eastward along Gage Road, near the central access points of the project footprint.

Figure C-12.
View South on Gage Road with Non-participating Residence



Figure C-12 is a photo taken looking southward from Gage Road towards a nearby non-participating residence.

Figure C-13.
North View of Participating Residence on Gage Road, Future Panels to Right



Figure C-13 is a photo taken looking northward from Gage Road into a nearby participating residence, with solar arrays proposed to be located in the field along the eastern (right) side of the photo.

Figure C-14.
Bondurant Road, Primary Access to East Portions of Site



Figure C-14 is a photo taken from a location along Bondurant Road, with a view of future locations of project solar modules.

Figure C-15.
Bondurant Road, Near Access Point



Figure C-15 is a photo taken from along Bondurant Road close to a proposed site access point.

Figure C-16.
Non-participating Grain Bins, Future Panels to Left



Figure C-16 is a photo taken from further south on Bondurant Road, showing a future solar panel location on the left.

Figure C-17.
Non-participating Residences Well Screened by Trees



Figure C-17 is a photo taken from further south on Bondurant Road, showing existing vegetative screening provided by trees that would obscure the view from nearby non-participating residences.

Figure C-18.
Non-participating Residences on Eastern Edge of Site, Future Panels to Right



Figure C-18 is a photo taken looking westward near the location of a proposed site access point along County Line Road/Kevil-Lovelaceville Road, at the far eastern edge of the proposed site. Future solar modules would be located in the area pictured in the right of the photo.

Conclusions and Recommendations Regarding Compatibility with Scenic Surroundings

The proposed Song Sparrow Solar facility would be located in an area of predominantly agricultural and some low-density residential land. The proposed facility is compatible with the scenic surroundings, provided the applicant follows through with their screening mitigation plan to reduce the visual impact on some of the nearby homes.

Recommended mitigation. BBC recommends the following mitigation measures regarding this portion of the Kentucky statutory requirements (KRS 278.708(3)(b):

- Existing vegetation between the solar arrays and nearby roadways and homes should be left in place to the extent feasible to help minimize visual impacts and screen the project from nearby homeowners and travelers.
- Song Sparrow Solar should execute their proposed screening plan—as presented in pages 15 and 16 of Appendix B of the SAR and depicted in Appendix E of the SAR—and ensure the new vegetative buffers are successfully established and develop as expected over time. Plantings should reach eight feet high within four years. Should the vegetation intended to provide a visual buffer fail to thrive after planting, Song Sparrow Solar should replace the trees to maintain the visual buffer.
- Song Sparrow Solar should cultivate at least two acres of native pollinator-friendly species onsite.
- Song Sparrow Solar should use panels with anti-reflective coating to reduce glare and corresponding visual impacts.
- Song Sparrow Solar should be open to communication with adjacent landowners regarding viewshed impacts and the implementation of strategic additional vegetative screening, if needed.

Potential Changes in Property Values for Adjacent Property Owners

Potential Issues and Standard Assessment Approaches

Development of new power plants can raise issues related to potential changes in property values for nearby property owners. These issues may arise from the widespread perception that a power plant and its ancillary facilities—such as ash disposal landfills, overhead electric transmission lines and electric transformer sites—may be “undesirable land uses” whose impacts are expected to be translated economically into negative effects on property values. Studies also show that impacts may extend for some distance from the site, and possibly beyond the immediately adjacent properties. These findings, however, primarily apply to conventional, fossil fuel-fired plants.

Criteria for evaluating property values effects that reflect the concerns of a broad range of interested parties typically include these aspects of the issue:

- Land use compatibility;
- Findings from other empirical studies; and
- Potential for effects to other than adjacent property owners.

Land use compatibility. State and local governments around the country use standards of land use compatibility to minimize the effect of industrial land uses, like power plants, upon nearby properties. KRS Chapter 278 incorporates setback requirements as its primary standard for buffering the siting of power plants. Land use compatibility, in the strict sense of legal use, and in the general sense of reasonably probable use for a given location and “neighborhood,” are also factors in a general appraiser’s judgment and analysis concerning the “highest and best use” of a property.

Other general issues are also considered to encourage facility siting in compatible settings where negative effects would be minimal to the uses and values of nearby properties. In Wisconsin, for example, the Public Service Commission publishes this general definition of the range of potentially compatible sites for power plants:

“Typically, active or vacant industrial lands may be more compatible and urban residential lands may be less compatible with power plants. Generally, sites that are more compatible with present and planned land uses are more desirable, as are those where the plant would comply with existing land use regulations.”

General land use planning practice offers the option to adopt or negotiate for performance standards for outdoor lighting, noise, vibration, odor, smoke, or particulate matter, and so forth to minimize off-site impacts to adjacent uses.

Findings from empirical studies. Standard real estate appraisals are the most common type of empirical study used to evaluate potential changes to property values. The appraiser generally relies upon an examination of as many actual sales as possible of comparable properties in similar locations and with similar expectations for highest and best use.

Academic studies published in the land and environmental economics literature have used a variety of property value-based analyses to estimate the actual effect of power plants and other “undesirable

land uses” whose impacts may have translated economically into negative effects on adjacent property values. So called “undesirable” uses that have been studied in this fashion over time include nuclear and non-nuclear power generation; hazardous, toxic, and nuclear waste disposal; conventional solid waste disposal; waste incineration; and hazardous industrial facilities.

For example, one study investigated the effect newly opened power plants had on property values in neighborhoods located within five miles of the plant. The study included 60 power plants, several of which were located in Kentucky and the surrounding states. The study found that housing values decreased by 3 to 5 percent between 1990 and 2000 in these neighborhoods compared to neighborhoods located further away from the plant. Another study of 262 undesirable or “noxious” facilities located across the country, including 92 coal, natural gas, or oil-fired power plants (of which two were in the East South Central region that includes Kentucky), illustrates this effect. Power plants were found to significantly decrease property values in the communities where they are located. The literature also includes numerous studies of the effect of electric transmission lines upon property values.

The standard statistical technique for evaluating the potential effects of an environmental amenity (such as beach frontage) or a disamenity (such as proximity to a hazardous waste site) is called hedonic pricing analysis. This technique recognizes that before one can evaluate the impact of an external characteristic on property values, the influences of other important value factors must be isolated and held constant using statistical techniques (e.g., multiple regression analysis). A hedonic pricing model treats the good in question (in this case local property values) as a bundle of amenities (size, aesthetic quality of property, access to local town, etc.) and disamenities (pollution, noise, etc.). Such a model is designed to isolate and quantify the implied effect on overall property value from each amenity or disamenity. Hedonic pricing models have been used to evaluate the impacts of many different factors contributing to the value of a piece of property. Examples include examining the effect of the proximity to hog farms (Palmquist, Roka and Vukina, 1997), beaches (Pompe and Rinehart, 1995), airports, and electric power plants (Blomquist, 1973).

