Supplemental Environmental Assessment
Elk Creek Solar Project

The Human and Environmental Impacts of
Constructing and Operating the 160 MW Elk Creek Solar Project

PUC Docket No. IP-7009/GS-19-495
January 2024

COMMERCE DEPARTMENT

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Sources

Much of the information used to prepare this environmental assessment comes from the site permit application. Additional sources include additional information provided by Elk Creek Solar, information from relevant environmental review documents for similar projects, and publicly available data.

Project Mailing List

To place your name on the project mailing list contact docketing.puc@state.mn.us or 651-201-2254 and provide the docket number (19-495), your name, email address, and mailing address. Please indicate how you would like to receive notices—by email or U.S. mail.

Alternative Formats

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Table of Contents

List of Appendices

List of Tables **Page**

List of Graphics **Page**

Abstract

A site permit from the Minnesota Public Utilities Commission (Commission) is required to construct a large electric power generating plant including those powered by solar energy. On December 31, 2020, the Commission issued a site permit to Elk Creek Solar, LLC (Elk Creek Solar) for an 80 megawatt (MW) solar energy generating system. Subsequently, Elk Creek Solar revised the size of the project to increase its generation capacity by 80 MW and increase the amount of land to accommodate the generation facility by 546 acres.

On August 25, 2023, Elk Creek Solar submitted an application to the Commission for the 160 MW project. Department of Commerce, Energy Environmental Review and Analysis (EERA) staff is responsible for conducting environmental review for applications submitted to the Commission. EERA has prepared this Environmental Assessment (EA) for the proposed 160 MW Elk Creek Solar Project. This EA addresses the issues required in Minnesota Rules 7850.3700, subpart 4, and those identified in the EA Scoping Decision issued on October 20, 2023.

Following release of this EA, a public hearing will be held. The hearing will be presided over by an administrative law judge (ALJ) from the Office of Administrative Hearings. Upon completion of the environmental review and hearing process, the ALJ will provide a summary report to the Commission. A decision on a site permit amendment for the project is anticipated in spring of 2024.

For additional information, or if you have questions, please contact Commerce or Commission staff – Erika Wilder (651-539-1009 or erika.wilder@state.mn.us) or Sam Lobby (651-201-2205 or sam.lobby@state.mn.us).

Additional documents and information, including the site permit application, can be found on eDockets by searching “19” for year and “495” for number: https://www.edockets.state.mn.us/EFiling/search.jsp or the EERA webpage https://apps.commerce.state.mn.us/web/project/13739

Introduction

Elk Creek Solar is proposing to construct a 160 megawatt (MW) solar generation facility in Magnolia and Vienna Townships in Rock County, Minnesota. The project would provide 160 MW of electrical generation for which Elk Creek Solar has executed Generation Interconnection Agreements with the Midcontinent Independent System Operator (MISO).

Under the Power Plant Siting Act, the Minnesota Public Utilities Commission (Commission) is charged with making sure that large electric power generating plants (LEPGPs) are sited in a manner that minimizes adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and fulfillment of electric energy needs in an orderly and timely fashion.[1] For LEPGPs, the Commission fulfills this charge through their site permitting process. In the site permitting process, proposers of LEPGPs file a site permit application with the Commission; Minnesota Department of Commerce (Commerce) Energy Environmental Review and Analysis (EERA) staff conducts an analysis of the human and environmental impacts of the project; the Minnesota Office of Administrative Hearings (OAH) conducts a public hearing: and the Commission then makes a permit decision. The permit defines the site for the project and appropriate mitigation measures.

This environmental assessment (EA) document provides information on the human and environmental impacts of the proposed project to the public and decision makers. The document analyzes potential impacts of the proposed project and how impacts of the project and alternatives can be mitigated. This EA studies only the proposed project. No alternative sites were proposed for study during the scoping period and EERA did not identify any reasonable alternatives to Elk Creek Solar's proposed site. Because there are no site alternatives, the primary permitting decision before the Commission focuses on the conditions in the site permit to mitigate impacts of the project.

Summary of Impacts

Elk Creek Solar provided a site for the project in their application. The site is situated on land primarily used for agriculture. Construction and operation of the project would impact human and environmental resources in the project area. Most of the impacts would be short-term and are common to any large construction project, such as noise, dust, and soil disturbance. These impacts can be mitigated through standard and site-specific construction practices. Long-term (operational) impacts, such as impacts to aesthetics or impacts to agriculture, cannot be mitigated, but in some instances, can be minimized or reduced.

The standard mitigation measures included in the Commission's site permit address many impacts of the proposed project. A draft Site Permit is included in **Appendix D**. The draft Site Permit contains project-specific mitigation measures that could further reduce the solar facility's impact including:

- State Listed Fish
- Facility Lighting
- Dust Control
- Wildlife-friendly Erosion Control

[1] Minnesota Statutes (Minn. Stat.) 216E.02

This EA is organized as follows:

- **Section 1** provides a brief overview of the proposed project.
- **Section 2** explains the regulatory framework and required permits and approvals.
- **Section 3** provides a description of the design, engineering, and construction of the proposed project.
- **Section 4** identifies the potential impacts to human and natural resources and identifies measures to avoid, minimize, or mitigate adverse impacts.
- **Section 5** discusses cumulative impacts and unavoidable impacts.

SECTION ONE: Project Overview

This section provides information about the proposed project, who would own and construct the project, including a description of the site, project components, estimated cost, and timeline.

Project Proposer

The project is proposed by Elk Creek Solar, LLC (Elk Creek Solar), a wholly-owned subsidiary of National Grid Renewables Development, LLC (NG Renewables), headquartered in Bloomington, Minnesota. NG Renewables is a utility-scale renewable energy development company that has a multi-gigawatt development pipeline of wind and solar projects in various stages of development throughout the United States, and 97 utility-scale and community solar projects completed.[2]

Purpose

The purpose of the project is to generate electricity for the full 160 megawatts that Elk Creek Solar has executed Generation Interconnection Agreements for with the Midcontinent Independent System Operator (MISO).[3]

Proposed Project

Elk Creek Solar is proposing to build a solar facility with up to 160 MW alternating current (AC) nameplate capacity on up to 1,522 acres located 0.7 miles north of the town of Magnolia, in Rock County, Minnesota.

County	Township Name	Township / Range	Sections
Rock	Magnolia	102 North / 44 West	3
	Vienna	103 North / 44 West	27, 34, and 35

Land Control Area and Preliminary Development Area

Elk Creek Solar has obtained leases, easements and purchase options on 1,522 acres of privately-owned land (Land Control Area). The project is expected to cover 1,161 acres of this area (Preliminary Development Area). The remaining 360 acres that are presently part of the Land Control Area but not in the Preliminary Development Area will be excluded from the area leased by Elk Creek during operation of the project. The underlying landowners can then continue to farm the area released from the lease.

Preliminary Design

The project includes solar panels and racking, inverters, electrical collection lines, a substation, an operations and maintenance (O&M) building, communication lines, weather stations, access roads, lighting, and security fencing. There are seven laydown areas and 28 stormwater retention basins proposed in the preliminary project layout. Preliminary design information is presented in this document, and is subject to final engineering and procurement.

[2] Application for a Site Permit for the up to 160 MW Elk Creek Solar Project: Docket No. IP-7009/GS-19-495: Documents 20238-198590-01 through 20238-198590-08, 20238-198591-01 through 20238-198591-08; henceforth referred to as "Elk Creek Solar Application"

[3] Docket No. IP-7009/GS-19-495: Document 20236-196370-01

Project Timeline and Cost

Elk Creek plans to construct the project on a schedule (**Table 1**) that facilitates an in-service date by the end of 2025.

Table 1 Estimated Project Timeline

Activity	Timeframe
Site Permit Issued	Spring 2024
Construction	Q2 2024 to Q4 2025
Commercial Testing	Q4 2025
Commercial Operations	Q4 2025

The total installed capital costs are estimated to be approximately $277.2 million, with final costs depending on variables including, but not limited to, construction costs, taxes, tariffs, and solar panel selection, along with associated electrical and communication systems. Costs associated with the various components are provided in **Table 2**.

Table 2 Estimated Project Costs

Project Components	Cost
Engineering, Procurement, Construction Contractor	$248.6 million
Development Expense	$ 10.5 million
Interconnection	$ 10.8 million
Financing	$ 7.3 million
Project Total	**$ 277.2 million**

SECTION TWO: Regulatory Framework

Under the Power Plant Siting Act, the Commission is charged with making sure that large electric power facilities are sited in a manner that minimizes adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and fulfillment of electric energy needs in an orderly and timely fashion. For LEPGPs like the one proposed by Elk Creek Solar, the Commission fulfills this charge through their site permitting process.[4] In this process, proposers of projects file an application with the Commission, EERA assists the Commission by reviewing human and environmental impacts of the proposal and alternatives to the proposal, and an Administrative Law Judge (ALJ) presides over a public hearing and compiles the record for the Commission. Finally, the Commission determines whether to issue the permit and what permit conditions are needed to mitigate human and environmental impacts.

Project proposers must apply for (and receive) a permit from the Commission before building an LEPGP in Minnesota. This project meets the definition of a LEPGP, defined as a "electric power generating equipment and associated facilities designed for or capable of operation at a capacity of 50,000 kilowatts or more."[5]

Site Permit and Site Permit Amendment Request

On September 13, 2019, Geronimo Energy applied to the Commission for a certificate of need (CN) and site permit to construct an 80 MW solar generating facility on 976 acres in Rock County, Minnesota[6]. A CN and site permit were issued by the Commission on December 31, 2020.[7] Construction at this facility had not started when on June 2, 2023, Elk Creek Solar, LLC, a wholly-owned subsidiary of National Grid Renewables (previously Geronimo Energy) requested amendments to the site permit from the Commission to increase the generating capacity of the facility to 160 MW (100 percent increase), and to increase the area considered for the project to 1,522 acres (56 percent increase).

According to Minn. Rule 7850.4900, subp. 2, a person requesting an amendment of a site permit must submit an application to the Commission describing the amendment sought and the reasons for the amendment. The Commission then mails notice of receipt of the application to those persons on the general list and to those persons on the project list, and provides a minimum ten-day period for interested persons to submit comments on the application or to request that the matter be brought to the Commission for consideration.

The Commission then decides within ten days after close of the public comment period whether to approve the amendment request, or to bring the matter to the Commission for consideration.[8]

After the close of the initial 10 day comment period, the matter was brought to the Commission for consideration on August 31, 2023, and the Commission approved review of Elk Creek Solar's requested site permit modifications through the site permit amendment process in Minn. Rule 7850.4900 on October 10, 2023, with the following modifications:

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[4] Minn. R. 7850.1200

[5] Minn. R. 7850.1000, Subp. 11.

[6] Docket No. IP-7009/GS-19-495: Documents 20199-155860-01 to 20199-155860-08; 20199-155862-01 to 20199-155862-03; 20199-155882-01 and 20199-155882-02

[7] Docket No. IP-7009/GS-19-495: Document 202012-169454-02

[8] Minn. R. 7850.4900, Subp. 3.

- The Commission varied the ten-day decision timelines in Minn. R. 7850.4900, subp. 3;
- Ordered Elk Creek Solar to file its updated standalone site permit application that incorporates the amended application and modifications to the application attachments at the Rock County Soil & Water Conservation District Land Management Office by September 7, 2023, for public viewing;
- Required the preparation of a supplement to the EA for the original 80 MW project that addresses the impacts in particular, but not limited to, the additional acres included, the closer proximity to Elk Creek (the public water), the reduced row spacing of the solar panels, and more efficient solar panels; and
- Required a meeting or hearing in the area of the project to take in-person comments from the public and local units of government and a summary of those comments by an Administrative Law Judge from the Office of Administrative Hearings.

Scoping

Scoping is the process used to determine the topics analyzed in the EA. Scoping focuses on: (1) the most relevant issues and impacts needed for a site permit decision, and (2) identifying and analyzing potential alternatives.

A notice of a public comment period on the scope of the EA was issued by Commission and Commerce staff on September 13, 2023, and the comment period closed on October 4, 2023. Written comments were received from the Minnesota Department of Natural Resources (MDNR),[9] and are summarized below:

- Security Fencing
  Placement of deer egress gates should be adjusted so that any deer removed from the solar facility are not directed onto nearby roadways. Additionally, placing the gates at an "outward facing" corner, rather than an "inward facing" corner, would aid in removing deer that may enter the facility. MDNR advised that their Commercial Solar Siting Guidance was updated in February 2023. The guidance reflects current fencing recommendations to help avoid or mitigate wildlife entanglement or entrapment.

- State-listed Fish
  The EA should describe measures to avoid and/or minimize impacts to state-listed fish species. The Topeka shiner (*Notropis topeka*), a federally listed endangered and state-listed special concern species, and plains topminnow (*Fundulus sciadicus*), a state-listed threatened species, have been documented in several places in Elk Creek in the vicinity of the project. These fish species are adversely impacted by actions that alter stream hydrology or decrease water quality. Stringent erosion and sediment control practices must be implemented and maintained near the stream and any of its tributaries during project construction and operation.

[9] Docket No. IP-7009/GS-19-495: Document 202310-199388-01

- Facility Lighting
  The EA should discuss measures to mitigate lighting impacts associated with the operation and maintenance facility, inverters, and security lighting at the entrances. Downlighting will help minimize light pollution. LED lighting is often high in blue light, which is harmful to birds, insects, and other animals. Potential project impacts related to illuminated facilities can be avoided or minimized by using shielded and downward facing lighting and lighting that minimizes blue hue.

- Dust Control
  The EA should address dust control. MDNR recommends avoiding dust control products containing calcium chloride or magnesium chloride, which are often used for dust control. Chloride products that are released into the environment do not break down, and instead accumulate to levels that are toxic to plants and wildlife.

- Wildlife-Friendly Erosion Control
  The EA should address the importance of using wildlife-friendly erosion control. Due to entanglement issues with small animals, the MDNR recommends that erosion control blankets be limited to "bio-netting" or "natural netting" types, and specifically not products containing plastic mesh netting or other plastic components. Hydro-mulch products may contain small synthetic (plastic) fibers to aid in its matrix strength. These loose fibers could potentially re-suspend and make their way into waterways.

On October 20, 2023, a scoping decision for the EA was issued and is included in **Appendix C**.[10]

Alternatives

No site alternatives were proposed during scoping, and EERA was not able to independently identify other alternatives for study. No alternative sites are analyzed in this EA.

EA Preparation

EERA staff prepared this EA, focusing on mitigation of impacts identified in Elk Creek Solar's Site Permit Application submitted on August 29, 2023, that covered the 160 MW proposal. The topics covered in this document reflect the scoping decision for the EA. Because there are no site alternatives to consider, the primary permitting decision before the Commission focuses on conditions to include in the site permit to mitigate human and environmental impacts. Therefore, EERA staff focused on studying issues relevant to the identification of appropriate mitigation measures.

EERA derived much of the information used in the preparation of the EA from documents prepared by Elk Creek Solar and its contractors. In addition to material provided by Elk Creek Solar, information from the comments received, relevant environmental review documents for similar projects, and spatial data were used to prepare this document.

[10] Docket No. IP-7009/GS-19-495: Document 202310-199809-01

Consistent with the scoping decision, there are some issues that this EA does not address because they are beyond the scope of what is relevant to the Commission's decision-making. Specifically, this EA does not address:

- Any site alternative other than the site location proposed by the applicant.
- The manner in which landowners are compensated for the project.

Public Hearing

A public hearing will be held after the EA is issued. An Administrative Law Judge (ALJ) from the Office of Administrative Hearings will lead the public hearing. The hearing is an opportunity for stakeholders to comment on the project, the EA, and the Commission's permit amendment decision. People can do this by attending the hearing and speaking, presenting evidence, asking questions, and making comments. Written and oral comments received during the hearing become part of the record in the proceeding. EERA staff will be available to respond to questions and comments about the EA. These questions and answers become part of the record, but staff does not revise or supplement the EA document.

After the public comment period is over, the judge provides a report to the Commission based on all of the information in the record.

Site Permit Amendment Decision

Once the Commission has received the ALJ's report, they will schedule a meeting to decide on issuing an amended permit. When the Commission issues a site permit it draws on the record (application, comments, environmental review, and all other documents in the project docket) to approve conditions specifying construction and operation standards and mitigation measures that must be taken to reduce project impacts.

At the Commission meeting for amending the site permit, the Commission will weigh human and environmental factors. The specific factors the Commission must weigh are specified in statute and rule. Minnesota Statutes 216E.03 lists considerations that guide the study, evaluation, and designation of site permits. Minnesota Rule 7850.4100 lists the factors the commission must consider when making a site permit decision:

A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.

B. Effects on public health and safety.

C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining.

D. Effects on archaeological and historic resources.

E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.

F. Effects on rare and unique natural resources.

G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.

H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries.

I. Use of existing large electric power generating plant sites.

J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.

K. Electrical system reliability.

L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.

M. Adverse human and natural environmental effects which cannot be avoided.

N. Irreversible and irretrievable commitments of resources.

The Commission is also guided by the "state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure".[11]

Other Permits, Approvals, and Applicable Codes

A site permit from the Commission is the only state permit required for siting the project. The Commission's site permit supersedes local planning and zoning and binds state agencies.[12] Thus, state agencies like MDNR and the Minnesota Department of Transportation (MnDOT) are required to participate in the Commission's permitting process to aid the Commission's decision-making and to indicate sites that are not permittable.

After the Commission issues a site permit, however, various federal, state, and local permits may be required for activities related to the construction and operation of the project. All permits subsequent to the Commission's site permit, and necessary for the project (commonly referred to as "downstream permits"), must be obtained by a permittee. **Table 3** identifies potential permits that might be required in addition to, in this case, the amended site permit.

Federal Permits

The United States Army Corps of Engineers (USACE) "regulates the discharge of dredged or fill material into waters of the United States, including wetlands."[13] Dredged or fill material could impact water quality. A permit is required from USACE if the potential for significant adverse impacts exists.

A permit is required from the United States Fish and Wildlife Service (USFWS) for the incidental "taking"[14] of any endangered species. As a result, USFWS encourages project proposers to consult with the agency to determine if a project has the potential to impact federally listed threatened and endangered species. Additionally, consultation can lead to the identification of mitigation measures for potential impacts associated with the project.

[11] Minn. Stat. 216E.03, subd. 7(a).
[12] Minn. Stat. 216E.10, Subd. 3.
[13] http://www.epa.gov/cwa-404/section-404-permit-program.
[14] 16 U.S.C. § 1532(19) (defining "take" to mean to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in such conduct).

Table 3 Permits and Approvals Required for the Project

Federal	
US Army Corps of Engineers	Section 404 of the Federal Clean Water Act
US Fish and Wildlife Service	Threatened and Endangered Species Consultation
US Environmental Protection Agency	Spill Prevention, Control, and Countermeasures Plan
State of Minnesota	
Department of Natural Resources	Endangered Species Consultation
	Temporary Construction Dewatering Permit
	Water Appropriation Permit
Department of Transportation	Oversize and/or Overweight Permit
Pollution Control Agency	National Pollutant Discharge Elimination System Permit for Construction Stormwater Discharge
	Clean Water Act Section 401 Certification
Minnesota Department of Health	Notification of Well Construction
Minnesota Department of Labor and Industry	Request for Electrical Inspection
Board of Water and Soil Resources, County, City, Townships	Wetland Conservation Act
Local	
Rock County, Magnolia Township, Vienna Township	Road Crossing/Right-of-way Permits
	County Entrance Permit
	Conditional Use Permit
	Building Permits
	Driveway/Access Permits
	Utility Permits
	Floodplain Development Permit
	Subsurface Sewage Treatment System Permit
	Overwidth Load Permits

A Spill Prevention, Control, and Countermeasures (SPCC) Plan is required by the USEPA for any facility storing 1,320 gallons or more oil products or wastes above ground, including petroleum, mineral oil, hydraulic systems, and synthetic oils and lubricants. Certain facilities qualify for self-certification.

