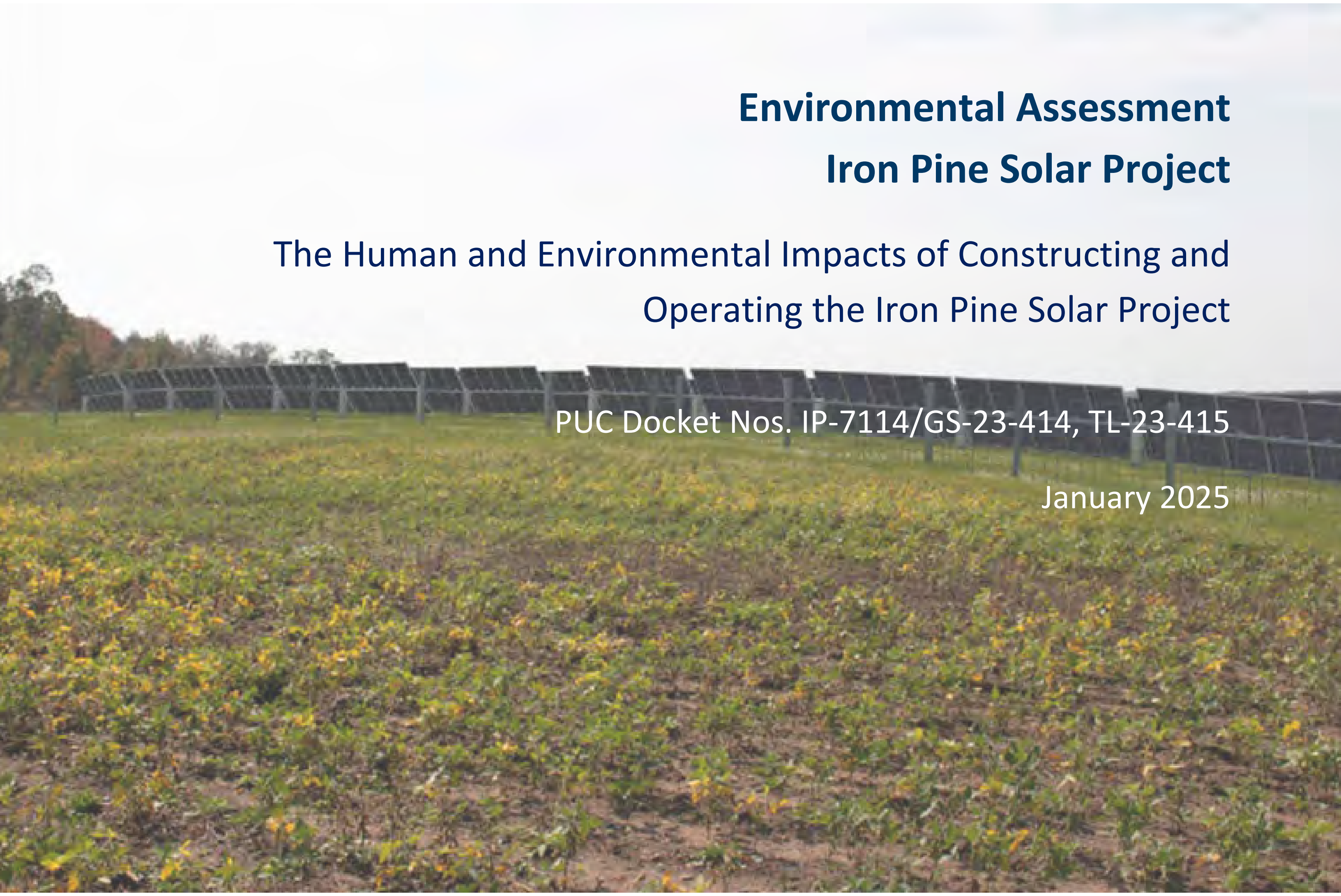


Environmental Assessment
Iron Pine Solar Project

The Human and Environmental Impacts of Constructing and Operating the Iron Pine Solar Project

PUC Docket Nos. IP-7114/GS-23-414, TL-23-415

January 2025

mn COMMERCE DEPARTMENT

Abstract

Responsible Government Unit
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101

Commission Representative
Jacques Harvieux
651-201-2233
jacques.harvieux@state.mn.us

Preparer
Minnesota Department of Commerce
85 7th Place East, Suite 280
Saint Paul, MN 55101

Commerce Representative
Ray Kirsch
(651) 539-1841
raymond.kirsch@state.mn.us

Applicant
Iron Pine Solar Power, LLC
470 Atlantic Avenue, Suite 601
Boston MA 02210

Project Representative
Joey Shannon
(832) 985-3288
jshannon@swiftcurrentenergy.com

Iron Pine Solar Power, LLC proposes to construct and operate the Iron Pine Solar Project (project) in Kettle River Township, Pine County, Minnesota. The project consists of two major components: a 325 megawatt photovoltaic solar energy generating system (solar facility) and a 230 kilovolt high voltage transmission line (gen-tie line) which will connect to the grid.

The project requires two approvals from the Minnesota Public Utilities Commission – a site permit and a route permit. On May 15, 2024, Iron Pine Solar Power, LLC submitted an application to the Commission for these approvals. 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 project. This EA addresses the issues identified in the EA Scoping Decision issued on September 3, 2024.

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 report to the Commission including findings, conclusions, and recommendations. The Commission will use the report in making decisions on a site permit and route permit for the project.

Additional documents and information, including the joint site and route permit application, can be found on eDockets by searching for “23-414” or “23-415” within the Docket number field: https://www.edockets.state.mn.us/documents or the EERA webpage: https://apps.commerce.state.mn.us/web/project/15441.

Sources

Much of the information for this environmental assessment comes from the site and route permit application. Other sources include additional information provided by Iron Pine Solar and information from relevant environmental review documents for similar projects, site visits, 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 (23-414 [site permit]; 23-415 [route permit]), your name, email address, and mailing address. Please indicate how you would like to receive notices—by email or U.S. mail.

Alternative Formats

This document can be made available in alternative formats, that is, large print or audio, by calling (651) 539-1530 (voice).

List of Preparers

Minnesota Department of Commerce
Energy Environmental Review and Analysis
Ray Kirsch

Barr Engineering Co.

Environmental Assessment

Iron Pine Solar Project – January 2025

Contents

Section | Page

List of Appendices

List of Tables **Page**

List of Figures **Page**

List of Maps

Abbreviations and Acronyms

AC	alternating current
AIMP	Agricultural Impact Mitigation Plan
ALJ	administrative law judge
applicant	Iron Pine Solar, LLC
application	joint site and route permit application
AQI	Air Quality Index
ARMER	Allied Radio Matrix for Emergency Response
BMPs	best management practices
CGA	County Geologic Atlas
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
Commerce	Minnesota Department of Commerce
Commission	Minnesota Public Utilities Commission
CSAH	County State Aid Highway
CST	Concentrated Solar Thermal
CSW	construction stormwater
CWA	Clean Water Act
dB	decibels
dBA	A-weighted decibel
DC	direct current
DNR	Department of Natural Resources
DWSMA	Drinking Water Supply Management Areas

EA	environmental assessment
EMS	Emergency Services
ENM	Early Notification Memo
ERP	emergency response plan
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FPPA	Farmland Protection Policy Act
G	Gauss
GHGs	Greenhouse gases
GWP	global warming potential
HVTL	high voltage transmission line
IPaC	Information for Planning and Consultation
IVM	Integrated Vegetation Management
kV	kilovolt
kV/m	kV per meter
LEPGP	large electric power generating plant
LGU	Local Government Unit
LIUNA	Laborers' International Union of North America
LS&M	Lake Superior & Mississippi Railroad
mA	milliamps
MBTA	Migratory Bird Treaty Act
MDH	Minnesota Department of Health
mG	milliGauss
MIAC	Minnesota Indian Affairs Council
MISO	Midcontinent Independent System Operator
MnDOT	Minnesota Department of Transportation
MnSHIP	Minnesota's Statewide Historic Inventory Portal
MPCA	Minnesota Pollution Control Agency
MW	megawatt
MWI	Minnesota Well Index
N_2O	nitrous oxide
NESC	National Electrical Safety Code
NEV	neutral-to-earth voltage
NFHL	National Flood Hazard Layer Viewer
NHPA	National Historic Preservation Act
NHR	Natural Heritage Review
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory

O&M	operations and maintenance
O_3	ozone
OHWL	Ordinary High Water Level
ORVW	Outstanding Resource Value Waters
OSA	Office of the State Archaeologist
PEM1Af	freshwater emergent wetlands
$PM_{2.5}$	fine particles
ppb	parts per billion
project	Iron Pine Solar Project
PSS1D	freshwater shrub wetland
PV	photovoltaic
PWI	Public Waters Inventory
ROI	regions of influence
SCADA	Supervisory Control and Data Acquisition
SDS	State Disposal System
SF_6	Sulfur hexafluoride
SHPO	State Historic Preservation Office
SO_2	sulfur dioxide
SO_X	sulfur oxides
SPCC	Spill Prevention, Control, and Countermeasure
SSA	sole source aquifer
SSURGO	Soil Survey Geographic Database
SWPPP	Stormwater Management Pollution Prevention Plan
TCP	Traditional Cultural Properties
tpy	tons per year
ug/m3	micrograms per cubic meter
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VMP	Vegetation Management Plan
VOCs	volatile organic compounds
WCA	Wetland Conservation Act
WHPA	Wellhead Protection Area
WMA	Wildlife Management Area

1 Introduction

Iron Pine Solar, LLC (applicant) is proposing to construct and operate the Iron Pine Solar Project (project) in Kettle River Township, Pine County, Minnesota (Map 1). Iron Pine Solar, LLC is a wholly owned subsidiary of Swift Current Energy, headquartered in Boston, Massachusetts. Swift Current Energy develops, constructs, owns, and operates wind, solar, and energy storage projects in North America.

The project includes a 325-megawatt (MW) photovoltaic (PV) solar energy generating system (solar facility) and a 230 kilovolt (kV) high voltage transmission line (gen-tie line), which will connect to the grid. The project will connect to the electric transmission grid through the existing Minnesota Power Arrowhead-Bear Creek 230 kV transmission line east of the solar facility. The applicant must obtain a site permit and route permit from the Minnesota Public Utilities Commission (Commission) before it can construct and operate the project.

The applicant submitted a joint site and route permit application (application) for the project on May 15, 2024.[1]

The Minnesota Department of Commerce (Commerce) has prepared this environmental assessment (EA) for the proposed project. The EA describes the project, highlights resources affected by the project and discusses potential human and environmental impacts to these resources. It also discusses ways to mitigate potential impacts. These mitigation strategies can become enforceable conditions of the Commission's site permit and route permit.

An EA is not a decision-making document, but rather an information document. The EA is intended to facilitate informed decisions by state agencies, particularly with respect to the goals of the Minnesota Power Plant Siting Act to "minimize adverse human and environmental impacts while insuring continuing electric power system reliability and integrity and insuring that electric energy needs are met and fulfilled in an orderly and timely fashion."[2]

1.1 How is this document organized?

This EA is based on the applicant's application and public scoping comments. It addresses the matters identified in the EA scoping decision (Appendix A). This EA is organized as follows:

- **Chapter 1** provides a brief overview of the proposed project.
- **Chapter 2** provides a description of the design, engineering, construction, operation and decommissioning of the project.

---

[1] Iron Pine Solar Project Joint Application to the Minnesota Public Utilities Commission for a Site Permit Solar Large Electric Generating Facility and a Route Permit for a High Voltage Transmission Line, May 15, 2024, eDockets Document Nos. 20245-206772-03 through 20245-206772-20; 20245-206773-01 through 20245-206773-20; 20245-206777-01 through 20245-206777-12; and 20245-206778-01 through 20245-206778-18; hereinafter referred to as "application."

[2] Minnesota Statutes 216E.02, subd. 1.

- **Chapter 3** explains the regulatory framework and required permits and approvals.
- **Chapter 4** identifies the potential impacts to human and natural resources and identifies measures to avoid, minimize, and mitigate adverse impacts.
- **Chapter 5** discusses unavoidable impacts.
- **Chapter 6** discusses irreversible and irretrievable resource commitments.
- **Chapter 7** discusses cumulative impacts.
- **Chapter 8** analyzes the project with respect to the Commission's siting and routing factors.

1.2 What does the applicant propose to construct?

The project includes a 325-megawatt (MW) photovoltaic (PV) solar energy generating system (solar facility) and a 230-kilovolt (kV) high voltage transmission line (gen-tie line) which will connect to the electric transmission grid. The project will connect to the grid through the existing Minnesota Power Arrowhead-Bear Creek 230 kV transmission line east of the solar facility. Terms used to describe the project and the areas in which it will be constructed are defined in Table 1-1 The associated boundaries for the terms used in Table 1-1 are shown in Map 2.

Table 1-1 Terms Used to Describe Areas

Term	Definition	Acres
Project Site	The Project Site is used to describe the area that could be used for construction purposes and operation of the project. The applicant has obtained private easements or lease options for land within the Project Site.[1]	2,296
Solar Project Area	The Solar Project Area is the bulk of the Project Site and located west of Interstate Highway 35. The solar facility would be constructed within this area.	2,207
Gen-tie Line Project Area	The Gen-tie Line Project Area is the smaller portion of the Project Site located primarily east of Interstate 35. The gen-tie line would be constructed in this area to connect the solar facility to the grid.	89
Development Area	The Development Area is contained within the Project Site. It is a term used to collectively describe where the project features would be operated from (that is, both the solar facility and the gen-tie line). For the solar facility, it is generally the area that would be contained within the fence line.	1,568 [2]

[1] As noted in the applicant's August 7, 2024, letter (Comments, eDocket Document Nos. 20248-209338-01 and 20248-209338-02), the applicant became aware there is a small tax-forfeited parcel cross by the gen-tie line that they are still seeking an easement for.
[2] Within the Development Area, approximately 1,538 acres would be contained within the fence line, 7 acres would be used to construct the project substation, and 23 acres would be used for the gen-tie line right-of-way and switchyard.

2 Proposed Project Design, Construction, Operation, and Decommissioning

The applicant is proposing to build an up to 325 MW solar facility and a 230 kV high voltage transmission line (gen-tie line) to connect the solar facility to the existing transmission system.

The project would generate up to 325 MW of energy and deliver the power to the Midcontinent Independent System Operator (MISO) via the gen-tie line. As noted in the application, the applicant is proposing to construct this facility to sell energy, capacity, and renewable energy credits, either bundled or unbundled, to one or more electric utilities or commercial customers. The applicant is actively marketing the project to a number of potential off-takers and may sell the power in the form of a power purchase agreement, virtual power purchase agreement, or similar contract; or the project could be owned directly by a utility.[3]

This chapter describes the project and how it would be constructed, operated, and decommissioned.

2.1 Project Design

The two main components of the project would be the solar facility (Section 2.1.1) and the gen-tie line (Section 2.1.2). Additional design components of the project would include the access roads (Section 2.1.3), laydown yards (Section 2.1.4), and the stormwater management system (Section 2.1.5).

2.1.1 Solar Facility

The solar facility includes solar panels and racking (on a single-axis tracking system), combiner boxes, inverters, step-up transformers and associated project substation equipment, MET (weather) stations, fencing and lighting, access roads, electrical collection lines, a project substation, and an operations and maintenance (O&M) facility (Map 3).

2.1.1.1 Solar Panels, Racking, and Connection to Inverters

Solar panels (sometimes referred to as solar modules) are made up of photoelectric (PV) cells that generate direct current (DC) electricity, which must be converted to alternating current (AC) electricity before reaching the electrical grid. Solar panels are arranged into electrically connected blocks and connected to inverters.

An inverter converts DC electricity to AC electricity. The inverters currently considered for the project are SUNGROW 4400kVA central inverters. A transformer (co-located with the inverter) would then step up the AC voltage of electricity to 34.5 kV. From the transformer, electrical cables would route the

[3] Application, page 2

power generated to the project's substation, where the voltage would be stepped up to interconnect to the grid. Figure 2-1 shows a schematic of the major components of a solar generating facility.

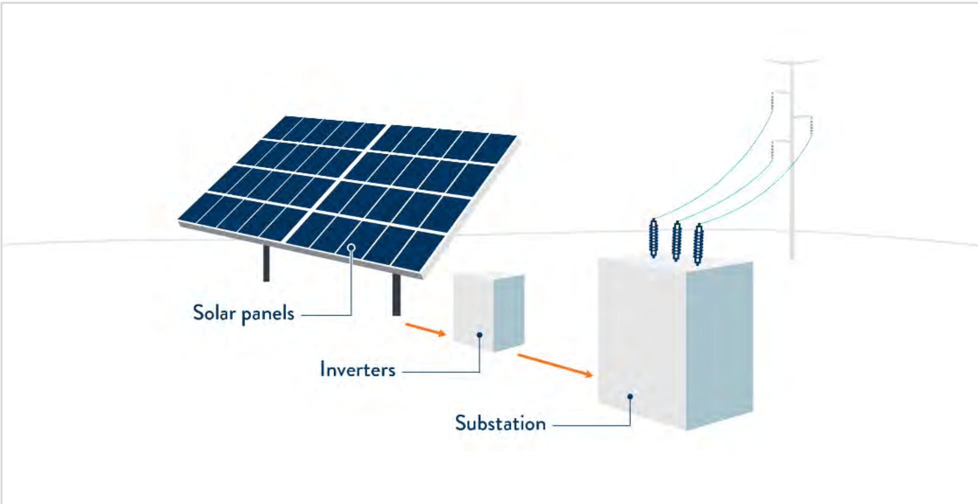


Figure 2-1 Solar Facility Schematic

The applicant notes that the final PV module specifications have not yet been determined. The applicant indicates that several PV module offerings would be considered, and a selection would be made closer to the date of construction. Technologies that would be considered are polycrystalline, monocrystalline and bi-facial PV modules, and the final supply of modules could contain a mix of several similar wattages.

The project would utilize PV panels with tempered glass and an aluminum frame or thin-film technology (cadmium telluride). Each panel would be approximately 3.9 feet by 7.5 feet in size. 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 the use of anti-reflective coatings.

The panels would be attached to a single-axis tracking rack system mounted on top of steel piers. The tracking system allows the panels to follow the sun across the sky each day. Panels would be 15 feet in height at maximum from the ground to the top of the panels and at minimum 1.5 feet in height from the ground to the bottom of the panels when at a 45-degree angle.

2.1.1.2 Inverters

The inverters would be located along access roads (Map 3). The application notes there would be approximately 82 inverters. Each inverter is approximately the size of a shipping container; the SUNGROW inverters anticipated to be used for the project are 238.5 by 114.0 by 96.0 inches (width x height x depth). The final number of inverters and the inverter model would be selected closer to the date of construction and based on available market offerings.

The inverters are typically part of a skid assembly, with the inverter and the assembly being mounted on a driven pile foundation and associated concrete pads. These concrete pads provide the foundation for the inverter, transformer, and the Supervisory Control and Data Acquisition (SCADA) system (Figure 2-2). The concrete pads will be poured onsite or precast and assembled off-site. Each inverter pad includes one transformer to which the inverters will feed electricity. Inverters convert the DC output of the panels to AC, which is required for delivery to the electrical grid. After the inverter has converted the electricity, the electricity is stepped up via a transformer from low voltage to medium voltage (34.5 kV). Below-ground cabling was assumed in the preliminary design and application to represent the maximum potential impacts.

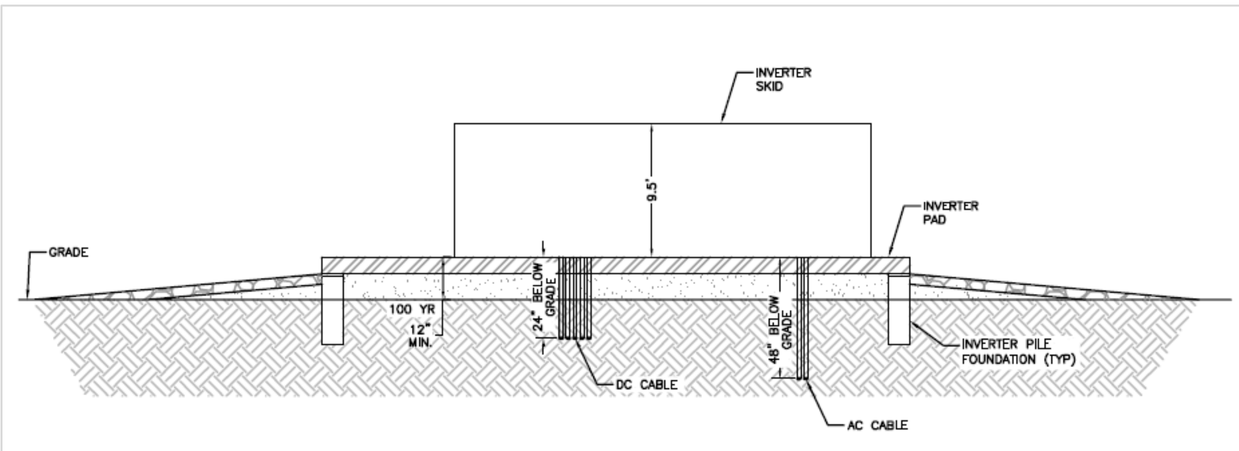


Figure 2-2 Typical Inverter Skid Section View

2.1.1.3 Electrical Collection System

The 34.5 kV lines would connect the transformers to the project substation. The collector circuits are planned as an underground system with direct buried cables (minimum 36 inches below ground surface) or cables installed in direct buried ducts (minimum 24 inches below ground surface). Approximately 35 miles of cable are proposed for the project.

Where multiple cables are installed parallel to each other, the cable separation would be up to eight feet apart; therefore, the width of the trench would vary, depending on the number of circuits within the trench.

The applicant would obtain relevant permits or authorizations from road authorities relating to electric cables and/or feeder lines that may be placed in or across a public road right-of-way.

2.1.1.4 Project Substation

The project substation would be located outside the fenced solar arrays and would occupy approximately 6.4 acres. The project substation would include two 230 kV circuit breakers, two 34.5 kV/230 kV generator step-up transformers, relays and protective equipment, SCADA equipment, telecommunication equipment, and metering equipment. Secondary containment areas for the transformer would be installed, as necessary. In addition, a stormwater basin approximately 0.78 acre in size is planned adjacent to the project substation.

The project substation location would be graded and overlain with crushed rock to minimize vegetation growth in the area and reduce fire risk. The project substation would require a seven- to eight-foot-high chain link fence, which may include three strands of barbed wire at the top.

The project substation would be connected to the switchyard, which would be adjacent to the Minnesota Power 230 kV Arrowhead to Bear Creek transmission line approximately one mile east of the project substation.

2.1.1.5 Weather Stations

The applicant intends to adhere to IEC standard 61724-1, which specifies weather station coverage for utility-scale solar projects. The standard recommends installing two weather stations for the first 16 MW of inverter capacity, and one additional station for each remaining 32 MW of capacity. The applicant anticipates installing 12 weather stations for the project. The height of these stations will be approximately 10 to 12 feet. The stations would be electrically powered, and the power cables co-located with station service in the nearest 34.5 kV collector line trench. The communication cable utilized for the SCADA and weather stations would be co-located with the 34.5 kV collection system.

2.1.1.6 Security Fencing and Lighting

The solar facility would be secured by an approximate seven- to eight-foot-high woven wire (deer exclusion) fence. There would be one public road entrance to the solar facility from County Highway 61 that would be gated with security locks.

Permanent lighting used for facility operation would be required. Lighting would be installed at the project substation to provide personnel with illumination for operation and maintenance under normal conditions and means of ingress/egress under emergency conditions. The proposed LED lighting would be dark sky compliant, inward facing, and not higher than 25 feet. Controls would incorporate a photo eye and timers with manual override. The applicant notes the facility maintenance would include lighting system checks.

2.1.1.7 Operations and Maintenance Facility

The operations and maintenance (O&M) facility would be a double-wide mobile modular construction trailer near the entrance to the solar facility from County Highway 61. It would house a remote monitoring SCADA system which would monitor the solar panels and other equipment. The O&M facility would also provide a location for storage and maintenance of equipment, and meeting space and parking for personnel. The O&M facility would also have water service, septic, restroom facilities, and a kitchen.

2.1.2 Gen-Tie Line

The transmission interconnection would consist of two main components: the gen-tie line and the switchyard. The gen-tie line would be approximately one mile in length and would include an access road.

2.1.2.1 Structures

Transmission structures proposed for the gen-tie line are single-circuit 230 kV weathering steel monopoles to be placed between the project substation and the project switchyard. The structures would hold insulators, a conductor (three phases), and an overhead lightning protection wire. The conductor used for the 230 kV HVTL is anticipated to be a single 1113 kcmil 45/7 ACSR "Bluejay" or a conductor of similar capacity and size. The overhead protection wire is anticipated to be a dual-purpose optical ground wire with a minimum of 24 fibers.