Hedonic models are statistically estimated using multiple regression analysis. However, hedonic studies are complex and require extensive statistical training and large amounts of data. Moreover, not all factors that influence a home’s selling price can be measured, and housing markets vary greatly from one region to another.

Potential for more distant off-site effects. Most analyses of property value impacts are local in scope. However, the effect of power plants and other facilities on property values has been shown to extend well beyond the site. This has been shown in at least one study, where negative effects of a small power plant located within the city of Winnetka, Illinois, were significant out to a distance of 11,500 feet, or more than two miles. As noted earlier, these findings also primarily apply to conventional, fossil-fuel fired plants.

Information Provided in the Applicant's SAR

Song Sparrow Solar engaged Kirkland Appraisals, LLC—which has conducted property value impact studies for several previous solar applications to the Siting Board—to examine the proposed project’s potential impact on property values.

Appendix A of the SAR (Property Value Impact Report) provides a comparative study of property values in proximity to solar facilities in Kentucky and in other states across the US, using a matched pairs design. The study draws its conclusions regarding the impacts of the proposed facility on adjacent property values based on market analysis of value impacts from numerous other solar facilities.

Appendix A states that the closest home to the proposed project will be 250 feet from the nearest solar panel and that the average distance will be 770 feet. Additionally, surrounding residential density is low and most of the surrounding acreage is agricultural or agricultural/residential. In a summary statement, Kirkland Appraisals concludes that there will be no property value impacts from the proposed Song Sparrow Solar facility on adjoining properties and that the proposed facility will be in harmony with the area.

The matched pair analysis shows no impact on home values due to abutting or adjoining a solar farm at the distances proposed for Song Sparrow LLC with a landscaped buffer. Similarly, paired sale data has shown no impact to abutting or adjacent vacant residential or agricultural land where the solar farm is properly screened and buffered such as what is offered at Song Sparrow LLC. The criteria that typically correlates with downward adjustments on property values such as noise, odor, and traffic all indicate that a solar farm is a compatible use for rural/residential transition areas and that it would function in a harmonious manner with this area.¹⁶

Supplemental Investigations, Research, and Analysis

BBC's investigation of additional research. To obtain further perspective on this issue, BBC reviewed recent studies regarding solar facility effects on nearby property values. As commercial scale solar facilities become more prevalent in the central and eastern portions of the United States, the research and information concerning potential impacts on property values is also continuing to evolve.

In 2018, a study of the potential effects of commercial solar farms on nearby property values was conducted by the LBJ School of Public Affairs at the University of Texas. That study contacted public sector property assessors in 430 counties across the United States that had at least one utility-scale PV solar facility in place. Thirty-seven residential property assessors agreed to fill out the on-line survey asking their opinion on the likelihood that a solar farm would impact nearby residential property values. Among the findings of that study were that:

- “The majority of responses suggested either no impact (66 percent of all estimates) on home prices, or a positive impact (11 percent of all estimates), as a result of proximity to solar installations.”
- “However, some respondents did estimate a negative impact on home prices associated with solar installations.” In the 23 percent of cases where negative impacts on value were estimated, the negative effect was estimated to increase with closer proximity and larger scale solar installations. Respondents who had actual experience in assessing homes near solar installations estimated a 3 percent decline in value for homes within 100 feet of a 20 MW solar installations and a 5 percent decline in value within 100 feet of a 102 MW solar facility.

¹⁶ SAR Appendix A, page 1.

- “The results also suggest that experience assessing near a solar installation is associated with a much less negative estimate of impact.”¹⁷

A 2020 study published by economists from the University of Rhode Island using the hedonic pricing analysis approach described earlier identified statistically significant negative impacts on home prices due to proximity to commercial solar sites in Rhode Island and Massachusetts —under certain conditions. Of the studies BBC has reviewed, this study appears to be the most robust in the sense that it covers a wide and diverse geographic area, observes hundreds of thousands of home sales transactions over a long period of time pre- and post-solar farm development, and has results that are robust to many different model specifications.

The study, based on “over 400,000 transactions within three miles of a solar site”, found that residential property values in suburban areas within one mile of a solar facility declined by 1.7 percent (on average) compared to surrounding properties, with larger effects on home values within 0.1 miles (500 feet) of a solar site (-7.0 percent). However, solar sites in industrial or rural areas¹⁸ had no statistically significant impact on home prices.¹⁹

Another recent contribution to the research on this topic is the 2019 PhD Dissertation of Dr. Nino Abashidze, an economist at the University of Georgia. Dr. Abashidze used the hedonic pricing model approach and econometric regression analysis to evaluate the effects from proximity to solar farms on both agricultural land values and residential property values in North Carolina. Dr. Abashidze found that proximity to solar farms had no discernable effect on *agricultural* land values (properties 30 acres or larger in size). However, Dr. Abashidze did find statistically significant, negative impacts on *residential* property values. Dr. Abashidze’s econometric analysis found that (on average) homes within one mile of solar facilities experienced an estimated nine percent decrease in value, while homes closer to the facilities (within one-half mile) experienced an estimated 12 percent decrease in value. It is also important to note, however, that most of the residential properties in Dr. Abashidze’s analysis were located on relatively small lots (average lot size of 0.9 acres, sample standard deviation in lot size of 1.6 acres) and that the study was based on a relatively small number of home sales transactions compared to the University of Rhode Island study.²⁰

Most recently, a team from the Lawrence Berkeley National Lab and the University of Connecticut examined the impact of large-scale non-rooftop photovoltaic projects on residential home prices in California, Massachusetts, Minnesota, North Carolina, New Jersey, and Connecticut.²¹ This 2023 study

¹⁷ *An Exploration of Property-Value Impacts Near Utility-Scale Solar Installations*. Project Director: Dr. Varun Rai. Policy Research Project (PRP), LBJ School of Public Affairs, The University of Texas at Austin, May 2018.

¹⁸ In the study by Gaur and Lang cited below, “rural” is defined as areas with municipal population density of less than 850 people per square mile. The proposed Song Sparrow Solar facility would sit in unincorporated Ballard County, and the surrounding area has a low population density.