State Permits

Potential impacts to state lands and waters, as well as fish and wildlife resources are regulated by MDNR. Not unlike the USFWS, the MDNR encourages project proposers to consult with the agency to determine if a project has the potential to impact state-listed threatened or endangered species. Additionally, consultation can lead to the identification of mitigation measures for potential impacts associated with the project. The MDNR also issues Construction Dewatering Permits (qualified temporary water appropriations) and Water Appropriation Permits (withdrawal of 10,000 gallons of water per day or 1 million gallons per year).

A permit from MnDOT is required for oversize and overweight loads[15] on state highways.

Construction projects that disturb one or more acres of land require a general National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Construction Stormwater Permit from the Minnesota Pollution Control Agency (MPCA). This permit is issued to "construction site owners and their operators to prevent stormwater pollution during and after construction."[16] The NPDES/SDS permit requires (1) use of best management practices (BMPs); (2) development of a Stormwater Pollution Prevention Plan (SWPPP); and (3) adequate stormwater treatment capacity once the project is complete. Additionally, MPCA regulates generation, handling, and storage of hazardous materials and wastes.

A Clean Water Act Section 401 Water Quality Certification from MPCA might also be required. Section 401 of the Clean Water Act requires that persons conducting activities that may result in a discharge of a pollutant into waters of the United States obtain certification from relevant States (in this case, Minnesota) that the discharge complies the applicable water quality standards.[17]

Prior to the start of drilling a water-supply well, the contractor or well owner must submit a notification form to the Minnesota Department of Health (MDH). After the well is installed, a Well and Boring Record with the construction details of the well, such as well depth, depth to groundwater, geology, well components, and pump information must be sent to the MDH.

Local Permits

Commission route permits preempt local zoning, building, and land use rules, regulations, or ordinances promulgated by regional, county, local, and special purpose government; however, coordination with local governments may be required for the issues listed below:

- Access/Driveway — Coordination may be required to construct access roads or driveways from county or township roads.
- Building Permits – Building code inspection and enforcement

[15] https://www.dot.state.mn.us/cvo/oversize/determine.html
[16] http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/index.html.
[17] https://www.pca.state.mn.us/water/clean-water-act-section-401-water-quality-certifications.

- Subsurface Sewage Treatment System Permit — Ensures septic system design conformity to standards.
- Overwidth Load — Coordination may be required to move over-width or heavy loads on county or township roads.
- Road Crossing and Right-of-Way — Coordination may be required to cross or occupy county or township road rights-of-way.

Applicable Codes

The project must meet the requirements of the National Electrical Safety Code (NESC). Owners must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or upgrading existing facilities. These standards are designed to safeguard human health from hazards arising from the installation, operation, or maintenance of conductors and equipment in electric supply stations as well as overhead and underground electric supply lines. They also ensure that facilities and all associated structures are built from materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

The project must be designed to meet North American Electric Reliability Corporation's requirements, which define the reliability requirements for planning and operating the electrical transmission grid in North America.

SECTION THREE: Engineering, Operational Design, and Construction

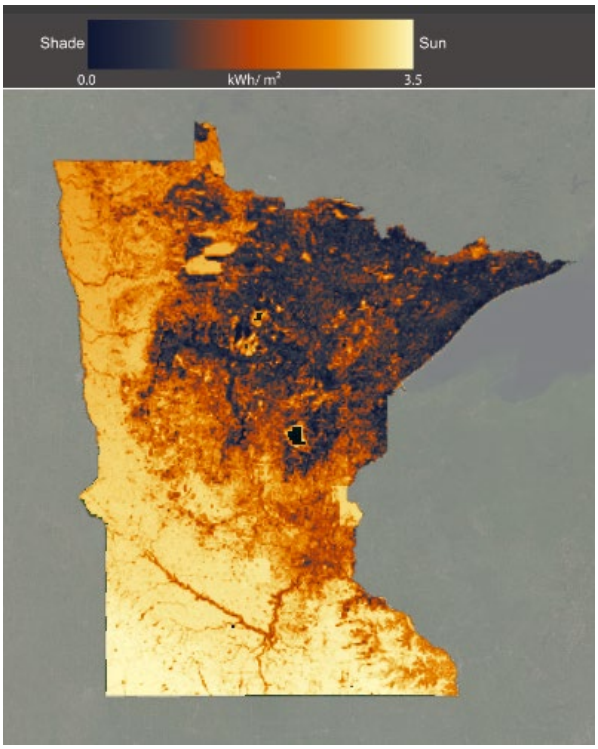
The project must be constructed according to the design and construction procedures in the administrative record, including the site permit applications, this EA, and the conditions provided in the site permit. Construction can begin after the amended site permit is issued and all the necessary downstream permits have been obtained. This section summarizes the engineering, operational design, and construction of the project proposed in Elk Creek Solar's August 29, 2023, site permit application.

Site Selection

When searching for the original 2020 Land Control Area, Elk Creek Solar explored Rock County for a solar project based on the high solar resource in this portion of the state. Elk Creek Solar identified the Magnolia Substation in Rock County as a potential interconnect location having available capacity to connect the project to the transmission system. The area also has a general lack of environmental constraints, has relatively flat and unobstructed terrain, and the presence of adequate roads for site access. Elk Creek Solar then met with landowners within approximately five miles of the Magnolia Substation to gauge whether there was enough interest from relatively contiguous landowners in voluntary participating in the project. This distance was selected to account for transmission interconnect efficiency. Elk Creek Solar ultimately signed sufficient leases or purchase options with landowners adjacent to the Magnolia Substation that were willing to host the entire 160 MW project and associated facilities.

Within Rock and Nobles Counties and five miles from the Magnolia Substation, Elk Creek Solar avoided parcels with environmental constraints that may prohibit or make solar development more challenging, as provided on **Figure 4**. These include parcels:

- Owned or managed by a state or federal agency (i.e., state park, Wildlife Management Area, or Waterfowl Production Area);
- Within a municipality;
- Within 2 miles of an airport;
- With USFWS designated critical habitat for Topeka shiner;
- With MDNR Sites of Biodiversity Significance;
- With MDNR mapped native plant communities and native prairie;
- With MDNR Public Waters Inventory watercourses; and
- With MDNR rare species records.



Source: https://solar.maps.umn.edu/app/

Graphic 1 **Solar Radiation per Square Meter**

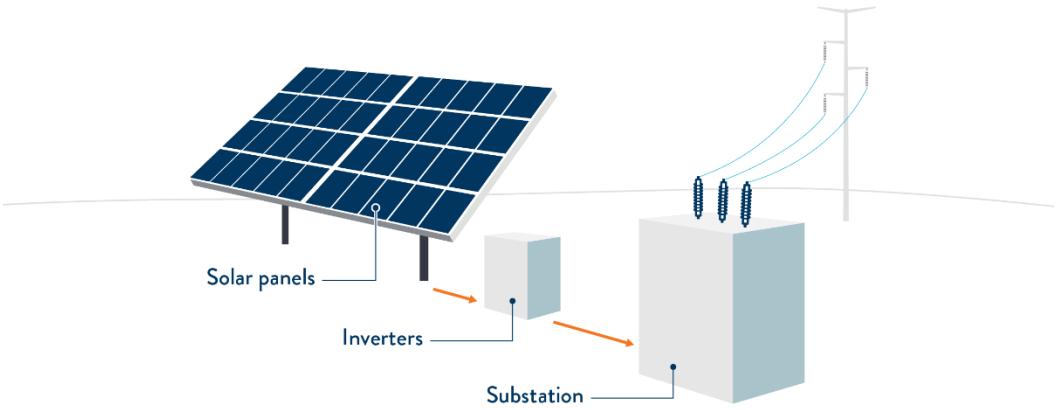
Subject to certain exceptions, Minnesota Rule 7850.4400, subp. 4 prohibits large electric power generating plants from being sited on more than 0.5 acres of prime farmland per MW of net generating capacity unless there is no feasible and prudent alternative. The 2020 Site Permit design required approximately 8.5 acres per MW for project facilities. The revised layout presently being considered requires approximately 7.3 acres per MW.

In its Order issuing the 2020 Site Permit, and with respect to prime farmland, the Commission concurred with Elk Creek that there was no feasible or prudent alternative to the project.[18]

Elk Creek has prepared an Agricultural Impact Mitigation Plan (AIMP) (see **Appendix E**) for the project. The updated AIMP details methods to minimize soil compaction, preserve topsoil, and together with the Vegetation Management Plan (VMP) (**Appendix I**) establish and maintain appropriate vegetation to help ensure the project is designed, constructed, operated and ultimately decommissioned and restored in a manner allowing the land to be returned to its original agricultural use in the future.

Project Components Engineering and Design

Graphic 2 below shows the process of converting solar energy and connecting it to the transmission grid. The process begins with solar panels converting energy from sunlight into direct current (DC) electrical power. Sets of panels would be electrically connected in series and terminated at an inverter. The inverters would convert the DC power (approximately 1,500 volts) from the panels to AC power (650-950 volts depending on the inverter specifications). Next, a transformer would step up the AC voltage of generated electricity from the inverter output voltage to 34.5 kilovolt (kV). From the transformers, electrical cable would route the power generated to the project's substation, where the voltage would be stepped up from 34.5 kV to 161 kV to interconnect to the region's existing transmission system.



Graphic 2 Solar Energy Generation and Conversion

[18] Docket No. IP-7009/GS-19-495: Document 202012-169454-02

Site Layout

The project's final layout would optimize electrical generation and efficiency of the solar facility while avoiding and minimizing environmental, cultural, and infrastructure impacts. The components would also be sited to comply with the county's setback requirements, where applicable. The setback requirements for solar energy systems in Rock County are provided in **Table 4**.

Table 4 Rock County Setback Requirements

Feature	Setback Requirement to solar array[19]	Preliminary Project Design
Neighboring Property Lines (property lines within Project boundary are exempt)	25 feet	42 feet
Non-participating residences	200 feet	274 feet
Road Right-of-Way	25 feet	40 feet
Public Conservation Lands	200 feet	The closest public conservation land is 3 miles west of the project.

Table 5 provides the estimated acreage for the project facilities within the 1,161.3-acre Preliminary Development Area based on the preliminary design.

Table 5 Estimated Project Facility Acreages within Preliminary Development Area

Project Facilities	Acres
Access Roads	22.1
Inverters	0.3
Project Substation and O&M Building	1.6
Laydown Areas	11.2*
Solar Panels	841.6[+]
34.5 kV collection lines between North, Central, and South Units	1.4
Stormwater Basins	44.2
Project Total	**922.4**

Notes:

*The laydown areas are temporary impacts to be used only during construction.

[+] The impacts associated with solar panels include 13-foot-wide grass area between every row of panels.

Solar Panels, Racking, and Inverters

The project would utilize photovoltaic (PV) panels with tempered glass varying in size approximately 4 to 7 feet long by 2 to 4 feet wide, and 1 to 2 inches thick. The PV panels have a silicon and weatherized

[19] https://www.co.rock.mn.us/general_information/county_ordinances.php

plastic backing or a side-mount or under-mount aluminum frame, heat strengthened front glass, and laminate material encapsulation for weather protection. To limit reflection, solar PV panels are constructed of dark, light-absorbing materials. Panels proposed for the project reflect as little as two percent of the incoming sunlight depending on the angle of the sun and assuming use of anti-reflective coatings. The solar arrays would occupy most of the Preliminary Development Area.

The panels would be attached to a tracking rack system mounted on top of steel piers. The panels and tracking rack system are generally aligned in rows north and south with the PV panels facing east toward the rising sun in the morning, parallel to the ground during mid-day, and then west toward the setting sun in the afternoon. The panels are rotated by a small motor connected to the tracking rack system to slowly track with the sun throughout the day. The tracking rack system allows the angle of the panels to be optimized in relation to the sun throughout the day, thereby maximizing production of electricity and the capacity value of the project. Panels would be approximately 15 feet in height from the ground to the top of the panels when at a 45-degree angle. Height may vary due to manufacturer, topography, and vegetation constraints, and could reach a height of approximately 20 feet above ground.

Sets of panels would be electrically connected in series and terminated at an inverter. Typical drawings of inverters are included in **Graphic 3** showing a central inverter and step-up transformer station. Electrical wiring would connect the panels to inverters, which would convert the power from DC to AC. Inverters convert approximately 1,500 volts of DC output of the PV panels to between 650-950 volts of AC. Then a step-up transformer converts the inverter AC voltage to an intermediate voltage of 34.5 kV.

Source: Elk Creek Solar Application

Graphic 3 Typical Inverter/Transformer Station

The inverters are within the interior of the Preliminary Development Area along access roads. The preliminary design proposes 89 central inverter skids (one inverter is required for every 2-3 MW). These skids provide the foundation for the inverter, transformer, and Supervisory Control and Data Acquisition (SCADA) system. The skids would be placed atop a concrete slab or pier foundations and typically measure 10 feet wide by 25 feet long, with a structure height of approximately 12 feet above grade. Concrete foundations would be poured onsite, or precast and assembled off-site.

Electrical Collection System

The electrical collection system is composed of DC lines (1,500 volts) and AC lines (34.5 kV). These lines can be placed above or below ground. Final engineering and procurement would determine the final configuration for the electrical collection system. A hybrid above-ground and below-ground electrical system is being considered for several reasons, including ease of access for operations and maintenance, reduced ground disturbance, and cost considerations.

DC Lines

The DC lines would be placed between the panels and the inverter/transformer, and can be placed above ground or below ground. If above-ground cabling is utilized, the DC collection cables would be strung under each row of panels on steel arms and a steel cable attached to the piles. At the end of each row, hanging brackets would connect several racks/rows of cables to a common collection point near their assigned inverter/transformer skid where cables would be routed below-ground at a minimum depth of at least four feet below grade to the inverter/transformer skid where the current is converted to AC and voltage is stepped up to 34.5 kV.

34.5 kV Lines

The 34.5 kV lines would connect the transformer to the project substation. These can be placed below ground or above ground (**Graphics 4 and 5** show renderings of this configuration). The below ground placement would place cables in trenches or be ploughed into place at a depth of at least 4 feet below ground surface. Above ground placement of 34.5 kV lines would have conductors strung on direct embed poles made of wood; or at locations where excess strain is placed on the conductor or structure (e.g., road crossings), would have a steel structure mounted to a concrete foundation. Each pole would be approximately 60 feet tall with a diameter of approximately 18 inches (wood poles) to 6 feet (steel). Preliminary pole placement is shown in **Appendix B**, and final locations would be determined based on final engineering and geotechnical analysis.

Source: Docket No. IP-7009/GS-19-495: Document 20207-165342-02

Graphic 4 Visual Simulation of Below Ground Placement of 34.5 kV Collection Lines

Source: Docket No. IP-7009/GS-19-495: Document 20207-165342-02

Graphic 5 Visual Simulation of Above Ground Placement of 34.5 kV Collector Lines

To connect the northern unit to the project substation, approximately 15 poles spaced roughly 300 feet apart would be installed along the west side of 190th Avenue. The first pole would be just outside the fenceline of the northern unit near the intersection of 190th Avenue and 141st Street, and the collection line would extend for about 0.6 mile along 190th Avenue before turning east, crossing over 190th Avenue, and connecting to another pole installed adjacent to the fenceline of the central unit. From here, the collection line would be moved below ground as it continues to the project substation.

Elk Creek Solar plans to install the AC collection system between the southern unit and the central unit below ground.

Substation and 161 kV Interconnection

The project substation would be a 34.5/161 kV step-up substation with metering and switching gear required to connect to the transmission grid. It would be designed according to regional utility practices, MISO Standards, Midwest Reliability Organization Standards, National Electrical Safety Code, and the Rural Utility Service Code. The area within the substation would be graveled to minimize vegetation growth in the area to reduce fire risk. The substation would be fenced with a 6-foot chain-link fence, topped with one foot of barbed wire for security and safety purposes. Lighting at the substation would be switch-controlled. The substation's area would be approximately 150 feet by 150 feet once construction is complete.

The project would interconnect into the existing Magnolia Substation via a 161-kV overhead generation interconnect (gen-tie) transmission line of less than 1,500 feet. ITC Midwest plans to expand the existing Magnolia Substation approximately 250 feet to the south to accommodate interconnection of the project (see **Figure 3**). The Magnolia Substation would expand into land that is currently row crop agriculture or otherwise maintained by ITC Midwest as part of the existing substation property.

A single dead-end structure within the project substation, and likely two to three additional structures would be installed to enter the Magnolia Substation with an overall length currently estimated to be approximately 500 feet, pending final engineering. The structures would be made of wood or steel and would be less than 150 feet tall. Per Minn. Stat. 216E.01 subd. 4, the transmission line does not meet the high voltage transmission line definition because the overall length is less than 1,500 feet. As such, a separate route permit from the Commission is not required for the gen-tie line.

Weather Stations

The project would include up to five weather stations up to 20 feet in height. Weather stations would be within the Preliminary Development Area; the final locations would be determined following final engineering and procurement.

Communication Lines

Communication cable utilized for the SCADA and weather stations would be co-located with the 34.5 kV collection system.

Access Roads

Elk Creek Solar has planned access roads at the site for effective and efficient access for operations and maintenance and for safe ingress and egress of employees, visitors, and emergency responders. The access roads provide access to all portions of the site and every central inverter, but not every block of panels has access roads along the entire perimeter (i.e., along the perimeter fence). This design minimizes the amount of ground disturbance and new impervious surfaces while still providing effective and efficient site access.

The project would include approximately 11.1 miles of graveled access roads. The final length of the access roads would depend on the equipment selected and final engineering. These roads are up to 16 feet wide along straight portions of the roads and wider along curves at internal road intersections (approximately 45 feet). There are ten access points to the site from existing county roads. These entrances would have locked gates.

Operations and Maintenance Building

An Operations and Maintenance (O&M) building would provide access and storage for maintenance and operations, and would be located adjacent to the project substation. Elk Creek Solar would obtain a building permit for the O&M building from Rock County prior to construction. The O&M building would measure approximately 60 feet long by 40 feet wide and would be made of metal (similar to a pole barn). It would contain an office for the onsite Plant Manager, a technician room, restroom, and storage area for equipment to operate and maintain the project. Equipment includes a SCADA cabinet, spare panels, spare parts for the substation, equipment to operate the substation, as well as safety equipment for working with energized equipment. The SCADA system allows remote control and monitoring of the status of the project, including electrical and mechanical data, operation and fault status, meteorological data, and grid station data.

A parking lot would be located adjacent to the O&M building and would be approximately 500 square feet and would be either gravel or paved, with the final size and cover material being determined in accordance with the Rock County Planning and Zoning Ordinance.

Stormwater Retention Basins and Runoff Protection

Elk Creek Solar has preliminarily designed 28 drainage basins throughout the Preliminary Development Area that range in size from 0.3 to 5.5 acres (see **Figure 3**). These basins are located in existing low areas that also contain hydric soils and for which the preliminary design for solar facilities has avoided. These areas would be vegetated with a wet seed mix that would help stabilize soils after rain events.

An SPCC Plan is required by the USEPA for any facility storing 1,320 gallons or more oil products or wastes above ground, including petroleum, mineral oil, hydraulic systems, and synthetic oils and lubricants. The project substation would contain a single, industry-standard main power transformer, which would require an SPCC Plan. Other onsite storage at the O&M building may include hydraulic oil stored in a plastic or poly tote or 55-gallon drums on secondary containment pallets, and potentially a fuel tank for maintenance vehicles. The fuel tank would be double walled with required secondary containment.

Construction Laydown Areas

Elk Creek Solar would prepare seven temporary laydown areas within the Preliminary Development Area, totaling 11.2 acres, to be utilized during construction. These areas would serve both as a parking area for construction personnel and staging areas for material and equipment during construction. These laydown areas have been sited to avoid any tree clearing. After construction, the laydown areas would be decompacted and reseeded as described in the Vegetation Management Plan (VMP, **Appendix I**).

Security Fencing and Lighting

Permanent security fencing would be installed along the perimeter of the Preliminary Development Area. Fencing would be secured to posts directly embedded in the soil or set in concrete foundations as required for structural integrity. The fencing proposed by Elk Creek Solar consists of an agricultural woven wire fence and extend approximately 7 feet above grade. Barbed wire would not be used around the perimeter of the project, and instead one foot of 3-4 strands of smooth wire would be used for a total height of approximately 8 feet above grade.[20] Additional gates would be strategically installed at corners for deer egress, and contact information for the Site Manager posted at the gates.