The poles would generally range in height from 100 feet to 140 feet tall and would be spaced approximately 100 to 900 feet apart. Three types of poles would be used between the project substation and the switchyard. These structures are illustrated in Figure 2-3 and would include:

- Tangent: for in-line (straight) segments
- Angle: used in locations where the alignment slightly shifts direction
- Dead-end: used at the project substation and at 90-degree turns

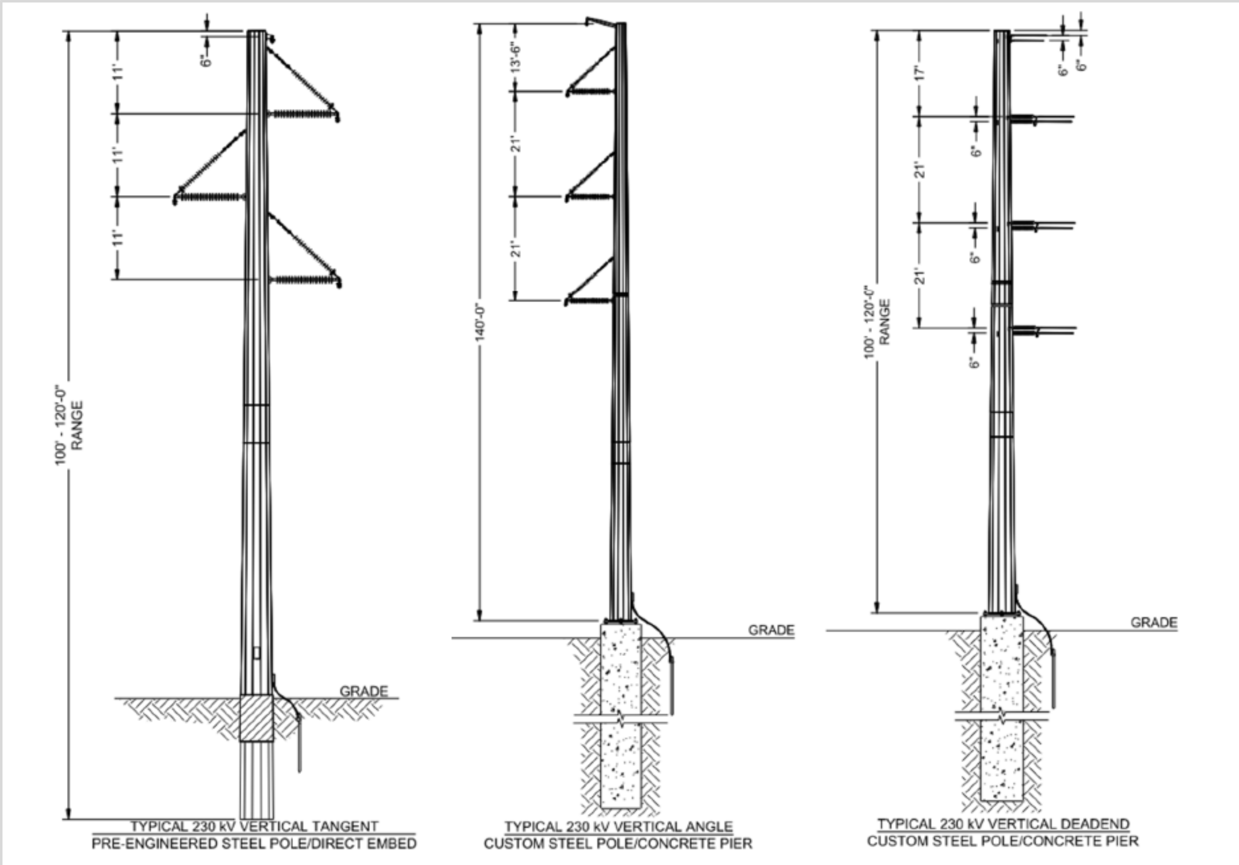


Figure 2-3 Typical Overhead Structures

The poles would either be installed in culverts (approximately 4 feet in diameter, 15 to 20 feet deep) or would be bolted to concrete foundations (approximately 10 to 12 feet in diameter, 20 to 60 feet deep).

2.1.2.2 Route Width and Right-of-Way

When the Commission issues a route permit, it approves a route, a route width, and an anticipated alignment within that route width (Figure 2-4). The route width is typically larger than the actual right-of-way needed for the transmission line. This additional width provides flexibility in constructing the line yet is not of such extent that the placement of the line is undetermined. A right-of-way is the specific area required for the safe construction and operation of the transmission line. The anticipated alignment is the anticipated placement of the transmission line within the route and right-of-way, in essence, where the transmission line is anticipated to be built.

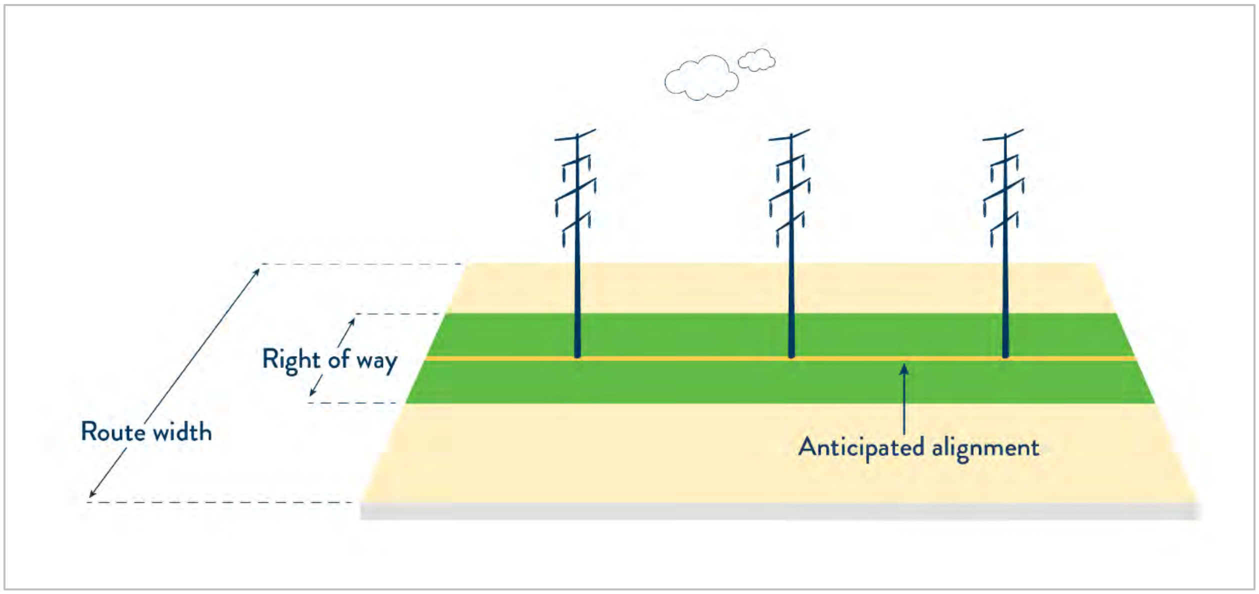


Figure 2-4 Route Width, Right-of-Way, and Anticipated Alignment Schematic

The applicant requested a variable route width with additional requested width at the Interstate Highway 35 crossing location. The requested route width coincides with what is referred to throughout this EA as the gen-tie project area. The 230 kV gen-tie line requires a 160-foot-wide right-of-way, with 80 feet on each side of the line.

2.1.3 Access Roads

Approximately 16 miles of access roads are proposed for the project. The project anticipates utilizing existing access roads that presently provide access to agricultural fields to the extent practicable. Access roads would consist of a 12-foot-wide aggregate base with approximate 4.5-foot-wide shoulders on either side to provide site access during construction and operation of the project. These roads may temporarily be wider during construction to accommodate construction equipment access where necessary.

2.1.4 Laydown Yards

The application notes there will be one permanent laydown yard approximately 0.7 acres in size (Map 3). Additionally, four temporary laydown yards would be needed for construction purposes and would be restored after construction. One of these laydown yards would be temporarily located within the Development Area and would be developed with solar panels and restored according to the plans for the remaining solar Development Area. This area would be approximately 15 acres in size. The other three temporary laydown yards would total approximately 3.7 acres in size and would be revegetated with permanent perennial herbaceous cover when no longer needed.

2.1.5 Stormwater Management System Design

The applicant provided a preliminary stormwater management plan as an appendix to its application. The project design includes installation of stormwater runoff ponds in accordance with the Minnesota

Pollution Control Agency (MPCA) regulations to collect and treat runoff from the project during its operation. This design would be finalized in the applicant's Stormwater Management Pollution Prevention Plan (SWPPP). The SWPPP would consider impervious surfaces which would be anticipated to include the access roads, inverters, and project substation. Solar panels are also considered impervious but are typically considered partially impervious and would be accounted for in accordance with MPCA applicable guidance.

The applicant acknowledges that because the project will disturb more than 50 acres where stormwater will discharge within one mile to special waters, the SWPPP would be submitted to MPCA for review and approval prior to construction.

2.2 Timeline and Cost

An estimated schedule of planned activities is provided in Table 2-1. Actual timelines for each activity may vary. The project is expected to be operational by Q4 2027.

Table 2-1 Estimated Project Timeline

Activity	Timeline
Site Permit and Route Permit	Q1 2024 – Q2 2025
Construction	Q2 2026 – Q4 2027
Testing and Commissioning	Q2 2027 – Q4 2027
Operation	Q4 2027 – Q1 2042

Costs associated with the various project components are provided in Table 2-2.

Table 2-2 Estimated Project Costs

Project Components	Cost ($ millions)
Solar Facility	
Engineering, Procurement, Construction Contractor	$481M
Development Expense	$3M
Interconnection	$0
Financing	$11M
Project Substation	$12M
Subtotal	**$507M**
Gen-Tie Line	
Engineering, Procurement, Construction Contractor	$6M
Development Expense	$1M
Interconnection	$31M
Financing	$0
Project Substation	$0
Subtotal	**$38M**
Project Total	**$545M**

The applicant filed an update regarding the project schedule on August 7, 2024.[4] In the update, the applicant noted that MISO is experiencing delays with interconnections, and that the applicant was continuing to evaluate the impact of these delays on the anticipated timeframe for execution of a Generator Interconnection Agreement.

2.3 Construction

The duration of construction for the project is estimated to be 15-19 months, including setup and demobilization. This timeline is in part dependent on winter weather conditions and the ability to work through the winter months.

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

Pre-construction

- Geotechnical investigation
- Underground utility discovery
- Design project substation
- Design solar array, access roads, transmission line, and electric collection system

[4] Letter, eDocket Document Nos. 20248-209331-01 and 20248-209331-02.

- Procure necessary facility components (solar panels, tracking system, and transformers)

Construction

- Pre-vegetate and stabilize tillable acreage and areas lacking appropriate soil-stabilizing vegetation
- Stabilize construction entrances and exits
- Receive security fencing and gate materials, and install perimeter security fencing and gates
- Remove vegetation in areas of construction and perform limited and localized grading, as needed for staging and laydown areas and for transformer substation
- Develop the staging and laydown areas for receiving of construction materials and equipment, storage of the construction materials and equipment containers, location of construction trailers and parking for personnel and construction-related vehicles
- Survey and stake the access roads and panel locations
- Develop access roads
- Delivery of equipment, including piles and potentially helical piers, aluminum supports/ mounting structures, tracking systems, and inverters
- Install driven piles or helical piers for a given block
- Install aluminum supports/mounting structures onto piles for a given block
- Install inverter pads for a given block
- Install tracking systems for a given block
- Delivery of PV modules and collection system equipment
- Install solar PV modules
- Install collection system by means of trenching and directional drilling
- Electrical testing and equipment inspections for each block and the collection system
- Receive materials and equipment for project substation
- Construct project substation and connect the collection system
- Electrical testing and equipment inspections of project substation and connections
- Installation of transmission culvert or concrete foundations
- Installation of poles, insulators and hardware
- Conductor stringing
- Installation of any aerial markers on transmission structures required by state or federal permits
- Install and inspect tie-in to Minnesota Power transmission line

Post-construction

- Conduct interconnection inspections, testing, and commissioning

- Vacate and restore staging and laydown areas, and de-compact subsoil, with windrowed topsoil re-distributed and de-compacted again as needed, consistent with the Agricultural Impact Mitigation Plan (AIMP)
- Reseed and revegetate staging and laydown and other disturbed areas consistent with the vegetation management plan
- Begin commercial operation

Construction equipment would include:

- Graders
- Bulldozers
- Excavators
- Forklifts
- Plows
- Trenchers
- Pile drivers
- Directional boring rigs
- Tree removal equipment
- Mowers
- Cranes
- Backhoes
- Digger-derrick line trucks
- Drill rigs
- Dump trucks
- Front-end loaders
- Bucket trucks
- Flatbed tractor-trailers
- Flatbed trucks
- Pickup trucks
- Concrete trucks
- Helicopters
- Various trailers and other hauling equipment

During construction, the workforce would be primarily comprised of laborers, equipment operators, and management personnel. Most of the personnel required to construct the project would be laborers who install racking systems and place the solar modules. The equipment operators would operate civil equipment, pile drivers, cranes, and material handling equipment. Approximately 200 to 375 workers are anticipated to be needed for construction.

As noted in the application's preliminary stormwater design, the Project Site has been designed with minimal grading to maintain existing drainage patterns.

To the extent possible, disturbance during construction would be phased to limit the amount of bare soil exposed on site at any one time. After site disturbance and construction are complete in an area, a temporary cover of oats or annual rye would be planted to prevent soil erosion. All disturbed portions of the site receiving seeding would be mulched, except for any areas where steep slopes are present. If steep slopes are present, wildlife-compatible erosion control blankets would be installed. Certified weed-free hay or straw mulch would be used. Temporary erosion and sediment control best management practices (BMPs) would remain in place until 70 percent vegetation cover is established.

2.3.1 Solar Facility Construction

The following sections provide an overview of activities associated with the solar facility construction.

2.3.1.1 Site Preparation

Construction would begin with the initial site preparation work after the necessary permits are received. Depending on timing of the start of construction, the clearing of residual row-crop debris from the 2025 harvest season may be required. Alternatively, and depending on construction timing, the applicant may plant a cover crop in Spring 2026 that is compatible with the Vegetation Management Plan (Appendix E) to stabilize soils if row crops are not planted that year.

The applicant completed a Geotechnical Report for the project in 2023. According to the report, the Project Site is predominately 8 to 18 inches of root/plow zone materials, peat, sand, and lean clay materials. This information, as well as more detailed information from the report, would be used to engineer the solar array foundation system.

The applicant notes they have had discussions with landowners and understand that drain tile may be present in this area. The applicant also noted further field investigation of drain tile networks would be conducted prior to construction. Upon successful mapping of active drain tile locations, considerable care during construction would be taken to a) avoid drain tile locations that are within the Project Site, b) re-route drain tile away from locations that could be damaged during construction, or c) in the case of fields with pattern tile networks, work with applicable landowners to establish acceptable criteria for rerouting, replacing, or abandoning in place drain tile that is within a PV array.

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 (Appendix C). 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 National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) stormwater permit for construction activity.

Temporary laydown areas would be graded and compacted for the duration of construction. After construction is complete, the area would be de-compacted to a depth of six inches, the topsoil returned, and the areas would be vegetated as described in the Vegetation Management Plan.

2.3.1.2 Access Roads

Topsoil would be stripped and stored for re-use. Geotextile matting would be installed prior to placement of aggregate to prevent mixing with native subsoil. The aggregate would be maintained for the life of the project. During decommissioning at the end of the project’s life, these areas may be restored unless the host landowner requests that they remain in place. Restoration activities typically include removing the aggregate, de-compacting the soil if required, restoring the topsoil, and either seeding to permanent perennial vegetation or returning the area to agricultural production.

2.3.1.3 Solar Array

Racking system foundations would be a driven pier and/or screw driven helical plates and would typically not require concrete. Some concrete foundations may be required depending on site-specific conditions and geotechnical analysis.

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 could be fastened.

Once racking systems are installed, the PV modules would be installed using industry standard, best practices. Upon completion of the final site design, pile lengths would be specified to allow the PV module racking system and tracker to be constructed at a minimum height above surrounding grade in order to account for average snow accumulation at the Project Site. Operating procedures call for modules to be placed in a stow position to avoid snow accumulation during snow events, and snow removal between arrays may be conducted on an as needed basis.

2.3.1.4 Electrical Collection System and Communications

Trench methods will be utilized for underground construction of collector circuits. Topsoil would be removed and segregated prior to installation. An average 18-inch-wide trench would be excavated, and the materials would be stockpiled in a nearby upland location. Once the circuits are installed, the trench would be backfilled and restored to match existing topography.

2.3.1.5 Project Substation

A typical construction sequence for the project substation involves, in order: site grading work, below grade foundation installation, above-grade physical construction of buswork and installation of major electrical equipment, wiring and completion of all terminations, followed by testing, commissioning, and energizing. A site-specific construction specification and schedule would be developed closer to the start of construction. All contractors would be required to follow the SWPPP, as well as adhere to any site-specific environmental requirements, including erosion and dust control. The project substation would be accessible for operations and approved parties at all times using the solar facility's access roads.

2.3.2 Gen-tie Line Construction

Gen-tie line construction activities would begin by survey staking of the gen-tie line centerline and pole locations, followed by removal of trees and other vegetation from the right-of-way. The width of the right-of-way would be cleared of vegetation for construction to ensure safe and reliable access and construction.

2.3.2.1 Transmission Structure Installation

Transmission structures are installed through a culvert by excavating a hole, placing the culvert vertically, placing the base of the pole into the culvert, and backfilling with an appropriate rock material. For the structures requiring concrete foundations, after excavating the hole, concrete is filled around a steel rebar support cage and anchor bolts. Once the foundation is cured, the pole is bolted to the foundation. In both types of structures, the pole is lifted using a crane or helicopter.

Some soil conditions and environmentally sensitive areas may require techniques to minimize impacts. When it is not feasible to avoid traversing sensitive areas, one or more of the following options would be used, in consultation with the appropriate agencies:

- Construction could be scheduled during frozen ground conditions.
- When construction during winter is not possible, construction mats would be used where wetlands and other sensitive areas would be impacted.
- Equipment fueling and other maintenance would occur away from environmentally sensitive and wet areas.

These techniques are also used to reduce impacts to private property, including driveways, yards, and drain tile.

2.3.2.2 Conductor and Shield Wire Stringing

After the structures are installed, the insulators and other hardware are attached. The applicant would then prepare conductor stringing areas and attach conductor wire to rollers on the insulators. A truck or helicopter can string the conductor between structures. Trucks at the pulling sites would provide tension to the conductor, and the conductor would be clamped to the insulators when the desired tension and conductor sag clearance are reached. Where the route crosses roads, highways, or the existing energized conductor or obstructions, temporary guard or clearance poles may be installed before the conductor stringing. The temporary guard or clearance poles ensure that conductors will not obstruct traffic or contact the existing energized conductor during stringing operations. Shield wire is installed utilizing similar techniques.

After conductor installation is complete, conductor marking devices would be installed where required. These marking devices may include bird flight diverters or air navigational markers. The applicant would work with the appropriate agencies to identify locations where marking devices would be installed.

2.4 Restoration

Once the panels and associated facilities have been installed, site restoration would start by vacating and restoring staging and laydown areas. Subsoil would be de-compacted as necessary, and windrowed topsoil would be redistributed and de-compacted again as needed. The applicant has developed a preliminary site-specific vegetation management plan (VMP) that outlines seed mixes, installation and establishment details, and proposed long-term vegetation management specifications (Appendix E).

Portions of the Project Site not utilized for the project or not impacted during construction would remain vegetated. These areas include most wetlands, forested lands, and other perimeter areas of the Project Site. Agricultural areas that have limited vegetation and areas disturbed by construction would be seeded and stabilized throughout construction. After construction activities have been completed, the applicant would contact the property owner to discuss any damage that has occurred as a result of the project. If fences, drain tiles, or other property have been damaged, the applicant would repair damages or reimburse the landowner to repair the damages.

If the drain tile is damaged, the damaged segments would be repaired in place or, if necessary, relocated as required by the condition and location of the damaged tile. In the event drain tile damage becomes apparent after commercial operation, the drain tile would be repaired in a manner that restores the operating condition of the tile at the point of repair. The applicant indicates that all repair, relocation, or rerouting referenced above would be consistent with the following policies a) materials would be of equal or better quality to those removed or damaged, b) work would be completed as soon as practicable, taking into consideration weather and soil conditions, c) work would be performed in accordance with industry-accepted, modern methods, and d) in the event water is flowing through a tile when damage occurs, temporary repairs would be promptly installed and maintained until such time that permanent repairs could be made.

As part of any road-use agreement, the applicant would keep a record of the condition of the roads before, during, and at the conclusion of construction or of any major construction event. This will assist the applicant, Kettle River Township, and Pine County in accurately assessing any possible damage to township and county roads. The applicant indicates that it will be responsible for the compensation or repair of any such damage to at least its original condition.

2.4.1 Vegetation Establishment and Maintenance

A draft Vegetation Management Plan (VMP) is included as Appendix E. This plan includes vegetation management objectives developed for the pre-construction and construction phase, as well as post-construction short-term establishment and long-term establishment for the Project Site. In areas where no grading is required as part of the construction activities, the applicant would establish perennial vegetation during the earliest available seeding window to increase the probability of successful long-term vegetation establishment.

Upon completion of construction, all disturbed areas would be seeded with a perennial seed mix that avoids the introduction of noxious weed seeds. Regionally appropriate grass-dominated seed mixes would be planted; seed mixes would be consistent with the Minnesota Department of Natural Resources (DNR) Prairie Establishment and Maintenance Technical Guidance for Solar Projects.

Ground-level vegetation disturbed or removed from the transmission right-of-way during construction will naturally reestablish pre-construction conditions. Areas where significant soil compaction or other disturbance from construction activities occur will require additional assistance in re-establishing the vegetation and controlling soil erosion. In these areas, the applicant will use seed that is free of noxious weed seeds to re-establish vegetation.

2.5 Commissioning

During and upon completion of the construction phase, the project would undergo inspection testing and commissioning. Testing and inspection of the facility would include:

- Electrical testing and equipment inspections for each block and the collection system
- Electrical testing and equipment inspections of transformer substation and connections to project substation
- Inspection of tie-in to Arrowhead-Bear Creek 230 kV transmission line
- Conduct interconnection inspections and testing and project commissioning

2.6 Operation and Maintenance

Once construction is complete, the facility would require approximately one full-time O&M manager and a mix of two to six on-site and off-site technicians at a given time. The plant operator(s) would have specific training/expertise to run a solar facility.

Maintenance activities would be conducted based on the National Renewable Energy Laboratory Best Practices for Operation and Maintenance of Photovoltaic and Energy Storage Systems. Maintenance activities would include access road, perimeter fence, and access gate maintenance; lighting system checks; and if needed, PV module washing. The applicant would also monitor for any wildlife that may be present within the facility.

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

- PV panels: visual check of the panels, tracking system, perimeter fence, and surrounding grounds to verify the integrity of the panels, tracking structure, and perimeter fence, and the presence of animals and nests
- Inverters, transformer, and electrical panels: visual check of the devices, including connection equipment and the grounding network, check for the presence of water and dust
- Electrical check: check of the main switches and safety devices (fuses)
- Noise: check for abnormal sounds
- Cabling and wiring: visual check of electrical lines and connection box to verify its status
- Routine visual inspection of the gen-tie line, structures, and components
- Project Substation: scheduled visual inspections

The applicant would be responsible for the operation and maintenance of the gen-tie line and performing annual inspections of the transmission equipment. Typically, two to six workers are required to perform these inspections. Any defects identified during these inspections would be assessed and corrected.

2.7 Repowering

As the project ages, or at the site permit's termination date, the applicant may decide to re-apply to the Commission to extend operations. Potential triggers for initiating a repower may be aging or faulty equipment, maintenance costs, extending the useful life of the project, or increasing the generation output of the project.

2.8 Decommissioning

The project would operate for at least 30 years and the useful life of the project may be 35 or 40 years based on current forecasts for modern equipment. At the end of the useful life of the project, the applicant would be responsible for removing all of the solar arrays and other associated facilities and restoring the site to its prior use. The applicant has prepared a draft Decommissioning Plan for the project (Appendix F).

Decommissioning activities would begin within 12 months of the project ceasing operation and are anticipated to be completed in 12 months, with monitoring and site restoration extending beyond this period to facilitate successful revegetation and restoration. The decommissioning timeline is dependent on, among other things, weather conditions, and any needed permitting. A partial list of activities include:

- De-energize solar arrays
- Remove panels and dismantle racking
- Remove inverters, transformers and skids
- Remove access and internal roads (unless the landowner requests they remain)
- Remove perimeter fencing
- De-compact subsoils and revegetate

The applicant would be responsible for all costs to decommission the project and associated facilities. The applicant would review and update its decommissioning plan and cost estimates every five years. Subsequent revisions to the decommissioning plan and cost estimates may be needed based on changes in construction techniques and technology, as well as changing material scrap or resale values.

At this time, consistent with applicable real estate agreements, the applicant anticipates financial assurance for decommissioning the project would take the form of one or more, or a combination of, the following: corporate security bonds, self-bonds, collateral bonds, surety bonds, or other forms of security. Decommissioning of the site would comply with applicable regulations in effect at the time of decommissioning, as well as the applicant's obligations under applicable real estate agreements.

3 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, integrity, and fulfillment of electric energy needs in an orderly and timely fashion. For facilities like those proposed by the applicant, the Commission fulfills this charge through its site permitting process and route permitting process, respectively.[5]

In these processes, project proposers file site and route permit applications with the Commission; EERA assists the Commission by reviewing the human and environmental impacts of the project; subsequently, an ALJ presides over a public hearing and compiles the record for the Commission. Finally, the Commission determines whether to issue the site permit or route permit and what permit conditions are needed to mitigate human and environmental impacts.

Project proposers must apply for and receive a site permit or route permit from the Commission before building a large electric power generating plant (LEPGP) or a high voltage transmission line (HVTL). This project meets the definition of a LEPGP, defined as “electric power generating equipment and associated facilities designed for or capable of operation at a capacity of 50,000 kilowatts or more,”[6] and the gen-tie line meets the definition of an HVTL, defined as a “conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts or more and is greater than 1,500 feet in length.”[7]

3.1 Joint Site and Route Permit Application

The applicant filed a joint site and route permit application on May 15, 2024. The application was filed for review under the alternative review process.[8] On July 2, 2024, the Commission issued an order accepting the joint site and route permit application as substantially complete. After an application is accepted, the permitting process, including environmental review, can proceed.