¹⁹ *Property Value Impacts of Commercial-Scale Solar Energy in Massachusetts and Rhode Island*. Vasunda Gaur and Cory Lang, University of Rhode Island. September 29, 2020. Available at https://works.bepress.com/cory_lang/33/

²⁰ Abashidze, Nino. *Essays on Economic and Health Effects of Land Use Externalities*. (Under the direction of Dr. Harrison Fell). Page 71. University of Georgia, 2019.

²¹ *Shedding light on large-scale solar impacts: An analysis of property values and proximity to photovoltaics across six U.S. states*. Elmallah, S., Hoen, B., Fujita, K.S., Robson, D., and Brunner, E; Energy Policy 175 (2023) 113425, January 2023. Available at <https://www.sciencedirect.com/science/article/pii/S0301421523000101>

analyzed data on 1,630 large solar facilities combined with data from the USGS National Land Cover Database (to determine land use type); urban-rural classification data from the US Census Bureau; and CoreLogic home sales data for more than 1.8 million transactions. Overall findings were that homes within half a mile of a large-scale solar project see an average price reduction of 1.5 percent compared to homes more than two miles away from the facility; that there was no statistically significant impact beyond one mile; and that property value impact was only measurable for certain states (Minnesota, North Carolina, New Jersey), for rural homes, and for larger projects located on agricultural land.

The results of this study indicate that, in a rural agricultural context, there is potential for a slight negative impact on property values for homes within one mile of a large solar project. However, the authors note in their discussion the wide variety among the 1,630 solar projects included in the study and that policy practices to mitigate potential negative impacts of solar development include vegetative screening and land use co-location (e.g., integrating solar development and agricultural production).

Conclusions and Recommendations

With the proliferation of commercial solar facilities across the U.S., there is an increasing focus on the potential effects on residential property values from proximity to such facilities.

Most studies sponsored by solar developers have analyzed this question using sales price comparisons of homes near solar facilities to comparable homes that are not proximate to a solar facility, using techniques similar to the approach used in appraising homes. These studies identify similar homes (except for their proximity to solar facilities) and use appraisal techniques, which may be more subjective than the statistical techniques used in econometric studies, to adjust for differences in age, square footage, and other home characteristics. BBC has reviewed several of these studies and can confirm that they have consistently found no impact on property values from proximity to solar installations.

To date, relatively few studies have been conducted by academic researchers or other “third-party” analysts, but the body of research is slowly growing. Using different methods, and different data sources, recent studies by professors at the LBJ School of Public Affairs (University of Texas), the University of Rhode Island, and the Lawrence Berkeley National Laboratory have found that there could be small, negative impacts on property values from proximity to commercial solar facilities. In some studies, those negative effects appear to be more likely in suburban settings, rather than rural settings. Another recent study by a University of Georgia economist of impacts to property values from solar farms in North Carolina – using a hedonic pricing model and econometric approach similar to the University of Rhode Island study – found that solar facilities did not impact nearby *agricultural land* values but did reduce nearby *residential* values (within one mile) by nine to 12 percent, on average. And in the case of the recent 2023 study of property value impacts across six U.S. states, impacts were found in only three states and were limited to rural homes in agricultural settings, with no consideration for the presence or absence of a vegetative screen.

Overall, research and literature on this topic continues to grow and has not reached a consensus on any universal relationship between home values and proximity to nearby solar facilities. Two econometric property value studies indicate that the likelihood of adverse impacts on property values from nearby solar facilities increases with proximity to the solar site and with residential

density, and decreases in more rural, agricultural settings. Another study indicates that the land use context and geographic location (e.g., state) of the solar project are essential factors in projecting any possible impacts. The duration of any adverse effects on nearby residential property values has yet to be established.

As shown earlier in Figure C-3, about 95 percent of the land use adjacent to the proposed Song Sparrow Solar facility is considered to be either agricultural or large lot “agri/residential,” while about 5 percent of the adjacent land is considered residential. These properties may be at risk of a reduction in value, though the findings from the studies discussed and cited above are not consistent in determining factors that influence value impacts.

Acknowledging that the project’s proposed vegetative buffers will help obscure the site’s physical elements from nearby residences and roads, we conclude that the proposed solar facility is unlikely to have measurable adverse impacts on most adjacent properties, but might affect the values of some smaller lot, adjacent residential properties – particularly those with homes located in closest proximity to nearby solar panels.

Recommended mitigation. It is important to note that while some of the academic studies discussed above have documented negative impacts to home values, the cause of the impacts has not been well researched. The studies hypothesize that solar farms may act as a visual disamenity, which suggests there is potential to mitigate negative impacts through actions designed to buffer the view of solar facilities from nearby homes. Consequently, BBC believes that Song Sparrow Solar’s vegetative screening plans may help to minimize any adverse impact on nearby residential property values and recommends the following mitigation.

- Song Sparrow Solar’s viewshed screening plan should incorporate particular efforts to reduce impacts on the views from the residential properties that are closest to the proposed project.

Expected Noise from Construction and Operation

This section evaluates the studies and conclusions discussed in the SAR concerning peak and average noise levels associated with construction and operation of the proposed Song Sparrow Solar facility. This component of the SAR is identified in KRS 278.708(3)(d).

Potential Issues and Standard Assessment Approaches

Various governmental agencies throughout the country employ noise assessment methodologies based on professionally accepted techniques. In evaluating the construction and operational stages of a project, these techniques are fundamentally consistent in that they seek to estimate the potential contribution to ambient noise levels at the site in terms of sensitive receptors. Generally, the assessment methodologies are meant to measure the increase in noise levels over the ambient conditions at residential and non-residential sensitive receptors.

A standard noise impact assessment focuses on several key factors:

- Identification of sensitive receptor sites;
- Existing local ambient noise levels;
- Estimated construction or operational noise intensities;
- Distances between noise sources and sensitive receptors;
- Time of day during which peak noises are anticipated;
- Noise created by transportation features such as conveyors, trucks, and rail lines; and
- Calculation of the cumulative effect of the new noise sources when combined with the existing ambient noise level, recognizing that new noise sources contribute to the ambient noise level, but not in an additive way.

Information Provided in the Applicant's SAR

Noise levels generated by facility construction and operation are addressed in Section 4 of the SAR (Anticipated Noise Levels) and in the Acoustic Assessment, conducted by Stantec, which is included as Appendix D of the SAR. During project construction—including site preparation, excavation, and solar equipment installation—impacts on nearby noise-sensitive receptors (NSRs) will be generated by construction equipment and vehicles, particularly during pile driving for the solar panel racking. Operational sound levels are expected to be modest and non-disruptive for the operating lifetime of the project.