The fencing around the substation would be a 6-feet above grade chain-link fence and include one foot of barbed wire to comply with the National Electric Code. This fencing would be designed to prevent the public from gaining access to electrical equipment which could cause injury. Additionally, the fencing would prevent larger wildlife from entering the facility.

The project would have security lighting at the entrances that would be downlit. The typical pole height would be ten feet and both operated by manual switch and motion activated if an intrusion is detected. There would be lights at each inverter for repair purposes that would be downlit and switch controlled. The project would also have security cameras.

Design Options to Accommodate Future Expansion

Elk Creek Solar has executed two 80 MW interconnection agreements. Elk Creek has no intention of expanding beyond the 160 MW for which it has interconnection agreements.

[20] Note there is a special condition in the draft Site Permit (**Appendix D**) regarding fencing that additionally reduces potential effects to wildlife.

Construction

A preliminary list of activities necessary to develop the project are provided below. Pre-construction, construction, and post-construction activities include:

Pre-construction

- Geotechnical analysis;
- Design substation and electrical collection system;
- Design solar array, access roads, and O&M building;
- Underground utility discovery; and
- Procure all necessary facility components (solar panels, tracking system, transformers).

Construction

- Site preparation, grubbing, and grading;
- Construct laydown areas and set up temporary job site trailers;
- Construct fencing;
- Civil construction of access roads;
- Install PV mounting posts;
- Install below-ground or hybrid collection system;
- Install electrical enclosure/inverter;
- Tracker installation;
- PV panel installation; and
- Construct gen-tie line.

Post-construction

- Restore disturbed areas not intended for permanent above-ground facilities. Permanent above-ground facilities include the substation, O&M building, inverter skids and electrical cabinets, and access roads;
- Testing; and
- Begin commercial production.

Throughout the construction phase, ongoing coordination would occur among the development, design, and construction teams. Elk Creek would designate an on-site construction manager to coordinate execution of the work. This coordination includes safety and quality control programs, cost, and schedule forecasting, as well as site security and ongoing communication with local officials, citizen groups, and landowners. The construction manager would be supported by other members of Elk Creek Solar's team specializing in engineering, permitting, meteorology, environmental compliance, real estate, and Geographic Information Systems (GIS) mapping.

During construction, equipment and work vehicles would travel to and from the site. Daily construction duration is anticipated to be consistent throughout the construction season when the majority of the access road construction, electrical, and substation work is taking place. Typical construction equipment such as scrapers, dozers, dump trucks, watering trucks, motor graders, vibratory compactors and pile drivers, pickup trucks, and backhoes would be used during construction. Specialty construction equipment that may be used during construction include:

- Skid steer loader;
- Medium duty crane;
- All-terrain forklift;
- Concrete truck and boom truck;
- High reach bucket truck; and
- Truck-mounted auger or drill rig.

Upon completion of construction, heavy equipment would be removed from the site.

Site Preparation

Some upgrades or other changes to the public roads may be required for construction or operation of the project. Elk Creek Solar would work with Rock County to facilitate and pay for required upgrades that meet the required public standards. Upgrades or changes could include, but are not limited to, road improvements, additional aggregate, and driveway changes. Road use and improvements will be incorporated into a Development Agreement with Rock County. Elk Creek executed a Development Agreement with Rock County in September 2021 for the 80 MW project in the 2020 Site Permit. Under that agreement, Vienna and Magnolia Townships executed Resolutions that approved Rock County to act on its behalf. Elk Creek will continue to coordinate with these agencies to update the Development Agreement for the Project. Driveway changes will require a county entrance permit from Rock County, which will be obtained prior to construction.

After the necessary permits are received, construction would begin with the initial site preparation work. Depending on timing of the start of construction, the clearing of residual row-crop debris from the 2024 harvest season may be required. Alternatively, and depending on construction timing, Elk Creek Solar may plant a cover crop in Spring 2025 that is compatible with the Vegetation Management Plan (**Appendix I**) to stabilize soils if row crops are not planted that year.

Geotechnical and pull testing studies would be performed to determine the topsoil and subsoil types, and the mechanical properties of the soils. These variables would be used to engineer the solar array foundation system.

Areas of the site to be graded (including temporary laydown areas) would have topsoil and organic matter stripped and segregated from the subsoil (depending on the depth of grading cut) in accordance with the Agricultural Impact Mitigation Plan. Some grading would be required to provide a more level workspace and maintain soil stability in areas with a slope greater than five percent. Temporary and permanent erosion control and soil stabilization measures would be established in accordance with the project's construction SWPPP supporting the NPDES/SDS stormwater permit for construction activity that would be obtained by Elk Creek Solar prior to the start of construction.

Temporary Laydown Areas would be graded and compacted for the duration of construction. After construction is complete, the area would be decompacted to a depth of six inches, topsoil returned, and the areas would be vegetated as described in the VMP.

Access Roads

As a component of earthwork, permanent access roads and permanent turnouts would be developed. The subgrade materials would be compacted 16-feet wide to the specified compaction requirements as laid out by the civil and geotechnical engineer. After compaction is reached and verified, the road would

be installed as designed, typically done with or without geo-fabric depending on the soil type, and then, with a surface of 4 to 12 inches of gravel. The gravel would be placed level with the existing grade to facilitate drainage and minimize ponding.

After gravel is installed and compacted to engineers' requirements, drainage ditches would be shaped as identified on the final grading plan. Finally, the previously stripped and windrowed topsoil material would be re-spread throughout the project area consistent with the AIMP developed for the project.

Solar Array Construction

Once grading activities are complete, the racking system supports would be constructed using steel piles driven into the ground. The solar facilities would be constructed in blocks, and multiple blocks could be constructed simultaneously. Construction of the blocks would include pre-positioning and driving piles, mounting the tracking rack system to the piles, pre-positioning of panel pallets, mounting panels to the tracking rack system, the completion of electrical connections, terminations and grounding, and installation of cable management systems. In some situations where soils are low strength or consist of loose, non-cohesive sand, helical screw or auger-type foundation posts may be used. Foundations are typically galvanized steel and used where high load bearing capacities are required. The pile is driven using a hydraulic ram that moves along tracks and is operated by two workers. Soil disturbance would be restricted to the hydraulic ram/screw machinery, about the size of a small tractor, temporarily disturbing soil at each pile insertion location and while driving between drilling locations.

The remainder of the tracking rack system would be installed by construction crews using hand tools and all-terrain tracked equipment to distribute materials. Array racking would be bolted on top of the foundation piling to create a "rack" to which the solar panels can be fastened.

During array and racking assembly, multiple crews and various types of vehicles would be working within the project area. To the extent practicable, vehicular traffic would be limited to permanent and temporary access roads to minimize soil disturbance, mixing and compaction; however vehicular traffic would occur off-road throughout construction. These vehicles include flatbed trucks for transporting array components, small all-terrain vehicles, rough-terrain forklifts and skid-steers, as well as pick-up trucks for transporting equipment and workers. Panels would be staged in advance throughout the Preliminary Development Area and brought to specific work areas for installation by wagon-type trailers pulled by small tractors or by all-terrain tracked equipment. The solar panels would be installed by multiple crews using hand tools. Installation crews would proceed in serpentine fashion along staked temporary access roads in a pre-established route to minimize off-road traffic.

Electrical Collection System and Communications Construction

The electrical collection system would be site-specific depending on geotechnical analysis, constructability, and availability of materials. Final engineering and procurement will help determine the construction method for the electrical collection system.

Below-ground AC collection systems would be installed in trenches or ploughed into place at a depth of at least four feet below grade. During trench excavation, the topsoil and subsoil would be removed and stockpiled separately in accordance with the AIMP. Once the cables are laid in the trench, the area would be backfilled with subsoil followed by topsoil.

Above ground poles would be installed by drill rig and crane. Wood poles would be directly embedded in a drilled boring, and steel poles would be attached to a concrete foundation set in a drilled boring.

The communications cables utilized for the SCADA and weather stations would be co-located with the electrical collections system.

Substation Construction

Construction work within the substation site would include site preparation and installation of substructures and electrical equipment. Installation of concrete foundations and embedments for equipment would require the use of trenching machines, concrete trucks and pumpers, vibrators, forklifts, boom trucks, and large cranes. Above-ground and below ground conduits from this equipment would run to a control enclosure housing the protection, control, and automation relay panels. A station service transformer would be installed for primary AC power requirements. Batteries and battery chargers would be installed inside the enclosure for auxiliary power to the switchyard's control system. Crushed rock would cover the area of the substation and adequate switch-controlled lighting would be installed around the substation for worker safety during construction and operation.

One of two methods would be used to install substation foundations. Option 1 would be to use a small rubber tire backhoe to dig out major foundations prior to pouring the concrete slabs. Option 2 would use an auger/drill type machine for minor foundations. In both scenarios, the limit of disturbance would be within the footprint of the substation for both the foundation equipment and the concrete delivery trucks.

All topsoil from the substation footprint would be removed to a pre-established suitable location for storage. The storage area would be near the site where the soil was removed, accurately located (boundaries, soil depth) and graded to facilitate revegetation. Subsoil would be removed, if necessary, to an acceptable pre-established and approved area for storage. After decommissioning, subsoil would be returned to the area from which it was excavated (as needed), topsoil would be replaced, and the area would be brought back to pre-construction contours.

Vegetation Establishment and Maintenance

Following construction, areas not containing project components for operation (area under the arrays and the laydown yards) would be stabilized with sediment stabilization and erosion control measures such as silt fence and biologs, and re-vegetated according to the VMP (**Appendix I**). The site would be seeded with site specific seed mixes developed in coordination with the MDNR and the interagency Vegetation Management Plan Working Group and include four native seed mixes: a low growing mix in and around the solar arrays, a pollinator mix to be installed in the upland areas or the supplemental pollinator planting zone, a wet-mesic mix for transitional areas between hydric and non-hydric soils, and a wet mix for areas with hydric soils and/or susceptible to holding water based on field reviews. Additionally, a cover crop would be planted with the native mixes to stabilize soil and prevent erosion during the time it takes for the native plants to establish.

The VMP outlines two vegetation maintenance strategies that may be implemented: mowing and grazing. Mowing may take the form of traditional mowing or haying, depending on Elk Creek Solar's preference and site feasibility. Should Elk Creek Solar enter into a haying partnership for some or all of the site, seed mixes would need to be reviewed and potentially revised to meet local agricultural needs. Alternatively, Elk Creek Solar may decide to use grazing with sheep as a long-term vegetation

management technique. Grazing solar facilities with livestock is a management approach under consideration for this project.

The VMP provides a guide to site preparation, installation of prescribed seed mixes, management of invasive species and noxious weeds, and control of erosion/sedimentation. The required restoration management is designed to continue for three to five years. The VMP outlines vegetation management tasks during the establishment and perpetual maintenance phases including monitoring for and treating any invasive species, mowing, and re-seeding. Additionally, vegetation community establishment targets are defined for each of the first five years of implementation of the VMP.

Commissioning

During and upon completion of the construction phase, the project would undergo inspection testing and commissioning. Inspection and testing would occur for each component of the solar array, as well as the associated communication, meteorological, collection, and SCADA systems.

Operation and Maintenance

Following commissioning and commercial operation, the care, custody, and control of the facility would transfer from the construction team to the operations staff. The construction manager would work with the operations staff, the equipment suppliers, and other construction and maintenance personnel to ensure a smooth transition from the start of construction to the commercial operation date of the project. The operations staff would have full responsibility for the facility to ensure operations and maintenance are conducted in compliance with approved permits, prudent industry practice and the equipment manufacturer's recommendations.

The project would be maintained and operated by Elk Creek Solar, an affiliate, or contractor. Primary tasks include scheduled monthly and quarterly inspections of electrical equipment, vegetation management, as well as snow removal on access drives.

The expected service life of the project is 30 years, and Elk Creek Solar estimates up to six full-time permanent positions would be needed to operate and maintain the facilities. A maintenance plan would be created for the project to ensure the performance of the solar facilities, including a scheduled check of the main items and a predictive maintenance approach of the devices subjected to derating/degradation. Derating/degradation refers to the known process of components losing efficiency or otherwise degrading over the course of the project's lifecycle; like all technology and physical components, a certain amount of this is unavoidable, and Elk Creek Solar would plan for it and maintain the facility as needed.

Once construction is complete, the solar facility would see one to three trucks on site daily, and at intervals associated with the maintenance schedule. The main scheduled activities are described in more detail below.

All maintenance activities would be performed by qualified personnel. Maintenance staff would conduct on-site diagnostics, repairs, predictive maintenance, and preventive maintenance activities. Maintenance activities would be performed during the day to the extent that they do not disrupt energy production. As an example, if a panel needs repair, that particular section of the array can be disconnected from the array by opening the combiner box circuit. The panel can then be replaced, and the combiner box circuit closed. Additionally, the power production circuits are separated from the

tracking circuits. This allows the PV panels to operate during an unscheduled outage of the tracker system. On occasion, it may be desirable to perform maintenance when the sun is down. Activities that have the potential for substantial noise generation would be performed during the day to minimize impacts in areas where residents are present.

The solar arrays would communicate directly with the SCADA system for remote performance monitoring, energy reporting and troubleshooting. The SCADA system provides data on solar generation and production, availability, meteorology, and communications. The SCADA system allows monitoring of, and communications with, the project and relays alarms and communication errors. All the monitored data would be managed by Elk Creek Solar on-site in addition to a qualified subcontractor that would remotely monitor the site 24 hours a day, 7 days a week through the SCADA system.

Inspection of the main equipment would occur at regular intervals, including:

- PV panels: visual check of the panels, tracking system and surrounding grounds to verify the integrity of the panels and tracking structure, the presence of animals and nests;
- Inverters, transformer and electrical panels: visual check of the devices including the connection cabinet and the grounding network. Check for presence of water and dust;
- Electrical check: measurement of the insulation level and dispersion. Check of the main switches and safety devices (fuses);
- Noise: check of abnormal sounds; and
- Cabling and wiring: visual check of the buried and aerial electrical line and connection box to verify their status.

Performance monitoring of the project facilities would consist of a weekly or monthly download of the data acquired by the onsite meteorological stations (energy produced, alarms, and faults).

Housekeeping at the site would include road maintenance, vegetation maintenance, fence and gate inspection, lighting system checks, and PV panel washing, if required; minimal to no washing of the panels is anticipated due to the naturally occurring and frequent precipitation.

Table 6 provides more information on the anticipated frequency of the operations and maintenance tasks associated with the project. Frequency of inspection may be varied based on facility demands and experience with performance of certain components and features.

Repowering

At the Site Permit's termination date, Elk Creek Solar may decide to re-apply to the Commission extend operations. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the facilities with upgrades based on newer technologies.

Table 6 Operations and Maintenance Tasks and Frequency

Plant Device	Task	Preliminary Frequency
Photovoltaic (PV) Field	PV Panels visual check	Once Yearly
	Wirings and junction boxes visual check	Once Yearly
	PV strings measurement of the insulation	Once Yearly
	PV strings and string boxes faults	Once Yearly
	PV panels washing	No regular washing planned (only as site-specific conditions warrant)
	Vegetation Management (if necessary at site)	Up to three times a year depending on site conditions
Electric Boards	Case visual check	Once Yearly
	Fuses check	Once Yearly
	Surge arresters check	Once Yearly
	Torque check	Once Yearly
	DC voltage and current check	Once Yearly
	Grounding check	Once Yearly
Inverter	Case visual inspection	Once Yearly
	Air intake and filters inspections	Once Yearly
	Conversion stop for lack of voltage	Once yearly
	AC voltage and current check	Once yearly
	Conversion efficiency inspection	Once yearly
	Datalogger memory download	Once yearly
	Fuses check	Once yearly
	Grounding check	Once yearly
	Torque check	Once yearly
Support Structures	Visual check	Once yearly
	PV panels torque check on random sample	Once yearly

Decommissioning

At the end of the project's useful life, Elk Creek Solar would decommission the project. Decommissioning activities would include:

- Removing the solar arrays, transformers, electrical collection system, fencing, lighting and substations, and possibly the O&M building (the O&M building may be useful for other purposes);
- Removal of below-ground electrical cables to a depth of four feet (cables buried below four feet would be left in place);
- Removal of buildings and ancillary equipment to a depth of four feet;
- Removal of surface road material and restoration of the roads to substantially the same physical condition that existed immediately before construction. If the land is sold to a new owner, Elk Creek Solar would retain any access roads the new landowner requested be retained;
- Grading, adding or re-spreading topsoil, and reseeding according to the Natural Resources Conservation Service (NRCS) technical guide recommendations and other agency recommendations, areas disturbed by the construction of the facility or decommissioning activities, grading and soil disturbance activities would be kept to the minimum necessary to restore areas where topsoil was stripped in construction, topsoil in decommissioned roads and compaction only in areas that were compacted during decommissioning activities so that the benefits to the soil that were achieved over the life of the project are not counteracted by decommissioning; and
- Standard decommissioning practices would be utilized, including dismantling and repurposing, salvaging/recycling, or disposing of the solar energy improvements, and restoration.

The removal and disposal details of the project components are found below:

- Panels: Panels inspected for physical damage, tested for functionality, and removed from racking. Functioning panels packed and stored for reuse (functioning panels may produce power for another 25 years or more). Non-functioning panels packaged and sent to the manufacturer or a third party for recycling or another appropriate disposal method;
- Racking: Racking uninstalled, sorted, and sent to metal recycling facility;
- Steel Pier Foundations: Steel piles removed and sent to a recycling facility;
- Wire: belowground wire abandoned in place at depths greater than four feet. Wire above four feet removed and packaged for recycling or disposal;
- Conduit: Above-ground conduit disassembled onsite and sent to recycling facility;
- Junction boxes, combiner boxes, external disconnect boxes, etc.: Sent to electronics recycler;
- Inverter/Transformer: Evaluate remaining operation life and resell or send to manufacturer and/or electronics recycler;
- Concrete pad(s): Sent to concrete recycler;

- Fence: Fence would be sent to metal recycling facility and wooden posts for the agricultural fence would be properly disposed; and
- Computers, monitors, hard drives, and other components: Sent to electronics recycler. Functioning parts can be reused.

After all equipment is removed, the facility would be restored to an agricultural use in accordance with the AIMP, or to another use if the economic conditions at that time indicate another use is an appropriate use for the site. Holes created by steel pier foundations and fence poles, concrete pads, reclaimed access road corridors, and other equipment would be filled in with soil to existing conditions and seeded. To maintain the soil benefits realized during the long-term operation of the project, grading and other soil disturbance activities during decommissioning would be kept to the minimum necessary to effectively decommission the site. Soil benefits include building topsoil through plant matter decay, capturing carbon, and maintaining beneficial soil bacteria that are often absent from soil subject to row crop agriculture.

Financial assurance would begin in year 10 and the surety would provide for full decommissioning costs prior to the expiration of any PPA and the operational life of the project. During the 10th year of operation, Elk Creek Solar would enter into a surety bond agreement, create an escrow account, create a reserve fund, or provide another form of security that would ultimately fund decommissioning and site restoration costs after project operations cease, to the extent that the salvage value does not cover decommissioning costs. Elk Creek would decommission the project in accordance with conditions in the site permit issued by the Commission. Elk Creek Solar would notify the appropriate landowners and local governing bodies of the decommissioning schedule, and has included an obligation to decommission the project components in applicable lease and easement agreements.

Decommissioning is estimated to take 13 months to complete. A copy of the draft Decommissioning Plan is provided in **Appendix J**.

SECTION FOUR: Affected Environment, Potential Impacts and Mitigation

Section 4 describes the environmental setting, affected resources, potential impacts, and mitigation of potential impacts. Construction and operation of the project would impact human and environmental resources in the project area. Some impacts would be short term and like those of any large construction project—e.g., noise, dust, soil disturbance. However, they can be mitigated by measures common to most construction projects, for example, the use of erosion-control blankets and silt fencing.