3.2 Environmental Review

The environmental review process ensures that the Commission and other stakeholders understand the human and environmental impacts of a proposed project before a permit is issued. EERA staff assist the Commission with environmental review by working with stakeholders and identifying issues, analyzing the impacts of the proposed project or its alternatives, and proposing mitigation measures to minimize these impacts. This allows the Commission to make informed decisions that avoid or reduce impacts to people and the environment while allowing for reliable and efficient delivery of electricity.

---

[5] Minnesota Rules, part 7850
[6] Minnesota Rules, part 7850.1000 subpart 11
[7] Minnesota Rules, part 7850.1000 subpart 9
[8] Minnesota Statutes, section 216E.04 and Minnesota Rules, parts 7850.2800 through 7850.3900

3.2.1 Scoping

Scoping is the process used to determine the topics analyzed in the EA. Scoping provides citizens, local governments, tribal governments, and agencies an opportunity to focus the EA on those issues and alternatives that are relevant to the proposed project.[9]

EERA and Commission staff jointly held two scoping and public information meetings for the project.[10] An in-person meeting was held at the Pine County Government Office in Sandstone on July 24, 2024, and a remote access meeting was held on July 25, 2024. The public comment period was open from July 12 to August 7, 2024.

3.2.1.1 Scoping Comments

EERA received oral and written comments from six members of the public and two public agencies. Comments from members of the public included the following topics:[11]

- Aesthetics
- Construction noise
- Property values
- Loss of wildlife
- Heat generated from panels affecting adjacent landowners and the weather
- Hazardous materials in solar panels and the potential to affect groundwater
- The extent to which construction, operation, and maintenance jobs are created or preserved by the proposed facility

Public agency comments were received from the Minnesota Department of Transportation (MnDOT) and Minnesota Department of Natural Resources (DNR). MnDOT raised the following areas of concern:

- Maintaining a visual barrier along Interstate Highway 35 to reduce motorist visual distractions and address other important safety concerns
- The effect of the project's vegetation removal on the performance of an existing structural snow fence
- Confirming that MnDOT's height clearances for the transmission line to cross the interstate right-of-way is adhered to (and noting that is a different requirement than those published in the National Electric Safety Code)

[9] Minnesota Rules, part 7850.3700 subpart 2
[10] Notice, eDocket Document Nos. 20247-208526-01 and 20247-208526-02.
[11] Comments, eDocket Document Nos. 20248-209565-01 through 20248-209565-04; 20248-209335-01 and 20248-209335-02.

- The Installation of electrical transmission requires the protection of existing structural snow fences by installing further grounding measures, as per MnDOT 2557 Standard Specification Book

- Noting that coordination with MnDOT by the applicant for a Utility Permit and other permissions would be required

DNR requested that the EA assess the project's potential impacts to the following resources:

- Recreation
  - The Willard Munger State Trail
  - Kettle River State Water Trail
  - Grant-in-Aid snowmobile trails that pass through the project area, such as trail 187, which runs north to south within the west side of the project area.
- Wildlife, Habitat, and Rare Species
  - Wild and Scenic River considerations, as the project is adjacent to the Kettle River Wild and Scenic River District
  - Protection of Wood and Blanding's turtles, with particular attention to fencing
  - Protection of state-threatened mussels, including preparation of an avoidance plan, if the project impacts the Kettle River
  - Bird collision and mortality from concentrated solar thermal devices and collision with transmission lines
  - Vegetation management plan, as it relates to chemicals, fertilizers, pollinators, mowing, grazing livestock, and planting of native seed mixes

On August 7, 2024, the applicant responded in part to public comments. The applicant noted their attendance at the scoping meetings and reiterated their commitment and willingness to coordinate with neighboring landowners regarding potential visual impacts and construction impacts, generally, as permitting, design, and construction of the project proceeds. The applicant also committed to coordinating with local authorities regarding emergency response and committed to developing an Emergency Response Plan.[12]

The applicant filed a second response to scoping comments on August 14, 2024. In this letter, the applicant responded to agency comments received from the DNR, MnDOT, as well as comments from the Laborers' International Union of North America (LIUNA). The applicant did not object to DNR's request to address nearby recreational resources and reiterated that given the low profile of the solar panels, and that hills and trees surround much of the site, the impact of aesthetic changes due to the

[12] Letter, eDocket Document Nos. 20248-209331-01 and 20248-209331-02.

solar facility are anticipated to be relatively minimal. They also reiterated their commitment to coordinate with the Northern Pine Riders regarding the snowmobile trail reroute.

In regard to DNR's request to coordinate on fencing strategies to keep Wood and Blanding's turtles out of the Project Site, the applicant noted the protected species had not been identified onsite to date and committed to ongoing coordination with DNR. The applicant also committed to implement and maintain effective erosion and sediment control measures to protect downstream water quality, including the Kettle River. Finally, the applicant acknowledged DNR's request the EA study Concentrated Solar Thermal ("CST") devices and the installation of avian flight diverters on the gen-tie line. The applicant indicated the project will not use CST devices, but rather PV modules. They also noted they would work with the appropriate wildlife agencies to identify locations where marking devices, including avian flight diverters, may be installed.[13]

With respect to MnDOT's concerns, the applicant committed to continuing coordinating efforts with MnDOT as the project proceeds.[14] With respect to LIUNA's comments, the applicant thanked LIUNA for recognizing the benefits of the project and indicated that they were not opposed to the considerations raised by LIUNA being studied in the EA.[15]

3.2.1.2 Scoping Decision

After considering public comments and recommendations by staff, Commerce issued a scoping decision on September 3, 2024.[16] The scoping decision identifies the issues to be evaluated in this EA. It is provided in Appendix A.

3.2.2 EA Preparation

EERA derived much of the information used in the preparation of this EA from documents prepared by the applicant, including the joint site and route permit application for the project. In addition to material provided by the applicant, information from the comments received, relevant environmental review documents for similar projects, spatial data, and information gathered during EERA visits to the project area, were also used to prepare this document.

3.2.2.1 Public Hearing

A public hearing will be held after the EA is issued.[17] An administrative law judge from the Office of Administrative Hearings conducts the public hearing. The hearing is an opportunity for interested persons to comment on the project, the EA, and the upcoming Commission's decision on the site and route permits. At the public hearing, persons can present evidence, ask questions, and make comments. Written and oral comments received during the hearing become part of the record in the proceeding.

---

[13] Letter, eDocket Document Nos. 20248-209484-01 and 20248-209484-02.
[14] Id.
[15] Id.
[16] eDocket Document Nos. 20249-209982-01, 20249-209982-02
[17] Minnesota Rules, part 7850.3800

EERA staff will be available to respond to questions and comments about the EA. These questions and answers become part of the record, but EERA staff does not revise or supplement the EA document.

After the public comment period is over, the ALJ provides a report with findings, conclusions, and recommendations to the Commission based on the information in the record.

3.3 Site and Route Permit Decisions

Once the Commission has received the ALJ's report, the Commission schedules a meeting to decide on the requested permits. When the Commission issues a site or route permit, it relies on the entire record to approve a site (site permit), and a route, route width, and anticipated alignment (route permit). Site permits and route permits also include conditions specifying construction and operation standards and mitigation measures that must be taken to reduce project impacts. A draft site permit and draft route permit are included in Appendix B and Appendix G, respectively.

At the Commission meeting to consider permits for the project, the Commission will weigh human and environmental factors in its decision. The specific factors the Commission must weigh are specified in statute and rule. Minnesota Statutes, section 216E.03, subdivision 7 lists considerations that guide the study, evaluation, and designation of site permits and route permits. Minnesota Rules, part 7850.4100 lists the factors the commission must consider when making a site permit or route permit decision. These include:

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."[18]

The Commission must make a final decision on the site permit and route permit within 60 days after receiving the ALJ report. A final decision must be made within six months after the Commission's determination the application is complete; however, this time limit may be extended for up to three months for just cause or upon agreement of the applicant. A decision by the Commission on a site permit and route permit for the project is anticipated in mid-2025.

A site permit or route permit from the Commission is the only state permit required for siting the project. The Commission's site or route permit supersedes local planning and zoning and binds state agencies.[19] Thus, state agencies are required to participate in the Commission's permitting process to aid the Commission's decision-making and to indicate sites or routes that are not permittable.

3.4 Other Permits, Approvals, and Applicable Codes

A site permit and route permit from the Commission are the only state permits required for siting the project. After the Commission issues a site or route permit, however, various federal, state, and local approvals might be required for activities related to the construction and operation of the project. These subsequent permits are referred to as "downstream" permits and must be obtained by the applicant prior to construction. Table 3-1 summarizes the federal, state, and local permits and approvals that may be required for construction and operation of the project, some of which are further discussed below.

Table 3-1 Potential Permits and Approvals Required for the Project

Agency	Permit	Applicability	Anticipated for Project
		Federal	
U.S. Army Corps of Engineers (USACE) St. Paul District	Clean Water Act (CWA) Section 404 Permit	Dredging or filling jurisdictional Waters of the United States (wetlands/waterways). If impacts to non-tidal wetlands are greater than 0.5 acres Regional General Conditions apply.	Yes
U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act (ESA) Section 10(a), Incidental Take Permit and Habitat Conservation Plan	Projects potentially taking federally listed species without a federal nexus.	Possible

[18] Minnesota Statutes, section 216E.03, subdivision 7(a)
[19] Minnesota Statutes, section 216E.10

Agency	Permit	Applicability	Anticipated for Project
	Bald and Golden Eagle Protection Act, Eagle Take Permit	Projects involving potential take of Bald and Golden Eagles.	Possible
U.S. Environmental Protection Agency (USEPA)	Spill Prevention, Control, and Countermeasure (SPCC) Plan	Project facilities with oil storage of more than 1,320 gallons.	Yes
Federal Aviation Administration (FAA)	Notification of Proposed Construction or Alteration (Determination of No Hazard) (Form 7460-1)	Required for construction or alteration of structures that are 200 feet or higher above ground level, structures near airports, or sited within line of sight of radar of an air defense facility.	No FAA form 7460-1 filed 2/21/2024 Received confirmation on 2/28/2024 of a "Does Not Exceed" notice, meaning no study is required.
		State	
Minnesota Pollution Control Agency (MPCA)	Section 401 Water Quality Certification	Federally permitted activities (Section 404 Individual or Nationwide Permit) that result in discharges to waters of the U.S. (including regulated wetlands).	Yes
	National Pollutant Discharge Elimination System (NPDES) General Permit and Stormwater Pollution Prevention Plan (SWPPP)	General NPDES Permit No. MN R100001 for stormwater discharges associated with regulated construction activity that will result in land disturbance equal to or greater than one acre.	Yes
Minnesota Department of Health (MDH)	Well construction permit	Required for installation of a well.	Possible To be obtained prior to construction for Operations and Maintenance (O&M) building, as needed
Minnesota Department of Labor and Industry	Electrical inspection of installed equipment	Compliance with state electrical codes.	Yes
Minnesota Department of Natural Resources (DNR)	Water Appropriation/ Dewatering Permit	Required for all users withdrawing more than 10,000 gallons of water per day or 1 million gallons per year (dewatering)	Possible
	Consultation and Review of State Threatened and Endangered Species	Potential effects on State threatened and endangered species.	Possible
DNR, Division of Lands & Minerals	Utility Crossing License	License for the passage of any utility over, under, or across any state land or public water.	Possible

Agency	Permit	Applicability	Anticipated for Project
DNR	Public Waters Work permit	Required for work occurring below the ordinary high-water line in public waters and public waters wetlands.	Possible
Minnesota Historical Society, State Historic Preservation Office (SHPO)	Consultation	Consultation with the SHPO.	Possible
Minnesota Department of Transportation (MnDOT)	Application for Utility Accommodation on Trunk Highway right-of-way	Installing utilities along, across or within trunk highway right-of-way.	Yes
	Oversize/ Overweight Permit	Vehicles delivering equipment, materials and supplies that exceed applicable MnDOT height/length limits and weight limits.	Yes To be obtained prior to equipment deliveries, as needed
County/Local			
Wetland Conservation Act (WCA) Local Government Unit (LGU) Pine County Planning and Zoning	MN WCA	The Minnesota WCA Rules (Chapter 8420) requires anyone proposing to drain, fill, excavate or otherwise impact a wetland first try to avoid impacts, then minimize any unavoidable impacts and replace any lost wetland acreages, functions, and values.	Yes
Pine County	Work Permit on County Highway right-of-way	Required to work within public road rights-of-way.	Possible
	Utility Permit(s)	Installing utilities along, across or within the county road right-of-way.	Possible
	Access/Entrance Permit(s)	Required for construction of a driveway/access road utilizing county road right-of-way.	Possible
	Oversize/ Overweight Permit(s)	Vehicles delivering equipment, materials and supplies that exceed applicable height/length limits and weight limits.	Yes
	Septic System Permit	Required for installation of an individual sewage treatment system (O&M)	Possible
Kettle River Township	Driveway/ Access Permit	Construction of new driveway/entrance on township roads.	Yes
	Utility Permit(s)	Construction and installation of new utilities along, across, or within township road right-of-way	Yes

3.4.1 Federal Permits

The U.S. Army Corps of Engineers (USACE) "regulates the discharge of dredged or fill material into waters of the United States, including wetlands" (reference (1)). 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 U.S. Fish and Wildlife Service (USFWS) for the incidental "taking" 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.

The U.S. Environmental Protection Agency (USEPA) enforces the Spill Prevention, Control, and Countermeasures (SPCC) Plan. "The purpose of the SPCC rule is to help facilities prevent a discharge of oil into navigable waters or adjoining shorelines. The SPCC rule requires facilities to develop, maintain, and implement an oil spill prevention plan, called an SPCC Plan" (reference (2)). If a plan is required for this project, it would prevent an oil spill, as well as control a spill should one occur. This plan may be required for power transformers within the project substation.

The U.S. Federal Aviation Administration (FAA) requires a notification of proposed construction or alteration of structures that are 200 feet or higher above ground level, structures near airports, or sited within line of sight of radar of an air defense facility. The nearest FAA-registered airport is Moose Lake Carlton Country Airport located approximately 11.5 miles north of the project area. The applicant has coordinated with FAA.

3.4.2 State Permits

Potential impacts to state lands and waters, as well as fish and wildlife resources are regulated by DNR. Not unlike the USFWS, the DNR 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 DNR 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 the Minnesota Department of Transportation (MnDOT) is required for oversize and overweight loads on state highways (reference (3)).

Construction projects that disturb one or more acres of land require a general NPDES/SDS Construction Stormwater Permit from the MPCA. This permit is issued to "construction site owners and their operators to prevent stormwater pollution during and after construction" (reference (4)). 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 with the applicable water quality standards (reference (5)).

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.

3.4.3 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
- Subsurface Sewage Treatment System Permit — Ensures septic system design conformity to standards
- Over-width 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

3.4.4 Applicable Codes

The project must meet the requirements of the National Electrical Safety Code (NESC). When constructing new facilities or upgrading existing facilities, 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. 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.

4 Affected Environment, Potential Impacts and Mitigation

This chapter describes the existing resources that may be impacted by the project, assesses potential impacts, and identifies measures to mitigate the impacts.

4.1 Terms and Concepts Used to Analyze Impacts

A potential impact is the anticipated change to an existing condition caused either directly or indirectly by the construction and operation of a proposed project. Potential impacts can be positive or negative, short- or long-term, and, in certain circumstances, can accumulate incrementally. Impacts vary in duration and size, by resource, and across locations.

Direct impacts are caused by the proposed action and occur at the same time and place. An indirect impact is caused by the proposed action but is further removed in distance or occurs later in time. This EA considers direct and indirect impacts that are reasonably foreseeable, which means a reasonable person would anticipate or predict the impact. Cumulative potential effects are the result of the incremental impacts of the proposed action in addition to other projects in the environmentally relevant area.

Impacts vary based on duration, size, and location. When considering duration, short-term impacts are generally associated with construction. Long-term impacts are associated with the operation and usually end with decommissioning and reclamation. Permanent impacts extend beyond the decommissioning stage. For size, potential impacts are described quantitatively if possible. Location is considered in its potential uniqueness.

The context of an impact can range from beneficial to harmful and at varying intensity levels. The following terms are used to describe and analyze potential impacts:

Negligible – Negligible impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.

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

Moderate—Moderate impacts alter an existing resource condition or function and are generally noticeable or predictable for the average observer. Impacts might be spread out over a large area, making them difficult to observe, but can be estimated by modeling or other means. Moderate impacts might 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. Impacts might 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.

Also discussed are opportunities to avoid, minimize, or compensate for potential impacts. Collectively, these actions are referred to as mitigation.

Avoid—To avoid an impact means to eliminate it altogether, for example, by not undertaking parts or all of a project, or relocating the project.

Minimize—To minimize an impact means to limit its intensity, for example, by reducing project size or moving a portion of the project.

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.

4.2 Regions of Influence

Potential impacts to human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). This EA uses the ROIs defined Table 4-1.

Table 4-1 Regions of Influence for Human and Environmental Resources

Resource Category	Resource Type	Region of Influence
Human Settlement	Displacement, Land Use and Zoning	Project Site
	Aesthetics	Within 500' of the Project Site
	Noise, Electronic Interference	Within 1,600' of the Project Site
	Cultural Values, Recreation, Public Services	Within a quarter-mile of the Project Site
	Property Values	Within one-half mile of the Project Site
	Socioeconomics, Environmental Justice	County
Public Health and Safety	Electric and Magnetic Fields, Implantable Stray Voltage, Induced Voltage, Worker and Public Safety	Project Site
Land-Based Economies	Agriculture, Forestry, Mining	Project Site
	Tourism	Project Site
Archaeological Resources	—	Development Area
Historic Resources	—	Within a quarter-mile of the Development Area
Natural Environment	Geology, Soils, Vegetation	Project Site
	Air Quality, Water Resources, Wildlife, Rare and Unique Resources	Project Site
	Greenhouse Gases, Climate Change	State

4.3 Environmental Setting

The project is in Sections 13, 14, 15, 22, 23, 24, 25, 26, and 27 of Kettle River Township, Pine County, Minnesota. The project is adjacent to the city of Rutledge boundary, and approximately 0.5 miles south of the city of Willow River (Map 1).

The Project Site is dominated by agricultural land cover, with some forested land cover and wetlands (Map 4). There are rural residences outside of the Project Site (Map 5). The solar facility is bordered on the east by Interstate Highway 35, on the west by County Highway 61, and on the south by County Road 33/Swanson Road. The project's gen-tie line will cross over Interstate Highway 35 and is bordered on the east by County Highway 152/Weeping Willow Road.

The project is in the St. Croix River Major Watershed Basin, which includes four subwatersheds: St. Croix River-Upper, Kettle River, Snake River, and St. Croix River-Stillwater (reference (6)). The Pine and Kettle Rivers are located on the west side of the project, and an unnamed stream runs through the southern portion of the project (Map 6).

The DNR and U.S. Forest Service have developed an Ecological Classification System for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map smaller areas of land with increasingly uniform ecological features (reference (7)). Under this classification system, the project is in the Laurentian Mixed Forest Province, the Western Superior Uplands (212K) Section, and the Mille Lacs Uplands (212Kb) Subsection.

The Mille Lacs Uplands Subsection (212Kb) consists of gently rolling till plains and drumlin fields. In most areas, there is dense glacial till underlying soils which impedes water movement through the soil profile. Total annual precipitation ranges from 27 inches in the west to 30 inches in the east. The growing season ranges from 97 to 135 days. Presettlement vegetation consisted of maple-basswood forests along the southern boundary, while the rest of the subsection was a mix of conifer, hardwood, and mixed conifer hardwood forests. Current land use includes forestry, recreation, and some agriculture (reference (8)). Thickness of the glacial deposits generally range from less than 50 feet to greater than 100 feet (reference (9)). The Project Site is underlain by Mesoproterozoic bedrock consisting of sandstone, siltstone and local conglomerate of the Hinckley Sandstone, Fond du Lac Formation and Solar Church Formation (reference (10)).

4.4 Human Settlement

Large energy projects can impact human settlements. Impacts might be short-term, such as increased local expenditures during construction, or long-term, such as changes to viewshed.

4.4.1 Aesthetics

Aesthetics refers to the visual quality of an area as perceived by the viewer and forms the impression a viewer has of an area. Aesthetics are subjective, meaning their relative value depends upon the perception and philosophical or psychological responses unique to individuals. Impacts to aesthetics are equally subjective and depend upon the sensitivity and exposure of an individual. How an individual values aesthetics, as well as perceived impacts to a viewshed, can vary greatly.

A viewshed includes the natural landscape and built features visible from a specific location. Natural landscapes can include wetlands, surface waters, distinctive landforms, and vegetation patterns. Buildings, roads, bridges, and power lines are examples of built features.

Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and viewer location. For example, a high exposure viewshed would be observed frequently by large numbers of people. These variables, as well as other factors such as viewing angle or time of day, affect the aesthetic impact.

Places with higher viewer exposure would be Interstate Highway 35 on the eastern side of the project and County State Aid Highway (CSAH) 61 on the western side of the project. Exposure to the viewshed would be observed frequently but for short periods of time while driving by the project. The Willard Munger Hinkley-Carlton State Trail is located along the western boundary of the project. The Development Area and solar arrays would be visible at certain points on the western boundary of the project where there are openings in the vegetative barrier.

The existing landscape in the Project Site is primarily agricultural land with some wetlands, hay/pasture, and forested areas (Map 4). The agricultural crops consist mainly of corn and soybeans. The topography varies, where the central portion of the Development Area is open and flat, the eastern and western portions have more variable topography. The Gen-tie Line Project Area has varied topography and portions of forest and wetlands.

The area surrounding the project is patchworks of forest, wetlands, streams, rivers, lakes, agricultural fields, and pastures, along with scattered rural residences and farm buildings There are 32 residences within a mile of the Development Area (Map 5). There are three residences within the properties that are considered participating parcels; these three residences are labeled as C, E, and G on Map 3 and Map 5. Two residences (C and E) are within the Solar Project Area. They are both shown on Map 3.2 and are located east of Pine Street and near the O&M facility. Both residences are located outside of the Development Area. Of these two residences, one residence has an existing forested vegetative buffer between it and the Development Area and the other does not. The third home (G) on a participating parcel is located northeast of the gen-tie line with a forested vegetative buffer between it and the project.

While not on a participating parcel, the closest residence to the Development Area and the planned solar array is shown as D on Map 3.3 on the southern end of the Solar Project Area. This residence is located 326 feet away from the nearest planned solar array.

The gen-tie line project area is on the east side of the Project Site and is where the planned point of interconnection for the Arrowhead-Bear Creek 230 kV transmission line is located. The gen-tie line would run south from the project substation within the Solar Project Area and then turn east to span Interstate Highway 35 and traverse through mostly forested and hay/pastureland. The closest residence to the gen-tie line is 692 feet north of the boundary and within a participating parcel. The next closest transmission line is located approximately 4.5 miles west of the Project Site.

4.4.1.1 Solar Facility Potential Impacts

The visible elements of the Solar Project Area will consist of new PV panels, transformers and inverters, multiple weather stations, an O&M facility, a project substation, and security fencing surrounding the project. Aesthetic impacts of the project are anticipated to be moderate near the project and to diminish with distance from the project. The project would be a noticeable change in the landscape, converting approximately 2,207 acres of agricultural fields into solar production. How an individual viewer perceives the change from an agricultural field to a field of solar panels depends, in part, on how a viewer perceives solar panels. The viewer could consider the harvesting of solar energy to be like harvesting crops or the replacement of agricultural use with the increase of pollinator and grazing habitats, the storing of carbon in the soil, in turn increasing soil health. The viewer could also see it as an agricultural use being replaced by an industrial use.

A large portion of the solar facility is surrounded by forested land or is surrounded by hills blocking all or part of the view of the project. Most residences generally have vegetative screening that will limit visual impacts. Portions of the solar facility would be visible from Interstate Highway 35, local roads, and nearby residences.

During scoping, three landowners expressed concerns regarding their lack of vegetative buffering and therefore, altered viewshed in relation to the Solar Project Area. The first landowner (shown as A) is located on the northwest corner of the Project Site (Map 3.1). Landowner A does not have a substantial barrier on the boundary shared with the Development Area, and so had concerns of visual impacts. The second landowner's property is on the western side of the project (shown as C) (Map 3.2), between CSAH 61 and the Project Site. Landowner C shared the same concerns as Landowner A regarding visual impacts, although they have a larger forested vegetative barrier between their residence and the Project Site. The third landowner (shown as F) (Map 3.4) is south of the temporary laydown area, across CSAH 33 on the southern side of the Project Site. There is minimal vegetative barrier between the residence and the proposed Development Area.

There would be a security fence around the perimeter of the solar facility. Down-lit security lighting would be installed at the gates to the facility as well as outside the O&M facility and project substation, and along the perimeter fence as necessary for safety and security. Lighting would be motion-activated and downlit.

Impacts to recreational opportunities in the area are described in Section 4.4.6. A portion of the Solar Project Area would be visible from the Willard Munger Hinckley-Carlton State Trail. The trail is located west of County Highway 61 on the west side of the Project Site (Map 7). Figure 4-1 and Figure 4-2 (View 1 and View 2, respectively, of Section 6.2.6 of the application) show the view of the Solar Project Area from the trail where there is an opening in the vegetative barrier to provide passage for farm equipment to the farm field from County Highway 61. Figure 4-1 shows the view under existing conditions, while Figure 4-2 simulates the view with the solar facility. Figure 4-3 and Figure 4-4 (View 3 and View 4, respectively, of Section 6.2.6 of the application) show the Solar Project Area from southbound travelers on Interstate Highway 35 and shows a transition from cultivated cropland to PV panels with permanent perennial vegetative cover. The PV panels have a relatively low profile (maximum 15 feet in height from the ground).