Noise generated during construction. Section 4 of the SAR summarizes key findings from the Acoustic Assessment (Appendix D). During the construction phase, Song Sparrow estimated that the nearest sensitive receptor (256 feet away from the closest panel) would experience noise levels of 64

to 70 dBA due to construction activity at the project site.²² Construction activity is expected to occur between 6 AM and 7 PM or dusk, if that occurs later than 7 PM.

The Acoustic Assessment notes that typical equipment to be used in the construction of the Song Sparrow facility includes vehicles and machinery such as backhoes, bulldozers, excavators, haul trucks, and impact pile drivers; this is similar to all other solar facility applications that BBC has reviewed. The Acoustic Assessment references standard sound emissions levels for construction vehicles and machinery (as published by the Federal Highway Administration Roadway), with the exception of one notable difference regarding their estimate for noise generated by the pile drivers that will install the posts for the solar panel racking:

Noise levels from construction equipment will vary by type, age of equipment, and overall condition. Typical construction equipment sound emission levels from the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) database are presented in Table 2. These sound levels are representative of typical infrastructure construction equipment and were used for this assessment; however, the types of pile drivers used for solar array post installation generate less noise than pile drivers used for heavy infrastructure construction. Pile driving was modeled assuming an L_{max} sound level of 84 dBA at 50 feet based on typical impact pile drivers used for solar energy projects. Sound levels associated with the types of equipment expected to be used will vary from approximately 74 to 85 dBA at 50 feet.²³

In the Siting Board’s First Request for Information, BBC requested Song Sparrow Solar provide documentation or publications to substantiate the claim that pile drivers used for solar energy projects are quieter than typical impact pile drivers.

Based on the assumptions and modeling in the Acoustic Assessment, the applicant provided the following summary of estimated noise levels at the nearest sensitive receptor during the construction phase of the project.

Figure C-19.
Song Sparrow Solar Projected Construction Noise Levels at Nearest Receptor

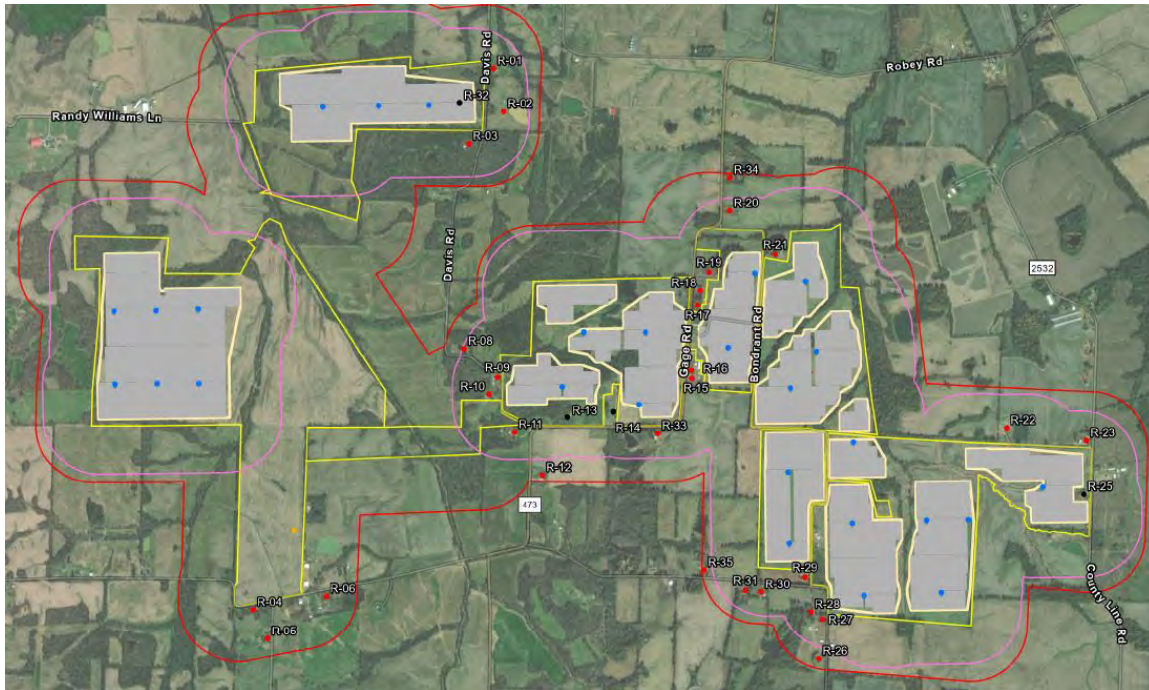
| Condition | Distance to Solar Array (ft) | Estimated L _{max} Sound Level (dBA) | Estimated L _{eq} Sound Level (dBA) |
|---------------------|------------------------------|--|---|
| With pile driver | 256 | 70 | 69 |
| Without pile driver | | 66 | 64 |

²² SAR, page 6.

²³ SAR Appendix D, page 5.

In addition, Song Sparrow Solar provided a noise levels contour map showing the areas within and surrounding the project where noise levels will reach 55 dBA (designated with a pink outline in Figure C-20) during parts of the construction phase. A noise level of 55 dBA is comparable to the ambient noise level of a suburban area during the day.

Figure C-20.
Song Sparrow Solar 55 dBA Noise Level Contour Map



From the nearest noise-sensitive receptors to the proposed Song Sparrow Solar project, the applicant's projected maximum construction noise levels were lower than BBC has observed for several other applications submitted to the Siting Board. This level of noise emission is unlikely to cause excessive disturbance. However, that conclusion was contingent on the applicant's justification of the lower noise emissions from pile drivers used during the construction of solar facilities, which BBC requested more information about in the Siting Board's First and Second Requests for Information from Song Sparrow Solar.

Noise generated during operation. During normal facility operation, select solar equipment will emit noise – specifically, the project substation transformer and the project inverters. In Section 4 of the SAR, Song Sparrow Solar states that the highest expected daytime sound level at the nearest sensitive receptor is 46 dBA; sound generated at nighttime will be much lower as the facility components will be in standby and will not resume electricity generation until the sun rises.

The Acoustic Assessment, conducted with the Cadna-A® sound model, provides a summary of estimated operational sound levels as experienced at nearby sensitive receptors (Figure C-21).