Other impacts would exist for the life of the project and may include aesthetic impacts and impacts to agriculture. These long-term impacts are generally not well mitigated by construction measures. That is, these impacts do not flow from how the project is constructed but rather where it is located and its design. Long term impacts can be mitigated through prudent selection of the site and design of the project.

Potential Impacts and Mitigation

Impacts vary based on duration, size, intensity, and location. This context is used to determine an overall resource impact level using qualitative descriptors. These descriptors ensure a common understanding among readers and allow for comparison of resource impacts between alternatives.

Minimal—Minimal impacts do not considerably alter an existing resource condition or function. Minimal impacts may, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short term.

Moderate—Moderate impacts alter an existing resource condition or function and are generally noticeable or predictable for the average observer. Effects may be spread out over a large area, making them difficult to observe, but can be estimated by modeling or other means. Moderate impacts may be long term or permanent to common resources but are generally short- to long-term for rare and unique resources.

Significant—Significant impacts alter an existing resource condition or function to the extent that the resource is severely impaired or cannot function. Significant impacts are likely noticeable or predictable for the average observer. Effects may be spread out over a large area making them difficult to observe but can be estimated by modeling. Significant impacts can be of any duration and may affect common and rare and unique resources.

Direct— Direct impacts are caused by the proposed action and occur at the same time and place.

Indirect— An indirect impact is caused by the proposed action but is further removed in distance or occurs later in time.

Cumulative— Cumulative potential effects are the result of the incremental impacts of the proposed action in addition to other projects in the environmentally relevant area. This EA also discusses ways to avoid, minimize, or mitigate specific impacts. These actions are collectively referred to as mitigation.

Avoid—Avoiding an impact means that the impact is eliminated altogether by moving or not undertaking parts or all of a project.

Minimize—Minimizing an impact means to limit its intensity by reducing the project size or moving a portion of the project from a given location.

Mitigate—Impacts that cannot be avoided or minimized could be mitigated. Impacts can be mitigated by repairing, rehabilitating, or restoring the affected environment, or compensating for it by replacing or providing a substitute resource elsewhere.

Region of Influence

Potential impacts to human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). Impacts to resources may extend beyond these distances but are expected to diminish quickly. ROIs vary between resources. **Table 7** summarizes the ROIs used in this EA.

This section describes the existing resources that may be impacted by the project, assesses potential impacts, and identifies measures to mitigate the impacts. The impacts of solar projects on the human and natural environment have been studied by EERA staff in other environmental review documents. The effect of solar projects on the human and natural environment are well documented and the general impacts and mitigation are well understood. Where relevant, this EA draws on this existing body of work.

The level of detail in the analysis in this section focuses on the applicability of potential mitigation. Therefore, where a quantitative data analysis is relevant to the selection of appropriate mitigation, impact numbers are presented. However, where a more qualitative discussion of the nature and magnitude of impacts is sufficient to inform decisions regarding mitigation, detailed data analysis has not been included.

Because there is only one site under consideration, the Commission's permitting decision centers on avoiding and minimizing impacts consistent with state goals to conserve resources, to minimize environmental impacts, and to minimize human settlement and other land use conflicts.[21]

Finally, where other planned projects would have overlapping impacts on the resources affected by the project, these cumulative effects have also been evaluated in the section that follows.

[21] Minnesota Rules 7850.4000 Standards and Criteria

Table 7 Regions of Influence for Human and Environmental Resources

Resource Category	Resource Type	Region of Influence
Human Settlement	Displacement, Land Use and Zoning	Land Control Area
	Aesthetics, Noise, Property Values, Electronic Interference	Project Vicinity*
	Cultural Values, Recreation, Public Services	Project Area[+]
	Socioeconomics, Environmental Justice	County
Public Health and Safety	Electric and Magnetic Fields, Implantable Medical Devices, Stray Voltage, Induced Voltage, Worker and Public Safety	Land Control Area
Land-Based Economies	Agriculture, Forestry, Mining	Land Control Area
	Tourism	Project Area
Archaeological and Historic Resources	—	Project Area
Natural Environment	Geology, Soils, Vegetation	Land Control Area
	Air Quality, Water Resources, Wildlife, Rare and Unique Resources	Project Vicinity
	Greenhouse Gases, Climate Change	State

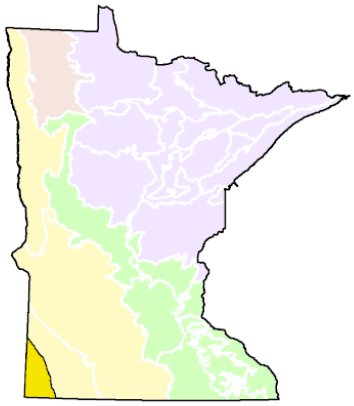
Notes:

* Project Vicinity is the area within 1,600 feet of the Land Control Area

[+] Project Area is the area within one mile of the Land Control Area.

Environmental Setting

The project area is situated on a rural landscape in Vienna and Magnolia Townships, Rock County, Minnesota, approximately 1 mile north of the Town of Magnolia and 4 miles east of the City of Luverne. This area is within the Inner Coteau Subsection of the Prairie Parkland Physiographic Province as shown on **Graphic 6**.[22]



Graphic 6 **Inner Coteau Subsection**

The project is located on what is presently flat agricultural fields that contain or are separated by several small drainages that connect to Elk Creek in the south, Champepedan Creek to the north, and the Rock River to the west. An exposed portion of the Sioux Quartzite rock (dating from the Late Precambrian age [1.6 billion to 600 million years before present]) is present in Blue Mounds State Park, extending approximately 150 feet above the surrounding landscape approximately 4 miles from the project area.

Prior to Euro-American settlement, vegetation in this region was predominantly tallgrass prairie, with wet prairies and forest restricted to ravines along a few streams. Few remnants of pre-settlement vegetation remain in the area. The landscape was formed by glaciation occurring between 75,000 and 11,000 years ago, and wind, water, and soil erosion since that time. Soils are loamy and well-drained with thick dark surface horizons. Precipitation in area is approximately 26 inches per year, and the average growing season lasts approximately 145 to 150 days in length.

Residences are scattered throughout Rock County, with a density of 20.1 persons per square mile;[23] land use is dominated by agricultural fields, predominately corn and soybeans planted in row crops.

County State Aid Highway (CSAH) 3 forms the eastern boundary of the Land Control Area, 151st Street is the northern boundary, 121st Street to the south, and 180th Avenue to the west. The project is bisected by 131st and 141st Streets. The Magnolia Substation is adjacent to the central unit of the Land Control Area.

A 161-kV transmission line runs east-west south of the Magnolia Substation, and bisects the central portion of the Land Control Area. A 69 kV transmission line exits Magnolia Substation and runs south along 190th Avenue and turns east along 131st Street.

[22] https://www.dnr.state.mn.us/ecs/251Bc/index.html
[23] https://maps.geo.census.gov/ddmv/map.html

Human Settlement

Large electric power generating plants have the potential to negatively impact human settlements through a variety of means. A solar facility could change the aesthetics of the project area, displace homes or businesses, introduce new noise sources, lower property values, be incompatible with local zoning, and interfere with electronic communications.

Impacts to human settlements resulting from the project are anticipated to range from minimal to moderate. Impacts to human settlements can be minimized by prudent siting (i.e., by choosing a site that avoid residences, businesses, and other places where people congregate).

Aesthetics

Aesthetic and visual resources include the physical features of a landscape such as land, water, vegetation, and structures. Determining the relative scenic value or visual importance of these features is a complex process that depends on what individuals perceive as being aesthetically appealing. Viewers' perceptions are based on their physical connection to the viewing area and their psychological relationship to the view, including distance to the structures, perspective, and duration of the view. Landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not compatible with a landscape or negatively impacts existing features of a landscape could negatively affect the aesthetics of an area.

The topography of the Land Control Area is generally flat with elevations ranging from 1,530 to 1,550 feet above sea level. Land use within the Land Control Area is predominantly agricultural, with corn and soybeans being the most common crops. There are windbreaks around most farmsteads and former farmsteads with agricultural buildings present in the project vicinity. Blue Mounds State Park is approximately 4 miles from the project, with a solid rock promontory rising 150 feet above the surrounding landscape. Visual range from this height is approximately 15 miles.[24]

The existing Magnolia Substation is located adjacent to the Land Control Area. Additionally, there are two transmission lines within or adjacent to the central portion of the Land Control Area. The transmission lines and substation are the current man-made focal points in the immediate project vicinity.

Impacts

The project would convert approximately 1,161 acres of predominately agricultural land to a solar facility. Visually, the new solar facility would be characterized by complex geometric forms, lines, and surfaces that may be divergent from the surrounding rural landscape. The panels utilized in solar PV are dark in color, and designed to maximize light absorption and minimize reflection.

The project's substation would be of similar vertical profile as the existing Magnolia Substation adjacent to the Land Control Area. The two to three transmission structures of less than 150 feet in height would be limited to the area between the project's substation and the Magnolia Substation, approximately 150 feet away. These new structures would be visible from the local roadways but would be one-half mile from the nearest residence. Two transmission lines are currently present in the area.

[24] https://aty.sdsu.edu/explain/atmos_refr/horizon.html

Operation of the project would require security lighting at the project entrance and would be down lit, and there would be down lit switch-controlled lights at each inverter for repair purposes. Impacts on light-sensitive land uses are not anticipated given the rural setting, coupled with minimal required lighting for operations.

In the project vicinity, the solar arrays would be visible from nearby roadways and parcels, but given their relatively low profile they would not be visible from long distances on roadways. There are eight residences and several agricultural buildings on parcels adjacent to the Land Control Area. **Table 8** provides distances to the nearest homes to the project, including approximate distance to the Preliminary Development Area boundary and approximate distance to the edge of solar arrays (per preliminary design). These residences are also shown on **Figure 3** (Preliminary Project Layout).

Table 8 Residences on Parcels Adjacent to Elk Creek Solar Facility

Residence	Description	Distance to Preliminary Development Boundary (feet)	Distance to Solar Arrays (feet)*
A	Adjacent to and opposite 180th Avenue from the northern unit. This residence has existing vegetative screening around three sides of the farmstead, including the east side adjacent to the Project.	132	275
B	Adjacent to central unit. The residence faces southeast and has existing vegetative screening along the west and north sides of the farmstead.	417	458
C	Approximately 500 feet south of central unit, opposite 131st Street. The residence faces southeast and has existing vegetative screening along the west and north sides of the farmstead.	668	1,094
D	Approximately 1,800 feet east of the central unit and opposite CSAH 3. The residence is screened on all sides within the farmstead.	1,841	1,876
E	Approximately 1,500 feet west and 1,200 feet north of the southern unit. Vegetative screening is present on the west side of the farmstead and outbuildings are present between the residence and the Land Control Area.	1,579	1,603

Residence	Description	Distance to Preliminary Development Boundary (feet)	Distance to Solar Arrays (feet)*
F	Adjacent to and opposite 180th Avenue from the southern unit. The residence faces south and has existing vegetative screening along the north side and partial vegetative screening along the east side of the farmstead.	674	695
G	Adjacent to and opposite 190th Avenue from the southern unit. The residence faces south and has existing vegetative screening along the north and west sides of the farmstead.	285	304
H	Approximately 4,500 feet west of central unit and 1,500 feet north and opposite 131st Street of southern unit. Nearest to the residence, vegetative screening is present along the north and west sides of the farmstead. An additional area of vegetative screening is present along the southern edge of the farmstead.	2,139	2,184

* Based on preliminary design.

While Residence A has existing vegetative screening along the east side of their residence, Elk Creek Solar has coordinated with the landowner and will implement approximately 150 feet of vegetative screening to help screen the south facing home from southeasterly views of the solar facility (see **Appendix B**). In addition, Elk Creek has negotiated with the landowner of Residence F and agreed to install vegetative screening along the west side of 180th Avenue to help screen the east facing home from easterly views of the solar facility.

The project would cover 1,161 acres approximately 4 miles from Blue Mound State Park. Given the elevation of the park above the surrounding landscape, the project would be visible from portions of the park, and may appear disharmonious from the surrounding agricultural landscape, resulting in a potentially moderate impact. No mitigation is available for this impact, and this impact would be present for the life of the project.

Mitigation

Elk Creek Solar will install approximately 150 feet of vegetative screening at Residence A to help screen the south facing home from southeasterly views of the solar facility. In addition, Elk Creek Solar will also install vegetative screening along the west side of 180th Avenue to help screen the east facing Residence F home from easterly views of the solar facility.

Cultural Values

Cultural values can be described as shared community beliefs or attitudes, among a given area or population that define what is collectively important and worthwhile to the group. Infrastructure projects have the potential to be inconsistent with the cultural values of an area, resulting in a deterioration of a community's shared sense of self.

Cultural representation in community events in Rock County appear to be tied to geographic features (such as Blue Mound State Park), seasonal events, national holidays, and municipal events. Examples of regional cultural events include summertime events like Buffalo Days and the Rock County Fair.

Impacts

The project would not impact public participation in the regional community cultural events noted above. Therefore, no impacts on cultural values are anticipated and no mitigation measures are proposed.

Displacement

Displacement is the need to remove structures (e.g., homes, businesses) to facilitate the construction and operation of the project. There are no residences, business, or structures such as barns or sheds within the northern and central portions of the Land Control Area. There is grain bin within the southern portion of the Land Control Area at a field edge along 190th Avenue.

Impacts

There is no potential for the project to displace residences. Elk Creek Solar has coordinated with the landowner of the grain bin, who has agreed to its removal. There are no occupied residences in the Land Control Area, and the business activity lost from removing land from agricultural production would be offset by the leases and purchase options with the landowners. There would not be any displacement by the project; as such, no mitigation is proposed.

Land Use and Zoning

Land use planning and zoning are tools used to manage land resources in a way that encourages orderly development and to protect the resources and uses that are valued by people living in an area. If LEPGPs are sited in areas where they are incompatible with existing or planned land uses, it can restrict landowners and communities from using their land resources in ways they prefer, interfere with efficient and organized use and development of land, or weaken protections of community and environmental resources.

Land cover in the Land Control Area is shown on **Figure 6** (Land Cover/Vegetation), and summarized in **Table 9** below.

Rock County zoning data shows that the Land Control Area is zoned as general agricultural.[25] Rock County has enacted an ordinance (Renewable Energy Ordinance) specifying development of large solar energy systems within the general agricultural district as a conditionally permitted use[26] that applies to solar projects with planned operation below the thresholds set forth in the Minnesota Power Plant Siting Act. Because the project is subject to the Power Plant Siting Act (see **Section 2: Regulatory**

[25] Application, see footnote 2

[26] https://www.co.rock.mn.us/general_information/county_ordinances.php

Framework), the following is presented for informational purposes only. The Commission's site permit determinations are guided by the state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land use conflicts, and ensure the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure.[27]

Table 9 Land cover in the Land Control Area

Land Cover Type	Observed Land Use	Land Control Area (acres)	Land Control Area (%)	Preliminary Development Area (acres)	Preliminary Development Area (%)
Agricultural	Row crop (corn, soybeans)	1,461.8	96.1%	1,144.6	98.5%
Developed	Public roads	49.1	3.2%	16.1	1.4%
Forested	Woodlot shelterbelts	2.9	0.2%	0.0	0.0%
Shrubland	Roadside ditches and wetlands	7.8	0.5%	0.6	0.1%
Total		**1,521.5**	**100%**	**1,161.3**	**100%**

Source: USGS Land Cover GAP, 2019.

Impacts

The Preliminary Development Area would predominately affect agricultural land. The agricultural land would be converted from an agricultural use to solar energy generation for the life of the project. This would not interfere with planned land use or development plans, and would have a minimal impact on the rural character of the surrounding area and Rock County.

The facility components would be setback from roads that bound and bisect the Preliminary Development Area (25 feet from the road right-of-way). The 34.5 kV collection lines that connect the three main units of solar panel arrays would be directionally bored under or spanned over roads. No forested areas are present within the Preliminary Development Area, and Elk Creek Solar is anticipating to limit tree clearing to two isolated trees located in the southern unit.

The Rock County Renewable Energy Ordinance outlines standards for large solar farms and solar facilities in general. The project differs from the Renewable Energy Ordinance in two ways:

- Height of panels: "ground-or-pole-mounted solar systems shall not exceed 15 feet in height when oriented at maximum tilt" (Section 10, subdivision 3, part 2B)
- Power and communication lines: "…shall be buried underground" (Section 10, subdivision 2, part 5)

The size of the panels used for the project will depend on equipment available at the time of final design and procurement, which together with the racking system, may have a maximum height up to 20 feet above ground.

[27] Minn. Stat. 216E.03 Subd. 7(a)

As provided in Section 3, Engineering, Operational Design, and Construction, Elk Creek Solar is evaluating below-ground and hybrid above-ground/below-ground electrical systems. A hybrid above-ground/below-ground system has many benefits, including less soil disturbance (i.e., fewer cables need to be installed belowground), thereby minimizing the construction impacts and preserving the soil structure for future agricultural uses after decommissioning.

Elk Creek Solar discussed the height of the panels and the potential for above ground collection systems with representatives of Rock County on July 31 and September 12, 2019, as described in Elk Creek's 2019 Site Permit Application. Elk Creek and Rock County entered into a Development Agreement to document how the County and Elk Creek would work together during construction of the project. Magnolia and Vienna Townships ratified the Development Agreement through resolutions dated November 10, 2020, and July 14, 2020, respectively. Elk Creek will work with the County and Townships to update the Development Agreement and resolutions to reflect the updated project. Rock County continues to support the Elk Creek Solar Project and a letter of support is provided in **Appendix K**.

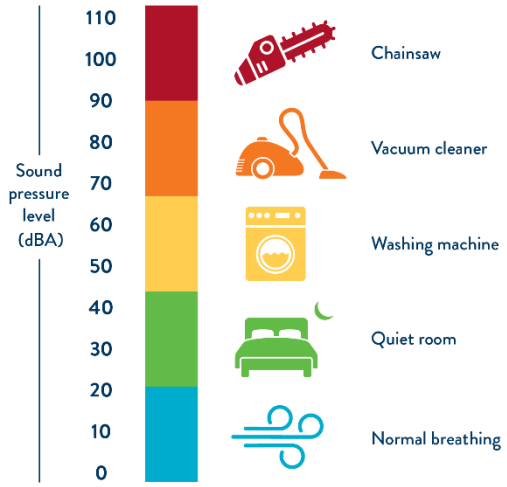
Mitigation

The project is subject to permitting under Minnesota's Power Plant Siting Act. Under this statute, the site permit issued for large electric power generating plant "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt all zoning, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government" (Minnesota Statute, section 216E.10). No land use or zoning mitigation is proposed.

Noise

Noise is defined as unwanted and objectionable sound. Sound levels are usually measured and expressed in decibels (dB), which are logarithmic units that can be used to conveniently compare wide ranges of sound intensities. The A-weighted decibel (dBA) scale of frequency sensitivity accounts for the sensitivity of the human ear, which is less sensitive to low frequencies, and correlates well with human perceptions of the annoying aspects of noise. On the logarithmic decibel scale, a 70 dBA sound level is approximately twice as loud as a 60 dBA sound level and four times as loud as a 50 dBA sound level.

The Minnesota Pollution Control Agency has developed protective standards for daytime and nighttime noise levels that vary based on land use at the location where the sound is heard (Noise Area Classification or [NAC]). MPCA noise standards are provided in **Table 10**. These standards are expressed as a range of permissible dBA over the course of an hour. "L_{10}" is the noise level may be exceeded 10 percent of the time, or six minutes per hour, while "L_{50}" may be exceeded 50 percent of the time, or 30 minutes per hour. Standards vary between daytime and nighttime hours.



Graphic 7 Noise Level Comparison

Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In wilderness areas, ambient noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to be around 50 or 60 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports. Although people often accept higher levels associated with noisy urban residential and residential commercial zones, high noise levels are considered adverse to public health. Comparative noise levels are shown on **Graphic 7**.