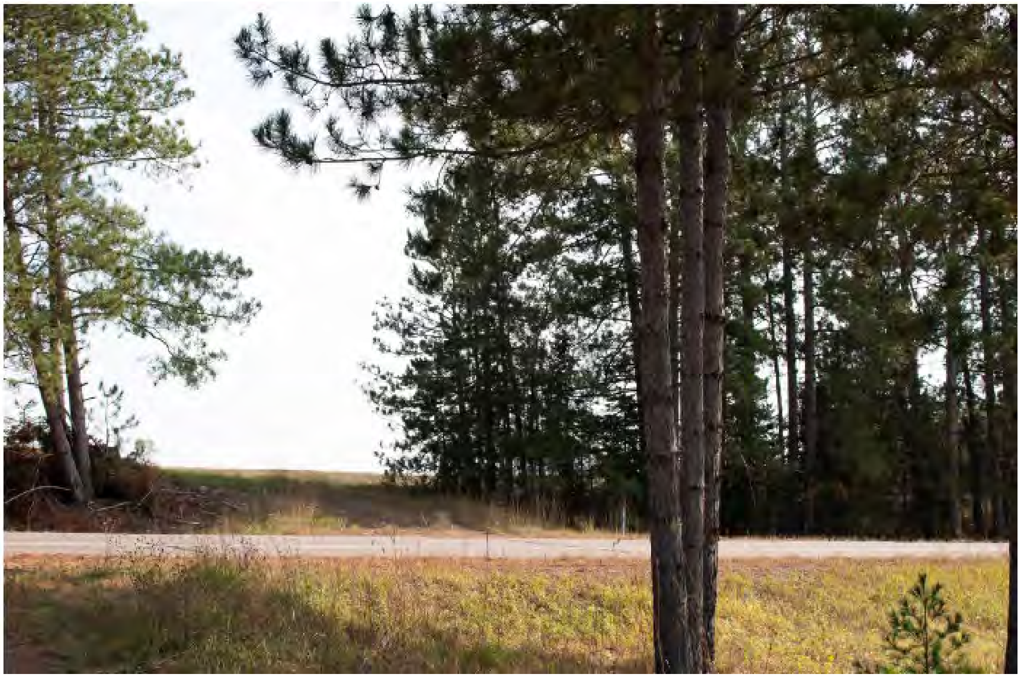


Figure 4-1 Development Area Existing Conditions Facing East from Willard Munger Hinckley-Carlton State Trail

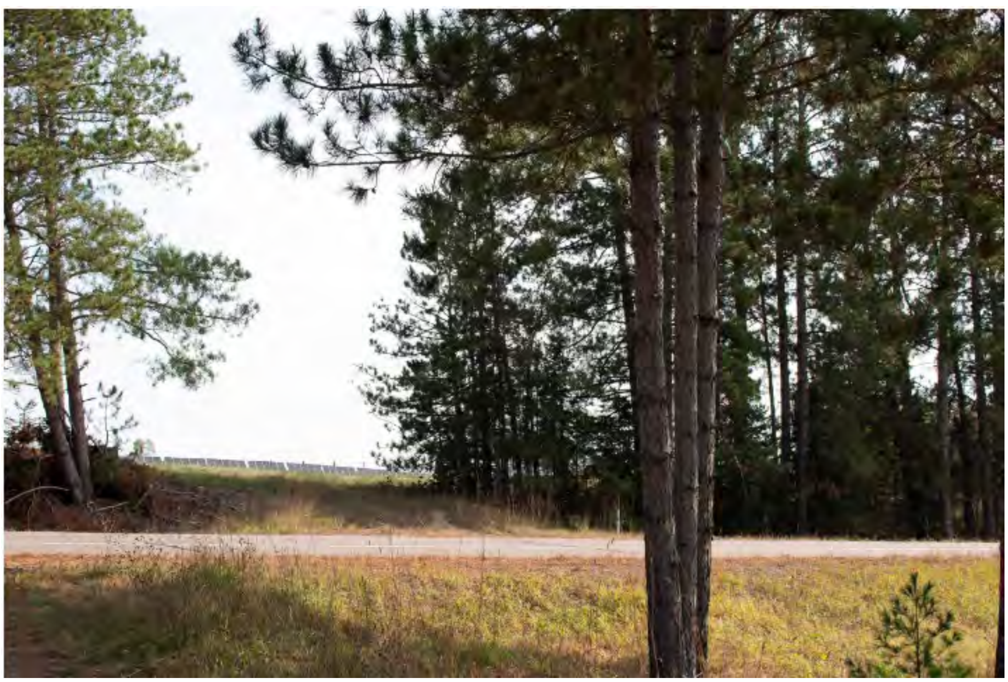


Figure 4-2 Development Area with Proposed Solar Facility Facing East from Willard Munger Hinckley-Carlton State Trail

Figure 4-3 Development Area Existing Conditions Facing Southeast from Southbound Interstate Highway 35

Figure 4-4 Development Area Proposed Solar Facility Facing Southeast from Southbound Interstate Highway 35

4.4.1.2 Gen-Tie Line Potential Impacts

The gen-tie line is one mile long. It would connect with an existing transmission line on the east side of the Development Area. Within the gen-tie line right-of-way there would be trees removed for safety, altering the aesthetics of the area. Impacts due to vegetation change are further described in Section 4.8.7. The addition of the gen-tie line poles and removal of trees within the right-of-way would be visible, particularly where it runs south from the project substation, paralleling and then spanning Interstate Highway 35. Transmission lines are a common sight along roadways, and so the length of the gen-tie line along the interstate within the Project Site is expected to have a minimal visual impact. Once the gen-tie line spans Interstate Highway 35, it runs east through mostly forested and hay/pasture areas. Because of this, despite clearing for safety, there is ample vegetative barrier between the nearby residences that are to the north and south of the Gen-tie Line Project Area. The aesthetic impacts due to the gen-tie are anticipated to be minimal.

4.4.1.3 Mitigation

Minimizing aesthetic impacts from solar projects is primarily accomplished by locating the facilities so that they are not immediately adjacent to homes, ensuring that damage to natural landscapes during construction is minimized, and shielding the facilities from view by terrain or vegetation. Impacts from facility lighting can be minimized by using shielded and downward facing light fixtures and using lights that minimizes blue hue. Impacts can be mitigated through standard or special permit conditions. A draft site permit for the project is included in Appendix B. Section 4.3.8 of the draft site permit is a standard condition that requires the permittee to consider landowner input with respect to visual impacts and to use care to preserve the natural landscape.

Existing vegetation between the Development Area and the Interstate Highway 35 right-of-way could be maintained to preserve vegetative barriers and to address concerns from MnDOT regarding solar panel glare and driver safety (reference (11);(12)). Solar panels in the Development Area would have an antireflective coating which significantly reduces glare and glint from the panels.

Three landowners with neighboring properties expressed concern regarding the view from their residences (reference (13)). One of the landowners noted impacts will be greater for him as a landowner compared to the impacts to those traveling Interstate Highway 35 or the Willard Munger Hinckley-Carlton State Trail given the frequency and duration of the viewshed interruption.

The applicant committed to coordinating with the concerned landowners regarding vegetative screening and mitigation of visual impacts. Site-specific landscaping plans can minimize visual impacts to adjacent land uses and homes through vegetation screening, berms, or fencing. A special permit condition is recommended requiring the applicant to develop and implement a visual screening plan with affected landowners (Appendix B). Impacts to Willard Munger Hinckley-Carlton State Trail could also be mitigated by vegetative buffers in areas that where the vegetative barrier is sparse between the state trail and the Development Area. Visual impacts might not be able to be mitigated along certain areas of the trail due to access needs to adjacent properties or at cross sections of the trail where vegetation is cleared.

4.4.2 Cultural Values

Cultural values can be defined as shared community beliefs or attitudes that define what is collectively important to the group. These values provide a framework for individuals and community thought and action. Infrastructure projects believed to be inconsistent with these values can deteriorate community character. Those found consistent with these values can strengthen it. Projects often invoke varying reactions and can, at times, weaken community unity.

Utility-scale renewable projects – generally located in relatively rural areas can be valued but, at times, opposed by residents. The highly visible, industrial look and feel of these projects can erode the rural feeling that is part of a resident's sense of place.

The Mille Lacs Band of Ojibwe (a federally recognized Tribe) lives within the vicinity of the project in east-central Minnesota and has cultural ties to the area. A portion of their reservation is in Mille Lacs County, and within the Twin Cities there are two of their nine statutory communities, and seven of their other statutory communities are located in Aitkin and Pine Counties. The project is located within the 1837 Treaty-ceded territory, in which tribal citizens exercise their usufructuary rights by hunting, fishing, and gathering resources protected in the Treaty. These rights are recognized by Pine County in their Statement of Principles on Government-to-Government Relations Between the Mille Lacs Band of Ojibwe and Pine County, Minnesota (reference (14))

Cultural values can be informed by ethnic heritage. According to the U.S. Census Bureau, the population of Pine County (29,449) is formed mostly by people of European heritage. Approximately 24 percent of the population is German, followed by 10 percent Swedish, and 8 percent Norwegian (reference (15)).

Cultural values are also informed by work and leisure pursuits, for example, fishing and outdoor recreation on the Kettle River and Munger trail system. Community events are usually tied to seasonal/municipal events, and national holidays. Some specific events include the Pine County Fair, Pine City Championship Rodeo, East Central Minnesota Pride, Freedom Fest, Czech Booya Festival, and Pine Technical Community College Shooter's Association Annual Gun Show (reference (16)).

Based on its website, the nearby city of Willow River self-describes its community in large part around its recreational resources including nearby camping, biking or snowmobiling, and hiking in the General C.C. Andrews State Forest (reference (17)). Willow River is also home to the Northern Pine Riders Club comprised of dedicated volunteers who develop and groom 156 miles of snowmobile and ATV trails (reference (18)).

4.4.2.1 Potential Impacts

The project contributes to the growth of renewable energy and is likely to strengthen and reinforce this value in the area. At the same time, the development of the project would change the character of the area. The value residents put on the character of the landscape within which they live is subjective, meaning its relative value depends upon the perception and philosophical or psychological responses unique to individuals. Because of this, project construction might—for some residents—change their perception of the area's character thus potentially eroding their sense of place.

While the Mille Lacs Band of Ojibwe supports renewable energy, they urge communication with tribes who hold rights within the 1837 Treaty-ceded territory to ensure that these rights can be protected. The band noted in their May 21, 2024, letter the potential loss of a diverse use of land and wildlife habitat due to the project.[20]

On whole, and recognizing that impacts will vary among community members, impacts to cultural values as a result of the project are anticipated to be minimal.

4.4.2.2 Mitigation

No mitigation measures are proposed for potential impacts to cultural values. Section 4.4.3.2 addresses potential impacts to cultural properties.

The applicant notes that it has been working with tribes in Minnesota, and per the information in the application, no concerns have been expressed to date by tribes. The applicant also noted in their June 12, 2024, letter their commitment to ongoing coordination with Mille Lacs throughout the life of the project. [21]

4.4.3 Displacement

Displacement can occur when residences or other buildings are located within a proposed site or right-of-way. If the buildings would potentially interfere with the safe operation of a project, they are typically removed from the site or right-of-way and relocated. Displacements from large energy facilities and transmission lines are rare and are more likely to occur in heavily populated areas where avoiding all residences and businesses is not always feasible, rather than in rural areas where there is more room to adjust site boundaries or rights-of-way to accommodate the proposed energy facility.

4.4.3.1 Potential Impacts

There are no residences, businesses, or structures such as barns or sheds located within the Project Site, and none will be displaced by the project.

4.4.3.2 Mitigation

No mitigation for displacement is proposed as no displacement would occur.

4.4.4 Land Use and Zoning

Construction and operation of the solar facility and gen-tie line would alter current and future land cover and land use. The National Land Cover Database provides “spatial reference and descriptive data for characteristics of the land surface” nationwide (reference (19)). Land cover documents how much of a region is covered by forests, wetlands, impervious surfaces, agriculture, and other land and water

---

[20] Docket No. 0245-206936-01, https://efiling.web.commerce.state.mn.us/documents/%7BF0FB9B8F-0000-C817-886F-F6DDC4DD674D%7D/download?contentSequence=0&rowIndex=40
[21] Docket No. , 20246-207620-02, https://efiling.web.commerce.state.mn.us/documents/%7B30740D90-0000-C638-9605-DAF25D32968B%7D/download?contentSequence=0&rowIndex=34

types, including wetlands. As shown in Table 4-2, the land cover within the Project Site is dominated by cultivated agriculture, with scattered areas of wetlands and forested areas.

Table 4-2 Land Cover in the Project Site

Land Cover Type	Acres in Solar Project Area	Acres in Gen-Tie Line Project Area	Total Acres
Cultivated Crops	1,664.8	0.0	1,664.8
Herbaceous/Hay/Pasture	38.6	21.0	59.6
Developed	15.1	9.1	24.3
Shrub/Scrub	13.0	0.0	13.0
Deciduous Forest	38.8	25.2	64.1
Evergreen Forest	223.6	18.0	241.5
Mixed Forest	18.4	3.8	22.2
Emergent Herbaceous Wetlands	100.3	1.4	101.7
Woody Wetlands	91.2	10.3	101.5
Open Water	2.9	0.0	2.9
Total	2,206.8	88.8	2,295.6

Land use is the characterization of land based on what can be built on it and how the land is used. Existing land uses within the Solar Project Area include primarily agriculture, followed by forests, and wetlands. Existing land uses within the Gen-tie Line Project Area include primarily deciduous and evergreen forests, along with herbaceous pasture, and a small variety of wetland types.

Zoning is a regulatory tool used by local governments (cities, counties, and some townships) to guide specific land uses within specific geographic areas. Per Minnesota Statutes, section 216E.10, a site permit from the Commission supersedes local zoning, building, or land use rules. Though zoning and land use rules are superseded, the Commission's site permit decision must be guided, in part and per Minnesota Statute 216E.03, by consideration of impacts to local zoning and land use in accordance with the legislative goal to minimize impacts to human settlement and other land use conflicts.

The Project Site is located within Kettle River Township in Pine County. The applicant has noted that they have been in communication with Kettle River Township and will continue to coordinate moving forward. The township has adopted the Kettle River Township Zoning Ordinance which governs development outside the zones regulated under the Shoreland Ordinance and/or Kettle River Wild and Scenic Ordinance (reference (20)). It is expected that through their coordination with the township, the applicant would comply with the ordinance.

The Pine County Zoning Ordinance has required setbacks for Commercial Solar Energy Production rated at less than 50 megawatts of power. While these setbacks are not applicable to this project, the applicant acknowledges and complies with the setback requirements in their application.

Pine County has a Shoreland Management Ordinance, Floodplain Management Ordinance, and Kettle River Wild and Scenic River Ordinance. The Pine County Planning and Zoning Department is responsible for the administration of county-wide Shoreland Zoning. This zoning applies to all land within 1,000 feet of a lake, 300 feet of a river or stream, and the landward extent of the 100-year floodplain (reference (21)). Parts of the Development Area are in the shoreland zoning district, and portions of the Project Site are within the designated floodplain under Pine County's regulations (Map 8). Portions of the Project Site and Development Area are also located within Zone SP – Special Protection Shoreland Management District. Portions of the land control area are in the Zone WS – Kettle River Wild & Scenic River Zone, and portions of the Development Area are located in the Shoreland General Development District, which are all administered by Pine County.

No proposed project facilities are in a floodplain zone or the Kettle River Wild and Scenic River Land Use District however a portion of the Project Site is located within the district (Map 9). Any grading or vegetative clearing would be required to comply with the Pine County Kettle River Wild and Scenic River Ordinance (reference (22)). Additional information pertaining to the Kettle River Wild and Scenic River District is provided in Section 4.8.6.

Pine County's Zoning Ordinance acknowledges that commercial solar energy systems that have a generating capacity of 50 MW or more fall under the jurisdiction of the Minnesota Public Utilities Commission (reference (23)). The applicant notes that the project generally considered the Pine County Zoning Ordinance regarding commercial solar energy systems.

4.4.4.1 Solar Facility Potential Impacts

A solar farm development would temporarily change the land use from predominantly agricultural uses to energy generation for the life of the project. The change of land use will have a minimal to moderate impact on the rural character of the surrounding area and a minimal impact on the county's character as a whole. Given that the solar Development Area does not encroach any county setbacks from dwellings, neighboring property lines, and public roads, the project design is generally consistent with Pine County Zoning Ordinances.

A portion of the solar facility Development Area is in the Special Protection Shoreland Management District associated with a DNR Public Watercourse (Map 6). The applicant has proposed the perimeter fencing to be setback at least 100 feet from the current course of this waterway. There may be minimal and temporary indirect impacts to water sources due to construction.

A portion of the Project Site is located within the Kettle River Wild and Scenic River District. Grading and/or clearing of existing vegetation within the district could indirectly cause impacts to the Kettle River which is regulated under county ordinance to maintain a high standard of environmental quality.

4.4.4.2 Gen-Tie Line Potential Impacts

Development of the gen-tie line would result in land use change for some land use types. The change of land use would have minimal impact to the character of the surrounding area and county as a whole.

Areas of woody vegetation, including forested areas would have vegetation cut close to the ground. Permanent vegetative cover would remain in the Gen-tie Line Project Area but woody vegetation would be periodically mowed to provide clearance for the line. A 160-foot cleared right-of-way is anticipated for the gen-tie line. The gen-tie line is proposed to cross over Interstate Highway 35, this would not impact the current land use of the highway. The Pine County Zoning Ordinance allows for permitted use of essential services on all land uses administered by the county. The switchyard is proposed for a currently forested area, trees would be removed from the switchyard to provide space for facilities and this area would be converted to the industrial use throughout operation of the project.

4.4.4.3 Mitigation

The project would convert approximately 1,568 acres mixed land use to solar energy production. As noted in the application, the applicant has coordinated with the Pine County zoning board and Kettle River township. Coordination efforts included local government meeting attendance to present the project. The applicant indicated they would continue to coordinate with Pine County and Kettle River Township on other potential permits for the project.

The Kettle Wild and Scenic River Ordinance was adopted to protect and preserve the outstanding scenic, recreational, natural, historical, and scientific values of the Kettle Rive in Pine County, Minnesota. A special permit condition is recommended that the permitted site not include any area within the Kettle River Wild and Scenic District or if temporary workspace is required and permitted within the district, then the applicant must consult with Pine County and complete all work (including any potential grading or clearing) in accordance with the Pine County Kettle River Wild and Scenic River Ordinance (reference (22)).

4.4.5 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 MPCA 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 4-3. 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.

Table 4-3 Noise Area Classifications and Noise Standards

Noise Area Classification[1]	Daytime Limit (dBA) L10	Daytime Limit (dBA) L50	Nighttime Limit (dBA) L10	Nighttime Limit (dBA) L50
NAC – 1: Residential and Other Sensitive Uses	65	60	55	50
NAC – 2: Non-Residential Uses (typical Commercial)	70	65	70	65
NAC – 3 Non-Residential Uses (typical Industrial, Agricultural)	80	75	80	75

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

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 rural 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 Figure 4-.

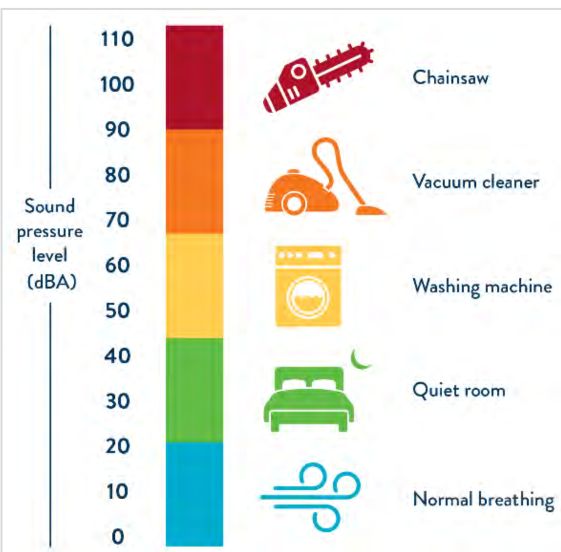


Figure 4-5 Noise Level Comparison

4.4.5.1 Solar Facility Potential Impacts

Potential noise impacts from the project are associated with both construction and operation. The project assessed potential noise impacts to 79 residential receptors (NAC-1) and two municipal buildings (NAC-2) located within one-half mile of the Project Site. The main sources of noise from the project during operation would be from the inverters and the project substation, and to a lesser extent the rotation of the tracking system.

The applicant provided a noise study as Appendix I of its application. The study includes modeling that shows project noise levels are not expected to exceed 43 dBA during daytime and 41 dBA during nighttime at residences and other noise-sensitive locations. After sunset, the inverters would revert to stand-by mode, emitting minimal noise. The project substation is generally expected to operate at full capacity during daylight hours when the solar array is generating power and to a lesser extent during nighttime hours. The expected sound levels are below MPCA noise limits of 60 dBA L_{50} during daytime and 50 dBA L_{50} during nighttime. The highest estimated daytime and nighttime noise level was at the nearest residence to the project substation, shown as residence receptor E (Map 3.4). These noise levels are within state standards. For the majority of the identified receptors, project-generated noise levels are expected to be 30 dBA or less during daytime periods and 20 dBA or less during nighttime periods.

Distinct noise impacts during construction are anticipated to be minimal to moderate depending on the activity occurring and equipment being used. Construction noise impacts will be temporary, localized, and intermittent. Major noise producing activities related to installation of the solar arrays are associated with clearing and grading, material delivery, and driving foundation posts.

4.4.5.2 Gen-Tie Line Potential Impacts

Noise associated with electrical conductors is due to small electrical discharges which ionize surrounding air molecules. The level of noise from these discharges depends on conductor conditions, voltage levels, and the weather conditions. Noise emissions are greatest during heavy rain events when the conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line. As a result, audible noise is typically not noticeable during heavy rains. In foggy, damp, or light rain conditions, transmission lines might produce audible noise higher than background levels. During dry weather, noise from transmission lines is a perceptible hum and sporadic crackling sound. Noise levels from the gen-tie line are anticipated to be within Minnesota noise standards.

4.4.5.3 Mitigation

Construction noise can be mitigated to minimize the impact of the construction process. 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
- Coordinating with nearby residences and landowners to best schedule high-impact construction noises, as practicable
- Equipping construction equipment with well-maintained, high-grade mufflers

Standard language as found in Section 4.3.7 of the draft site permit (Appendix B), requires permittees to adhere to MPCA noise standards which protect against impacts to human health and welfare. Operational noise from the solar facility is projected to be below and not anticipated to cause or significantly contribute to exceedances of the state noise standards, therefore, no mitigation is proposed to be implemented after construction is completed.

4.4.6 Recreation

Recreation includes outdoor leisure activities done for enjoyment, amusement, and pleasure. Pine County activities include hiking, ATV, canoeing/kayaking, biking, rock climbing, cross-country skiing, and snowmobile trails (reference (24)). Other activities include hunting and fishing.

Impacts to recreation can be direct or indirect. Direct impacts are impacts that directly impede the use of a recreational resource, for example, closing of a trail to facilitate project construction. Indirect impacts reduce the enjoyment of a recreational resources but do not prevent use, for example, aesthetic impacts visible from a scenic overlook.

A state trail, a state water trail, and snowmobile trails are within or adjacent to the Project Site. The Williard Munger State Trail and Kettle River State Water Trail are adjacent to the Project Site (Map 7). The Kettle River is adjacent to the Project Site and designated as a state Wild and Scenic River. Grant-in-Aid Snowmobile Trail 187 runs through the Project Site. The William Munger Hinckley-Carlton State Trail (Snowmobile Trail 235) runs adjacent to the Project Site.

The northern boundary of Banning State Park is one mile south of the Project Site. Rutledge Wildlife Management Area (WMA) is a quarter mile south of the eastern portion of the Project Site and Mark Lake WMA is one mile northwest of the Project Site. There is a DNR public access boat launch on Long Lake three-quarters of a mile west of the Project Site.

4.4.6.1 Solar Facility Potential Impacts

One snowmobile trail runs through the western portion of the Project Site and would need to be rerouted. Snowmobile Trail 187 (Pine Trails 1, 2, & 3) currently crosses through the western and northwestern portions of the Solar Project Area. Its path would intersect with two fenced areas (Map 7).

The Solar Project Area is immediately east of the Kettle River. Near the east side of the river, the elevation ranges from approximately 1,010 to 1,060 feet. Within the Solar Project Area, the elevation ranges from approximately 1,035 to 1,045 feet. Based on aerial photography and land cover data, the east side of the river is primarily forested or contains other tall vegetation. Due to the elevation changes and vegetation, the solar panels would likely not be visible from the river. Solar panels may be visible from the William Munger State Trail in certain areas where vegetation does not provide screening (see Figures 4-1 and 4-2). Impacts to users of the trail would be indirect and are anticipated to be minimal. Solar panels would not impair the primary viewshed of the trail, the Kettle River.

The project would not impact access to public hunting or fishing areas, so no impacts to recreational fishing or hunting are anticipated.

4.4.6.2 Gen-Tie Line Potential Impacts

The gen-tie line would not be close to the recreational resources identified above and would not be expected to impact recreational opportunities.

4.4.6.3 Mitigation

The applicant has reached out to the Northern Pine Riders snowmobile club which manages the trail to coordinate the reroute of Snowmobile Trail 187. The trail would need to be relocated outside the project's fenced solar areas. The DNR reiterated this need, and specifically recommended siting access roads or routes that will allow working with the local government sponsor and local club to maintain connectivity for the recreational trail.[22] The Willard Munger Hinckley-Carlton State Trail (Snowmobile Trail 235) runs adjacent to the western project boundary along CTH 61 and could be an alternative passage route. A special permit condition is recommended requiring the applicant to coordinate with the Northern Pine Riders snowmobile club to re-route snowmobile trails impacted by the project (Appendix B).