Figure C-21.
Song Sparrow Solar Operational Sound Levels at Nearby Receptors

| Expected Sound Level (Leq) | Number of Receptors |
|----------------------------|---------------------|
| 35 dBA or less | 6 |
| 35 to 40 dBA | 15 |
| 40 to 45 dBA | 7 |
| Greater than 45 dBA | 1 |

The Acoustic Assessment Report summarizes the impacts of operational noise emissions as follows:

The results of the operational sound modeling demonstrate that the highest expected daytime sound level at nearby sensitive receptors is 46 dBA at receptor R-21, which is the in the northeast portion of the study area. Nighttime operation will result in lower sound emissions, as power will not be generated and therefore the solar inverters and substation transformer will be operating in stand-by mode. A sound level of 35 dBA is comparable to a quiet suburban nighttime environment and 50 dBA is comparable to outdoor daytime sound levels in rural to quiet urban environments [...]

The nearest sensitive receptor to solar arrays with tracking motors (R-09) is expected to be approximately 256 feet away from the edge of the nearest solar array. The sound level from the tracking system is expected to be less than 32 dBA at 256 feet. During the approximately four minutes per hour that tracker motors are operating, the sound generated by the motors is likely to be masked by existing daytime ambient sound sources and inaudible at this distance.²⁴

Supplemental Investigations, Research, and Analysis

Pile driving noise estimates for KY solar projects. BBC compared the projected construction and operational noise levels from the Song Sparrow Solar project to previous estimates for other Kentucky solar projects we have reviewed for the Siting Board over the past four years.²⁵ We found that the noise level estimates in the Song Sparrow Solar Acoustic Assessment for pile driving activity (84 dBA at 50 feet) are substantially lower than noise level projections from these other proposed solar facilities. Figure C-22 summarizes the pile driving noise levels estimated in several proposed solar facility applications.

²⁴ SAR Appendix D, page 9.

²⁵ In addition to the proposed Song Sparrow Solar project, BBC has also reviewed the proposed Turkey Creek, Unbridled, Ashwood, Flat Run, Martin County, Green River, Rhudes Creek, Russellville, Telesto, and Pine Grove solar facilities.

**Figure C-22.
Estimated Noise Levels from Pile Driving, KY Solar
Project Proposals (dBA)**

Note: *In the applicant’s response to the Siting Board’s Second Request for Information, Song Sparrow Solar revised their estimate of the pile driver noise level to 100 dBA at 50 feet. The revised data and implications for noise analysis are discussed on the following page of this report.

| | Maximum estimated noise level at 50 ft (dBA) |
|----------------------------|--|
| <i>Song Sparrow Solar</i> | |
| Pile driver | 84.0* |
| <i>Pine Grove Solar</i> | |
| Pile driver | 101.0 |
| <i>Telesto Energy</i> | |
| Pile driver (impact) | 90.0 |
| <i>Russellville Solar</i> | |
| Pile driver (impact) | 102.0 |
| <i>Rhudes Creek Solar</i> | |
| Pile driver & other equip. | 90.0 |
| <i>Green River Solar</i> | |
| Pile driver | 94.9 |
| <i>Martin County Solar</i> | |
| Pile driver (impact) | 101.0 |
| Pile driver (sonic) | 95.0 |
| <i>Flat Run Solar</i> | |
| Pile driver | 100.6 |
| <i>Ashwood Solar</i> | |
| Pile driver (impact) | 101.0 |
| Pile driver (sonic) | 95.0 |
| <i>Unbridled Solar</i> | |
| Pile driver (impact) | 101.0 |
| <i>Turkey Creek Solar</i> | |
| Pile driver (impact) | 101.0 |
| Pile driver (sonic) | 96.0 |

In the Siting Board’s First Request for Information to the applicant, BBC requested documentation substantiating the pile driver noise level estimate. In their response, Song Sparrow Solar stated:

The source of the estimate of 84 dBA at 50 feet for pile driving is based on manufacturer information on the Vermeer PD10 pile driver that was used for noise modeling, and while the exact construction equipment has not yet been selected, this model is typical of the type of pile drivers used for solar post panel installation.²⁶

In the Second RFI, BBC requested a copy of the manufacturer specification sheet for the Vermeer PD10 pile driver. In their response, Song Sparrow Solar stated:

The Vermeer PD10 pile driver noise level of 84 dBA sound pressure level (SPL) at 50-feet was based on specifications in Vermeer’s Operator’s and Maintenance Manual dated 2012. In the process of confirming this information, Vermeer provided an updated manual dated 2021, which provides equipment sound power levels (PWL) for two Vermeer PD10 engine options; one with a PWL of 123 dBA and a second with a PWL of 132 dBA.

Based on this new information, the noise model was updated using the PWL of 132 dBA to demonstrate the results of the louder equipment (Table 3). With this understanding, the SPL at a 50-foot distance

²⁶ Song Sparrow Solar Responses to the First RFI, Siting Board 1-29.

would be 32 dBA lower than the PWL, resulting in the pile driver generating a sound level of 100 dBA SPL at 50-feet during construction.²⁷

Based on the updated noise generation level for the pile driver, the applicant provided a revised table of estimated sound levels at the nearest sensitive receptor. This new information (which can be compared to the original version from the SAR shown earlier on page 35 of this section) is excerpted as Figure C-23.

Figure C-23.
Updated Song Sparrow Solar Projected Construction Noise Levels at Nearest Receptor

| Condition | Distance to Solar Array (ft) | Estimated L _{max} Sound Level (dBA) | Estimated L _{eq} Sound Level (dBA) |
|---------------------|------------------------------|--|---|
| With pile driver | 256 | 86 | 84 |
| Without pile driver | | 66 | 64 |

Commonly accepted noise level exposure limits. BBC researched noise level exposure limits advocated by public health agencies such as the CDC and the National Institute for Occupational Safety and Health (NIOSH). NIOSH has a recommended exposure limit of 85 dBA (note that decibels are measured on a logarithmic scale).²⁸ Figure C-24 identifies the time that it takes for a person to reach their full daily noise dose based on differing levels of noise exposure.

Figure C-24.
Time to Reach 100 Percent of Daily Noise Dose

Source: Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health, Guidance and Regulations

| Time to reach 100% noise dose | Exposure level (dBA) |
|-------------------------------|----------------------|
| 8 hours | 85 |
| 4 hours | 88 |
| 2 hours | 91 |
| 1 hour | 94 |
| 30 minutes | 97 |
| 15 minutes | 100 |

At 86 dBA—the reported maximum noise level experienced during pile driving at the nearest receptor in Song Sparrow Solar’s updated acoustic assessment—the 100% daily noise dose would be reached within approximately 8 hours. This level of noise is not hazardous but warrants management to ensure that no noise sensitive receptor experiences continuous exposure to pile driver noise for eight hours in a single day. Note that this finding is contingent on the accuracy of the updated sound generation level for the pile drivers used during construction of the proposed project.