Table 10 Noise Area Classifications and Noise Standards

Noise Area Classification	Short Description of Use*	Daytime (7:00 a.m. to 10:00 p.m.)		Nighttime (10:00 p.m. to 7:00 a.m.)	
		L_{10}	L_{50}	L_{10}	L_{50}
1	Residential housing, religious activities, camping and picnicking areas, health services, hotels, educational services	65	60	55	50
2	Retail, business and government services, recreational activities, transit passenger terminals	70	65	70	65
3	Manufacturing, fairgrounds and amusement parks, agricultural and forestry activities	80	75	80	75
4[+]	Undeveloped and unused land	--	--	--	--

Notes:
All numerical standards are presented in dBA
* Full description can be found at https://www.pca.state.mn.us/sites/default/files/p-gen6-01.pdf
[+] There is no noise standard for NAC 4

Impacts

Potential noise impacts from the project are associated with both construction and operation. The primary noise receptors are eight adjacent residences, and could also include individuals working outside in the project vicinity. Residences are in NAC 1. **Table 11** provides information for the adjacent residences and the distances to project components.

Table 11 Distance of Adjacent Residential Receptors to Project Components

Residence	Distance to Preliminary Development Boundary (feet)	Distance to Solar Arrays (feet)*	Distance to Nearest Inverter (feet) 1
A	132	275	874
B	417	458	1,247
C	668	1,094	1,836
D	1,841	1,876	2,400
E	1,579	1,603	2,205
F	674	695	1,240
G	285	304	665
H	2,139	2,184	2,856

Notes:
* Based on Preliminary Development

Construction Noise

During construction, noise would be emitted by the construction vehicles and equipment, potentially affecting residential receptors. The amount of noise would vary based on what type of construction is occurring on a given day. The US Department of Transportation provides a handbook with estimates of construction noise for particular equipment,[28] which was used in this analysis.

Pile driving of the rack supports is anticipated to create the most noise estimated at 101 dBA at 50 feet. Installation of each rack support takes between 30 seconds to 2 minutes depending on the soil conditions; Elk Creek Solar anticipates this activity would take up to 8 weeks across the site. Noise reaching residential receptors could be reduced by limiting driving piles within range of residential receptors to different days or hours in order to meet the MPCA noise standard.

Grading equipment, bobcats, and other construction equipment are anticipated to emit noise between 76-85 dBA at 50 feet. Noise associated with these types of equipment would primarily occur during the initial site grading and access road construction, which is expected to last approximately six weeks. Mitigation for potential construction noise impacts is provided below.

Operation Noise

The main source of noise from the project during operation would be from the inverters, which include air conditioners housed in each; and to a lesser extent, from the transformers and the rotation of the tracking system. **Table 12** summarizes the noise levels of a range of equipment under consideration for use at the site and anticipated distance to reach the most stringent MPCA noise standard (50 dBA).

[28] https://www.fhwa.dot.gov/Environment/noise/construction_noise/handbook/handbook09.cfm

Table 12 Equipment and Estimated Noise Levels

Equipment Type	Equipment Model*	dBA at 50 feet	Distance to 50 dBA
Inverter	Sungrow 44001	72	640 feet
	TMEIC Solar Ware Ninja PVU-L0920GR	51	58 feet
	SMA Sunny Central 2750-EV-US	60	160 feet
	ABB PVS980	64	260 feet
Tracker	ATI DuraTrack HZ v3	30	--
	NexTracker	54	82 feet

Notes:
*Noise estimates from the manufacturer

Noise levels are estimated to be less than 50 dBA at distances between 5 and 82 feet from the trackers, depending on which model is selected. The closest home to the facility is 275 feet away from the edge of a solar array. The distance of the nearest inverter to a residence is 665 feet. Noise levels from the equipment are not expected to be discernible from background noise levels at homes in the vicinity. Noise impacts to wildlife are discussed in the **Wildlife** impact section of this document.

Mitigation

Standard language in Commission site permits requires permittees to adhere to MPCA noise standards which protect against impacts human health and welfare.[29] Operational noise from the solar facility is not anticipated to significantly contribute to exceedances of the MPCA's noise standards, therefore, no mitigation is proposed to be implemented after construction is completed.

Construction noise can be mitigated to minimize the impact of any exceedances of the standard that may occur. Possible mitigation measures include the following:

- Conducting construction activities during normal business hours
- Conducting pile driving and other high impact construction noise nearest residences intermittently to meet MPCA noise standards
- Equipping construction equipment with residential-grade mufflers

Recreation

Recreation includes outdoor leisure activities done for enjoyment, amusement, and pleasure. From hiking, to boating, and nature watching to hunting, LEPGPs are a concern for recreation because they can (1) alter recreational resources in a way that diminishes their utility; or (2) alter the visual setting in a way that changes the experience and reduces the user's enjoyment, amusement, or pleasure. Both types of impacts tend to occur where the LEPGP is located immediately adjacent to the recreational resource.

[29] Draft Site Permit Section 4.3.7.

Recreational opportunities are shown on **Figure 7**. There are no MDNR Scientific and Natural Areas, state trails, state water trails, Wildlife Management Areas, Aquatic Management Areas, state parks, migratory waterfowl feeding and resting areas, or MDNR mapped snowmobile trails within one mile of the Land Control Area. Similarly, there are no county or city parks within one mile of the Land Control Area.

Impacts

Construction and operation of the project would not impact any recreational opportunities in or near the Land Control Area. Therefore, no mitigation measures are proposed.

Socioeconomics and Environmental Justice

Socioeconomic factors provide an indication of how economic activity affects and is shaped by social processes. Socioeconomic measures tell us how societies progress, stagnate, or regress because of their local or regional economy, or the global economy. Environmental justice is the" fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[30] The goal of this "fair treatment" is not to shift risks among populations, but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts.[31]

The project is in a rural area within Vienna and Magnolia Townships, Rock County, Minnesota. The incorporated communities that are geographically closest to the Land Control Area are Magnolia (0.7 mile north), Kenneth (3.0 miles north/northwest), Luverne (4.0 miles west/southwest), Hardwick (5.6 miles northwest), and Adrian (6.9 miles southeast). The nearest metropolitan area is Sioux Falls, South Dakota, which is approximately 29 miles southwest of the project.

Impacts

Table 13 presents population and economic information gathered from the US Census Bureau 2021 American Community Survey 5-year Estimates about Minnesota and Rock County. Census tracts 5701 and 5703 underlie the Land Control Area.

Table 13 Population and Economic Information in the Project Area

US Census Metric	Minnesota	Rock County	Census Tract 5701	Census Tract 5703
Total Population	5,706,494	9,704	2,347	3,145
White only population, Not Hispanic or Latino (%)	77.5	92.7	94.6	90.4
Total Nonwhite Population (%)	22.4	7.2	5.3	9.6
Total Housing Units (number)	2,420,473	4,270	1,105	1,591

[30] US EPA Environmental Justice, https://www.epa.gov/environmentaljustice.
[31] US EPA, Guidance for Incorporating Environmental Justice Concern in EPA's NEPA Compliance Analyses (pdf).

US Census Metric	Minnesota	Rock County	Census Tract 5701	Census Tract 5703
Vacant Housing Units (number)	252,672	292	70	111
Per Capita Income (in 2021 Inflation Adjusted US Dollars)	$41,204	$34,517	$37,641	$31,062
Persons at or below 200 percent poverty level (%)	22.1	26.7	24.5	29.2
Unemployment Rate (%)	4.0	2.2	2.7	3.3
Limited English Speaking Households (%)	2.2	0.0	0	0.1

Source: https://www.census.gov/data.html

Minn. Statutes § 216B.1691, Subd. 1(e) defines an environmental justice area in Minnesota as an area in Minnesota that, based on the most recent data published by the United States Census Bureau, meets one or more of the following criteria:

- 40 percent or more of the area's total population is nonwhite;
- 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;
- 40 percent or more of residents over the age of five have limited English proficiency; or
- The area is located within Indian country, as defined in United State Code, title 18, section 1151.

Rock County is not an environmental justice area in the state of Minnesota, nor are the census tracts that underlie the Land Control Area.

Elk Creek Solar has indicated that construction of the project is expected to utilize approximately 100 personnel for the majority of construction (approximately 20 months). General skilled labor is expected to be available in Rock County or Minnesota to provide for the site development activities. Specialized labor may be imported from other areas of Minnesota or neighboring states, because the relatively short construction duration often precludes special training of local or regional labor. Much of the workforce needed to construct a solar facility must be comprised of Minnesota licensed electricians, as most of the assembly and wiring work for solar installations is considered electrical work under the Minnesota State Electrical Code.

There are five hotels in Luverne, and more than 20 hotels in Sioux Falls, South Dakota, approximately 35 miles away. Construction of the project would provide temporary increases to the revenue of the area through increased demand for lodging, food services, fuel, transportation, and general supplies. Opportunities exist for subcontracting to local contractors for gravel, fill, and civil work.

Operation of the project would require up to six personnel. Sufficient temporary lodging and permanent housing is available within Rock County, and within the Sioux Falls metropolitan area, to accommodate construction laborers and long-term personnel.

The Elk Creek Education Fund would be established by Elk Creek Solar, to which it would contribute $ 32,000 annually for the first 20 years of operation. Because the Land Control Area is located within the Luverne school district, the fund would be distributed to this district.

The project would provide additional production tax payments to Rock County beyond what was presented in the 2019 Site Permit Application. Production tax payments to Rock County are estimated to total approximately $ 7.94 million annually over 25 years. Additionally, Vienna and Magnolia Townships would receive approximately $ 1.985 million annually over 25 years.

Mitigation

Because impacts to socioeconomics generally would be long-term and beneficial, no mitigation is proposed.

Property Values

A property's value is influenced by a complex interaction of factors, including the presence of a LEPGP. Impacts to property values can be measured in three ways: sale price, sales volume, and marketing time. Many of these factors are parcel specific, and can include condition, size, acreage, improvements, and neighborhood characteristics; the proximity to schools, parks, and other amenities; and the presence of existing infrastructure, for example, highways or transmission lines. In addition to property-specific factors, local and national market trends, as well as interest rates, can affect all three measures. The presence of a solar facility becomes one of many interacting factors that could affect a specific property's value. Studies of property values in the vicinity of solar facilities have reported a range of results, both positive and negative. [32, 33]

Impacts

Often, negative effects from LEPGPs that could influence property values result from impacts extending beyond the land control area. Examples include emissions, noise, and visual impacts. Unlike combustion-based electric generating facilities, the project would not generate emissions through the energy production process. Potential impacts from operational noise are not anticipated. Aesthetic impacts would occur, but because the project is relatively low-profile, impacts to the immediate surrounding area would also be low. Potentially affected properties either have or are planned to have vegetative screening.

Considerations such as setbacks, benefits to the community, economic impact, and vegetative features could have influence over property value. For instance, Elk Creek Solar's preliminary development plan complies with Rock County Zoning Ordinance setbacks. Economic benefits are analyzed in the **Socioeconomics and Environmental Justice** section.

Direct impacts to property values from the solar facility are anticipated to be minimal; as such, no mitigation is proposed.

[32] https://www.sciencedirect.com/science/article/pii/S0301421523000101.
[33] Kurt Schneider, Environmental Services Director, (October 20, 2017) *Email to Commerce staff*.

Public Services and Emergency Response

Public services and infrastructure include the systems that supply essential amenities like public water supplies, electricity, gas, internet, and transportation by road, rail, and air. Emergency response encompasses Rock County Sheriff and the Magnolia volunteer fire department, as well as services from Luverne, including the fire department and the Sanford Luverne Medical Center ambulance. Construction activities can cause temporary disturbances to public services and emergency response through traffic restrictions or utility outages.

Most rural residences in Rock County are supplied water by wells or by Rock County Rural Water. Sewage is serviced by residential septic tanks and drain fields. Approximately 20 telephone service providers and 15 broadband providers operate in Vienna and Magnolia townships.[34]

The project would be located adjacent to the existing ITC Midwest Magnolia Substation. There are two transmission lines partially within the Land Control Area and extending east-west, and others to the south and east. Approximate locations of these transmission lines are displayed on **Figure 3** (Preliminary Project Layout). There are no pipelines in the Land Control Area.[35]

There are four towers that are a part of the Allied Radio Matrix for Emergency Response (ARMER) in Rock County.[36] These ARMER towers are a part of Minnesota's Statewide Communication Interoperability Plan, which aims to improve communication for emergency responders. The ARMER radio system operates by line of sight, communicating with other ARMER towers. For the system to operate effectively, multiple towers are needed to produce a solid blanket of coverage. The system can be interrupted if tall objects are proposed within the line-of-sight, typically at or near the top of a tower over 150 feet tall. There are no ARMER towers within one mile of the Elk Creek Solar Project.

Quentin Aanenson Field Airport located approximately 6 miles southwest of the project. It operates one asphalt runway and is used primarily for transient and local general aviation.[37]

Impacts

There would be no impacts to the water or sewer services in the project area as a result of the project. Groundwater use is discussed in the **Geology and Groundwater** section later in this document.

The project would interconnect to the existing Magnolia Substation via a 161 kV gen-tie transmission line. During interconnection, customers may experience short outages when the Magnolia Substation is shut down and temporary service is being established. The timing and duration of any service interruptions would be determined and communicated by the interconnecting utility, ITC Midwest.

The major roadway in the area is Interstate 90, approximately 1.5 miles south of the Land Control Area. Other than CSAH 3 which forms the eastern boundary of the project, roads that surround or run through the Land Control Area are local county or township roads. Annual Average Daily Traffic (AADT) counts from Minnesota Department of Transportation's Traffic Mapping Application are provided for roads in

[34] https://mn.gov/puc/consumers/utility/
[35] https://pvnpms.phmsa.dot.gov/PublicViewer/
[36] https://dps.mn.gov/divisions/ecn/programs/armer/Documents/Armer%20Site%20Map/ARMER%20Site%20Map%202018-01-01.pdf
[37] https://www.airnav.com/airport/KLYV

the project vicinity in **Table 14**. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day AADT. Since the area roadways have AADTs that are well below capacity, this increased traffic may be perceptible to area residents, but the slight increase in volume is not expected to affect traffic function. Slow-moving construction vehicles may also cause delays on smaller roads, similar to the impact of farm equipment during planting or harvest. However, these delays should be minimal for the relatively short construction delivery period.

Table 14 AADT in the Project Area

Roadway	Year	AADT Traffic Volume Total
CSAH 3 (adjacent to Land Control Area)	2022	305
Interstate 90 (approximately 1.5 miles south of Land Control Area)	2022	11,392
CSAH 8 (one mile north of Land Control Area)	2022	276

Source: https://mndot.maps.arcgis.com/apps/webappviewer/index.html

Construction traffic would use the existing county roadway system to access the project facilities and deliver construction materials and personnel. There are a total of 10 permanent access points planned for the project:

- Northern unit: from 180th Avenue
- Central unit: two from CSAH 3 and two from 190th Avenue
- Southern unit: two from 131st Street, one from 180th Avenue, and one from 121st Street

There would also be an access to the project substation from 190th Avenue. All ten access points are shown on **Figure 3** (Preliminary Project Layout).

Traffic during construction is estimated to be approximately on average 75-100 pickup trucks, cars, and/or other types of employee vehicles onsite for the majority of construction. It is estimated that approximately 10-20 semi-trucks per day would be used for delivery of facility components. Semi-truck delivery would vary per day depending on time of construction and delivery timeline of equipment. Overweight or oversized loads are unlikely. If they are required, Elk Creek will obtain the appropriate approvals prior to construction.

After construction is complete, traffic impacts during the operations phase of the project would be negligible. A small maintenance crew driving through the area in pickup trucks on a regular basis would monitor and maintain the facilities as needed, but traffic function would not be impacted as a result.

If emergency personnel were needed at the facility, multiple agencies would likely respond, depending on the situation. These include the Rock County Sheriff, Magnolia volunteer fire department, and services from Luverne including the fire department, Sanford Luverne Medical Center ambulance, and police department, all of which are approximately 4.0 miles west of the Land Control Area. The project is unlikely to have an undue impact on these services.

Mitigation

Section 8.10 of the draft Site Permit (**Appendix D**) (Emergency Response) requires Elk Creek Solar to prepare an Emergency Response Plan in consultation with the emergency responders having jurisdiction over the facility prior to construction. Copies of the plan are to be distributed emergency responders and Public Safety Answering Points (PSAP) with jurisdiction over the project. Elk Creek Solar will also be required to obtain and register the facility address or other location indicators acceptable to the emergency responders and PSAP having jurisdiction over the facility.

Public Health and Safety

Impacts to human health and safety are assessed by looking at three main issues: electric and magnetic fields (EMF), stray voltage, and induced voltage. The extent to which a project may raise concerns around EMF and stray voltage is correlated with the voltage of the line and how close it is to human settlement areas. The sections that follow evaluate how the project may impact human health and safety and how these impacts may be mitigated. Given the distance from homes, the voltage of the line and Elk Creek Solar's obligations for safe operation and proper maintenance of lines, no notable impacts to human health and safety are expected.

Electric and Magnetic Fields

EMF refers to electric and magnetic fields that are present around any energized electrical device. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, power collection lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductor. EMF can occur indoors and outdoors. The general consensus is that electric fields pose no health risk to humans.[38]

There are no federal regulations regarding allowable electric or magnetic fields produced by transmission lines in the United States. In Minnesota, the Commission has adopted a prudent avoidance approach in routing transmission lines. This means avoiding highly populated areas in routing when possible and maximizing the distance from homes (by placing the line across the road instead of in a front yard, for example). Since EMF levels drop off quickly to background levels with increasing distance from the centerline of a transmission line, these avoidance strategies minimize human exposure to EMF created by the project. The prudent avoidance approach has been incorporated into project design by avoiding population centers and minimizing the proximity of homes and businesses to the project.

In addition to prudent avoidance, the Commission has adopted a maximum electric field under high voltage transmission lines in Minnesota to 8.0 kilovolts/meter. It has not adopted a standard for magnetic fields.

Impacts

The sources of EMF for the project would be the electrical collection lines, the 161 kV gen-tie transmission line, and from the inverters/transformers. The gen-tie line is the only component that would operate at a voltage subject to Minnesota's electric field standard. The line would be operated consistent with this standard. EMF from collection lines and inverters/transformers is anticipated to be minimal. Accordingly, public health impacts related to EMF are anticipated to be minimal. As such, no mitigation measures are proposed.

Stray Voltage

Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. The grounding of these electrical systems results in a small amount of current flow through the earth.

[38] https://www.who.int/news-room/questions-and-answers/item/radiation-electromagnetic-fields

Impacts

Impacts to residences, businesses, or farming operations resulting from stray voltage are not anticipated. The collection system does not directly connect to businesses or residences at any point, and does not change local electrical service. No mitigation is proposed.

Induced Voltage

When an electric field reaches a nearby conductive object, such as a vehicle or a metal fence, it can induce a voltage on the object. The magnitude of this voltage is dependent on many factors, including the object's capacitance, shape, size, orientation and location, resistance with respect to ground, and the weather conditions. If the object is insulated or semi-insulated from the ground and a person touches it, a small current could pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, like what occurs when a person walks across a carpet and touches an object or person.

Most shocks from induced current are more of a nuisance than a danger. The Commission's electric field limit of 8 kilovolts/meter is designed to prevent serious hazard from shocks due to induced voltage under transmission lines. Site permits issued by the Commission require that transmission lines be constructed and operated to meet the National Electric Safety Code (NESC) standards and the Commission's electric field limit.

Impacts

Section 4.5.1 of the draft Site Permit (Safety Codes and Design Requirements) requires solar energy generating systems and associated facilities be designed to meet or exceed all relevant local and state codes, Institute of Electrical and Electronics Engineers, Inc. standards, the NESC, and North American Electric Reliability Corporation requirements.

Any potential impacts due to induced voltage would be mitigated by conditions in Commission site permits; no impacts are anticipated and no mitigation is proposed.

Land-Based Economies

Large electric power generating plants can impact land-based economies such as mining, forestry, and agriculture. The extent to which a project may impact these sectors is closely correlated with how much the project would impact lands earmarked for use by the industry. Resources can be renewable, such as forests or agriculture, or non-renewable, such as mining or other extractive industries. In some regions, a local economy can be connected to visitors traveling to an area to enjoy unique natural resources or to attend local events. Impacts to land-based economies are tied to land use impacts or impacts to public services.