4.4.7 Socioeconomics

Pine County's population growth rate is less than that of Minnesota as a whole; between the 2010 and 2020 U.S. Census, the population in Pine County decreased by 2.9 percent, compared to a growth rate of 7.6 percent for Minnesota. Population estimates from the 2018-2022 American Community Survey, 5-year estimates have shown an increase in population compared to 2020. From 2010 to 2020 the population of the Kettle River Township show the same pattern of decreasing by 5.0 percent, before increasing in the 2022 estimates (Table 4-4).

Table 4-4 Population Changes

US Census Metric	2010 Census	2020 Census	% Change 2010-2020	2022 Estimate
Minnesota	5,303,925	5,706,494	7.6	5,695,292
Pine County	29,750	28,876	-2.9	29,090
Kettle River Township	504	479	-5.0	648

According to the 2018-2022 American Community Survey, 5-year estimates, the industry sectors with the largest employment in Pine County were educational services (24.3 percent), construction (11.0

[22] Docket No. 20248-209338-01, https://efiling.web.commerce.state.mn.us/documents/%7B40E62E91-0000-CB11-93D3-31B7DCF25B39%7D/download?contentSequence=0&rowIndex=23

percent), and arts, entertainment, recreation, accommodation, and food services (11.0 percent) (reference (25)).

Pine County is part of the Minnesota Department of Economic Development Region 7E, which is in the East Central Planning Region. Unemployment rates fluctuate with the economy, but the unemployment rate for Region 7E has consistently been approximately 1.5 percent above Minnesota's unemployment rate (reference (26)). In 2022, Pine County had a slightly higher unemployment rate (3.3 percent) than the state average (2.7 percent), with Kettle River Township having a higher unemployment rate (5.3 percent) than both the county and state (Table 4-5). The county also had a labor force participation rate (56.8 percent) less than that for Minnesota (68.7 percent) (reference (27)). Table 4-5 includes housing characteristics for the county and township, showing ample available housing in the area.

Table 4-5 Housing, Income and Unemployment Conditions

US Census Metric	Minnesota	Pine County	Kettle River Township
Total Housing Units (number)	2,253,990	17,277	344
Vacant Housing Units (number)	231,568	5,402	140
Per Capita Income (in 2021 Inflation Adjusted US Dollars)	$44,947	$32,335	$33,803
Unemployment Rate (%)	2.7	3.3	5.3

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

4.4.7.1 Potential Impacts

Economic benefits from the project include financial benefits to participating landowners as they execute voluntary lease, purchase, or easement agreements with the applicant. Construction of the project is expected to temporarily increase demand for goods and services from the local and surrounding communities. The applicant indicates that construction of the project is expected to utilize approximately 200-375 personnel for approximately 15-19 months.

During scoping, the Laborers' District Council of Minnesota and North Dakota (LIUNA) recommended hiring local construction laborers and, in turn, providing wages that support families and respect the rights of workers to organize and unionize. LIUNA requested supporting participation by residents of environmental justice areas and individuals who live in or near plant host communities.[23] The applicant has committed to using local labor for project construction.[24]

Job opportunities that may be created in the short-term, during construction of the project, include general skilled and specialized labor positions, equipment operators, and licensed electricians. General

---

[23] Docket no. 20248-209331-01, https://efiling.web.commerce.state.mn.us/documents/%7B20E82E91-0000-C63B-980A-9A2241DE30DA%7D/download?contentSequence=0&rowIndex=22.

[24] Docket no. 202411-212280-01, Microsoft Word - Iron Pine Solar Response to LIUNA Petition to Intervene(84510976.2).docx

skilled labor is expected to be available in Pine County or Minnesota to provide for Project Site development activities. Specialized labor may be imported from other areas of Minnesota 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 resorts, motels, hotels and cabins scattered north and south of the project that mostly surround Interstate Highway 35. The largest concentration of lodging near the Project Site is in Hinckley, Minnesota, approximately 22 miles south. Construction of the project would provide temporary increases to the revenue of the area through demand for lodging, food services, fuel, transportation, and general supplies.

Operation of the project would require up to seven personnel, including one full-time O&M manager and between two and six solar technicians. Other long-term positions would include snow plowing and access road and landscape maintenance. Sufficient temporary lodging and permanent housing are available within Pine County and Kettle River Township to accommodate construction laborers and long-term personnel (Table 4-5).

The project is anticipated to provide approximately $560,000 to $640,000 annually in production tax revenue to Pine County, and $140,000 to $160,000 annually to Kettle River Township, depending on the final design.

Overall, socioeconomic impacts to Pine County and the local area are anticipated to be positive and minimal to moderate. Some impacts will be short-term, e.g., impacts to local businesses, wages and benefits for construction workers. Some impacts will be long-term, e.g., financial benefits to participating landowners and production tax revenue for the county and township.

4.4.7.2 Mitigation

Section 8.5 of the draft site permit (Appendix B) requires quarterly reports concerning efforts to hire Minnesota workers. Consistent with Minnesota Statutes, section 216E.03, subdivision 10 (c), Section 4.5.3 of the draft site permit requires the permittee, as well as its construction contractors and subcontractors, to pay no less than the prevailing wage rate.

The applicant has committed to utilizing local, union construction craft employees to the greatest extent feasible during the construction process. The selected engineering, procurement, and construction contractors would work with labor unions and other stakeholders to implement a staffing model that maximizes local hiring and local economic benefits of the project. The applicant has also committed to meeting and adhering to the prevailing wage and registered apprenticeship provisions contained in the federal Inflation Reduction Act. This ensures that laborers employed by the applicant would be paid wages at rates not less than the prevailing rates for jobs of a similar character in the locality in which such facility is located. This would also further workforce development at the local level by imposing apprenticeship requirements rules regarding labor hours, apprentice-to-journey-worker ratios, and participation by qualified apprentices.[25] Because impacts to socioeconomics generally would be long-term and beneficial, no mitigation is proposed.

4.4.8 Environmental Justice

Environmental justice is “the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other federal activities that affect human health and the environment” (reference (28)). 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 (reference (29)).

4.4.8.1 Potential Impacts

Energy-related infrastructure can adversely impact low-income, minority, or tribal populations. To identify potential environmental justice concerns in the project area, the US EPA’s EJ Screening Tool was used to consider the composition of the affected area to determine whether low-income, minority, or tribal populations are present and whether there may be disproportionately high and adverse human health or environmental effects on these populations (reference (30)). Low-income and minority populations are determined to be present in an area when the low-income percentage or minority group percentage exceeds 50 percent or is “meaningfully greater” than in the general population. In this analysis, a difference of 10 percentage points or more was used as the threshold to distinguish whether a “meaningfully greater” low-income or minority population resides in ROI.

A demographic assessment of potentially affected communities was conducted to identify low-income and minority populations using the 2018-2022 American Community Survey, 5-year estimates. These communities include Pine County, Kettle River Township, and Census Tract 9502. Pine County, Kettle River Township, and Census Tract 9502 all have a lower minority population than Minnesota. Pine County reported a higher percentage of the population below the poverty level than the state, the township and the census tract. Both the county and township have a smaller limited English-speaking population percentage than Minnesota. Table 4-6 provides low-income, minority, and limited English-speaking population data. Both Kettle River township and the census tract do not have low-income, minority, or limited English-speaking populations that exceed 50 percent or are “meaningfully greater” than the general population.

[25] Docket no. 202411-212280-01, https://efiling.web.commerce.state.mn.us/documents/%7B40D25093-0000-C710-98D0-C5141748D640%7D/download?contentSequence=0&rowIndex=1v

Table 4-6 Environmental Justice Analyses

Area of Comparison	% Below Poverty Level	% Minority Population	% Limited English Speaking Population
Minnesota	9.3	20.3	12.4
Pine County	10.6	9.5	4.2
Kettle River Township	2.7	1.4	4.6
Project Census Tract			
Census Tract 9502	6.6	6.1	4.5

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

4.4.8.2 Mitigation

The project would not create disproportionate or adverse impacts to low-income or minority populations because the percentage of low-income and minority residents in the project area is not meaningfully greater than Pine County or the state of Minnesota.

4.4.9 Property Values

Impacts to property values can be measured in three ways: sale price, sales volume, and marketing time. These measures are influenced by a complex interaction of factors. 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.

Because each landowner has a unique relationship and sense of value associated with their property, a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. The landowner's judgments, however, do not necessarily influence the market value of a property. Professional property appraisers assess a property's value by looking at the property "after" a project is constructed. Moreover, potential market participants are likely to see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might (reference (31)). Staff acknowledges this section does not and cannot consider or address the fear and anxiety felt by landowners when facing the potential for negative impacts to their property's value.

Electrical generating facilities can impact property values. Often, negative effects result from impacts that extend beyond the project location. Examples include emissions, noise, and visual impacts. Unlike fossil-fueled electric generating facilities, the project would not generate emissions. Potential impacts from operational noise are not anticipated. Aesthetic impacts would occur, but because the project would be relatively low in height – as compared to a wind turbine or a smokestack – impacts would be localized.

Large solar facilities exist in Minnesota; however, limited sales information is available. A review of the literature identified one peer-reviewed journal article that addressed impacts to property values based on proximity to utility-scale, PV solar facilities. The Lawrence Berkeley National Lab studied over 1,500 large-scale PV solar facilities in six states (including Minnesota) to determine whether home sale prices were influenced within 0.5 miles of a solar facility (reference (32)). In summary, the study found that effects, "on home sale prices depend on many factors that are not uniform across all solar developments or across all states."

In Minnesota in particular, the study found that homes within one-half mile of large-scale PV solar facilities had a 4 percent reduction in home sale prices compared to homes 2-4 miles away. This finding was considered statistically significant. Additionally, only large-scale PV solar facilities developed on previously agricultural land, near homes in rural areas, and larger facilities (roughly 12 acres or more) were found to be linked to adverse home sale price impacts within one-half mile. The analysis did not include consideration of site features or site design, for example setbacks or landscaping features, which could play a role in nearby property valuation. Another limitation of the study was the lack of examination of the broader economic impacts or benefits to host communities from large-scale PV solar facilities, which might positively impact home sale prices.

A study prepared by CohnReznick compared sale prices of properties near 10 existing large solar facilities with comparable properties, and did not find a consistent negative impact to the sales value of properties near large solar facilities (reference (33)).

In response to one of a few comments regarding property values during the scoping meeting, the applicant notes an additional recent study on property values from Chisago County. The Chisago County Assessor reported that the 1,000-acre rural solar energy project, referred to as North Star, has had no apparent negative impact on surrounding property values according to the value of sales of properties near North Star between January 2016 and October 2017 (reference (34)).

4.4.9.1 Potential Impacts

Impacts to the value of specific properties within the project vicinity are difficult to determine but could occur. Considerations such as setbacks, benefits to the community, economic impact, and vegetative screening could have an influence on property values. Several, but not all, of the closest residents have some screening from the project.

Based on analysis of other utility-scale solar projects, minimal to moderate property value impacts could occur, but significant negative impacts to property values in the project vicinity are not anticipated. To the extent that negative impacts do occur, they are expected to be within one-half mile of the solar facility and to decrease with distance from the project and with time. Aesthetic impacts that might affect property values would be limited to residences and parcels in the project vicinity where the solar panels are easily visible.

4.4.9.2 Mitigation

Impacts to property values can be mitigated by reducing aesthetic impacts and limitations on future land use. Impacts can also be mitigated through individual agreements with neighboring landowners, such as a visual screening plan.

4.4.10 Public Services and Emergency Response

Public services and emergency response are services provided by a governmental entity or by a regulated private entity to provide for public health, safety, and welfare.

<u>Water and Wastewater</u>

Water and wastewater services for rural residences in the Project Site are supplied by domestic wells and private septic systems.

<u>Utilities</u>

Minnesota Power Company and East Central Energy are the two primary electrical providers for the Project Site. Minnesota Energy Resources provides natural gas service in the Project Site.

<u>Phone and Internet</u>

Mobile telephone services are provided by New Cingular Wireless, T-Mobile, and Cellco Partnership. The top fixed wireless provider is T-Mobile, and the top cable provider is Savage Communications Inc. Various other providers also provide DSL, satellite, and fiber services. The solar facility and gen-tie line are not expected to impact phone and internet services.

<u>Pipelines</u>

No natural gas or hazardous liquid pipelines were identified in the Project Site. The closest pipelines are a natural gas pipeline, and a crude oil pipeline located approximately 1.75 miles west of the Project Site. The solar facility and gen-tie line are not expected to impact pipelines.

<u>Roads</u>

The Project Site would be accessed using existing local and county roads. Interstate Highway 35 is adjacent to the solar facility, and the gen-tie line will cross over Interstate Highway 35. Access to the project would only occur from local roads. The gen-tie line would conform to MnDOT crossing requirements.

<u>Railroads</u>

There are no railroads located within one mile of the Project Site. The solar facility and gen-tie line are not expected to impact railroads.

Airports

There are no FAA-registered airports or airstrips located within the Project Site. The nearest FAA-registered airport is Moose Lake Carlton County Airport located approximately 11.5 miles north of the Project Site on the Pine – Carlton County line. The solar facility and gen-tie line are not expected to impact airports or airstrips.

Emergency Response

If emergency personnel and/or services were needed at the Project Site, multiple services would likely respond. These include Pine County Sheriff Department, Willow River Police Department, and Willow River Fire Department. The Project Site is also served by a combination of the Essentia Health Emergency Services (EMS) – Moose Lake, Essentia Health EMS – Sandstone, and Sturgeon Lake ambulance services.

Hospitals near the Project Site include Essentia Health – Sandstone, and Essentia Health – Moose Lake/Mercy Hospital in Sandstone and Moose Lake, respectively. Smaller medical clinics in the area include Gateway Family Health Clinics in Sandstone and Moose Lake, as well as Sandstone Healthcare Center and Selah Wellness Clinic in Sandstone.

According to the Minnesota Department of Public Safety, there are two Allied Radio Matrix for Emergency Response (ARMER) towers located within a 15-mile radius of the Project Site. The closest one is located approximately 4.5 miles southeast of the project near Askov, Minnesota. The next closest tower is located approximately 10 miles northwest of the project near Moose Lake, Minnesota. According to the MDH, the ARMER system is Minnesota's primary two-way 700-800 MHz trunked public safety radio system for all state agencies as well as all police, fire, EMS, city, county, federal, and Tribal governments. The ARMER radio system operates by line of sight, talking to 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.

4.4.10.1 Potential Impacts

Water and Wastewater

The project would likely install a single, domestic-sized private well and onsite septic system at the O&M facility to provide potable water for drinking and sanitary services for employees. Impacts due this well and septic system are not anticipated.

Utilities

No long-term impacts to utilities will occur as a result of the project. Limited, temporary impacts to service may occur during interconnection of the project into the existing Minnesota Power 230 kV

Arrowhead-Bear Creek transmission line. These outages are anticipated to be of a short duration and closely coordinated with utilities and landowners.

Roads

The project would be accessed using existing local and county roads. During construction of the project, a temporary increase in local traffic is expected as a result of vehicles delivering materials and bringing personnel to the site. Construction traffic volume would vary depending on the stage of construction and timing of deliveries. The functional design capacity for a typical two-lane paved rural highway is approximately 5,000 vehicles per day. Local roadways currently have traffic volumes below the design capacity, allowing for sufficient capacity to handle construction traffic. While local residents may notice temporary increases in traffic at times, it should not impair traffic function of the roadway. Occasionally, slow-moving construction vehicles could cause delays on local roads, and impacts would be similar to slow-moving farm equipment. Following completion of construction, traffic impacts are expected to be minimal and would primarily consist of a small number of maintenance staff using pickup trucks or similar vehicles to monitor and maintain the project as needed. Visibility on local roads could be impacted by blowing snow across the Project Site.

MnDOT noted a blowing snow concern within the Project Site. The Project Site is adjacent to an existing MnDOT structural snow fence. The project would require tree removal within its southern boundary, which MnDOT believes would create a new blowing snow problem and therefore, trigger the need for extra snow fencing. Without the additional snow fencing needed, potential human and environmental impacts could include the following as noted by MnDOT:

- Crash and spinout rate increases (without trees to protect the roadway)
- Impaired driving visibility
- Plow route operations changes
- Increased material and equipment costs
- Increased chloride usage along the roadway[26]

Emergency Response

The inflow of temporary construction personnel could increase demand for emergency and public health services. On the job injuries of construction workers requiring assistance due to slips, trips or falls, equipment use, or electrocution can create a demand for emergency, public health, or safety services that would not exist if the project were not to be built. Although no road closures are

[26] Docket no. 20248-209326-01, https://efiling.web.commerce.state.mn.us/documents/%7B40172E91-0000-CA1F-80EC-A1F426A4A423%7D/download?contentSequence=0&rowIndex=20

anticipated during construction, any temporary closures could impede police, fire, and other rescue vehicles access to the site of an emergency.

4.4.10.2 Mitigation

Water and Wastewater

A well construction permit from the MDH would be required if a well is installed at the O&M facility. A septic system permit would be required from Pine County or the MPCA prior to installation of a septic system. The septic system would not be allowed within the Kettle River Wild and Scenic District and would be subject to an on-site sewage treatment system setback of 50 feet from the Kettle River Wild and Scenic District (reference (35)).

Utilities

Section 4.3.5 of the draft site permit (Appendix B) requires the permittee to minimize disruptions of public utilities. Electrical outages and disruption would be minimized by coordinating with Minnesota Power Company and East Central Energy and communicating with customers.

The location of underground utilities would be identified using the Gopher One Call system before and during construction. Underground utility locations would be marked prior to construction. Section 4.3.30 of the draft site permit (Appendix B) require the permittee to submit the location of all underground facilities to Gopher One Call following the completion of the construction of the project.

Roads

Section 4.3.22 of the draft site permit (Appendix B) requires the permittee to inform road authorities of roads that would be used during construction and acquire necessary permits and approvals for oversize and overweight loads. Permitted fencing and vegetative screening cannot interfere with road maintenance activities, and the least number of access roads shall be constructed.

In addition to permit requirements for driveway access and the condition of the draft site permit (Appendix B), the following practices can mitigate potential impacts:

- Pilot vehicles can accompany movement of heavy equipment.
- Deliveries can be timed to avoid traffic congestion and dangerous situations on the roadway.
- Traffic control barriers and warning devices can be used, as necessary.
- Photographs can be taken prior to construction to identify pre-existing conditions. Permittees would be required to repair any damaged roads to preconstruction conditions.

Snow fence would need to be installed or modified to meet MnDOT requirements per their request to mitigate potential visibility issues along Interstate Highway 35 due to blowing snow.[27] MnDOT specifically noted:

> *"Noted human (safety) and environmental impacts can be mitigated by ensuring that affected snow fences within the Project area continue to meet MnDOT's requirements for maintaining an equally safe roadway from blowing and drifting snow, minus the current, protective vegetation. Any utility project that adversely impacts a snow fence causing the loss of blowing snow control functionality must work with MnDOT to find a blowing snow control solution."*

Additionally, and per MnDOT's letter, the gen-tie line would be required to protect existing structural snow fences by installing further grounding measures, as per MnDOT 2557 Standard Specification Book. MnDOT's required height clearances for transmission line crossings of trunk highway/Interstate rights-of-way modify those published in the National Electric Safety Code and must be adhered to. A special permit condition is recommended requiring the applicant to coordinate with MnDOT on snow fencing required for the project and on clearances and grounding for the gen-tie line's crossing of Highway 35 (Appendix B; Appendix G).

The applicant has provided supporting information to illustrate their ongoing coordination with MnDOT, including meetings and submittal of an Early Notification Memo (ENM) package in May 2024.

Emergency Response

Section 8.12 of the draft site permit (Appendix B) requires the permittee to file an Emergency Response Plan with the Commission, in consultation with the emergency responders having jurisdiction over the project, prior to construction.

Section 8.13 of the draft site permit (Appendix B) requires permittee to notify the Commission of any extraordinary event within 24 hours of discovery of occurrence. Extraordinary events include but are not limited to fires, solar panel collapse, acts of sabotage, collector or feeder line failure, and injured worker or private person.

4.5 Public Health and Safety

4.5.1 Project Construction and Operation

Construction and operation of a solar facility has the potential to impact public health and safety. Construction crews must comply with local, state, and federal regulations when installing the project. This includes standard construction-related health and safety practices such as safety orientation and training as well as routine safety meetings. The project would be designed and constructed in compliance with applicable electrical codes and undergo routine inspection. Electrical work would be

---

[27] Docket no. 20248-209326-01, https://efiling.web.commerce.state.mn.us/documents/%7B40172E91-0000-CA1F-80EC-A1F426A4A423%7D/download?contentSequence=0&rowIndex=20

completed by trained technicians. Fencing would deter public access, and signage will provide appropriate public warning.

The project would provide training resources for local responders, as well as the collaborative development of an emergency response plan (ERP) specific to the project prior to operation. The applicant has committed to cooperation and training meetings with local emergency response providers to provide them with familiarity with the solar facility and emergencey response measures.

If emergency personnel and/or services were needed at the Project Site, multiple services would likely respond. These include Pine County Sheriff Department, Willow River Police Department, and Willow River Fire Department. The Project Site is also served by a combination of the Essentia Health EMS – Moose Lake, Essentia Health EMS – Sandstone, and Sturgeon Lake ambulance services. Hospitals near the Project Site include Essentia Health – Sandstone, and Essentia Health – Moose Lake/Mercy Hospital in Sandstone and Moose Lake, respectively. Smaller medical clinics in the area include Gateway Family Health Clinics in Sandstone and Moose Lake, as well as Sandstone Healthcare Center and Selah Wellness Clinic in Sandstone. Additional details regarding public services and emergency response are included in Section 4.3.10.

4.5.1.1 Potential Impacts

Like any construction project, there are risks. Risks include potential injury from falls, equipment and vehicle use, electrical accidents, potential exposure to hazardous materials, etc. Worker safety issues are primarily associated with construction. Public safety concerns would be most associated with unauthorized entry to the project.

Construction projects typically use hazardous materials for equipment fueling, degreasers, solvents, and lubricants. Hazardous materials, if not properly handled, have the potential to contaminate surface or groundwater, primarily during construction, when several pieces of equipment are in daily use.

Construction might disturb existing environmental hazards on-site, for example, contaminated soils. A review of What's in My Neighborhood, a database maintained by the MPCA, indicates that potentially contaminated sites do not occur within the Project Site (reference (36)). Within the project vicinity, there are two active sites: MPCA site ID 34846 (hazardous waste generator, underground tanks) and MPCA site ID 24171 (hazardous waste generator).

In Minnesota, unless solar panels discarded by commercial entities are specifically evaluated as non-hazardous, the panels are assumed to be hazardous waste due to the probable presence of heavy metals. Heavy metals in solar panels can include arsenic, cadmium, lead, and selenium. If hazardous waste, they must be properly disposed of in a special facility or recycled if recyclers are available (reference (37)).

4.5.1.2 Mitigation

The project would be designed and constructed in compliance with applicable electrical codes and undergo routine inspection. Electrical work would be completed by trained technicians.

Construction is bound by federal and state Occupational Safety and Health Administration requirements for worker safety, and must comply with local, state, and federal regulations regarding installation of the facilities and qualifications of workers. Established industry safety procedures would be followed during and after project construction. Crews would be trained and briefed on safety issues, reducing the risk of injury. The project would be fenced to prevent unauthorized access.

Public health and safety are addressed in several sections of the draft site permit (Appendix B):

- Section 4.3.28 of the draft site permit requires the permittee to take all appropriate precautions to protect against pollution of the environment. The permittee shall be responsible for compliance with all laws applicable to the generation, storage, transportation, clean up, and disposal of all waste generated during project construction and restoration.
- Section 4.3.30 of the draft site permit requires the permittee to take several public safety measures, including landowner educational materials, appropriate signs and gates, etc.
- Section 8.12 of the draft site permit requires the permittee to file an Emergency Response Plan with the Commission, in consultation with the emergency responders having jurisdiction over the project, prior to construction.
- Section 8.13 of the draft site permit requires the permittee to notify the Commission of any extraordinary event within 24 hours of discovery of occurrence. Extraordinary events include but are not limited to fires, solar panel collapse, acts of sabotage, collector or feeder line failure, and injured workers or private persons.
- Section 9.1 of the draft site permit requires the permittee to prepare a decommissioning plan prior to construction and update it every five years.

4.5.2 Electric and Magnetic Fields

Electric and magnetic fields (EMF) are invisible lines of force that surround electrical devices and that are produced through the generation, transmission, and use of electric power (reference (38)). For lower EMF frequencies associated with power lines, electric and magnetic fields are relatively decoupled. Generally, electric fields are dependent on the voltage of a transmission line and magnetic fields are dependent on the current carried by a transmission line.

Electric fields are the result of electric charge, or voltage, on a conductor. Using a garden hose as an analogy, voltage is equivalent to the pressure of the water moving through the hose. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is measured in kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of current through wires or electrical devices. Using the same analogy, current is equivalent to the amount of water moving through the garden hose. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is measured in units of Gauss (G) or milliGauss (mG).

Because the EMF associated with a transmission line is proportional to the amount of electrical energy passing through the power line it will decrease as distance from the line increases (reference (39)). This means that the strength of EMF that reaches a house adjacent to a transmission line right-of-way will be significantly weaker than it would be directly under the transmission line. Electric fields are easily shielded by common objects and structures, such as trees and buildings.

Magnetic fields, unlike electric fields, are not shielded or weakened by the materials through which they pass. Both magnetic and electric fields decrease rapidly with increased distance from the source. Electric and magnetic fields are invisible just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (40)).

Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances. Table 4-7 illustrates the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (38)).

Table 4-7 Electric and Magnetic Field Ranges for Common Household Appliances

Electric Field [1]		Magnetic Field [2]			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

[1] German Federal Office for Radiation Safety
[2] Long Island Power Institute

Research on whether exposure to magnetic fields causes biological responses and health effects has been performed since the 1970s. The U.S. National Institute of Environmental Health Sciences and the World Health Organization's research does not support a relationship or association between exposure to electric power EMF and adverse health effects. The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of scientific literature regarding association of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found" (reference (41)).

Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high-voltage transmission lines. Their research found that some epidemiological studies have shown no statistically significant association between exposure to EMF or health effects, and some have shown a weak association. Studies have not been able to establish a biological mechanism for how magnetic fields could cause cancer or other disease (reference (42)).

4.5.2.1 Solar Facility Potential Impacts

The main source of solar facility EMF is a small amount of EMF from the collection line system connecting the solar panels. However, the collection system would either be buried at a depth of at least 36 inches to the top of the cables or would be enclosed within a conduit and buried at a depth of at least 24 inches and there would be shielding around the cables. Electric and magnetic fields weaken rapidly as the distance from the source of the fields increase. The electric field would be cancelled out by the shielding of the cables and conduits, and the magnetic field will be very weak and is expected to have dissipated to background levels outside of the Project Site. No public health impacts from the EMF associated with the solar facility are anticipated.

4.5.2.2 Gen-Tie Line Potential Impacts

The electric and magnetic fields from the gen-tie line are the highest directly underneath the transmission line, with a maximum strength of 2.8 to 3.2 kV/m and 155 to 164 mG, respectively, at one meter above ground level. The strength of the electric and magnetic fields decreases with distance and at the edge of the right-of-way, 80 feet from the transmission line, the strength of the electric field decreases to 0.2 to 0.4 kV/m and the magnetic field to 22.8 to 37.4 mG. No public health impacts from the EMF associated with the gen-tie line are anticipated.

4.5.2.3 Mitigation

The gen-tie line is the only project component subject to Minnesota's electric field standard of 8 kV/m. Electric field strengths for the gen-tie line would be below this standard (2.8 to 3.2 kV/m). Accordingly, human health impacts related to EMF are not anticipated. As such, no mitigation measures are proposed.

4.5.3 Stray Voltage

Stray voltage is a condition that can potentially occur at a property or on the electric service entrances to structures from distribution lines connected to these structures. The term generally describes a voltage between two objects where no voltage difference should exist. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences (reference (43)).

Where utility distributions systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within building and other structures (reference (44)). 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. Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, due to faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity independent of whether there is a transmission line nearby. Site-specific mitigation measures are required to address potential stray voltage impacts.

4.5.3.1 Solar Facility Potential Impacts

All electrical components in the project, including inverters and transformers, would be grounded in accordance with the NESC. Constructing the project to NESC standards and Commission route permit requirements would mitigate stray voltage concerns. Therefore, no impacts from stray voltage are anticipated.

4.5.3.2 Gen-Tie Line Potential Impacts

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Under normal operating conditions, transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms. Thus, no impacts from stray voltage due to the gen-tie line are anticipated.

4.5.3.3 Mitigation

The project would not directly connect to businesses or residences in the area and would not change local electrical service, therefore impacts due to stray voltage are not anticipated. As such, no mitigation measures are proposed.

4.5.4 Induced Voltage

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This might induce a voltage on the object; the magnitude of the voltage depends on several factors such as the size, shape and orientation of the object along the right-of-way.

Smaller conductive objects near the transmission line that are insulated or semi-insulated from the ground could cause a nuisance shock to a person from a small current passing through the person's body to the ground. If there were insulated pipelines, fences, telecommunication lines, or other conductive objects with greater lengths and sizes, induced voltage from a transmission line could produce a larger shock. This larger shock has not been found to be a health safety hazard (reference (45)). Similar to stray voltage, transmission lines could cause additional current on distribution lines where they parallel. If the distribution lines are not properly wired or grounded, induced voltage could be created.

4.5.4.1 Solar Facility Potential Impacts

All electrical components in the project, including inverters and transformers, would be grounded in accordance with the NESC.

4.5.4.2 Gen-Tie Line Potential Impacts

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow NESC standards, which require the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA). Section 5.4.1 of the draft route permit (Appendix G) requires grounding to prevent impacts due to any induced currents.

4.5.4.3 Mitigation

All electrical and metal objects would be properly grounded in accordance with the NESC. Also, all required distance clearances near and beneath the gen-tie line would be followed to mitigate induced voltage. Potential impacts from induced voltage are not anticipated. As such, no mitigation measures are proposed.

4.5.5 Electronic Interference

Electronic Interference refers to the disturbance of electronic communications, e.g., radio, television, by high-voltage transmission lines. The discussion here applies solely to the gen-tie line and not the solar facility.

4.5.5.1 Potential Impacts

Electronic interference from HVTLs can impact electronic communications like radios, television and microwave communications in three ways: corona noise, shadowing effect, and gap discharge.

Corona noise primarily occurs in the radio frequency range of amplitude modulated (AM) signals. This generated noise typically occurs underneath a transmission line. It dissipates rapidly as the distance increases from the transmission line. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise decreases in magnitude with increasing frequency and are quite small in the FM broadcast band. In most cases, the strength of the radio or television broadcast signal within a broadcaster's primary coverage area is great enough to prevent interference. Additionally, due to the higher frequencies of television broadcast signals (54 MHz and above) a transmission line seldom causes reception problems within a station's primary coverage area.

Shadowing effect comes from physically blocking communication signals. This primarily can impact two-way mobile radio communications and television signals. Digital and satellite television transmissions are more likely to be affected by shadowing generated by nearby towers. Interference could occur if the device was located immediately adjacent to a transmission line structure, blocking its signal. While television interference is rare, it can happen when a structure is aligned between a receiver and a weak, distant signal. Telecommunication towers can also be susceptible to the shadowing effect.

Gap discharge interference is the most noticed form of power line interference with radio and television signals, and typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line causing small gaps to develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which, in addition to audible noise, can cause interference with radio and television signals. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna system, and the distance between the receiver and the power line. Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified.

4.5.5.2 Mitigation

Section 5.4.3 of the draft route permit notes that if interference with radio, television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the HVTL, then the permittee is required to take whatever action necessary to restored or provide reception equivalent to reception levels in the immediate area prior to construction (Appendix G). Thus, impacts to electronic communications are not anticipated..

4.6 Land-Based Economies

Solar facilities may impact land-based economies by precluding or limiting land use for other purposes.

4.6.1 Agriculture and Prime Farmland

In 2022, the market value of agricultural products sold in Pine County was approximately $58 million. The most common crops grown, by acreage, in Pine County include foraging crops (hay/haylage), corn for grain, soybeans for grain, and corn for silage/greenchop. Cattle and calves top of the list of livestock inventory in Pine County, followed by layers, sheep and lambs, and broilers and other meat-type chickens (reference (46)). Cultivated crops are the predominant land cover within in the Project Site (Map 4).

Three categories of soils identified by the Soil Survey Geographic Database (SSURGO) database are subject to protection under the Farmland Protection Policy Act (FPPA): prime farmland, prime farmland when drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland when drained includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property. No prime farmland or farmland of statewide importance is within the Project Site (reference (47)).

4.6.1.1 Solar Facility Potential Impacts

Project construction would temporarily limit the usage of agricultural land within the Solar Project Area.

The solar facility would convert approximately 1,667 acres of farmland into solar facilities. None of this land is considered prime farmland or farmland of statewide importance. These 1,667 acres of farmland represent approximately 1 percent of the farmland in Pine County and 0.007 percent of the farmland in Minnesota (references (46); (48)). The farmland would be out of agriculture production for the life of the solar facility. Commission site permits for solar farms are issued with a 30-year term. Thus, the farmland could return to production after this term, and after the solar facility is decommissioned. On whole, impacts to agricultural production in Pine County are anticipated to be minimal.

4.6.1.2 Gen-Tie Line Potential Impacts

Project construction would temporarily limit the usage of agricultural land within the Gen-tie Line Project Area. Hay/pasture is the land cover for 20.3 acres within the Gen-tie Line Project Area (Map 4). Agricultural production (including crop cultivation and hay production) could continue in the gen-tie line right-of-way during operation.

4.6.1.3 Mitigation

Converting agricultural land to a solar facility will negatively impact farming revenues. However, lost farming revenues would be offset by lease or easement agreements. The applicant has developed an Agricultural Impact Mitigation Plan (Appendix C) which identifies potential soil limitations and suitability within the Project Site and describes the BMPs that would be used during construction and operation of the project in consideration of these potential limitations. The applicant has also developed a site-specific Vegetation Management Plan (Appendix E) which describes the site restoration and vegetation management practices, including seed mixtures, planting plans and methodologies, and maintenance practices to be conducted during the construction and operational phases of the project. Permanent, perennial vegetative cover would be established throughout the Project Site to manage erosion and increase stormwater infiltration within the Project Site.

Erosion control measures and other BMPs would be employed during the initial construction activities and maintained through the post-construction stages. The use of BMPs would be outlined in the SWPPP prepared specifically for this project. The SWPPP would also discuss topsoil management and soil handling practices to reduce impacts to soil resources to ensure future soil productivity after restoration. Topsoil contains significant amounts of organic matter, plant nutrients, and biological activity, and is critical for successful crop production.

In their agricultural impact mitigation plan, the applicant committed to avoiding drain tile locations, re-routing drain tile away from locations which could be damaged during construction and working with applicable landowners to establish acceptable criteria for rerouting, replacing or abandoning in place drain tile. If drain tile is damaged, the damaged segments would be repaired in place or, if necessary, relocated as required by the condition and location of the damaged tile. In the event drain tile damage becomes apparent after commercial operation, the drain tile would be repaired in a manner that restores the operating condition of the tile at the point of repair.

Several sections of the draft site permit (Appendix B) address agricultural mitigation and soil-related impacts:

- Section 4.3.9 requires protection and segregation of topsoil.
- Section 4.3.10 requires measures to minimize soil compaction.
- Section 4.3.11 requires the permittee to "implement erosion prevention and sediment control practices recommended by the [MPCA]" and to "obtain a [CSW Permit]." A CSW Permit requires both temporary and permanent stormwater controls to ensure that stormwater does not become a problem on or off-site.
- Section 4.3.16 requires that "site restoration and management" practices enhance "soil water retention and reduces storm water runoff and erosion."
- Section 4.3.17 requires the permittee to develop a VMP that defines how the land control area will be revegetated and monitored over the life of the project. Appropriate seeding rates and timing of revegetation will stabilize soils and improve overall soil health.
- Section 4.3.18 requires the permittee to develop an AIMP with the Minnesota Department of Agriculture.
- Section 4.3.20 requires the permittee to develop an Invasive Species Management Plan to prevent the introduction and spread of invasive species during project construction.
- Section 4.3.21 requires the permittee to take reasonable precautions against the spread of noxious weeds.
- Section 4.3.29 requires the permittee to fairly restore or compensate landowners for damages to crops, fences, drain tile, etc. during construction.

4.6.2 Tourism

Tourism in Pine County is primarily limited to outdoor recreational activities, including snowmobile trails, parks, and hunting grounds. Refer to Section 4.4.6 for additional information on recreation.

4.6.2.1 Potential Impacts

Impacts to tourism are anticipated to be minimal and temporary. Due to construction, there will be short-term increases in traffic, noise, and dust that could potentially impact outdoor recreational activities in close proximity to the Project Site. However, the impacts will be temporary.

No significant long-term impacts to tourism are anticipated. There is a snowmobile trail that would be impacted by the project (Section 4.4.6). If this trail is re-routed, impacts to the trail are anticipated to be minimal.

4.6.2.2 Mitigation

BMPs would be used to minimize noise (muffled equipment) and fugitive dust (standard dust suppression techniques) during construction.

4.6.3 Forestry

4.6.3.1 Potential Impacts

Though forested areas are present within the Project Site, no commercial forestry resources will be impacted.

4.6.3.2 Mitigation

There are no anticipated forestry impacts; therefore, no mitigation is proposed.

4.6.4 Mining

4.6.4.1 Potential Impacts

No mining resources are located within the Project Site. According to the applicant, there are two active commercial aggregate pits within one mile of the proposed Project Site. No direct impacts to mining operations would occur as a result of the project.

4.6.4.2 Mitigation

There are no anticipated impacts to mining; therefore, no mitigation is proposed.

4.7 Archeological and Historic Resources

Cultural resources consist primarily of archaeological sites and historic architectural resources. Archaeological sites are defined as the material remains of past human life or activities (reference (49)). Historic architectural resources are sites, buildings, and structures greater than 45 years in age that “create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction,” as defined in the Minnesota Historic and Architectural Survey Manual (reference (50)). Traditional Cultural Properties (TCP) are also considered cultural resources. TCPs are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (51)).

Federal laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA), provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the National Register of

Historic Places (NRHP). Currently, the project is not a federal undertaking; however, should the project require federal funding or permitting, it would become subject to Section 106 regulations.

The project is subject to the Minnesota Historic Sites Act (Minnesota Statutes, sections 138.661 to 138.669) and the Field Archaeology Act (Minnesota Statutes, sections 138.31 to 138.42). The Minnesota Historic Sites Act requires that state agencies consult with the State Historic Preservation Office (SHPO) before undertaking or licensing projects that might affect properties on the State or National Registers of Historic Places. The Minnesota Field Archaeology Act establishes the position of State Archaeologist and requires State Archaeologist approval and licensing for any archaeological work that takes place on non-federal public property.

4.7.1 Potential Impacts

Previous cultural resources inventories were reviewed through the Minnesota Office of the State Archaeologist (OSA) online Portal (reference (52)) as well as Minnesota's Statewide Historic Inventory Portal (MnSHIP) (reference (53)) to identify previously recorded cultural resources within and around the Project Site.

The APE (Area of Potential Effect) for archaeological resources is the Development Area. For historic architecture, the APE includes a one-quarter mile buffer surrounding the Solar Project Area and Gen-tie Line Project Area to account for viewshed impacts. However, for the purposes of analysis, previous cultural resource surveys and documented archaeological and historic resources within a 1-mile buffer of the proposed Project Site were reviewed.

A Phase I Archaeological Survey of the Development Area was conducted by Stantec, Inc. (Stantec) in November 2023 and May 2024. This survey identified one archaeological site within the Development Area (site 21PN0113/Rehbein Point). Site 21PN0113 is recommended not eligible for listing on the NRHP. A review of the OSA portal identified ten additional archaeological sites within the 1-mile study area, all of which are unevaluated for listing on the NRHP (Table 4-8; Map 10).

Stantec also conducted a historic architectural survey for the project area APE in November 2023. Thirty-two historic architectural resources are within the 1-mile study area, 22 of which are within the APE (Table 4-9; Map 10). One previously recorded resource, XX-RD-00036/Willard Munger State Trail, is eligible for listing on the NRHP. This resource is adjacent to the western perimeter of the Project Site but is not within the Development Area.

A finding of No Historic Properties Effected was recommended as a result of these surveys.

4.7.1.1 Archaeological Sites

In November 2023, Stantec conducted a Phase I archaeological survey of the project area (reference (54)). During this survey, Stantec identified one archaeological site, 21PN0113/Rehbein Point within the solar facility Development Area. This site consists of one isolated quartz projectile point basal fragment, identified during a surface survey of a soybean field on an upland north of an unnamed creek.

The projectile point is side-notched with a convex base and likely dates to the Late Archaic period. In May 2024, Stantec excavated shovel tests at the find location and at 5 meters radials around the site. All shovel tests were negative. Stantec recommended that the site is not eligible for listing on the NRHP.

A review of the OSA online portal identified ten additional archaeological sites with the 1-mile study area, all of which are unevaluated for listing on the NRHP (Table 4-8; Map 10). This includes one pre-contact burial site (21PNaa); however, this site is a significant distance (nearly one mile) from the APE.

In addition, the OSA Portal was reviewed for historic cemetery locations, as documented in Vermeer and Terrell (reference (55)). This data indicates that two historic cemeteries have been identified within the 1-mile study area. St. Mary's Catholic Church cemetery (Cem ID 23160) is an extant cemetery in Willow River with 431 memorials, the earliest of which date to at least 1905 (reference (56)). St. Mary's Catholic Cemetery is in Section 2, Township 44N, Range 20W, and does not intersect the project area. An unknown historic cemetery is also documented west of the project area (Cem ID 23153). This cemetery is adjacent to the Lakeview Cemetery and is mapped at the section level in Section 28 of Township 44N, 20W. It does not intersect the APE.

Table 4-8 Archaeological Resources within the 1-Mile Study Area

Resource Number	Resource Name/ Description	NRHP Eligibility	Location
21PN0113	This site, named Rehbein Point, consists of one isolated quartz projectile point basal fragment. The projectile point is side-notched with a convex base and potentially dates to the Late Archaic period. The artifact was identified during a Phase I archaeological survey conducted by Stantec in November 2023 and is within the developable area in Section 26 of Township 44N, Range 20W.	Recommended Not Eligible	Project Area
21PNz	This alpha site consists of the Willow River Indian Village that was recorded based on a 1971 DNR map and is approximately one mile north of the project.	Unevaluated	1-mile
21PNaa	This alpha site consists of Willow River Indian Burial Ground and was recorded based on a 1971 DNR map. No additional information is available regarding this resource. It is located nearly one mile north of the project boundary.	Unevaluated	1-mile
21PNy	This alpha site consists of the Willow River Mill, a historic sawmill depicted on a 1971 DNR map.	Unevaluated	1-mile

Resource Number	Resource Name/ Description	NRHP Eligibility	Location
21PN0087	This site, named Long Lake 1, is a precontact lithic scatter identified during a Phase I archaeological survey conducted by the Duluth Archaeology Center in 2005. Two positive shovel tests produced quartz and gunflint silica lithic debitage.	Unevaluated	1-mile
21PN0088	This site, named Long Lake 2, is a single precontact surface find, consisting of Knife Lake siltstone debitage. It was identified during a Phase I archaeological survey conducted by the Duluth Archaeology Center in 2005.	Unevaluated	1-mile
21PA0089	This site, named Long Lake 3, is a single precontact surface find, consisting of quartz debitage. It was identified during a Phase I archaeological survey conducted by the Duluth Archaeology Center in 2005.	Unevaluated	1-mile
21PN0078	This site, Burrow Pit, the Burrow Pit, is a multi-component site consisting of a single precontact projectile point and post-contact structural ruins with an associated artifact scatter dating to the twentieth century. This site was identified during a Phase I archaeological survey conducted in 1980 by Anfinson.	Unevaluated	1-mile
21PNav	This alpha site consists of Kettle River, a post-contact ghost town. This town is depicted on the 1874 Andreas map.	Unevaluated	1-mile
21PNaf	This alpha site consists of the Rutledge Lumber & Manufacturing Company, a historic sawmill. Structural foundations and adjacent earth mounds were identified during T. Kapler’s study, and the site is pictured on the 1971 DNR map.	Unevaluated	1-mile
21PNaw	This alpha site is the Point Douglas-St. Louis River Road, consisting of a military road constructed in the 1850s, running approximately 26 miles north-south in Pine County, east of Highway 35.	Unevaluated	1-mile
Cem ID 23153	Unknown historic cemetery, mapped at the PLS Section level.	N/A	1-mile
Cem ID 23160	St. Mary’s Catholic Church Cemetery, mapped at PLS Forty Level	N/A	1-mile

4.7.1.2 Historic Architecture

Within the 1-mile study area, 32 historic architectural resources were identified, 22 of which are within the one-quarter mile buffer surrounding the Project Site.

In November 2023, Stantec conducted a historic architectural survey within and around the APE (reference (57)). Stantec identified 21 historic architectural resources over 40 years of age that had not been previously recorded. Stantec also investigated four previously recorded resources. One previously recorded resource, XX-RRD-00036/Willard Munger State Trail is eligible for listing on the NRHP and within the APE (Table 4-9; Map 11).

The Willard Munger Trail is a former railroad right of way converted to a recreational trail for pedestrians and cyclists. The trail runs 70 miles from Hinckley to Duluth and passes through Jay Cooke State Park. A portion of the trail runs north-south along the western perimeter of the project area, along the western side of Highway 61. The trail was originally the Lake Superior & Mississippi Railroad (LS&M), constructed in 1868. It is eligible for the NRHP under criterion A for its significance to the development of Minnesota's railroad network and the expansion of industry. The railroad connected the Twin Cities and Duluth, thereby facilitating the affordable transportation of goods from the Duluth shipping port to other portions of the state (reference (58)).

No other resources within the APE have been recommended eligible for listing on the NRHP. Within the APE, one resource is unevaluated for listing on the NRHP. The remaining 20 resources have been recommended not eligible and consist primarily of domestic residences and farmsteads constructed in the twentieth century.

Within the 1-mile study area, ten additional resources have been recorded. One of these resources, PN-KRV-00001/Bridge No. 1811, was previously listed on the NRHP under criterion C, based on its architectural Pratt through Truss design and its structural integrity. Constructed in 1915, the Pratt through Truss was a common architectural style in the early twentieth century, but examples of this style with good integrity are now rare. However, this resource was demolished in 2004 and removed from the NRHP in 2005 (reference (53)). Three resources within the 1-mile study area are unevaluated for listing on the NRHP, and include a farmstead, the Rutledge Village Hall, and Bridge L2730 (Table 4-9 within the 1-mile study area). The remaining six resources have been recommended not eligible and consist of agricultural buildings, domestic dwellings, and bridges.

Table 4-9 Historic Architectural Resources within the 1-Mile Study Area

Resource Number	Resource Name/Type	Approximate Construction Date	NRHP Eligibility	Location
PXX-RRD-00036	Willard Munger State Trail / Recreational trail / former railroad right-of-way	1868	Eligible	APE

Resource Number	Resource Name/Type	Approximate Construction Date	NRHP Eligibility	Location
PN-KRV-00006	Bridge 58809	unknown	Unevaluated	APE
PN-KRV-00011	Bridge 58520	1980	Not Eligible	APE
PN-KRV-00014	Farmstead	1933	Not Eligible	APE
PN-KRV-00016	House	1980	Not Eligible	APE
PN-KRV-00017	Underhill Farm/Farmstead	1957	Not Eligible	APE
PN-KRV-00019	Farmstead	1920	Not Eligible	APE
PN-KRV-00020	House	1968	Not Eligible	APE
PN-KRV-00021	House	1982	Not Eligible	APE
PN-KRV-00022	House	1918	Not Eligible	APE
PN-KRV-00023	House	1972	Not Eligible	APE
PN-KRV-00024	House	1982	Not Eligible	APE
PN-KRV-00025	Kettle River Township Hall	1982	Not Eligible	APE
PN-KRV-00026	House	1969	Not Eligible	APE
PN-KRV-00027	House	1968	Not Eligible	APE
PN-KRV-00028	House	1966	Not Eligible	APE
PN-KRV-00031	Quarry	1930	Not Eligible	APE
PN-KRV-00032	Farmstead	1930	Not Eligible	APE
PN-NOR-00003	House	1930	Not Eligible	APE
PN-NOR-00004	House	1918	Not Eligible	APE
XX-ROD-00012	TH 61 from Wyoming to Duluth	1924-1928	Not Eligible	APE
XX-ROD-00019	TH 61 from La Crescent to Duluth	1921-1928	Not Eligible	APE
PN-KRV-00001	Bridge 1811	1915	Previously Listed, Not Eligible as of 2005	1-mile
PN-KRV-00002	Bridge No. L2730	1912	Unevaluated	1-mile
PN-KRV-00003	John Walta Farmstead	1921	Unevaluated	1-mile
PN-KRV-00012	Bridge 58524	1995	Not Eligible	1-mile
PN-KRV-00015	Farmstead	1950	Not Eligible	1-mile
PN-KRV-00018	Agricultural Outbuilding	1970	Not Eligible	1-mile
PN-KRV-00029	Farmstead	1927	Not Eligible	1-mile
PN-KRV-00030	House	1978	Not Eligible	1-mile
PN-RTC-00001	Rutledge Village Hall	1890	Unevaluated	1-mile

Resource Number	Resource Name/Type	Approximate Construction Date	NRHP Eligibility	Location
PN-WRC-00013	Bridge L2979	1926	Not Eligible	1-mile

4.7.2 Mitigation

In November 2023, Stantec conducted a Phase I Archaeological and Historic Architecture survey of the project area in accordance with federal and state guidelines for cultural resources investigations. Stantec recommended a finding of No Historic Properties Affected for the proposed project. The survey reports and recommendations were submitted to SHPO on September 10, 2024 (reference (54)).

In the event that cultural resources are encountered during project construction, the applicant has indicated they would prepare an Unanticipated Discoveries Plan. Construction and contractor personnel would receive training on the protocol detailed in the plan, should unanticipated cultural materials be encountered during construction. If an unanticipated discovery is made, construction activities within 100 feet of the find will cease, and the OSA, the Minnesota Indian Affairs Council (MIAC), landowners, a qualified archaeologist, and other interested parties will be notified. Construction would not resume until the materials have been assessed by a qualified archaeologist, who will advise the applicant on recordation or additional testing and survey.