Construction noise mitigation methods. In the Siting Board’s First RFI, the applicant was asked to describe any mitigation measures that would be used for construction noise. Song Sparrow Solar

²⁷ Song Sparrow Solar Responses to the Second RFI, Siting Board 2-4.

²⁸ Noise and Hearing Loss Prevention. The National Institute for Occupational Safety and Health. <https://www.cdc.gov/niosh/topics/noise/default.html>

responded that significant adverse noise impacts are not anticipated during the construction of the proposed project:

Based on previous experience constructing solar projects, Song Sparrow believes that noise concerns resulting from pile driving activities are most effectively managed through limiting pile driving activities within a certain radius to certain hours during the day to avoid potentially impacting nearby receptors. To this end, Song Sparrow proposes to limit pile driving activities within 1,000 feet of potentially impacted receptors to 9AM-5PM Monday through Friday. Previous experience has shown this to be an effective method, and Song Sparrow believes that these measures will adequately address possible noise concerns.²⁹

This response from the applicant regarding noise mitigation measures is similar to responses from other solar facility applicants whose applications BBC has reviewed. While the mobile nature of pile driving activity subjects nearby noise sensitive receptors to noise levels that are temporary and intermittent, the maximum noise levels from pile driving have the potential to be disruptive.

Conclusions and Recommendations

During construction, noise from the pile drivers will have the most substantial impact on the nearest noise receptors. However, maximum noise levels at the nearest receptors are not projected to reach a hazardous level, and the activity of pile driving is intermittent and unlikely to disturb any one receptor for an extended period.

During normal operation of the proposed Song Sparrow Solar facility, noise levels from inverters and the substation transformer are unlikely to be disruptive to local residents.

The area in which the proposed project site sits is a working agricultural and rural residential landscape bordered by several roadways. It is unlikely that the noise levels at the site during facility operation will be incongruous with the existing noise profile of the area.

Recommended mitigation. Song Sparrow Solar should clarify precisely where pile driving will occur and mitigate hazardous or annoying noise as necessary, depending on the proximity to nearby residences. Further:

- After finalizing equipment and before commencing construction, Song Sparrow Solar should confirm with the Siting Board the pile driver selected for use on site during construction and provide the manufacturer's documentation to support the estimated sound power level of that equipment. Use of a pile driver with higher maximum noise generation than cited by Song Sparrow Solar in its Application, SAR, or RFI responses may necessitate a new Acoustic Assessment.
- Song Sparrow Solar should conduct construction activity only between 6 AM and 7 PM, Monday through Sunday, and pile driving only between 9 AM and 5 PM, Monday through Friday.
- Song Sparrow Solar should prioritize vegetative screen planting before commencing construction activity. This will not only mitigate noise but also allow for the growth of the tree

²⁹ Song Sparrow Solar Responses to the First RFI, Siting Board 1-32.

screens during the construction phase, providing an established visual screen to protect the viewshed before the facility begins operation.

- Song Sparrow Solar should notify residents and businesses within 2,400 feet of the project boundary about the construction plan, the noise potential, and mitigation plans one month prior to the start of construction.
- If pile driving activity occurs within 1,500 feet of a noise sensitive receptor (e.g., residence), Song Sparrow Solar should implement a construction method that will suppress the noise generated during the pile driving process. In prior reviews of proposed solar facilities for the Siting Board, mitigation methods have been identified as the semi-tractor and canvas method, sound blankets on fencing surrounding the solar site, or other comparable methods.
- During construction, Song Sparrow Solar should locate stationary noise-generating equipment, such as air compressors or portable power generators, as far as practicable from neighboring residences.
- Song Sparrow Solar should implement a Customer Resolution Program to address any complaints from surrounding landowners. Song Sparrow Solar should submit an annual status report on the Customer Resolution Program to the Siting Board, identifying any complaints, the steps taken to resolve those complaints, and whether the complaint was resolved to the satisfaction of the affected landowner.

Impacts on Transportation

This portion of the SAR review examines the impacts of the proposed Song Sparrow Solar facility on road transportation. This also includes traffic effects, such as congestion, safety, fugitive dust, and degradation of the transportation infrastructure. This component of the SAR corresponds to KRS 278.708(3)(e).

Potential Issues and Standard Assessment Approaches

Development of a new power plant can raise a variety of potential traffic related issues. These issues may arise from the movement of construction workers and heavy and oversized loads during the construction process and added congestion during both construction and subsequent operations.

Standard components of the evaluation of traffic-related impacts include:

1. Identification of access methods, and a description and visual portrayal of primary access routes to the site during construction and during operation.
2. Description of baseline traffic conditions: existing traffic counts, road capacity and level of service and any major existing constraints (e.g., bridge weight limitations, etc.).
3. Identification of any special transportation requirements during construction (e.g., the need to reinforce or "ramp over" existing bridges, detours, temporary closures, etc.).
4. Projection of traffic volumes related to construction and operation.
5. Determination of whether the additional traffic, during construction and operation, would lead to congestion, changes in the level of service of the existing road network or additional road maintenance costs.

Information Provided in the Applicant's SAR

Section 5 of the SAR (Effect on Road and Railways) and Appendix F of the SAR (Traffic Impact Study by Stantec) provide information regarding anticipated impacts on transportation at and around the proposed project site during construction and operation.

As discussed in earlier sections of this report, several roadways are in proximity of the proposed Song Sparrow Solar site, which has a non-contiguous footprint comprising fenced sections of solar arrays. Roadways near to the proposed site include five with entrances to the project site—Mosstown Road, Davis Road, KY-473/Gage Road, Bondurant Road, and KY-2532/County Line Road/Kevil-Lovelaceville Road—as well as KY-358/Hinkelville Road, Steel Road, and Buchanan Lane.

Stantec, on behalf of the applicant, reviewed available traffic volume data from the Kentucky Transportation Cabinet (KYTC) for seven count stations located along roadways adjacent to the proposed project site. The KYTC count stations are located along Hinkelville, Gage, Kevil-Lovelaceville, and Mosstown/Buchanan Roads, as well as along two other roads that are near the project boundary to the north and south: Robey Road and KY-286/Wickliffe Road.