Agriculture and Prime Farmland

Of the 309,120 acres that comprise Rock County, 287,871 acres (93 percent) are actively cultivated farmland. A total of 701 individual farms are located in Rock County, with the average farm size at 411 acres. The top crops (in acres) cultivated in Rock County include corn, soybeans, and foraging crops (hay and haylage, grass silage, and greenchop). Hogs and pigs are at the top of the list of livestock inventory in Rock County, followed by cattle and sheep and lambs.[39]

The market value of agricultural production in Rock County in 2017 was approximately $419 million. Livestock, poultry, and their products accounted for approximately 66 percent of the total value of agricultural production, while crop sales accounted for the remaining 34 percent.

Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pasture, woodland, or other lands).[40] Urbanized land and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods and is not subject to frequent or prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

The US Department of Agriculture (USDA) National Resource Conservation Service also recognizes farmlands of statewide importance, which are defined as lands other than prime farmland that are used for production of specific high-value food and fiber crops (e.g., citrus, tree nuts, olives, fruits, and vegetables). Farmlands of statewide importance have the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Farmland of statewide importance is similar to prime farmland but with minor shortcomings such as greater slopes or less ability to store soil moisture. The methods for defining and listing farmland of statewide importance are determined by the appropriate state agencies, typically in association with local soil conservation districts or other local agencies.

[39] https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27133.pdf

[40] https://www.nrcs.usda.gov/publications/Legend%20and%20Prime%20Farmland%20-%20Query%20by%20Soil%20Survey%20Area.html

Impacts

Table 15 lists the soils considered prime farmland and soils of statewide or local importance within the Preliminary Development Area.[41] **Figure 8** (Farmland Classification) depicts the distribution of prime farmland, prime farmland if drained, and not prime farmland in the Land Control Area. Conversion of 1,161.3 acres of agricultural land for operation of a solar facility would reduce the amount of agricultural land in the county by less than one percent.

Table 15 Farmland Classifications in the Preliminary Development Area

Farmland Classification	Preliminary Development Area (acres / %)
Prime Farmland	885.0 / 76.21%
Prime Farmland if Drained	256.6 / 22.09%
Prime farmland if protected from flooding or not frequently flooded during the growing season	2.7 / 0.23%
Farmland of Statewide Importance	3.6 / 0.31%
Not Prime Farmland	13.5 / 1.16%
TOTAL	**1,161.3 / 100.00%**

The prime farmland within the Preliminary Development Area would be placed in a permanent cover of prairie grasses according to seeding and management specifications as proposed in the Vegetation Management Plan (**Appendix I**) to benefit wildlife and soil. Removing the land from agricultural production may be beneficial for limiting nitrogen infiltration into groundwater supply, and improving groundwater quality. Elk Creek Solar anticipates that the property would be restored to agricultural use upon decommissioning of the project.

Agricultural production would be allowed to continue in the area within the Land Control Area but outside the fence of the Preliminary Development Area during construction and operation of the project. Additionally, if haying or grazing vegetation management strategies are used, some agricultural activities would continue within the Preliminary Development Area.

Elk Creek met with the Minnesota Department of Agriculture (MDA) on April 12, 2023, to discuss the site-specific characteristics and the contents of a revised Agricultural Impact Mitigation Plan to be prepared for the project. The AIMP was provided to MDA for review and on May 25, 2023, MDA responded and approved the AIMP for the Elk Creek Solar Project (**Appendix E**).

The AIMP incorporates best management practices into site layout; pre-construction, construction, and post construction methods; operational procedures; and decommissioning and restoration procedures to avoid and minimize impacts to soil and site productivity such that pre-construction agricultural productivity (anticipated use, appropriate management) is rapidly returned to the site following decommissioning.

One of the primary means to protect and preserve the topsoil during construction and operation of the project is to separate the topsoil from the other subgrade/subsoil materials when earthmoving activities

[41] Application, see footnote 2

or excavation are taking place. Topsoil would re-spread on top of the backfilled and disturbed areas to maintain the overall integrity and character of the pre-construction farmland. Any excess topsoil material (e.g., from access roads, project substation footprint) would be re-spread and stored at pre-established locations on the site during the operating years of the project. This topsoil would be revegetated as appropriate and consistent with the VMP to maintain a rhizosphere suitable for plant growth when the project is decommissioned, and preserving the health of topsoil for agricultural use in the future.

As provided in the AIMP, Elk Creek Solar is aware of drain tile in the Land Control Area, and has obtained drain tile mapping from landowners for a majority of the Land Control Area and will continue to coordinate for mapping on remaining parcels. In the event the remaining drain tile mapping cannot be identified, Elk Creek will utilize other sources, including infrared aerial photographs, LiDAR data, and, if necessary, a site-specific tile locate survey. If damage occurs to drain tile or private ditches as a result of construction activities or operation of the project, Elk Creek Solar will repair any damages.

Initial post-construction revegetation efforts and maintenance of vegetation during operation and maintenance will consider selecting suitable plants, managing seeding times for late spring early summer when soil moisture is optimum for germination, and the use of mulch and other BMPs. Existing tile drainage systems will be maintained during operation of the project. The impact to prime farmland is that the land would not be farmed for the term of the site permit.

Mitigation

Section 4.3.18 of the draft Site Permit (**Appendix D**) requires an Agricultural Impact Mitigation Plan be included as part of a pre-construction package filed at the Commission prior to the start of construction. A draft AIMP is included as Appendix E, and includes measures such as:

- Utilize an Environmental Monitor to ensure appropriate measures are taken to properly segregate and handle topsoils.
- Separate the topsoil from the other subgrade/subsoil materials when earthmoving activities or excavation is taking place.
- Temporary halt of construction activities during wet weather if equipment would cause rutting or compaction of soil, or damage to drain tile.

Tourism

Large electric power generating plants may impact tourism if it reduces visitors to destinations within the project area. Primary tourism activities in the vicinity of the project are associated with recreational activities, local community festivals and other events. Examples of local community festivals include summertime events like Buffalo Days and the Rock County Fair hosted by the City of Luverne.[42]

Impacts

Elk Creek Solar would construct the project within the limits of the Land Control Area, and no road closures are anticipated to be necessary during active construction. The annual events hosted by the City of Luverne are held within city limits or in areas outside of the Land Control Area. No impacts to public access to these events is anticipated during construction or operation of the project, and no

[42] https://www.luverneevents.com/

mitigation is proposed.

Forestry

The Minnesota Forest Resources Council has not identified forestry resources in Rock County.[43] As such, construction and operation of the project would not impact forestry resources, and no mitigation is required.

Mining

Rock County has hardrock mineral resources where bedrock has outcropped, and aggregate resources in and near drainages.[44,45] The project is planned for land presently used for agriculture, and would not impact known mineral resources or current mining operations.

[43] https://mn.gov/frc/

[44] https://files.dnr.state.mn.us/lands_minerals/mpes_projects/minnesota_mine_sites_and_advanced_minerals_projects_january2016.pdf

[45] https://www.dot.state.mn.us/materials/asis_GE.html

Archeological and Historic Resources

Cultural resources, including archaeological and historic artifacts and features, contribute to the record of human occupation and alteration of the landscape. Archaeological resources include historic and prehistoric artifacts, structural ruins, or earthworks, and are often partially or completely below ground. Historic resources include extant structures, such as buildings and bridges, as well as districts and landscapes. Traditional cultural properties (TCPs) are also considered historic or cultural resources that reflect cultural or religious importance.

Impacts

In 2019, Area M Consulting conducted a Phase I cultural resources inventory of substantial portions of the north, central, and south units of the project. To fully capture the current Land Control Area, an additional Phase I cultural resources field inventory of the 545 acres in the southern unit not previously surveyed was conducted by Tetra Tech in May 2023.

The Phase I inventories included a background literature review of documentation on file at the Minnesota State Historic Preservation Office (SHPO), as well as various historical maps (i.e., Century Public Land Survey maps, Andreas maps, General Land Office maps, Trygg maps, and historic aerial photographs), to identify archaeological or historic sites, historic structures, and previous cultural resource inventories within and within one-half mile of the project. The background literature reviews included reviews of the online database of archaeological data managed by the Office of the State Archaeologist, as well as LiDAR imagery. One previous cultural resources inventory was identified within one-half mile of the Land Control Area. No previously recorded archaeological or historic sites, or historic structures were noted within or within one-half mile of the Land Control Area.

The Phase I field inventories included systematic pedestrian survey along transects spaced 3 meters apart in areas where ground visibility was greater than 25 percent. No cultural resources were identified as a result of the Phase I field inventories conducted by Area M in 2019. Tetra Tech's field inventory identified one post-Contact artifact scatter in the southern unit (Site 21RK0107).

Area M submitted the Phase I inventory reports for the 2020 Land Control Area and the additional 1,1077.8-acre area to the Minnesota SHPO in June 2019. In letters dated July 3, 2019, and July 5, 2019, the Minnesota SHPO agreed with Area M's recommendations that the project would not affect historic properties listed in or eligible for listing in the National Register of Historic Places. Tetra Tech submitted the Phase I inventory addendum report for the Addendum Land Control Area to SHPO on October 9, 2023, and the SHPO responded November 22, 2023, that the documentation provided was insufficient to determine if the site (post-Contact artifact scatter, [Site 21RK0107]) was eligible for listing in the National Register of Historic Places (NRHP). Copies of the Minnesota SHPO's letters are provided in **Appendix K**.

There is a potential for cultural resources to be present or uncovered during construction, and mitigation is provided in the section below.

Mitigation

Presently, Elk Creek Solar does not have plans to develop the area where the post-Contact artifact scatter Site 21RK0107 was observed. However, as final engineering and procurement progresses, the site may be impacted. There is a standard provision in the draft Site Permit (**Appendix D**) that applies to protection of archeological and historic resources:

Section 4.3.23 of the draft Site Permit addresses archeological resources and require the Permittee to avoid impacts to archaeological and historic resources where possible and to mitigate impacts where avoidance is not possible.

The Permittee is required to train workers about the need to avoid cultural properties, how to identify cultural properties, and procedures to follow if undocumented cultural properties, including gravesites, are found during construction. If previously unidentified archaeological sites are found during construction, the permit requires the permittee to stop construction and contact SHPO and the State Archaeologist to determine how best to proceed. If human remains are discovered, ground disturbing activity will stop and local law enforcement will be notified.

Natural Resources

Impacts to the natural environment are assessed by looking at a variety of resources including air quality, geology, soils, water resources, flora, fauna, and rare and unique resources. Impacts of a LEPGP on these resources are associated with activities directly within a resource area. Wildlife near the construction area, for example, may be disturbed by noise from construction equipment; or may be disturbed by lighting used at night.

Air Quality

Air quality is a measure of how pollution-free the ambient air is and how healthy it is for humans, other animals, and plants. Emissions of air pollutants during construction and operation of new infrastructure can cause concern about degradation of air quality. Overall air quality in Minnesota has improved over the last 20 years, but current levels of air pollution still contribute to health impacts.[46]

The nearest air quality monitor to the project is in Marshall, Minnesota, approximately 50 miles to the north. This station monitors for ozone (O3) and particulate matter below 2.5 microns (PM2.5). Ozone is produced from chemical reactions from volatile organic compounds (VOCs), oxides of nitrogen (NOx), and sunlight. Typical sources of VOCs and NOx are related to the burning or refining of fossil fuels. The sources of PM2.5 include vehicle emissions (particularly diesel), smoke, dust, and chemical reactions of ammonia with NOx or sulfur oxides (SOx). Sources of ammonia in rural areas include agricultural fertilizers and animal waste. **Table 16** shows the air quality monitoring results from the Marshall air quality monitoring site.

Table 16 Air Quality Monitoring Results, Marshall, Minnesota[47]

Year*	Pollutant	Reported Concentration	Air Quality Standard[+]
2022	Ozone	62 parts per billion (ppb)	70 ppb
2021		62 ppb	
2022	PM2.5	22 micrograms per cubic meter (ug/m3)	35 ug/m3
2021		22 ug/m3	
2020		16 ug/m3	

Notes:
*End year of a three-year period
[+] The measure for meeting the ozone standard is the 3-year average of the annual 4th-highest daily maximum 8-hour average concentration is less than or equal to the standard; the measure for meeting the PM2.5 standard is the 3-year average of the annual 98th-percentile daily average PM2.5 concentration is less than or equal to the standard.

Impacts

Impacts on air quality from construction and operation of the project would be low and primarily limited to the period of construction. When necessary, dust from construction activities would be controlled

[46] The State of Minnesota's Air Quality, January 2023 Report to the Legislature, https://www.pca.state.mn.us/sites/default/files/lraq1sy23.pdf.
[47] MPCA Data Services: https://public.tableau.com/app/profile/mpca.data.services/viz/CriteriaPollutantDataExplorer/CriteriaPollutantDataExplorer

using standard construction practices such as watering of exposed surfaces, covering of disturbed areas, reduced speed limits, and the use of chemical dust suppressants. Dust suppressants containing chloride can be damaging to wildlife, as discussed in the **Wildlife** section. Overall, dust emissions currently experienced annually in the area through farming activities would be reduced for the life of the project through the establishment of perennial vegetative cover.

The Elk Creek Solar Project would also reduce precursors to ozone and PM2.5 in the project vicinity by converting nitrogen-intensive cropland to perennial vegetation that would not receive nitrogen fertilizer application. Following construction, the project would have a net benefit to air quality in the project vicinity.

Mitigation

Impacts to air quality can be mitigated by the following measures:

- Exhaust emissions can be minimized by keeping vehicles and equipment in good working order, and not running equipment unless necessary.
- Utilizing existing power sources, for example, grid supplied-power, or cleaner fuel generators and vehicles rather than diesel-powered generators and vehicles, wherever practical, would also reduce emissions that negatively affect air quality.

Special Condition 5.3 of the draft Site Permit (**Appendix D**) is included to protect plants and wildlife from chloride products that do not break down in the environment. The Permittee would be prohibited from using dust control products containing calcium chloride or magnesium chloride during construction and operation.

Greenhouse Gases

Greenhouse gases (GHGs) are gaseous emissions that trap heat in the atmosphere and contribute to climate change. These emissions occur from natural processes and human activities. The most common GHGs emitted from human activities include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N_2O). Greenhouse gas emissions are typically reported in carbon dioxide equivalents (CO2e) to account for the variation of global warming potential of different gases to produce warming effects. As an example, CH4 is 27 times more potent than CO2 as a greenhouse gas, and N_2O is 273 times more potent than CO2 as a greenhouse gas.[48]

In 2007, Minnesota passed the Next Generation Energy Act, which set statutory goals to reduce GHG emissions by 80 percent between 2005 and 2050.[49] Minnesota's GHG emissions declined 23% between 2005 and 2020.[50]

Impacts

Estimates of GHG emissions associated with the project are provided in **Appendix G**. Construction of the project would result in GHG emissions from the combustion of diesel and gasoline in heavy construction equipment, delivery vehicles, and worker passenger vehicles. Emissions from construction activities

[48] https://www.epa.gov/ghgemissions/understanding-global-warming-potentials
[49] Minn. Stat. § 216H.02
[50] https://www.pca.state.mn.us/sites/default/files/lraq-2sy23.pdf

were calculated by estimating the volume of fuel expected to be consumed by each piece of equipment and determining the GHG emissions released upon combustion of those fuel volumes. Construction activities are expected to produce a total of 2,949 tons CO2e. GHG emissions from construction vehicles would be minimized by keeping construction equipment in good working order. Upon completion of the construction activities, emissions from heavy equipment, delivery vehicles, and construction personnel would cease.

During the operational stage, up to six permanent full-time workers would staff the solar facility, and maintenance activities requires the use of one to two maintenance trucks per day. The commuter vehicles and maintenance trucks generate a minor amount of GHG emissions. Utilities required to support operation of the solar farm include electricity, water, and sanitation. Approximately 1,350 kilowatt hours (kWh) per month of electricity may be purchased from the grid if needed to meet operational needs such as lighting, cameras, and comfort heating. Approximately 17 tons per year (tpy) CO2e would be generated during operation.

Sulfur hexafluoride (SF6), a GHG with a global warming potential 23,500 times that of CO2, would be used at the substation. SF6 is a gas used in high voltage circuit breakers to extinguish arcs formed when the circuit breaker opens. Small releases will occur as part of regular breaker operation and maintenance. Companies purchasing more than 10,000 metric tons CO2e of any one high global warming potential (GWP) gas annually must report purchases of all high GWP chemicals to the MPCA.[51]

During operation, the project is expected to produce enough renewable electricity to service 46,300 homes and could replace approximately 213,556 tpy CO2e generated from other sources in Minnesota.[52] This is equivalent to removing nearly 43,112 passenger vehicles from the road annually.[53] In addition, the project would convert approximately 1,161 acres of predominately row crop agricultural land to herbaceous land. Agricultural lands and herbaceous lands can both act as carbon sinks. The carbon storage capacity of herbaceous lands is about 65 percent higher than that of agricultural lands.[54]

Mitigation

Currently, there are no Minnesota-specific thresholds of significance for determining impacts of GHG emissions from an individual project on global climate change. In the absence of such a threshold, state regulations establish 100,000 tpy as the threshold to prepare an Environmental Assessment Worksheet to aid in determining if potential significant environmental effects might exist. A reasonable conclusion is that a project with GHG emissions below 100,000 tpy does not have the potential to result in significant GHG effects.

Climate Change

Climate change refers to long-term shifts in temperatures and weather patterns. Such shifts can be natural, due to changes in the sun's activity or large volcanic eruptions. But since the 1800s, human activities have been the main driver of climate change, primarily due to the burning of fossil fuels like coal, oil and gas.[55]

[51] https://www.pca.state.mn.us/business-with-us/high-global-warming-potential-greenhouse-gases
[52] https://www.eia.gov/electricity/data/browser/
[53] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator
[54] https://www.sciencedirect.com/science/article/pii/S2212041620301698
[55] https://www.un.org/en/climatechange/what-is-climate-change

The Minnesota Department of Natural Resources publishes historical climate data from the years 1895 to 2023.[56] This data shows that the average temperature of Rock County, Minnesota has been increasing at a rate of 0.16 °F per decade to reach an annual average temperature of 47.14 °F in 2023. Over the 30-year lifespan of the project, the average temperature could increase by 0.48 °F.

The annual precipitation in Rock County has increased at a rate of 0.16 inches per decade since records have been kept, including 2023, where the annual precipitation was the 6th lowest on record at 18.41 inches. However, over the lifespan of the project, precipitation could increase an additional 0.48 inches per year.

The frequency and intensity of heavy rainfall is increasing across the state. The MDNR climate office has defined mega-rain events as rainfalls of more than 6 inches over 1,000 square miles in 24 hours or less.[57] Sixteen mega-rain events have been recorded in the past 50 years. Of these, 11 events have occurred since the year 2000. Over the next 30 years, Rock County is predicted to have minor risk of flooding.[58] Rock County experienced a period of extreme drought in 2012 and 2013. Currently, the Rock County is ranked as in moderate drought.[59]

Since 2005, average wind speed at the Luverne, Minnesota airport weather station has decreased by 0.017 miles per hour per decade. However, over the same time period, the maximum peak wind gust speed has increased by 0.59 miles per hour per decade.

Impacts

A warming climate is expected to cause increased flooding, storms, and heat wave events. These events, especially an increased number and intensity of storms, could increase risks to the project, e.g., high winds or flooding could impact the facility components or access roads. Heavy rainfall events could also lead to increased soil erosion.

Preliminary project design has incorporated the occurrence of weather events typically experienced in southwestern Minnesota, as well as the potential for increased severity of storms and periods of drought due to climate change discussed above. In an effort to minimize impacts on the facility infrastructure and equipment, the project location was selected to avoid areas subject to flooding and pooled water during a 100-year rain event. Permanent drainage systems and stormwater ponds are sized to store and treat precipitation from more severe storms. Additionally, perennial vegetation plantings would replace current row crop agriculture in the Preliminary Development Area, increasing water uptake and slowing runoff.