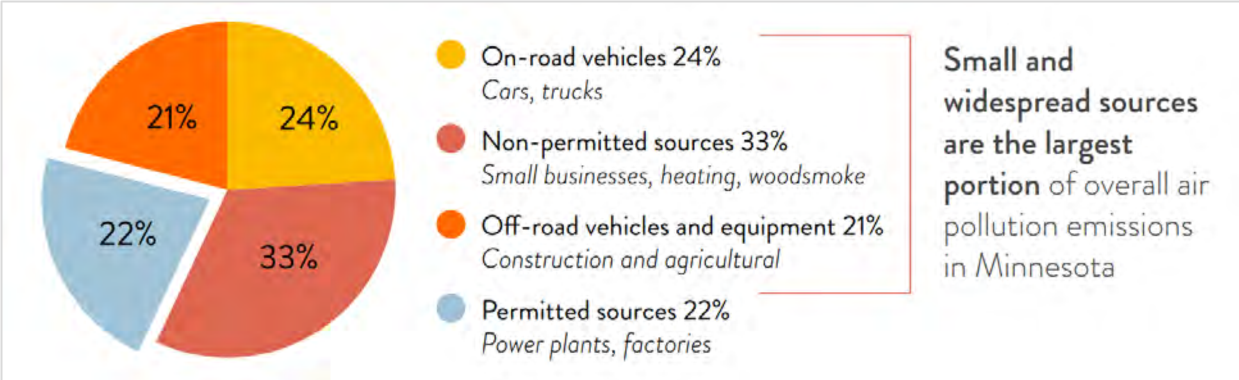
If human remains are encountered during construction, pursuant to the Minnesota Private Cemeteries Act (MS 307.08), construction at that location will be halted immediately and local law enforcement and the OSA will be contacted. Construction would proceed at that location until authorized by local law enforcement and the OSA. Section 4.3.23 of the draft site permit requires the applicant to avoid impacts to archaeological and historic resources (Appendix B). This section of the draft permit requires the applicant to train workers on how to identify and avoid cultural resources.

4.8 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. Wildlife near the construction area, for example, may be disturbed by noise from construction equipment or lighting used at night.

4.8.1 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 negatively impact 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 (reference (60)). As illustrated in Figure 4-6, today, most of our air pollution comes from smaller, widespread sources and the rest comes from a wide variety of things we use in our daily lives: our vehicles, local business, heating and cooling, and yard and recreational equipment (reference (60)).



Source: reference (60)

Figure 4-6 Air Pollution Sources by Type

In Minnesota, air quality is monitored using stations located throughout the state. The MPCA uses data from these monitoring stations to calculate the Air Quality Index (AQI) on an hourly basis for ozone (O_3), fine particles ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and carbon monoxide (CO). Each day is categorized based on the pollutant with the highest AQI value for a particular hour (reference (61)).

The nearest air quality monitor to the project is the Cloquet – Fond du Lac Band monitoring station in Cloquet, Minnesota, approximately 30 miles to the north of the Project Site. This station monitors for O_3 and $PM_{2.5}$. Ozone is produced from chemical reactions from volatile organic compounds (VOCs), oxides of nitrogen (NO_X), and sunlight. Typical sources of VOCs and NO_X are related to the burning or refining of fossil fuels. The sources of $PM_{2.5}$ include vehicle emissions (particularly diesel), smoke, dust, and chemical reactions of ammonia with NO_X or sulfur oxides (SO_X). Sources of ammonia in rural areas include agricultural fertilizers and animal waste. Table 4-10 shows air quality monitoring results from the Cloquet – Fond du Lac Band air quality monitoring site.

Table 4-10 Air Quality Monitoring Results, Cloquet – Fond du Lac Band Monitoring Station

Year[1]	Pollutant	Reported Concentration	Air Quality Standard[2]
2014	Ozone	57 parts per billion (ppb)	70 ppb
2017		59 ppb	
2021	PM2.5	14 micrograms per cubic meter (ug/m3)	35 ug/m3
2022		13 ug/m3	
2023		19 ug/m3	

[1] End year of a three-year period
[2] 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.

Table 4-11 shows the air quality index at the Cloquet – Fond du Lac Band air quality monitoring site. The air quality has been categorized as “Good” for the majority of the past five years. In 2023, there were 91 days with air quality that was considered “Moderate” and four days with air that was considered

"Unhealthy for Sensitive Groups." The increase in days considered "Moderate" and days considered "Unhealthy for Sensitive Groups" in 2023 were likely due to Canadian wildfire smoke.

Table 4-11 Air Quality Index Category Days, Cloquet – Fond du Lac Band Monitoring Station

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2019	341	15	0	0	0
2020	347	7	0	0	0
2021	318	43	4	0	0
2022	351	4	0	0	0
2023	266	91	4	1	0

4.8.1.1 Solar Facility Potential Impacts

Air emissions are expected during construction of the project and have the potential to create a temporary minor decrease in air quality as a result of the use of heavy equipment, worker vehicle trips, and truck hauling. Depending on the time of year, weather, and soil moisture, driving and earth-moving activities could result in increased fugitive dust emissions during drier conditions. Vehicle and construction equipment exhaust would generate short-term CO, CO_2, NO_2, and PM emissions.

After construction, there would be a reduction in emissions. Fewer vehicles and no heavy equipment would be required for operation with the exception of maintenance activities. There would also be a reduction is fugitive dust and wind erosion throughout the Development Area as there would be perennial vegetative cover underneath the solar panels.

4.8.1.2 Gen-Tie Line Potential Impacts

Similar to the solar facility, air emissions would be expected during gen-tie line construction. However, the amount of ground disturbance necessary to construct the gen-tie line is much less than the solar facility.

Transmission lines can produce O_3 and NO_X. These molecules are produced by the corona effect – the ionization of air molecules surrounding the transmission line conductor. These emissions are unavoidable but are anticipated to be minimal (reference (62)).

4.8.1.3 Mitigation

Exhaust emissions can be minimized by keeping vehicles and equipment in good working order, and not running equipment unless necessary. When necessary, dust from construction activities could be controlled using standard construction practices such as watering of exposed surfaces, covering of disturbed areas, reduced speed limits, and the use of chemical dust suppressants.

4.8.2 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 (CO_2), methane (CH_4), and nitrous oxide (N_2O). Greenhouse gas emissions are typically reported in carbon dioxide equivalents (CO_2e) to account for the variation of global warming potential of different gases to produce warming effects. As an example, CH_4 is 28 times more potent than CO_2 as a greenhouse gas, and N_2O is 265 times more potent than CO_2 as a greenhouse gas (reference (63)).

In 2007, Minnesota passed the Next Generation Energy Act, which set statutory goals to reduce GHG emissions by 80 percent between 2005 and 2050 (reference (64)). Minnesota's GHG emissions declined 23 percent between 2005 and 2020 (reference (60)).

4.8.2.1 Solar Facility Potential Impacts

Solar facility construction activities would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. GHG emissions from the project would primarily include CO_2, CH_4, and N_2O.

Appendix D provides the applicant's GHG emission calculations for the construction, operation, and decommissioning of the solar facility**.** Total GHG emissions for the solar facility construction activities are estimated to be 3,969 metric tons of CO_2, 0.39 metric tons of CH_4, and 0.48 metric tons of N_2O. GHG emissions from temporary construction land use changes are estimated to be 2,856 metric tons of CO_2e. The total amount of CO_2 equivalent (CO_2e) for the solar facility construction is 6,964 metric tons of CO_2e (Appendix D). Total GHG emissions for the state of Minnesota in 2020 were approximately 137 million tons of CO_2e (reference (65)). In comparison with statewide GHG emissions, potential impacts due to construction GHGs will be negligible.

Once operational, the applicant estimates the project is expected to offset 230,000 metric tons of CO_2 annually by displacing energy that would otherwise be generated by carbon-fueled power plants. Emissions associated with operation would result from vehicle usage, maintenance operations and land use changes. Electrical consumption emissions are expected to be negligible compared to project emission offsets. GHG emissions from operations mobile source combustion are estimated to be 2.9 metric tons CO_2 annually and negligible CH_4 and N_2O emissions. GHG emissions from permanent land use changes are estimated to be 6,238 metric tons of CO_2e annually. The total amount of CO_2 equivalent (CO_2e) for the solar facility operation is 6,240 metric tons of CO_2e annually (Appendix D). Compared to non-renewable energy generation, the project would offset a significant amount of GHGs which would otherwise be emitted by a carbon-fueled power plant.

Sulfur hexafluoride (SF_6), a GHG with a global warming potential 23,500 times that of CO_2, would be used at the project substation (reference (63)). SF_6 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. GHG impacts from these releases are anticipated to be minimal.

4.8.2.2 Gen-Tie Line Potential Impacts

Gen-tie line construction activities will result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. GHG emissions from the project will primarily include CO_2, CH_4, and N_2O.

Appendix D provides the applicant's GHG emission calculations for construction, operation, and decommissioning of the gen-tie line**.** Total GHG emissions for the gen-tie line construction are estimated to be 1,222 metric tons of CO_2, 0.12 metric tons of CH_4, and 0.68 metric tons of N_2O. GHG emissions from temporary construction land use changes are estimated to be 428 metric tons of CO_2e. The total amount of CO_2e for the Gen-Tie Line project construction activities is 1,832 metric tons of CO_2e (Appendix D). In comparison with statewide GHG emissions, potential impacts due to construction GHGs will be negligible.

Once operational, the applicant estimates the project is expected to offset 230,000 metric tons of CO_2 annually by displacing energy that would otherwise be generated by carbon-fueled power plants. Emissions associated with operation would result from vehicle usage, maintenance operations, and land use changes. GHG emissions from electrical consumption are expected to be negligible compared to project emission offsets. GHG emissions from operation mobile source combustion are estimated to be 2.90 metric tons of CO_2 annually, and negligible CH_4 and N_2O emissions. GHG emissions from permanent land use changes are estimated to be 573 metric tons of CO_2e annually. The total amount of CO_2 equivalent (CO_2e) for the gen-tie line operation is 576 metric tons of CO_2e annually (Appendix D). Compared to non-renewable energy generation, the project would offset a significant amount of GHG which would otherwise be emitted by a carbon-fueled power plant.

4.8.2.3 Mitigation

Construction, operation, and decommissioning of the project would result in GHG emissions. GHG emissions from construction vehicles could 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. GHG emissions related to operation would be minimized by keeping vehicles and equipment in good working order.

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 tons per year (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, such as the proposed Iron Pine Solar project, does not have the potential to result in significant negative climate change effects.

4.8.3 Climate Change Resiliency

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 (reference (66)).

The Minnesota Department of Natural Resources publishes historical climate data from the years 1895 to 2023 (reference (67)). This data shows that the average temperature of Pine County, Minnesota has been increasing at a rate of 0.27 °F per decade to reach an annual average temperature of 41.86 °F in 2023. Over the 30-year lifespan of the project, the average temperature could increase by 0.81 °F.

The annual precipitation in Pine County has increased at a rate of 0.36 inches per decade since records have been kept, with 2019 being the second-highest recorded precipitation year with 40.97 inches. Over the lifespan of the project, precipitation could increase an additional 0.36 inches per year.

The frequency and intensity of heavy rainfall is increasing across the state. The DNR climate office has defined mega-ran events as rainfalls of more than 6 inches over 1,000 square miles in 24 hours or less (reference (68)). 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, Pine County is predicted to have minor risk of flooding (reference (69)). Pine County experienced a period of extreme drought in 2012 and 2013. Currently, the drought intensity in Pine County is ranked as abnormally dry to moderate drought (reference (70)).

4.8.3.1 Potential 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. More extreme storms also mean more frequent heavy rainfall events, which can cause localized soil erosion or flooding. Flooding could damage the project's electrical collection system including inverters and collection wiring. There is potential for soils to become rutted due to increased rain events. Permanent, perennial vegetative cover would be established throughout the Project Site to manage erosion and increase stormwater infiltration within the Project Site.

The FEMA National Risk Index rates Pine County as having "very low" risk for hail (reference (71)).

4.8.3.2 Mitigation

Project developers can employ location, design, construction, and operation strategies to mitigate impacts resulting from a warmer, wetter, and more energetic climate by:

- Avoiding sites with high probability for extreme weather events to the extent possible
- Designing solar panels and solar arrays to withstand stronger storms and winds
- Planning for the potential repair and replacement of solar arrays damaged by storms

- Designing the project’s stormwater system to prevent flooding during heavy rainfall events
- Designing the project’s electrical collection system to be resistant to flooding damage
- Designing the project’s gen-tie line to North America Electric Reliability Corporation reliability standards to address thermal limitations
- Removing wildfire prone debris as a maintenance activity during operation

4.8.4 Geology and Groundwater

The Project Site surface geology is dominated by quaternary-aged glacial deposits from the most recent Wisconsinian glaciation. Outwash consisting of sand and gravelly sand deposited by glacial meltwater of the Superior lobe are most prevalent and are part of the Cromwell Formation. Stagnation-moraine consisting of till, stratified glacial sediments and glaciolacustrine sediments deposited by melting glacial ice of the Superior lobe are present on the eastern edge and are part of the Barnum Formation. Post-glacial floodplain alluvium deposited by streams, and peat and organic-rich sediment deposited in marshes and shallow lakes are also present (reference (72)). The glacial deposit thickness generally ranges from less than 50 feet to greater than 100 feet (reference (9)). The Project Site is underlain by Mesoproterozoic bedrock consisting of sandstone, siltstone, and local conglomerate of the Hinckley Sandstone, Fond du Lac Formation, and Solar Church Formation (reference (10)).

While karst features can be found associated with the Hinckley Sandstone, there are no karst features within the Project Site. The nearest karst feature is approximately three miles to the south (reference (73)). The topography within the Project Site is generally flat, with elevations ranging from about 1,050 feet to 1,100 feet above sea level.

The project area seismic risk is very low; it is located within an area rated as less than a two-percent chance of damage from natural or human-induced earthquake in 10,000 years (reference (74)).

The type of landslide most common in Minnesota is shallow slope failure triggered by a heavy rain event. This slope failure is generally less than 3 feet deep but can erode the entire length of a slope. Deeper landslides, mudflows, and debris flows are much less common in Minnesota than in more mountainous areas. Less destructive landslides, such as slow-moving earthflows and soil creep, can also occur when soil moisture and shallow groundwater saturate sediments during heaving rain events or snowmelt. Human factors, including inadequate stormwater management, undercutting of slopes, placement of artificial fill, and land-use changes, such as urbanization and agricultural practices, can lead to erosion and landslides (reference (75)). The USGS United States Landslide Inventory has no records of landslides within the vicinity of the Project Site (reference (76)).

The DNR divides Minnesota into six groundwater provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock and unconsolidated sediments deposited by glaciers, watercourses, and waterbodies. The majority of the Project Site is within the East-Central Province. This province is characterized by buried sand aquifers and relatively extensive surficial sand plains, overlying sedimentary bedrock with good aquifer properties. The southeast portion of the Project Site is within the Karst Province, characterized by thin or absent sediment underlain by productive bedrock aquifers (reference (77)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary throughout the Project Site depending on factors such as the presence of shallow bedrock, underground utilities, and/or other surficial features. The depth to the water table is generally less than 10 feet below ground surface within the Project Site (reference (78)).

There are no springs (sinkholes, etc.) identified within the Project Site based on a search of the Minnesota Spring Inventory database. The nearest documented spring is approximately three miles to the south (reference (79)).

The EPA defines a sole source aquifer (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
- 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 within the Project Site (reference (80)).

The Minnesota Well Index (MWI), which is managed by the MDH, provides information about wells and borings such as location, depth, geology, construction, and static water level at the time of construction. According to the MWI, there are four active wells within the Project Site (reference (81)). The wells are shown on Map 6 and summarized in Table 4-12.

Table 4-12 MWI Active Water Wells within the Project Site

MWI Well ID	Status	Depth (feet)	Static Water Level (feet) on MWI Report	Use
431176	Active	51	5	Piezometer
431177	Active	42	5	Piezometer
438482	Active	87	6	Domestic
522848	Active	140	8	Irrigation

The Wellhead Protection Area (WHPA) program administers the public and non-public community water supply source-water protection in Minnesota. WHPAs are areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply. 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 MDH (reference (82)). The viewer also includes the Drinking Water Supply Management Areas (DWSMA) and DWSMA Vulnerability. DWSMAs are delineated areas within the WHPA and are managed in a wellhead protection plan, usually by a city. According to the viewer, there are no WHPAs or DWSMAs within the project area. The closest WHPA and associated DWSMA is located north of the Project Site in Willow River. The DWSMA vulnerability is designated as low.

A Special Well and Boring Construction Area, or well advisory, is a mechanism that provides for controls on the drilling or alteration of public and private water-supply wells and environmental wells in an area where groundwater contamination has or might result in risks to public health. There are no MDH-designated Special Well and Boring Construction Areas within the Project Site (reference (83)).

Surficial geology, glacial sediment thickness, and local geologic factors are used to determine pollution sensitivity ratings. According to the CGA Sensitivity to Pollution of the Uppermost Bedrock Aquifers map for Pine County (reference (84)), areas within the Project Site are rated as having Very Low (a century or more) to Very High (hours to months) pollution sensitivity ratings. Very high ratings within the Project Site are located just west of Interstate Highway 35 and correspond to areas with glacial sediment thicknesses up to 50 feet and surficial geology of sand and gravel with thicknesses up to 50 feet. Very Low ratings are in the middle of the Project Site and correspond to areas with glacial till over 50 feet thick or glacial sand and gravel of over 150 feet.

4.8.4.1 Solar Facility Potential Impacts

Construction and operation of solar projects can impact geology and groundwater through temporary, construction-related impacts and/or long-term impacts. Preliminary geotechnical soil borings for the project were completed in 2023. Bedrock was not encountered to a depth of 16 feet, which is the anticipated depth of the direct-embedded piers. Due to the thickness of surficial materials, excavation or blasting of bedrock is unlikely. Karst features have not been identified at the Project Site. Peat materials were encountered to depths of 2 to 9 feet below ground surface in geotechnical soil borings and are expected to be prevalent across the Project Site.

According to MWI well records and preliminary geotechnical logs, shallow groundwater occurs at depths ranging from 4 to 29 feet below ground surface. Because of the shallow depth to groundwater, dewatering may be required during construction. If dewatering exceeds 10,000 gallons of water per day, a DNR water appropriation permit would be required.

Direct impacts to groundwater are generally associated with construction, for example, structure foundations that could penetrate shallow water tables or groundwater usage. Indirect impacts could occur through spills or leaks of petroleum fluids or other contaminants that contaminate surface waters which could ultimately contaminate groundwater. The disturbance of soil and vegetative cover could affect water quality in groundwater resources.

Minnesota solar projects are considered semi-impervious in nature. An increase in impervious surfaces within the Project Site has the potential to increase stormwater runoff, and in turn reduce groundwater recharge.

The project is not anticipated to require the use or storage of large quantities of hazardous materials that might otherwise have the potential to spill or leak into area groundwater.

4.8.4.2 Gen-Tie Line Potential Impacts

Construction and operation of transmission line projects can impact geology and groundwater through temporary, construction-related impacts and/or long-term impacts. Impacts to topography, such as the creation of abrupt elevation changes are not expected. Transmission line structures would be installed at existing grade.

Direct impacts to groundwater are generally associated with construction, for example, structure foundations that could penetrate shallow water tables.

4.8.4.3 Mitigation

Potential impacts to geology and groundwater are anticipated to be minimal. The applicant indicates that it would coordinate with the DNR, as necessary, to confirm that ground disturbing activities such as geotechnical investigation and structure installation placement does not disrupt groundwater hydrology.

The applicant notes that it would assess any wells identified within the Project Site during construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements. As noted in Section 4.4.10.2, if an onsite septic system is required it would be subject to a setback of 50 feet from the Kettle River Wild and Scenic District to avoid impacts.

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Measures to control soil erosion and sedimentation would be implemented during construction activities.

4.8.5 Soils

Soil characteristics within the Project Site were assessed using the SSURGO database. The SSURGO database is a digital version of the original county soils surveys developed by the NRCS. It provides the most detailed level of soils information for natural resource planning and management. This said, soil mapping information for the Project Site by the NRCS is limited.

4.8.5.1 Solar Facility Potential Impacts

Impacts to soils may occur during both the construction and operation stages of the project, and may include soil compaction, soil mixing, and rutting during construction, and compaction during operation. Grading impacts would primarily be associated with the construction of foundations for the project substation, access roads, O&M building, and spot grading for the solar arrays and inverter skids. In addition, some compactions may occur as a result from the installation of direct-embedded piers for the solar arrays and inverter skids. Some soil mixing would likely occur during installation of collection lines and during base preparation for the project substation, laydown yards, and O&M building. During operation, soils would be subject to minor disturbance if maintenance were required.

4.8.5.2 Gen-Tie Line Potential Impacts

Minimal impacts to soils would occur in the form of soil mixing for the few poles to be installed during construction of the gen-tie line. During operation, soils would be subject to minor disturbance if maintenance were required.

4.8.5.3 Mitigation

Soil compaction would be mitigated by regrading and tilling these areas following construction. Soil mixing would be minimized to the degree possible by separately stockpiling topsoil from the underlying subsoil. Once construction work is completed, disturbed areas would be backfilled with subsoil, followed by topsoil.

The use of best management practices can protect topsoil and minimize the potential for soil erosion. These practices include temporary and permanent topsoil stabilization measures in accordance with the project's construction stormwater (CSW) permit; restoring disturbed areas to pre-construction conditions to the extent practicable; minimizing erosion by implementing environmental control measures, such as temporary and permanent seeding, mulching, filter strips, erosion blankets, and sod stabilization. The applicant has prepared an Agricultural Impact Mitigation Plan in coordination with the Minnesota Department of Agriculture (Appendix C). The AIMP details practices that will be taken by the applicant to minimize soil impacts.

Several sections of the draft site permit (Appendix B) also address soil-related impacts:

- Section 4.3.9 requires protection and segregation of topsoil.
- Section 4.3.10 requires measures to minimize soil compaction.
- Section 4.3.11 requires the permittee to obtain a MPCA CSW Permit and implement the BMPs within for erosion prevention and sediment control.
- Section 4.3.16 requires that "site restoration and management" practices enhance "soil water retention and reduces storm water runoff and erosion."
- Section 4.3.17 requires the permittee to develop a VMP that defines how the land control area will be revegetated and monitored over the life of the project. Appropriate seeding rates and timing of revegetation will stabilize soils and improve overall soil health.
- Section 4.3.18 requires the permittee to develop an AIMP which details methods to minimize soil compaction, preserve topsoil, and establish and maintain appropriate vegetation to ensure the project is designed, constructed, operated and ultimately restored in a manner that would preserve soils to allow for the land to be returned to agricultural use.

4.8.6 Surface Water Resources

The project is located within the Kettle River watershed. The Kettle River is approximately 0.11 miles west of the Project Site at its closest point. The Kettle River is in the Minnesota Wild and Scenic River system, defined by the DNR as a river or segments of a river that possess outstanding scenic, recreational, natural, historic, or scientific significance. Each segment of the river is classified into one or more of the three classes of rivers: wild, scenic, and recreational. The Kettle River is designated as scenic from the Carlton-Pine County line downstream to the Kettle River dam site at Sandstone. Scenic rivers are those rivers that exist in a free-flowing state, have excellent water quality, and with adjacent lands that are largely undeveloped. The Development Area would be located outside of the Kettle River Wild and Scenic District; the Project Area includes a portion of the district (Map 9).

The Public Waters Inventory (PWI) is a compilation of public waters maintained and regulated by the DNR. The regulatory boundary of these public waters is referred to as the Ordinary High Water Level (OHWL). There is one PWI waterway in the southeastern part of the Project Site, flowing from the eastern boundary of the Project Site, joined by unnamed stream M-050-046-023-011, and exiting the Project Site along the southern boundary (Map 6). A total of four waterways and 26 channelized human-made ditches are found in the Project Site. There are no PWI basins within the Project Site.

Minnesota designates some water resources as outstanding resource value waters because of their exceptional qualities. Minnesota Statute, section 7050.0180 prohibits, or stringently controls, new or expanded discharges from either point or nonpoint sources to outstanding resource value waters. The Kettle River is designated as an Outstanding Resource Value Waters (ORVW) and is the closest ORVW to the Project Site. There are no outstanding resource value waters or MPCA-impaired waters identified within the Project Site.

Wetlands

The National Wetlands Inventory (NWI) is a nationwide inventory of U.S. wetlands and is the federal standard for wetland classification. The inventory was developed for wetland classification and mapping and identifies wetlands and deepwater water features. Prior to the introduction of agriculture, the area in the southern half of the Project Site was largely covered by freshwater emergent wetlands (PEM1Af). These wetland types still appear on the NWI map today, though agricultural practices have altered these wetlands.

The NWI map identifies several wetlands and wetland complexes within the Project Site (Map 6). Wetlands identified by the NWI include emergent, scrub-shrub, forested, riverine, and unconsolidated bottom wetlands. Many of the wetlands on the west side of the Project Site are classified as farmed wetlands. A review of the NWI was conducted of the farmed wetlands within the Solar Project Area. Though currently agricultural fields, these farmed wetlands are in the NWI due to the low topographic relief and poorly drained soils and would likely return to wetland vegetation should agricultural activities cease.

The NHD (national hydrography dataset) flowlines create a grid-like pattern of ditched wetlands around many of the agricultural fields in the Project Site (Map 6). Throughout the Project Site many wetlands are connected through these NHD surface water connections, resulting in fewer wetlands identified compared to the NWI. Wetlands connected through surface water connections are considered as one wetland, though these wetlands may have multiple wetland communities.

On-site wetland delineations were completed by the applicant across the Project Site based on the criteria and methods outlined in the Corps of Engineers Wetlands Delineation Manual (reference (85)). Wetland field delineations were conducted during four site visits in September and October 2022. The Project Site consists of 42 wetlands according to the delineation. In addition to these wetlands, there are 26 channelized human-made ditches, four waterways, one excavated open water feature, with a combined total of 290.16 acres of wetlands and 0.20 acre of excavated open water features. Of the 290.16 acres of delineated wetlands, 165.27 acres, or about 57 percent are farmed wetlands. The remaining wetlands consist of floodplain forest, wet meadow, shrub-carr, hardwood swamp, and sedge meadow.