The Traffic Impact Study states that, during the construction phase of the project, traffic flow will be impacted by the commute of construction workers to and from the site (assumed to occur during

peak AM and PM hours) as well as the frequent arrival and departure of large trucks necessary for equipment delivery. Modeling the projected peak hour two-lane traffic during the project's construction phase (and assuming that existing peak traffic volumes would increase by 50 percent), the results in Appendix F state that the impacted roadways would maintain a high level of service – LOS A for six locations and LOS B for one location.³⁰

The Traffic Impact Study projects that up to three employees would be present at the project site for up to 40 hours per week during the operational lifetime of the project, and that this level of traffic to the project site would have no measurable impact on traffic flow on nearby roadways.³¹

Most workers and delivery vehicles are likely to access the site by exiting either US-60 (north of project footprint) or KY-286 (south of project footprint) onto one of the aforementioned local roads serving the project site. While Song Sparrow Solar projects that the roadways will maintain a high LOS, the projected volume of construction traffic described above will be a noticeable increase from the limited number of vehicles currently using these secondary roads.

In the First RFI, BBC requested more information about the estimated number and class of delivery trucks anticipated on site and the load weight of the substation transformer delivery, as well as documentation of any correspondence between Song Sparrow Solar and the KYTC District Engineer or the Ballard County Road Department.

Supplemental Investigations, Research, and Analysis

Vehicle load weights and compatibility with local roadways. BBC conducted further research on the weight limits and vehicle classes permitted to travel on specific roadways in Kentucky. The primary roadways serving the project area are rated for weight limits of 80,000 pounds, 44,000 pounds, or 36,000 pounds (KYTC Truck Weight Classification). Any vehicle loads exceeding these limits could subject the roadway and shoulder to damage or degradation. The smaller, local roads transited by delivery trucks may be more susceptible to degradation from heavy loads.

Regarding potential damage to local roadways, the most concerning delivery to site would be that of the proposed project's substation transformer. A 2012 publication on Large Power Transformers (LPTs) by the U.S. Department of Energy states:

Transporting an LPT is challenging – its large dimensions and heavy weight pose unique requirements to ensure safe and efficient transportation... When an LPT is transported on the road, it requires obtaining special permits and routes from the department of transportation of each state on the route of the LPT being transported. According to an industry source, obtaining these special permits can require an inspection of various infrastructure (e.g., bridges), which can add delay. In addition, transporting LPTs on the road can require temporary road closures due to traffic issues, as well as a number of crew and police officers to coordinate logistics and redirect traffic.

BBC contacted the Kentucky Transportation Cabinet's Department of Overweight/Over-dimensional Vehicles regarding their permitting process. BBC then utilized the KYTC Route Evaluation online tool

³⁰ SAR Appendix F, page 8.

³¹ SAR Appendix F, page 9.

to ascertain potential route restrictions for oversized deliveries. The BBC team input information for several sample configurations into the KYTC Route Evaluation tool and found that there could be problems with load clearances, particularly during delivery of the power transformer, dependent on the exact configuration of the delivery load.

Any local roads that are not state routes are not covered by KYTC permits and must instead be permitted through the appropriate County entity. However, overall BBC finds that the limitations and challenges of the primary roadways adjacent to the proposed Song Sparrow Solar project site are comparable with those of several other recent solar facility applications reviewed and approved by the Siting Board over the past few years.

In the First RFI, BBC requested further information from the applicant regarding planning or correspondence between Song Sparrow Solar and the KYTC District Engineer or the Ballard County Road Department. The applicant responded that no formal communication had yet occurred with either entity, but that they expect to begin those conversations in late 2023 or early 2024.³²

In a separate response, Song Sparrow Solar updated their projections to say that three to five full-time jobs were expected during the operational lifetime of the project.³³ BBC does not expect that this would have any material impact on the traffic or level of service on area roads during project operation.

Delivery vehicles. Responding to the First RFI, Song Sparrow Solar stated that many specific details about the number of vehicles traveling to site during construction are not yet known. Commuter vehicles, equipment delivery vehicles, and heavy and light duty trucks will arrive at the project site daily. The applicant expects that the substation transformer will weigh 200,000 to 250,000 lbs. and will be delivered on a Class 8 truck.³⁴

Regarding fugitive dust—such as that generated by frequent traffic of heavy or light duty trucks—Song Sparrow Solar states that they will follow best management practices including proper construction equipment maintenance and the use of water trucks.³⁵

BBC expects that advance planning between Song Sparrow Solar and the KYTC (as well as the Ballard County Road Department, as applicable) can mitigate problems resulting from overweight and over-dimensional load delivery.

Conclusions and Recommendations

During construction, daily deliveries on semi-truck trailers and workforce commuter traffic will substantially increase the amount of traffic on primary roadways near the project site. However, all impacted roadways are projected to maintain a high level of service (LOS).

³² Song Sparrow Solar Responses to the First RFI, Siting Board 1-35 and 1-36.

³³ Song Sparrow Solar Responses to the First RFI, Siting Board 1-27.

³⁴ Song Sparrow Solar Responses to the First RFI, Siting Board 1-33.

³⁵ SAR, page 10.

Delivery of the project's substation transformer will likely present some challenges given the load ratings of surrounding roadways, but, in general, challenges can be overcome with careful advance planning with the KYTC and Ballard County Road Department and by utilizing an appropriate traffic management plan.

Recommended mitigation. BBC recommends the following measures to mitigate potential impacts on traffic and the local road network:

- Song Sparrow Solar should submit a final construction schedule, including revised estimates of on-site workers and commuter vehicle traffic, to the Siting Board prior to commencement of construction.
- Song Sparrow Solar should develop and implement a traffic management plan for the construction phase of the project to minimize impacts on traffic flow and keep traffic safe. As part of this plan, Song Sparrow Solar should implement ridesharing between construction workers; use appropriate traffic controls; or allow flexible working hours outside of peak hours to minimize any potential delays during AM and PM peak hours.
- Song Sparrow Solar and its construction contractors should comply with all laws and regulations regarding the use of roadways.
- Song Sparrow Solar should obtain permits from the KYTC and local road authorities as needed for overweight and overdimensional vehicle transport to the site and comply with all permit requirements, coordinating with the KYTC Permits Engineer and the Ballard County Road Department as needed.
- Song Sparrow Solar should determine whether shoulder stabilization and/or road widening is necessary on any local route to accommodate deliveries to the site. Song Sparrow Solar should coordinate with the Ballard County Road Department regarding any necessary improvements.
- Song Sparrow Solar should commit to rectify any damage to public roads by fixing or fully compensating the appropriate transportation authorities for any damage or degradation to the existing road network that it causes or to which it materially contributes.
- Song Sparrow Solar should properly maintain construction equipment and follow best management practices related to fugitive dust throughout the construction process. Dust impacts should be kept to a minimal level.

Other Issues

While not specifically required under the statutes authorizing SAR reviews by consultants for the Siting Board (KRS 278.708), it has become customary to consider additional issues in these reviews, including economic impacts and project decommissioning. This final portion of this section of BBC's report includes these aspects.