Southwestern Minnesota can experience a range of weather events including high winds, hail, high and low temperatures, and heavy snowfall. Solar modules and related equipment are designed to withstand storms that are potentially stronger than normal with minimal equipment downtime. During operation, Elk Creek Solar would use industry best practices to reduce the impact of high winds and weather events, including options such as optimized stow regimes to reduce equipment exposure, and installing dampening equipment to reduce oscillation during high winds. The system would be designed so that

[56] https://arcgis.dnr.state.mn.us/ewr/climatetrends/
[57] https://www.dnr.state.mn.us/climate/summaries_and_publications/mega_rain_events.html
[58] https://riskfactor.com/county/rock-county-mn/27133_fsid
[59] https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?fips_27133

equipment can be isolated when necessary and includes an appropriate level of redundancy to allow for maintenance, repairs, and potential replacement of equipment damaged by storms.

Infrastructure supporting project operation would be designed to comply with all applicable industry, local, and state building codes and standards. Civil and structural design would include safety factors for increased wind and snow loads, as set by the current standards. The septic system would be designed, installed, and maintained to withstand weather events associated with climate change, including increased heavy rains. The electrical system would be designed for reliability, robustness, and compliance with the current codes and standards.

Mitigation

Additional minimization of the effects of climate change to the project could include identifying processes in operations and maintenance plans that are sensitive to high precipitation or high wind; to periodically review process performance, and to update processes when performance is deteriorating.

Geology and Groundwater

Geology is the study of the structure, evolution and dynamics of the Earth and its natural mineral and energy resources. Geology is important for the exploration of minerals, understanding the stability of the subsurface, evaluating water resources, and the remediation of environmental hazards. Geologic and hydrological systems often determine land use choices and is a factor in siting energy infrastructure.

The surface topography in southwestern Minnesota was heavily influenced by the most recent glaciation. Ice sheets crossed the region several times during the Wisconsin glaciation, depositing layers of sediment 100 to 600 feet thick in most places. The major landform in the Inner Coteau ecological subsection is highly dissected moraines of pre-Wisconsin drift, capped by thick (6 to 15 feet) wind-blown silt (i.e., loess) deposits. Topography is level to gently rolling till plains, moraines, lake plains, and outwash plains.[60] There is an outcrop of the Sioux Quartzite in Rock County of Late Precambrian age (1.6 billion to 600 million years before present).[61]

Groundwater is water that exists beneath the land surface. Groundwater is the source of about 37 percent of the water that county and city water departments supply to households and businesses (public supply). It provides drinking water for more than 90 percent of the rural population who do not get their water delivered to them from a county/city water department or private water company. Groundwater is the source for 39 percent of water used for agriculture in the United States.[62]

Minnesota is divided into six groundwater provinces based on bedrock and glacial geology. The project is located within the Western Province, which is characterized by clayey glacial sediment overlying Precambrian and Cretaceous bedrock. In this province, groundwater is typically derived from limited extent surficial and buried sand aquifers. Fractured bedrock is usually buried deeply beneath glacial sediments, and may be accessed as a groundwater resource.

[60] https://www.dnr.state.mn.us/ecs/251Bc/index.html
[61] Minnesota's Geology. 1982. Ojakangas, R. and Matsch, C. University of Minnesota Press.
[62] https://www.usgs.gov/faqs/what-groundwater.

Groundwater resources are protected by the Safe Drinking Water Act through EPA-designated sole source aquifers (SSA), and through the local identification and administration of Wellhead Protection Areas (WHPAs).

The USEPA defines a SSA or principal source aquifer area as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer, where contamination of the aquifer could create a significant hazard to public health, and where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer. There are currently no EPA-designated SSAs in the project vicinity.[63]

WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by Minnesota Department of Health. A search for WHPAs in the MDH database indicated there are none in the Land Control Area.[64]

Nitrogen, in the form of fertilizer, is a common component used in agricultural production. However, nitrogen is a potent water pollutant that is difficult to manage once it has been introduced into the environment. Elevated nitrate levels can be harmful to fish and aquatic life, and pollute drinking water in surface water and in groundwater.[65] The primary human health concern for ingesting water high in nitrates is with pregnant women and with infants under six months old developing "blue baby syndrome" (methemoglobinemia).[66]

The MDA determines current nitrate-nitrogen concentrations in private wells, on a township scale, through the Township Testing Program. Seven townships in Rock County were assessed in 2016 and 2017, including Vienna and Magnolia Townships, which are within the Land Control Area. According to the MDA's Final Township Testing Report for Rock County, all seven townships sampled in Rock County have 10 percent or more of wells reported results over the Health Risk Limit for Nitrate-N (> 10 milligrams per liter [mg/L]), meaning nitrogen from fertilizer appears to be contaminating private wells, including drinking water.[67] The northern unit of the Land Control Area is adjacent to an area identified by the MDA as having Fertilizer Application Restrictions for the protection of groundwater.[68]

Impacts

Impacts associated with geology and groundwater are typically associated with unstable rock formations, dewatering during construction, improper installation or abandonment of wells, or the introduction of a source of pollutants to an area identified for the protection of groundwater. The project would obtain a permit from the MDH to install a well for water use at the site during construction and operation, and approximately 600 gallons of water are expected to be used per day. This minor use of water is not expected to have a noticeable impact on the area's water supply. Depth to groundwater in the Land Control Area is estimated between 0 - 20 feet.[69] If dewatering is necessary

[63] https://www.epa.gov/dwssa
[64] https://gisdata.mn.gov/dataset/water-wellhead-protection-areas
[65] https://www.pca.state.mn.us/sites/default/files/wq-s6-26c.pdf
[66] https://www.health.state.mn.us/communities/environment/water/docs/contaminants/nitratmethemog.pdf
[67] https://www.mda.state.mn.us/sites/default/files/2019-10/rockfinalttnreport.pdf
[68] https://www.mda.state.mn.us/chemicals/fertilizers/nutrient-mgmt/nitrogenplan/mitigation/wrpr/wrprpart1/vulnerableareamap
[69] https://mnatlas.org/resources/water-table-depth/

above 10,000 gallons per day or 1 million gallons per year, Elk Creek Solar would obtain a Water Appropriation Permit from MDNR. The potential effects of dewatering to surface water quality is presented in the **Surface Water Resources** section.

Improper well abandonment could serve as a conduit for surface materials to enter groundwater. The Minnesota Well Index identified one domestic well associated with a former farmstead within the Land Control Area.[70] The residential structure where the well is likely located is no longer present, and it is unknown if this well has been appropriately abandoned. Elk Creek Solar would assess whether the well is open and properly abandon it, if necessary, in accordance with Minnesota Department of Health requirements.

Sources of nitrogen from the project that could affect groundwater include the septic system, if it is malfunctioning. Elk Creek Solar would obtain the applicable subsurface sewage treatment system construction permit and operation permit from Rock County, which would minimize the potential for malfunction.

The Elk Creek Solar Project would convert nitrogen-intensive cropland to perennial vegetation that would not receive nitrogen fertilizer application. Perennial vegetation also acts as a mechanism of capturing nitrogen and reducing the ability of that nitrogen to leave the Land Control Area.[71] Nearby surface water bodies (Rock River, Champepadan Creek, Elk Creek) may also benefit from fewer nitrogen-intensive activities in the watershed. Even though the Land Control Area is considered prime farmland, shifting the land cover in the Preliminary Development Area from row crops to perennial vegetation for the life of the project could prove to be beneficial for limiting nitrogen infiltration into groundwater supply, as well as nitrogen in stormwater runoff, improving both groundwater and surface water quality.

Mitigation

Potential effects to groundwater are expected to be minimal; as such, no mitigation is proposed.

Soils

Soil is a mix of living and non-living material. Soil health is defined as "the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans."[72] Healthy soil provides a multitude of benefits: clean air and water, bountiful crops and forests, productive grazing lands, diverse wildlife, and beautiful landscapes. Soil performs five essential functions:

- Regulating water
- Sustaining plant and animal life
- Filtering and buffering potential pollutants
- Nutrient cycling
- Providing physical stability and support

[70] https://www.health.state.mn.us/communities/environment/water/mwi/index.html
[71] https://www.agridrain.com/webres/File/TenWaystoReduceNitrateLoadsILExtension2016.pdf
[72] https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health

Impacts

Soil impacts can result from erosion and sedimentation of soil during construction, not properly stabilizing soil during operation, and the compaction of soil during construction and operation. Erosion and sedimentation impacts are discussed in the **Surface Water Resources** section below. Impacts to topsoil are discussed in the **Agriculture and Prime Farmland** section above. The Agricultural Impact Mitigation Plan prepared for the project (**Appendix E**) evaluated soils in the Land Control Area, and is summarized below.

Soil texture affects water infiltration and percolation, drought tolerance, compaction, rutting, and revegetation among other qualities of soils. A majority of the soils in the Preliminary Development Area are classified as Fine Silty and Fine Loamy textural families, indicating medium-textured soils dominated by soil particles in the loam and silt fractions with fewer particles in the clay and sand fractions.

Hydric soils are generally described as soils in poorly drained to very poorly drained drainage classes. Hydric soils are formally a component of regulated wetlands and can be used to indicate areas with potential jurisdictional wetlands. Most of the soils in the Preliminary Development Area are non-hydric (846.7 acres, 77 percent), with 272.7 acres (23 percent) being considered hydric soils. Virtually all of the hydric soils that were historic wetlands have been legally converted to non-wetland by subsurface tile drainage.

Mitigation

Mitigation for impacts to soil are presented in the **Surface Water Resources** section (for erosion and sedimentation), and in the **Agriculture and Prime Farmland** section (topsoil).

Surface Water Resources

Surface water resources include surface water bodies, water courses, and wetlands that supply water for drinking, irrigation and industrial uses, provide wildlife habitat, and serve as swimming and fishing resources for people. The extent of surface water resources (their amount and distribution) and their condition (physical, chemical, and biological attributes) are critical to ecosystems, human uses, and the overall function and sustainability of the hydrologic cycle.

The project is situated within the Rock River watershed, which is a tributary to the Missouri River. There are no natural lakes in this watershed. Prior to European settlement, uninterrupted prairie covered the basin. This prairie has been converted from mostly a range of tallgrass and a small amount of wet prairie to intensive agricultural uses. This conversion has resulted in an increase in runoff, an increase in sediment loads in creeks and rivers, and a decrease in groundwater infiltration, all of which have affected water resources in the area.[73]

Recreational uses of the Rock River include fishing, swimming and canoeing. In addition, the corridor of the Rock River provides wildlife habitat, and as such is utilized by hunters and bird watchers. Surface water from the Land Control Area drains toward Champepedan Creek to the north, Elk Creek to the south, and a small portion drains towards the main stem of the Rock River to the west. All of these drainages have been identified by the State of Minnesota as being impaired waters, meaning the water

[73] https://www.pca.state.mn.us/sites/default/files/wq-ws3-10170204b.pdf

quality does not meet the standards needed for its designated use. Impairments and designated uses are presented in **Table 17**.[74]

Table 17 Waterbody Impairments and Designated Uses

Waterbody	Designated Use	Impairment
Champepedan Creek	Aquatic life, Aquatic recreation	*E.coli*
Elk Creek	Aquatic life, Aquatic recreation	*E. coli*, Turbidity
Rock River	Aquatic life	Turbidity

Adjacent to many waterbodies are riparian areas and wetlands. Wetlands are important resources for flood abatement, wildlife habitat, and water quality. Wetlands that are hydrologically connected to the nation's navigable rivers are federally protected under the Clean Water Act. In Minnesota, wetlands are also protected under the Wetland Conservation Act. The National Wetland Inventory (NWI) provides data and information on wetlands across the United States.[75]

A floodplain is any area subject to flooding from any source, such as rivers, streams, and lakes.[76] Natural floodplains provide flood risk reduction benefits by slowing runoff and storing flood water. Floodplains not only play a vital role in spawning habitat and refuge for aquatic biota, but also for nutrient removal and energy dissipation for river stability. Another important function of floodplains is the recharging of oxbows (i.e., filling up disconnected channel cutoffs with water). These oxbows provide critical habitat to many slack-water species, including the federally endangered Topeka shiner (*Notropis topeka*) that have been documented throughout the Rock River watershed.[77] The Topeka shiner is discussed later in the **Rare and Unique Resources** section of this document.

Impacts

Impacts to surface water resources typically include pollutants entering wetlands and water bodies from stormwater runoff containing agricultural or other chemicals, an excess of sediment from soil erosion, or effluent from a malfunctioning septic system. Developing floodplains or siting infrastructure in floodplains can present problems if flooding occurs, damaging infrastructure, homes, and businesses. The septic system planned for the project and its impacts is discussed in the **Geology and Groundwater** section.

A National Pollutant Discharge Elimination System permit application to discharge stormwater from construction facilities would be acquired by Elk Creek Solar from the MPCA. Construction stormwater permits specify site-specific requirements to control discharge from the site to nearby waterbodies, and include control measures for soil erosion and sedimentation, stormwater runoff control, dust control, and materials management. A Stormwater Pollution Prevention Plan would be developed for the project prior to construction that would include BMPs such as silt fencing (or other erosion control devices), revegetation plans, and management of exposed soils to prevent erosion. Because the project would disturb more than 50 acres, Elk Creek Solar would submit the SWPPP to MPCA for review and approval prior to construction and obtaining coverage under the General Construction Stormwater Permit.

[74] https://www.pca.state.mn.us/air-water-land-climate/minnesotas-impaired-waters-list
[75] https://www.fws.gov/program/national-wetlands-inventory.
[76] https://floodsciencecenter.org/products/elected-officials-flood-risk-guide/introduction/.
[77] https://www.pca.state.mn.us/sites/default/files/wq-b7-01.pdf

Erosion and sediment control measures utilized by the project should be wildlife friendly. The MDNR recommends that erosion control blankets be limited to "bio-netting" or "natural netting" types to reduce the potential for entanglement with small animals, and specifically not products containing plastic mesh netting or other plastic components. Hydro-mulch products may contain small synthetic (plastic) fibers to aid in its matrix strength. These loose fibers could potentially re-suspend and make their way into waterways, and degrade water quality.

There are 28 permanent stormwater retention basins proposed for the project to retain water during storm events, ranging in size from 0.3 to 5.5 acres (**Figure 3**). The volume of stormwater required to be retained on site is based on the amount of impervious surface being added to the site during development.[78] Stormwater retention improves surface water management by providing general flood protection, lessening extreme floods, and improving water quality by capturing sediment that would have flowed off site.[79]

Floodplains are present within the Land Control Area (**Figure 9**); however, Elk Creek Solar does not plan to develop these areas in its preliminary development plan. If these areas are developed during project implementation, Elk Creek Solar would work with the local agency to ensure floodplain management requirements are met.

A wetland delineation report for the project was prepared by Tetra Tech in August 2023 (**Appendix H**). Five palustrine emergent wetland areas and three streams were identified within the Land Control Area (**Figure 9**). No wetlands or streams were identified in the northern unit. Wetlands for the central and southern unit are summarized in **Table 18**, and streams are summarized in **Table 19**.

Table 18 Summary of Delineated Wetlands in the Land Control Area

Wetland ID	Area (acres)	Regulatory Jurisdiction		
		USACE	MN WCA	MN Public Water
Central Unit				
WA012	0.401	No	No	No
WA013	1.914	No	Yes	No
Southern Unit				
WA001	3.373	Yes	Yes	No
WA004	0.355	No	Yes	No
WA005	16.553	Yes	Yes	No

[78] https://stormwater.pca.state.mn.us/index.php?title=Stormwater_management_for_solar_projects_and_determining_compliance_with_the_NPDES_construction_stormwater_permit

[79] https://www.epa.gov/emergency-response-research/stormwater-management-technologies-flow-control-devices

Approximately 0.03 acres of delineated wetlands would impacted by access road construction, primarily due to site access crossings of the wetlands from public roads. In addition, approximately 45 feet of fence intersects delineated wetland; however, impacts would be limited to the location of fence posts in the wetland, which would be minimized to the extent possible.

Table 19 Summary of Delineated Streams in the Land Control Area

Stream ID	Flow Regime	Average width (feet)	Surveyed Length (feet)	Surveyed Area (acres)	Regulatory Jurisdiction	
					USACE	MN Public Water
Southern Unit						
SA001	Intermittent	7 - 10	1,745	0.336	Yes	No
SA002	Perennial	9	6,557	1.558	Yes	No

Any collection lines crossing wetland areas would be installed via drill. Elk Creek would permit this work under US Army Corps of Engineers Nationwide Permit 51 – Land-Based Renewable Energy Generation Facilities, and by the local government unit for the Minnesota Wetland Conservation Act. Elk Creek Solar would coordinate with both the USACE and Local Government Unit prior to construction for wetland impacts.

Mitigation

Potential water resource impacts associated with construction can be mitigated by utilizing Best Management Practices during construction that will be included in the site-specific Stormwater Pollution Prevention Plan prepared for the project.

Protection of surface water quality during construction and operation of the project is required to protect designated Critical Habitat of the Topeka shiner from excessive stormwater discharge and sediment-laden stormwater runoff that could alter stream hydrology. Additional information about the Topeka shiner is in the **Rare and Unique Resources** section.

Special conditions have been included in the draft Site Permit (**Appendix D**) regarding the use of surface water quality control measures during construction and operation (see also **Wildlife** section):

- Section 5.1, State Listed Fish: The permittee shall follow the US Fish and Wildlife Service's Recommendations for Construction Projects Affecting Waters Inhabited by Topeka Shiners in Minnesota.
- Section 5.3, Dust Control: The Permittee is prohibited from using dust control products containing calcium chloride or magnesium chloride during construction and operation.
- Section 5.4, Wildlife-friendly Erosion Control: The Permittee shall use erosion control blankets limited to "bio-netting" or "natural netting" types, and shall specifically not use products containing plastic mesh netting or other plastic components, including hydro-mulch products that may contain small synthetic (plastic) fibers to aid in its matrix strength.

Section 4.3.13 of the draft Site Permit requires that construction in wetland areas occur during frozen ground conditions to minimize impacts, to the extent feasible. When construction during winter is not

possible, wooden or composite mats shall be used to protect wetland vegetation. Soil excavated from the wetlands and riparian areas shall be contained and managed in accordance with all applicable wetland permits. Wetlands and riparian areas shall be accessed using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts.

Vegetation

Impacts to vegetation from LEPGP development are primarily connected to the removal of vegetation to accommodate the project. Exposed soils as a result of vegetation removal are discussed in the **Surface Water Resources** section, and the vegetation supporting wildlife and protected species are discussed in the **Wildlife** and **Rare and Protected Species** sections, respectively. Land cover and vegetation-type information for the project vicinity is presented in the **Land Use** section.

Impacts

Agricultural land within the Preliminary Development Area would be converted to open, herbaceous cover with the exception of the project substation, O&M building, inverter skids, and access roads, which would be converted to developed land and impervious surfaces (24 acres).

Table 9 (Land Cover in the Land Control Area) included approximately 0.6 acre of shrubland being present within the Preliminary Development Area; this has not been confirmed in the field. If present, the shrubland would also be converted to open, herbaceous cover for the life of the project (estimated at 30 years). The preliminary layout of the project minimizes tree clearing, with two isolated trees within the southern unit planned to be removed.

Vegetation at the site during operation would have a shorter prairie mix within the panel footprint, taller prairie plantings in the open space between the fence and array, and a wet seed mix for any wetlands or areas anticipated to hold water. The mixes are selected to be native and are developed with prairie specialists to compile a mix that would achieve Elk Creek Solar's goals for operating the solar facility, promote pollinator habitat, establish stable ground cover successfully, reduce erosion, reduce runoff, and improve infiltration. Elk Creek Solar's Vegetation Management Plan, including the four types of seed mixes, is included as **Appendix I**.

Mitigation

Section 4.3.17 of the draft Site Permit requires a Vegetation Management Plan be included as part of a pre-construction package filed at the Commission prior to the start of construction. A draft Vegetation Management Plan has been included as **Appendix I**, and includes measures to be implemented to reduce dust, erosion, and sedimentation (see **Air Quality** section and **Surface Water Resources** section), to ensure the health of topsoil (**Agriculture and Prime Farmland** section), and improve groundwater quality (**Geology and Groundwater** section). Proposed implementation strategies are summarized below:

- Decompaction of soil prior to seeding
- Development of seed mixes appropriate to soil type and setting
- Prescribed treatment for common invasive species
- Long-term maintenance of plantings
- Establishing monitoring protocols

Wildlife

Construction and operation of the proposed project may cause short-term and long-term impacts on wildlife resources. Impacts on wildlife are assessed by evaluating the vegetation cover/habitat in the Land Control Area, and the proximity of the project to wildlife habitat.

Impacts

The USFWS identified 25 species of birds within Eastern Tallgrass Prairie Bird Conservation Region (BCR) as Birds of Conservation Concern (BCC); BCC are avian species that represent the agency's highest conservation priorities. The BCC in the Eastern Tallgrass Prairie BCR that were identified in the USFWS Information for Planning and Conservation report for the project[80,81] include:

- American bittern (*Botaurus lentiginosus*)
- Black rail (*Botaurus lentiginosus*)
- Upland sandpiper (*Bartramia longicauda*)
- Red-headed woodpecker (*Melanerpes erythrocephalus*)
- Bobolink (*Dolichonyx oryzivorus*)
- Lesser yellowlegs (*Tringa flavipes*)

Given the agricultural setting of the Land Control Area, few migratory bird species that use trees or forested areas as habitat would be present; similarly, few wetland- or water-dependent birds would use the Land Control Area for nesting. Species of migratory birds associated with grasslands would also be limited or absent. Overall, few if any BCC are likely to use the Land Control Area as habitat.

In addition to birds, other groups of wildlife that may occur in the Land Control Area include mammals, reptiles, and insects. Mammals that may be present include white-tailed deer (*Odocoileus virginianus*), striped skunk (*Mephitis mephitis*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), badger (*Taxidea taxus*), Virginia opossum (*Didelphis virginiana*), and coyote (*Canis latrans*). Reptiles that may occur in the Land Control Area are plains gartersnake (*Thamnophis radix*), and common gartersnake (*Thamnophis sirtalis*).[82] Some pollinator insects may be present in the Land Control Area including native bees, butterflies, and moths.

During construction, highly mobile species of wildlife including deer, birds, and snakes are expected to divert to areas outside the construction zone. Less mobile species and ground nests of birds, eggs, and chicks may be impacted; however, given that the Land Control Area is presently used as cropland, these impacts may have occurred regardless of the project. Overall, construction of the project is expected to have minimal impacts on common wildlife species.

During operations, 1,137 acres would be restored as herbaceous cover, including a seed mix with some native plants, thereby potentially benefitting and increasing the overall populations of wildlife species in the area, including birds, small mammals, reptiles, and pollinator insects. Potential impacts to wildlife would be connected to vehicle traffic and parking, fencing, mowing, lighting, or noise associated with electrical equipment.

[80] https://www.fws.gov/sites/default/files/documents/birds-of-conservation-concern-2021.pdf
[81] IPaC report, included in Appendix K of this document
[82] Elk Creek Solar Application, see footnote 2 of this document

To minimize fencing impacts to wildlife, fencing should be high enough to exclude deer and elk. To completely exclude deer and elk, an eight-foot, woven wire fence, topped with two strands of smooth, high-tensile wire is recommended. MDNR's Fencing Handbook For 10 ft Woven Wire Deer Exclusion Fence[83] has additional details for fencing design. The placement of deer egress gates should be adjusted so that any deer removed from the solar facility are not directed onto nearby roadways. Additionally, placing the gates at an "outward facing" corner, rather than an "inward facing" corner, would aid in removing deer that may enter the facility.

The inverters considered for the project range in noise levels at 50 feet of 51 dBA (similar to a quiet nighttime setting) to 72 dBA (similar to a vacuum cleaner). Selecting inverters that made the least noise would reduce impacts to wildlife.

Similarly, lighting impacts to wildlife can be reduced by planning lighting necessary for safety and security. Downlighting would help minimize light pollution. LED lighting is often high in blue light, which is harmful to birds, insects, and other animals. Potential impacts related to illuminated facilities can be avoided or minimized by using shielded and downward facing lighting and lighting that minimizes blue hue.

Mitigation

Selecting low-noise electrical equipment for the project would reduce impacts to wildlife.

Section 4.3.31 of the draft Site Permit (**Appendix D**) requires the security fencing be developed in coordination with EERA and MDNR. The MDNR has indicated in their scoping comment that Elk Creek Solar utilize a fencing design consistent with the DNR Fencing Handbook For 10 ft Woven Wire Deer Exclusion Fence to exclude deer and elk from the facility. The final fence plan will be submitted to the Commission as part of the site plan prior to the start of construction.

Special conditions have been included in the draft Site Permit to minimize impacts to wildlife:

- Section 5.2, Facility Lighting: To reduce harm to birds, insects, and other animals, the Permittee shall utilize downlit and shielded lighting at the site entrances and inverters. Lighting utilized shall minimize blue hue.
- Section 5.3, Dust Control: The Permittee is prohibited from using dust control products containing calcium chloride or magnesium chloride during construction and operation. (See also **Air Quality** section)
- Section 5.4, Wildlife-friendly Erosion Control: To protect plants and wildlife from chloride products that do not break down in the environment, the Permittee shall use erosion control blankets limited to "bio-netting" or "natural netting" types, and shall specifically not use products containing plastic mesh netting or other plastic components, including hydro-mulch products that may contain small synthetic (plastic) fibers to aid in its matrix strength. (See also **Surface Water Quality** section)

[83] https://files.dnr.state.mn.us/assistance/backyard/privatelandhabitat/woven_wire_fence_handbook_deer.pdf

Rare and Unique Resources

Rare and unique resources include assemblages of species or habitat that are designated for special care and conservation by state and federal agencies because loss of habitat and small or shrinking population is cause for concern. Rare and unique resources at the federal level are typically evaluated and protected by the USFWS or USACE. The plants and wildlife protected by the USFWS are discussed in this section, and the resources protected by the USACE are discussed in the **Surface Water Resources** section. Project applicants can access information about plants and wildlife protected by federal law through the Information for Planning and Consultation (IPaC) tool developed and maintained by the USFWS.

At the state level, the evaluation and protection of Minnesota's rare and unique resources are overseen by the MDNR through the identification and evaluation of native plant communities, native prairie, plants, wildlife, and unique wetlands such as calcareous fens. Native prairie is defined as land that has never been plowed where native prairie vegetation originating from the site currently predominates or, if disturbed, is predominantly covered with native prairie vegetation that originated from the site.[84] Calcareous fens are rare groundwater-fed wetlands that are sensitive to changes in water quality and quantity. Information about rare and unique resources protected by the state can be found through (1) a review of Sites of Biodiversity Significance (SOBS) maps maintained by the Minnesota Biological Survey (MBS); and (2) requesting information from the Natural Heritage Information System. Although these reviews do not represent a comprehensive survey, they provide information on the potential presence of rare and unique species and habitats.

The MDNR has also developed a Commercial Solar Siting Guidance to provide information to solar developers to minimizing natural resource impacts while siting their projects.[85]

Impacts

The majority of the Land Control Area is used for agriculture, specifically row crops; no prairie habitat or old fields are present. Some roadside ditches are present along the perimeter of portions of the Land Control Area.

Elk Creek Solar submitted a request to the USFWS IPaC website, as well as the MDNR's Natural Heritage Information System (NHIS) for documented occurrences of federally listed species, state-listed species, and designated critical habitat. The information returned from both agencies is summarized in **Table 20** below. Sites of Biodiversity Significance are shown on **Figure 4**.

Table 20 Rare and Unique Resources in the Project Vicinity

Information Source	Species/Resource	Protection Classification	Potential for Project to Affect Resource
USFWS	Monarch Butterfly (*Danaus plexippus*)	Federal Candidate	No effect*
USFWS, MDNR	Topeka Shiner (*Notropis topeka* (=*tristis*))	Federal Endangered, State Species of Concern	Not likely to Adversely Affect*, see discussion below++

[84] Minn. Stat. 82.02 Subd. 5

[85] https://files.dnr.state.mn.us/publications/ewr/commercial_solar_siting_guidance.pdf

Information Source	Species/Resource	Protection Classification	Potential for Project to Affect Resource
USFWS	Tricolored Bat (*Perimyotis subflavus*)	Federal Proposed Endangered	Not Likely to Adversely Affect*, see discussion below
USFWS	Western Prairie Fringed Orchid (*Platanthera praeclara*)	Federal Threatened	No effect*
USFWS	Northern Long-eared Bat (*Myotis septentrionalis*)	Federal Endangered	Consultation required,* see discussion below
USFWS	Bald and Golden Eagles	Fully protected	Effects discussed below
MDNR	Plains topminnow	State Threatened	Effects discussed below
MDNR	Sites of Biodiversity Significance	Protection driven by resources present	Discussed below
MDNR	Native Plant Communities	Protection driven by resources present	Not identified
MDNR	Calcareous Fens	Federal and state protected wetland	Do not occur within 5 miles of Land Control Area
Desktop review	Large Block Habitat+++	Protection driven by resources present	Does not occur within project vicinity

Notes:
* IPaC response letter, April 24, 2023 (**Appendix K**)
+ IPaC response letter, May 23, 2023 (**Appendix K**)
++ MDNR Correspondence # MCE 2023-00287, July 5, 2023 (**Appendix K**)
+++ MDNR Commercial Solar Siting Guidance

According to Elk Creek's review of the USFWS IPaC, there are three species that are listed as threatened or endangered under the federal Endangered Species Act (ESA): northern long-eared bat (NLEB), Topeka shiner, and western prairie fringed orchid, one species proposed for listing as endangered (tricolored bat), and one candidate species (monarch butterfly) that may be present within the Land Control Area. In addition to these five federally listed, proposed, and candidate species, there is designated critical habitat for the Topeka shiner in Rock County, located adjacent the Land Control Area.

There is one MBS SOBS within the project vicinity. ranked moderate (identified as Magnolia 2), which is associated with Elk Creek located directly adjacent to the southeast boundary. The southern unit of the Land Control Area is upgradient and hydraulically connected to the Magnolia 2 SOBS. This area is shown on **Figure 4**.

Both the Topeka shiner and plains topminnow would be impacted by actions that alter stream hydrology or decrease water quality. Topeka shiners prefer pools to riffle or run habitats and require silt-free

substrates for spawning.[86] Stringent erosion and sediment control practices must be implemented and maintained during construction and operation in the southern unit along the delineated waterbody (presented as SA002 in the **Surface Water Resources** section) and at the culvert that connects the southern unit to Elk Creek. Because the entire Land Control Area drains to areas designated as Critical Habitat for the Topeka shiner, all discharge points require protection from excessive or silt-laden runoff. Elk Creek Solar will follow the USFWS' "Recommendations for Projects Affecting Waters Inhabited by Topeka Shiners (*Notropis topeka*) in Minnesota".[87] Recommendations include promptly stabilizing disturbed soil, frequent inspection of controls, and ensuring all contractors and subcontractors understand all permit provisions necessary to avoid or minimize all adverse effects to Topeka shiners.

Operation of the project would benefit water quality in Elk Creek and the Rock River by reducing sediment (via perennial vegetation maintained at the site), and reducing nitrogen (via not utilizing fertilizers). Water quality benefits of the project are discussed in the **Surface Water Resources** section.

Both the Northern long-eared bats and Tricolored bats hibernate in caves and mines. After spring emergence, bats migrate to summer roosting and foraging grounds. In summer, the NLEB is often associated with forested habitats, where they make use of tree roosts, especially near water sources. Tricolored bats generally roost singly, often in trees, but also roost in caves and mines. The project would require the removal of two trees; impacts to bats can be minimized or avoided by completing tree removal during the bats' inactive season (December – April). Additionally, during the wetlands permitting process (see **Surface Water Resources** section), the USACE will consult with the USFWS about potential effects to protected plants and wildlife that could result from the permitted activities, and additional protective measures may be required.

Bald eagles live near rivers, lakes, and marshes where they can find fish. Their habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. In winter, the birds congregate near open water in tall trees for spotting prey and night roosts for sheltering. Bald eagles usually choose the tops of large trees to build nests.[88]

The range of Golden eagles is widespread, and can be found from the tundra, through grasslands, forested habitat and woodland-brushlands, and south to arid deserts. They are aerial predators and eat small to mid-sized reptiles, birds, and mammals up to the size of mule deer fawns and coyote pups. Golden eagles build nests on cliffs or in the largest trees of forested stands that often afford an unobstructed view of the surrounding habitat.[89]

Construction and operation of the project is unlikely to affect eagles, as the two trees within the Preliminary Development Area that could provide nesting or perching habitat would be removed. Nesting season for the eagles is typically December to August,[90] a time period that overlaps with the protected bats' inactive season identified for tree removal. A nesting survey may be required prior to removing the trees to confirm eagle nests are not present.

[86] https://ecos.fws.gov/tails/pub/document/14634295
[87] https://mn.gov/eera/web/project-file/10918/
[88] https://www.fws.gov/media/bald-eagle-fact-sheet
[89] https://www.fws.gov/sites/default/files/documents/golden-eagle-fact-sheet.pdf
[90] https://www.fws.gov/sites/default/files/documents/national-bald-eagle-management-guidelines.pdf

Mitigation

Implementation of the following measures would reduce impacts to protected rare and unique resources:

For Northern long-eared bats and Tricolored bats

- Conduct tree removal during the bats' inactive season (December – April).

For bald eagles and golden eagles

- A nesting survey prior to removing the trees to confirm the eagle nests are not present, if necessary.

The draft Site Permit (**Appendix D**) includes Special Condition 5.1 to protect State Listed fish (Topeka shiner and plains topminnow) to follow the US Fish and Wildlife Service's Recommendations for Construction Projects Affecting Waters Inhabited by Topeka Shiners in Minnesota. Measures include:

- Promptly stabilizing disturbed soil
- Frequent inspection of controls
- Ensuring all contractors and subcontractors understand all permit provisions necessary to avoid or minimize all adverse effects to Topeka shiners.

Draft Site Permit Special Condition 5.1 will also minimize impacts to the MDNR Site of Biodiversity Significance (Magnolia 2).

Section Five: Cumulative Potential Effects

Cumulative impacts include those associated with the proposed project and impacts from other projects in the area. Cumulative potential effects result when impacts from the proposed project are combined with impacts associated with past, present, or reasonably foreseeable future actions within the area. Analysis of cumulative potential effects accounts for the possibility that the minor impacts of many separate actions could be significant, and considers resources that are expected to be affected by the proposed project and assesses past, present, and reasonably foreseeable future actions to identify any geographic or temporal overlap in impacts on these resources.

When making the determination as to what is "reasonably likely to occur," EERA considers whether any applications for permits have been filed with any units of government or whether detailed plans and specifications have been prepared for the project, among other considerations. A project is not required to be permitted to be reasonably likely to occur.

Past actions are those actions and their associated impacts that occurred within or influenced the geographic region of influence of each resource and have shaped the current affected environment of the proposed project area. For the purposes of this EA, actions that have occurred in the past and associated impacts are now part of the existing environment and are included in Section Four.

In addition to temporal factors, the potential for cumulative impacts also depends on spatial factors within the environment, which can vary for the resources evaluated in this EA. For example, the geographic area of consideration for cumulative impacts could be limited to the discrete area of disturbance for vegetation resources but also include all vantage points for visual resources.

Future projects identified in the area include:

Potential local or state roadway improvements.

- The nearest proposed MnDOT project would be a resurfacing project for Highway 75 through the City of Luverne that is currently planned for the year 2025. The City of Luverne is approximately 4.0 miles west of the Project.

Other Developments

- Expansion of the fenceline of the Magnolia Substation to accommodate the 161 kV gen-tie transmission line from the Elk Creek Solar Project.

Even if limited development in the area occurs in the future, the cumulative effects of the proposed project would be minimal, the anticipated minimal human and environmental impact, and its location.

Associated Actions

Associated actions occur as a result of the proposed project. If the project is approved, ITC Midwest would be required to obtain a permission from the Commission in order to expand the fenceline of the Magnolia Substation to accommodate the 161 kV gen-tie transmission line from the Elk Creek Solar Project.

Unavoidable Impacts

Resource impacts are unavoidable when an impact cannot be avoided even with mitigation strategies. Solar projects have unavoidable adverse human and environmental impacts. These potential impacts and the possible ways to mitigate against them were discussed above. However, even with mitigation strategies, certain impacts cannot be avoided.

Unavoidable adverse impacts associated with construction of the proposed project include:

- Increased traffic on roads in the project vicinity
- Fugitive dust from the site.
- Noise disturbance to nearby residents.
- Soil compaction and erosion.

Unavoidable adverse impacts associated with the operation of the proposed project include:

- Visual disharmony when viewed from Blue Mounds State Park.
- Noise disturbance to nearby residents and wildlife.

Irreversible and Irretrievable Resource Commitments

Resource commitments are irreversible when it is impossible or very difficult to redirect that resource to a different future use; an irretrievable commitment of resources means the resource is not recoverable for later use by future generations.

Irreversible impacts could include the generation of greenhouse gas during construction and operation; irretrievable impacts could include the use of water, aggregate, hydrocarbons, steel, concrete, wood, and other consumable resources. The commitment of labor and fiscal resources is also considered irretrievable.

List of Acronyms and Abbreviations

Acronyms and Abbreviations	
°F	Degrees Fahrenheit
AADT	Annual Average Daily Traffic
AC	Alternating current
AIMP	Agricultural Impact Mitigation Plan
ALJ	Administrative law judge
Application	Application for a Site Permit for the up to 160 MW Elk Creek Solar Project, Docket No. IP-7009/GS-19-495: Documents 20238-198590-01 through 20238-198590-08, 20238-198591-01 through 20238-198591-08
ARMER	Allied Radio Matrix for Emergency Response
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BMP	Best management practice
CH4	Methane
CN	Certificate of need
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalents
Commerce	Department of Commerce
Commission	Minnesota Public Utilities Commission
CSAH	County State Aid Highway
dB	Decibels
dBA	Decibels on the A-weighted scale
DC	Direct current
EA	Environmental Assessment
Elk Creek Solar	Elk Creek Solar, LLC
EMF	Electric and magnetic fields
ESA	Endangered Species Act
gen-tie	Generation interconnect
GHG	Greenhouse gases
GIS	Geographic Information Systems
GWP	High global warming potential
IPaC	Information for Planning and Conservation
kV	Kilovolt
kWh	Kilowatt hours
L10	10 percent limit
L50	50 percent limit
LEPGP	Large electric power generating plant
MBS	Minnesota Biological Survey
MDA	Minnesota Department of Agriculture
MDNR	Minnesota Department of Natural Resources
mg/L	Milligrams per liter

Acronyms and Abbreviations	
MISO	Midcontinent Independent System Operator
MnDOT	Minnesota Department of Transportation
MW	Megawatts
N2O	Nitrous oxide
NAC	Noise Area Classification
NESC	National Electrical Safety Code
NG Renewables	National Grid Renewables Development, LLC
NLEB	Northern long-eared bat
NOx	Oxides of nitrogen
NPDES/SDS	National Pollutant Discharge Elimination System/State Disposal System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
O&M	Operations and Maintenance
O3	Ozone
PM2.5	Particulate matter below 2.5 microns
ppb	Parts per billion
PSAP	Public Safety Answering Points
PV	Photovoltaic
ROI	Regions of influence
SCADA	Supervisory Control and Data Acquisition
SDS	State Disposal System
SF6	Sulfur hexafluoride
SHPO	Minnesota State Historic Preservation Office
SOBS	Sites of Biodiversity Significance
SOx	Sulfur oxides
SPCC	Spill Prevention, Control, and Countermeasures
SSA	Sole source aquifers
SWPPP	Stormwater Pollution Prevention Plan
TCPs	Traditional cultural properties
tpy	Tons per year
ug/m3	Micrograms per cubic meter
USACE	United States Army Corps of Engineers
USDA	US Department of Agriculture
USFWS	United States Fish and Wildlife Service
VMP	Vegetation Management Plan
VOCs	Volatile organic compounds
WHPAs	Wellhead Protection Areas

Appendices