Economic Impacts

Current economic conditions and trends. As discussed previously, the proposed Song Sparrow Solar facility would be located in Ballard County, which sits in the westernmost part of Kentucky and shares borders with both Illinois and Missouri. The County is one of the least populous in the state, with 7,728 residents at the 2020 Decennial Census. This is a slight decline from 8,249 residents in 2010. The largest municipality in the area is Paducah—the county seat of neighboring McCracken County—with a population of 27,000.

Per capita personal income in Ballard County was approximately \$50,000 in 2022. There are about 3,100 jobs located in Ballard County as of 2022. The largest employment sector is manufacturing (18 percent of all jobs), followed by farm employment (13 percent), and government (13 percent) – predominantly local government.

There were about 94,000 acres of cropland in Ballard County as of the last Census of Agriculture in 2017, about 1.5 percent of the more than 6.6 million acres of cropland across all of Kentucky. Cropland in Ballard County decreased by about 16,000 acres over the ten-year period between the 2007 and 2017 Censuses of Agriculture. Across Kentucky as a whole, cropland decreased by about 650,000 acres over the same period.³⁶

Applicant economic impact study. Attachment G to the Song Sparrow Solar Application (Economic Report) contains a study of the projected economic impacts from the proposed facility. The analysis was conducted by Dr. Paul Coomes, Emeritus Professor of the University of Louisville, using IMPLAN modeling.

Key findings from the analysis include:

- There will be a one-time spike in construction-related employment over about a 14-month period. The spike will include about 298 new jobs in Ballard County in the first year, with a new payroll of \$18 million and a one-time yield of \$180,000 in occupational tax revenues for the County.
- Pursuant to an Industrial Revenue Bond agreement between Song Sparrow Solar and the County Fiscal Court, a total of approximately \$3.1 million in PILOT payments is estimated to be paid during a 40-year operational life of the project, or about \$78,000 per year.

Review and assessment of applicant economic information. The level of investment in Ballard County projected in the economic impact analysis appears to be roughly consistent with industry standards for a solar project of the size of the proposed Song Sparrow Solar facility. The overall

³⁶ 2017 Census of Agriculture and 2007 Census of Agriculture. County Data. U.S.D.A. National Agricultural Statistics Service.

conclusions that the operating phase will have very modest economic impacts, but that the proposed solar facility will enhance local government revenue while requiring very few services, are consistent with the findings of other commercial solar economic impact studies. The largest impact on employment will be felt during the initial construction period.

Some information that would provide a more complete picture but which is not provided in the applicant's economic study includes the direct, indirect, and induced economic benefits from the current use of the site in agriculture; and the potential induced economic benefits from the additional income received by the participating landowners if at least a portion of that income is spent locally. The former would at least slightly reduce the projected net economic benefits from ongoing operations of the facility, while the latter would likely increase those projected net benefits. Neither of these aspects would likely result in a material change to the results of the economic impact analysis.

Recommended mitigation. BBC recommends the following measures in regard to potential economic impacts:

- Song Sparrow Solar should commit to prioritizing local hiring and seeking to hire Ballard County residents to fill the projected direct construction jobs.

Project Decommissioning

In prior solar projects reviewed by the Siting Board, plans and assurances for decommissioning the sites at the end of their functional lives have been an important issue of concern to both the Siting Board and local governments.

Applicant project decommissioning plan. Attachment H of the Application (Decommissioning Plan) contains a plan for the decommissioning of the proposed facility. The plan was authored by Stantec on behalf of the applicant.

The anticipated lifetime of the proposed Song Sparrow Solar project is 30 to 35 years, or potentially more than 40 years with equipment replacement.³⁷ Ballard County Resolution 2023-04-18 requires decommissioning activities to occur within 12 months of the project ceasing to generate electricity.

Equipment and vehicles required for decommissioning will be similar to those required for project construction, such as bulldozers, cranes, dump trucks, front-end loaders, water trucks, and other ancillary equipment.³⁸ Decommissioning activities include the removal of all project components, including solar modules; tracking system and steel piles; inverters and transformers; electrical cabling; substation and transmission line; site access roads; and perimeter fencing. Figure C-25, excerpted from Attachment H, is a table identifying the type and quantity of components to be removed upon project decommissioning.

Figure C-25.
Primary Components of Song Sparrow Solar Project to be Decommissioned

| Component | Quantity | Unit of Measure |
|---|----------|-----------------|
| Solar Modules (approximate) | 246,116 | Each |
| Tracking System (full equivalent trackers) | 3,156 | Tracker |
| Steel Piles (tracker and inverter station) | 41,352 | Each |
| Inverters/Transformer Stations | 27 | Each |
| Electrical Cables and Conduits (below ground) (approximate) | 105,185 | Lineal Foot |
| Perimeter Fencing (approximate) | 89,201 | Lineal Foot |
| Access Roads (approximate) | 39,363 | Lineal Foot |
| Overhead Transmission Line (approximate) | 200 | Lineal Foot |
| Substation | 1 | Each |

Project components in either working or salvageable condition may be sold in the secondary market or as salvage, providing revenue to offset decommissioning costs. Project components that are not suited for resale or salvage will be disposed of at an approved solid waste facility.³⁹

The sequence of decommissioning begins with reinforcing internal roads and other site groundwork, then progresses to the removal of physical project components, and concludes with the restoration

³⁷ Application Attachment H, page 2.

³⁸ Application Attachment H, page 8.

³⁹ Application Attachment H, pages 5-6.

and revegetation of disturbed land to allow a return to pre-construction land use to the extent possible. The decommissioning plan provided appears adequate and details the installation placement and subsequent removal of each type of project equipment at the facility.

Figure C-26 shows the estimated net \$3.5 million decommissioning cost (\$5.5 million in costs and \$2.0 million in estimated salvage revenue) of the facility, as excerpted from Attachment H.

**Figure C-26.
Estimated Net
Decommissioning Costs
for Song Sparrow Solar
Project**

| Item | Cost/Revenue |
|---|--------------------|
| Decommissioning Expenses | \$5,546,043 |
| Potential Revenue – salvage value of panel components and recoverable materials | \$2,006,551 |
| Net Decommissioning Cost | \$3,539,492 |

Recommended mitigation. To mitigate concerns regarding decommissioning:

- Song Sparrow Solar should follow the decommissioning plan as laid out in Attachment H of the Application submitted to the Siting Board; and
- Song Sparrow Solar should work with Ballard County to address any concerns that arise at any point regarding its proposed decommissioning plan.