A total of 16,211 linear feet of waterways and 101,514 linear feet of channelized ditches were identified within the Project Site as part of the wetland delineation conducted for the project. The majority of channelized ditches are classified as ephemeral, meaning the ditch does not contain water year-round, and may only flow or contain standing water after a rainfall event or during abnormally wet conditions.

Floodplains

The Federal Emergency Management Agency (FEMA) National Flood Hazard Layer Viewer (NFHL) was reviewed and identified designated floodplains within the southwest part of the Project Site (Map 8). This area is a designated floodplain with a one-percent chance of annual flooding (or 100-year FEMA flood zone). This zone is classified as an “area of minimal flood hazard” by the viewer module.

4.8.6.1 Solar Facility Potential Impacts

Solar projects have the potential to directly impact surface water resources and floodplains through construction and installation activities that disrupt, move, or alter soil and vegetation. Any changes to soil or vegetation can alter soil integrity and compaction and could result in changes to surface water runoff. These impacts would be short term and would be avoided or significantly reduced through project design and proper environmental mitigation efforts.

The project is designed to avoid impacts to surface waters by placing project components, such as structures, roads, and solar arrays outside of the delineated surface water boundaries. Indirect impacts to surface waters could result from this project if sediment or released dust created by construction activity were to reach nearby surface waters. This could occur through excavation, grading, vegetation removal, and construction traffic. Surface water could also be impacted due to regrading or alterations made to existing ditches and waterways. The project is expected to have a long-term positive impact on water quality because of the establishment of perennial vegetation at the solar facility. Though the benefits of perennial vegetation won't be immediately recognized, once established, the deep-rooted native vegetation would improve water quality within the Project Site and indirectly improve water quality downstream during operation of the solar facility.

To minimize impacts to wetlands and other surface waters, construction matting would be used during the installation of project components to gain access to different areas of the Project Site. The applicant indicates that this matting installation would temporarily impact ten farmed wetlands. Project components could be installed by a vibratory plow method or via horizontal directional drill or bore method to avoid impacts to the wetlands. Vibratory plows and directional drills would be the preferred methods of installation because each are designed to minimize ground disturbance and impacts.

Each solar array is supported by driven piers, and some may be placed within farmed wetland boundaries. Posts and pilings are typically not considered fill or as resulting in a wetland loss defined by the Minnesota Wetland Conservation Act (WCA). However, per WCA guidance specific to solar facilities, posts and pilings could be considered as wetland fill if they result in bringing a wetland into a nonaquatic use or they significantly alter the wetland's function and value. The WCA program is focused on whether or not the panel arrays would result in a significant alteration of a wetland's function and value which in part, recognizes that not all projects negatively impact wetlands (reference (86)).

The applicant indicates the project's solar array piers would not alter wetland hydrology or function.

4.8.6.2 Gen-Tie Line Potential Impacts

Transmission line and project substation sites could temporarily or permanently impact wetlands if they cannot be avoided through project design. In most cases, transmission line structures can span wetlands to avoid direct impacts. When a wetland cannot be spanned, direct disturbance and fill would occur within the wetland. A freshwater shrub wetland (PSS1D) is in the path of the gen-tie line and poses the biggest obstacle for avoidance of impacts (Map 6); this wetland can be spanned.

Transmission line construction typically includes vegetation cutting or clearing, movement of soils, and construction traffic, which could result in soil compaction. These activities could alter or impair wetland function and localized habitats. Even small changes in hydrology (for example, periods of inundation, changes in flow, sedimentation) can impair wetland function. Wetlands that would contain a gen-tie line structure within them would also be impacted during operation of the project due to equipment access through the wetland for maintenance.

Wetlands can also be impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat. Construction materials, small debris, or engine oil could also negatively affect the wetland function.

4.8.6.3 Mitigation

Construction matting, BMP installation, low ground pressure equipment, or completing construction activities during frozen ground conditions would be used to avoid or minimize wetland impacts from construction equipment. The applicant would continue to evaluate ground conditions within wetland areas where solar panels would be constructed. Culverts would be installed to maintain flow of existing drainageways if construction activities, such as access road construction or other construction activities, could temporarily impact hydrological functions. Impacts to wetlands would be permitted in accordance with applicable USACE and WCA requirements. Section 4.3.13 of the draft site permit requires the applicant to minimize impacts to wetlands using a variety of best practices (Appendix B).

No project components would be located within the designated floodplain; therefore, no mitigation is proposed.

4.8.7 Vegetation

According to the Minnesota Department of Natural Resources (DNR) Ecological Classification System, the Project Site is located within the Mille Lacs Uplands (212Kb) Subsection of the Western Superior Uplands Section in the Laurentian Mixed Forest Province (reference (8)). Presettlement vegetation in this subsection consisted of a mosaic of forest types, including deciduous forests, conifer forests, mixed conifer-hardwood forests, and peatlands. At present, agriculture is the dominant land use in the western and southern portions of this subsection, while forestry and recreation are the most dominant land uses in the central and eastern parts of the subsection, where the Project Site is located.

The current vegetation within the Solar Project Area primarily consists of cultivated crops including corn and soybeans, along with small areas of hay/pastureland, emergent and woody wetlands, deciduous forest, mixed forest, and a recently harvested pine plantation (Map 4).

Vegetation in the Gen-tie Line Project Area consists of a mixture of deciduous and coniferous forests, cropland, hay pastureland, and woody wetlands, with some developed land associated with Interstate Highway 35.

4.8.7.1 Solar Facility Potential Impacts

During construction, temporary and permanent vegetation removal would occur to accommodate installation of solar arrays, access roads, laydown yards, and other infrastructure. Removal of vegetative cover exposes soils and could result in soil erosion and the potential introduction and/or spread of invasive species within the Solar Project Area. As noted in Section 4.4.10, removal of existing vegetation within the eastern portion of the Solar Project Area that currently serves as part of a MnDOT snow fence could also be removed which may result in safety concerns due to blowing snow.

Once the solar infrastructure is installed, the Project Area would be seeded with low growing, native perennial vegetative cover. This conversion from active cropland to low-growing perennial vegetation would likely benefit soil health, water quality, and wildlife, including pollinators.

Perennial vegetation would be established maintained according to the applicant's vegetation management plan (VMP) (Appendix E).

4.8.7.2 Gen-Tie Line Potential Impacts

The construction and operation of the gen-tie line would alter the existing vegetation within the gen-tie project area. To accommodate the switchyard facilities, all vegetation, including trees, in proposed switchyard areas would be permanently removed and the ground surfaced with gravel.

Along the gen-tie line right of way, woody vegetation would be cleared. Non-woody perennial vegetation would be established and maintained within the right of way to allow for safe operation of the line and to reduce the risk of interference with electrical infrastructure. Woody vegetation removal along the right of way would increase sunlight infiltration in areas that were densely wooded, likely reducing the quantity of shade-preferring plant species and increasing the prevalence of species which utilize forest edge habitats.

Removal of vegetative cover during construction exposes soils and could result in soil erosion and the potential introduction and/or spread of invasive species within the Gen-Tie Line Project Area.

4.8.7.3 Mitigation

As noted in Section 4.3.17 of the draft site permit (Appendix B), the applicant would be required to develop a vegetation management plan (VMP) in coordination with state agencies and to file the VMP prior to construction. VMPs are required to include the following:

- Management objectives addressing short term (Year 0-3, seeding and establishment) and long term (Year 4 through the life of the permit) goals;
- A description of planned restoration and vegetation management activities, including how the site will be prepared, timing of activities, how seeding will occur (broadcast, drilling, etc.), and the types of seed mixes to be used;
- A description of how the site will be monitored and evaluated to meet management goals;
- A description of the management tools used to maintain vegetation (e.g., mowing, spot spraying, hand removal, fire, grazing, etc.), including the timing and frequency of maintenance activities;
- Identification of the third-party (e.g., consultant, contractor, site manager, etc.) responsible for restoration, monitoring, and long-term vegetation management of the site;
- Identification of on-site noxious weeds and invasive species (native and non-native) and the monitoring and management practices to be utilized;
- A marked-up copy of the site plan showing how the site will be revegetated and that identifies the corresponding seed mixes.

Section 5.3.10 of the draft route permit (Appendix G) outlines requirements for vegetation management for the gen-tie line. The applicant would need to minimize the number of trees to be removed in selecting the right-of-way specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation to minimize impacts.

The applicant would need to remove tall growing species located within the gen-tie line right of way that endanger the safe and reliable operation of the gen-tie line. The applicant would leave undisturbed, to the extent possible, existing low-growing species in the right of way or replant such species in the right of way to blend the difference between the right of way and adjacent areas, to the extent that the low-growing vegetation that will not pose a threat to the gen-tie line or impede construction.

The applicant has prepared a draft VMP for the project (Appendix E). In the VMP, the applicant committed to minimizing the presence of noxious weeds by using Integrated Vegetation Management (IVM), a strategic approach that combines chemical, biological, cultural, and mechanical methods to manage vegetation, promoting desirable plant communities while controlling unwanted species. IVM involves site assessment, regular evaluation, and long-term maintenance to ensure effective and environmentally sound vegetation control. The applicant also committed to controlling invasive species during construction by taking proactive measures the prevent their introduction and spread, such as requiring construction equipment entering or leaving the site free of soil and vegetation (reference (87).

The applicant has committed in the VMP to establishing and maintaining perennial vegetation. This includes establishing low-growing, regionally appropriate grasses within the arrays and associated buffers to stabilize the soil and meet regulatory requirements. They additionally committed to protecting adjacent natural areas, which includes evaluating and mapping existing natural areas, avoiding disturbance during construction, and implementing best practices for revegetation. Some of these best practices would include using appropriate seeding methods and seed mixes for different soil types and conditions to ensure successful vegetation establishment.

Decommissioning

In the Solar Project Area, the applicant's decommissioning plan (Appendix F) outlines that excavated and backfilled areas would be graded and restored to pre-construction conditions, and that any damaged drain tiles would be repaired. The plan includes revegetation in consultation with landowners and in compliance with regulations at the time of decommissioning. Soils compacted during deconstruction would be de-compacted as necessary to restore the land for agricultural use or other pre-construction uses.

In the Gen-tie Line Project Area, decommissioning would involve dismantling the line and associated structures, likely disturbing the vegetation along the one-mile length of the gen-tie line. Similar to the Solar Project Area, the Gen-tie Line Project Area would be restored and revegetated to pre-construction conditions, including grading and reseeding disturbed areas to promote successful revegetation. The plan also includes the use of BMPs to control erosion and protect surface water during the removal of the gen-tie line, which would be implemented to minimize the impact on vegetation and soil stability.

4.8.8 Wildlife

The Project Site is dominated by agricultural land. As such, wildlife using the Project Site are accustomed to disturbance and human activities. In addition to agricultural land, several other habitat types are also present, including pastures, deciduous and evergreen forests, and wetlands; these habitats may support a variety of wildlife species.

Common mammal species likely to be present in the area include white-tailed deer, which utilize forested areas for cover and wetlands for water sources, and eastern cottontail rabbits, which are often found in pastures and croplands. Predators such as the red fox and coyote are also prevalent, utilizing a range of habitats for hunting. Open habitats may support migratory species such as Canada goose, sandhill crane, and a variety of common songbird species. Wetlands and forest edges support species like the American woodcock and various waterfowl, including the mallard duck (reference (88)) . Wetlands provide habitat for amphibians such as the northern leopard frog and the American toad. Reptiles like the common garter snake are frequently found in both wetland and forested areas (reference (89)).

No managed wildlife areas are present within the Project Site. The Kettle River Banning State Park Important Bird Area is located just south of the Project Site (Map 12). Approximately 200 species of birds have been observed within this Important Bird Area, and its location makes it a significant migratory corridor for bald eagles and waterbirds (reference (90)). Rutledge Wildlife Management Area (WMA) is located approximately 0.4 miles southeast of the Project Site. WMAs provide habitat for upland birds, waterfowl, and mammals.

The Kettle River is a high-quality habitat corridor, particularly for aquatic species including fish and freshwater mussels. Within the Project Site the MPCA surveyed fish (Station ID: 06SC082) on an unnamed creek (AUID: 07030003-626) in 2007. The MPCA identified five species of fish within this survey area: brassy minnow, brook stickleback, central mudminnow, fathead minnow, and northern redbelly dace. Additionally, in 1998, the MPCA surveyed fish (Station ID: 98SC012) on the south end of the Project Site within Public Watercourse Unnamed Stream M-050-046-023-001. This survey identified eight species of fish: blacknose dace, brook stickleback, central mudminnow, common shiner, creek chub, fathead minnow, pearl dace, and white sucker.

4.8.8.1 Solar Facility Potential Impacts

The Solar Project Area is largely composed of agricultural land. Noise and human activity associated with construction in the Solar Project Area would likely lead to wildlife displacement that currently uses these agricultural lands. More mobile species would abandon habitat for nearby adjacent habitats. Less mobile species could be directly impacted by construction equipment.

Although habitat disruption may occur during construction, wildlife species are likely to adapt by using adjacent natural areas, such as the adjacent Kettle River Banning State Park Important Bird Area, which would likely serve as a refugia for displaced wildlife.

Fencing around solar facilities represents a potential impact to wildlife inhabiting the area. Although deer can jump many fences, they can become tangled in both smooth and barbed-wire fences, especially if the wires are loose or installed too closely together (reference (91)).

Potential impacts also include collision mortality, where birds may fly into solar panels or other infrastructure (reference (92)), and predation, where predators may exploit solar sites. Additionally, bird behavior such as foraging, nesting, and territoriality within solar sites can increase their vulnerability to these risks.

As discussed in Section 4.8.7, restoration of the Solar Project Area would include native perennial vegetation. This vegetative cover would likely benefit many species that prefer this habitat type over agricultural cover.

4.8.8.2 Gen-Tie Line Potential Impacts

Similar to the Solar Project Area, noise and human activity associated with gen-tie line construction would likely result in displacing wildlife inhabiting the area. The right-of-way clearing would fragment wildlife habitat in this area, converting it from a forested habitat to an open, routinely maintained habitat. The switchyard would be enclosed by a fence to keep large wildlife away from project substation equipment and out of the switchyard area. Impacts during construction are expected to be of short duration.

During operation, potential impacts to avian species (e.g., songbirds, raptors, and waterfowl) include those described above for non-avian species but also include potential impacts from electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors. Independent of the electrocution risk, birds may be injured by colliding with transmission line structures and conductors. The collision risk is influenced by several factors including habitat, flyways, foraging areas, and bird size. Waterfowl, especially larger waterfowl such as swans and geese, are more likely to collide with transmission lines.

4.8.8.3 Mitigation

As noted in the draft site permit (Appendix B), the applicant would be required to commit to the following measures to minimize potential impacts to wildlife:

- Section 4.3.16 requires the use of "site restoration and management practices that provide for native perennial vegetation and foraging habitat beneficial to gamebirds, songbirds, and pollinators."
- Section 4.3.32 requires the applicant to coordinate to develop a final fence plan for the specific site in coordination with the Department of Commerce and DNR.
- Section 8.14 requires permittees to report "any wildlife injuries and fatalities" to the Commission on a quarterly basis.

As noted in the draft route permit (Appendix G), the applicant would be required to commit to several measures to minimize potential impacts to wildlife. The applicant, in cooperation with the DNR, must identify areas of the transmission line where bird flight diverters will be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. Standard transmission design must incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors that may simultaneously come in contact with a conductor and grounding devices. The applicant is required to submit documentation of its avian protection coordination with the plan and profile for the gen-tie line.

The applicant would implement a regular equipment inspection schedule as described in Section 2.6. This would include a perimeter fence assessment and repair of any damaged fence in a timely manner. The maintenance schedule would include at least two routine inspections per year and additional inspections after storm events that could result in blown-down trees.

4.8.9 Rare and Unique Natural Resources

Rare and unique natural resources include assemblages of species or habitats that are designated for special care and conservation by state or federal agencies. Species protections are administrated at both the federal and state level with each entity maintaining their own list of protected species and their own regulations governing them.

At the federal level, the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool was utilized to investigate species that may be present and protected by the Endangered Species Act (ESA). State protections are codified in Minnesota Rules, chapter 6134 and Minnesota Rules, parts 6212.1800 to 6212.2300. The DNR's NHIS database was reviewed through the Minnesota Conservation Explorer in November 2024 to determine if any Minnesota state-listed species have been documented within the vicinity of the Project Site.

An official list of federally listed species potentially occurring in the Project Site was requested through the USFWS IPaC program on November 27, 2024 (Appendix H). According to the IPaC results, no federally designated critical habitat is present in the Project Site. The USFWS defines critical habitat as the habitat necessary to support the special needs of federally threatened or endangered species.

The IPaC query identified the following federally protected species as potentially being present in the vicinity of the Project Site: the Canada lynx (*Lynx canadensis*; threatened), gray wolf (*Canus lupus*; threatened), whooping crane (*Grus americana*; experimental, non-essential population), and monarch butterfly (*Danaus plexippus*; candidate species). The whooping crane is designated as a non-essential experimental population in Minnesota. This designation refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in the recovery of the species. Consultation under Section 7(a)(2) of the ESA is only required if project activities will occur within a National Wildlife Refuge or National Park. A federal candidate species, such as the monarch butterfly, is a species for which the USFWS has sufficient information to propose listing them as endangered or threatened under the ESA; however, until they are listed, candidate species have no federal protection.

Although no longer protected under the ESA, bald eagles (*Haliaeetus leucocephalus*) are protected by the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act (MBTA); the IPaC query identifies bald eagles as potentially being present in the vicinity of the Project Site. The IPaC query also identifies two migratory bird species, bobolink (*Dolichonyx oryzivorous*) and verry (*Catharus fuscescens fuscescens*), that could be present in the vicinity of the Project Site. Both species are considered USFWS Bird of Conservation Concern. Migratory birds are protected under the MBTA.

At the state level, the NHIS database identifies records of five threatened species and eight species of special concern within one mile of the Project Site; these include three species of fish, seven mussel species, and three plant species. None of the NHIS database records are located within the Solar Project Area or Gen-Tie Line Project Area. Although state special concern species are tracked and monitored by the DNR, they are not legally protected under state law. Table 4-13 summarizes the species identified through IPaC and the NHIS that have potential to occur in the Project Site; the table also provides habitat characteristics for each species.

Table 4-13 State and Federal Listed Species

Common Name	Scientific Name	Source	Federal Status[1]	State Status	Habitat
Mammals					
Canada lynx	*Lynx canadensis*	IPaC	T	SC	Boreal forests with abundant snowshoe hare and red squirrel.
Gray wolf	*Canus lupus*	IPaC	T	-	Prefer remote areas that are heavily forested.
Birds					
Whooping crane	*Grus americana*	IPaC	Experimental / Non-essential	-	Inland marshes, lakes, open ponds, upland swales, wet meadows and rivers, pastures and agricultural fields.
Bald Eagle	*Haliaeetus leucocephalus*	IPaC	BGEPA	-	Nests in tall trees near water.
Bobolink	*Dolichonyx oryzivorus*	IPaC	MBTA	-	Open grasslands, meadows, and wetlands, particularly in areas with tall grasses and abundant flowering plants for nesting and foraging.
Veery	*Catharus fuscescens fuscescens*	IPaC	MBTA	-	Prefers dense, moist deciduous forests and shrubby areas in Minnesota, often near streams or wetlands, where it can find ample cover for nesting and foraging.

Common Name	Scientific Name	Source	Federal Status[1]	State Status	Habitat
Fish					
Gilt darter	*Percina evides*	NHIS	-	SC	Medium rivers and streams; large rivers
Lake sturgeon	*Acipenser fulvescens*	NHIS	-	SC	Deep water and littoral zones of lakes; large rivers
Southern brook lamprey	*Ichthyomyzon gagei*	NHIS	-	SC	Large, medium, and small rivers; medium and small stream.
Mussels					
Mucket	*Actinonaias ligamentina*	NHIS	-	T	Large and medium rivers; medium streams
Fluted-shell	*Lasmigona costata*	NHIS	-	T	Large and medium rivers; medium streams
Black sandshell	*Ligumia recta*	NHIS	-	SC	Large and medium rivers; medium streams
Round pigtoe	*Pleurobema sintoxia*	NHIS	-	SC	Large, medium, and small rivers; medium and small streams
Creek heelsplitter	*Lasmigona compressa*	NHIS	-	SC	Small rivers and streams
Spike	*Eurynia dilatate*	NHIS	-	T	Littoral zone of lakes; large, medium, and small rivers; medium and small streams
Elktoe	*Alasmidonta marginata*	NHIS	-	T	Large, medium, and small rivers; medium and small streams
Plants					
Robbins' spikerush	*Eleocharis robbinsii*	NHIS	-	T	Littoral zone of lakes
Discoid beggarticks	*Bidens discoidea*	NHIS	-	SC	Wet meadow, shrub-carr and marsh wetlands; large rivers
Slendar naiad	*Najas gracillima*	NHIS	-	SC	Littoral zone of lakes
Insects					
Monarch butterfly	*Danaus plexippus*	IPaC	C	-	Obligate of milkweed species.

[1] E = Endangered; T = Threatened; SC = Species of Special Concern; C = Candidate for listing; PE = Proposed Endangered; BGEPA = Bald and Golden Eagle Protection Act; MBTA = Migratory Bird Treaty Act

The Project Site generally consists of agricultural land; no sensitive ecological resources were identified within it. However, several sensitive ecological resources are located adjacent to the Project Site (Map 12). DNR Sites of Biodiversity Significance ranked outstanding and moderate are located just west and south of the Project Site. A DNR native plant community (dry barrens oak savanna (south) Jack pine subtype) is also located immediately west of the Project Site. The Kettle River Banning State Park Important Bird Area is located just south of the Project Site. No other sensitive ecological resources have been identified within the immediate vicinity of the Project Site.

4.8.9.1 Solar Facility Potential Impacts

Potential impacts to federal or state-protected wildlife would be similar to those discussed above in Section 4.8.8. The USFWS IPaC tool was used to assess the project's potential impact on federally protected species. This review resulted in the project having a no effect determination on the monarch butterfly and whooping crane, and a may affect, though not likely to adversely affect, determination on the Canada lynx and gray wolf (Appendix H). The bald eagle nesting habitat is not present in the Project Site; as such, impacts to this species are not anticipated. The project has the potential to impact the USFWS Birds of Conservation Concern and other migratory birds; these potential impacts would be the same as those described for avian species under Section 4.8.8.

The Solar Project Area does not intersect with suitable habitat for state-listed species. As noted in Table 4-13, these species are associated with riparian or aquatic habitats that occur within one mile of the Project Site but not within it. As a result, the project is not anticipated to affect state-listed species. The project is not anticipated to impact sensitive ecological resources because none of these resources are present in the Project Site. Impacts to the Kettle River Banning State Park Important Bird Area are not anticipated from the project. This area may actually serve as a refugia for some species that are displaced from the Project Site during construction and operation. Although not anticipated, indirect impacts to aquatic species and sensitive ecological resources could occur as a result of ground-disturbing activities that result in erosion and subsequent sedimentation of nearby waters.

4.8.9.2 Gen-Tie Line Potential Impacts

The potential impacts to federal and state-protected species described above for the solar facility would also apply to the gen-tie line. However, the gen-tie line has a greater habitat diversity than the Solar Project Area and would result in a smaller but more impactful habitat alteration. Tree removal during construction of the gen-tie line would result in fragmentation of forested habitat. Species that occupy these forested habitats may be displaced and forced to use similar adjacent habitats. Other species, which prefer edge or open habitat may move into the fragmented habitat. Potential impacts to avian species are discussed under Section 4.8.8.

4.8.9.3 Mitigation

Mitigation measures described for vegetation and wildlife, including the measures outlined in the draft route permit (Appendix G) and the draft site permit (Appendix B), would also minimize potential impacts to federal and state-protected species. Impact mitigation measures for avian species are discussed in Section 4.8.8. Avoiding identified areas of species occurrence or preferred habitat is the preferred mitigation measure.

The DNR conducted a Natural Heritage Review (NHR) for the project as part of the site permit application (MCE 2023-00842; Appendix I). In this NHR, the DNR had several recommendations to minimize the potential for indirect impacts to nearby sensitive ecological resources and state-protected species. To minimize potential indirect impacts to the adjacent native plant community and Sites of Biodiversity Significance the DNR recommends the following:

- Retain a buffer between proposed activities and the Minnesota Biological Survey site and native plant community
- Use effective erosion prevention and sediment control measures
- If possible, conduct the work under frozen ground conditions
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species
- As much as possible, operate within already-disturbed areas
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern are birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas
- Review the DNR's Commercial Solar Siting Guidance (reference (93))

To minimize potential indirect impacts to state-protected aquatic species, which have been documented in the Kettle River, the DNR recommends that effective erosion prevention and sediment control practices are implemented and maintained for the duration of the project and incorporated into any stormwater management plan.

To minimize potential impacts to bats, the DNR recommends that tree removal be avoided from June 1 through August 15. At the time of the permit application, the USFWS IPaC query indicated the potential presence of two rare bat species. An updated review of the IPaC in November 2024 no longer indicates the presence of these species in the official USFWS species list (Appendix H).

The DNR also submitted a scoping letter for the EA, which included additional recommendations.[28] The DNR indicated that wood turtles (*Glyptemys insculpta*) and Blanding's turtles (*Emydoidea blandingii*) may occupy the surrounding landscape of the project, such as the Kettle River and wetland complexes. To minimize the potential for turtles becoming trapped, the DNR recommends coordination on fencing strategies to keep turtles from entering the Project Site. To avoid trapping a turtle within the Project Site, a fence (permanent or temporary) should be installed around the perimeter after August 30 and before April 15.

To minimize potential indirect impacts to state-protected mussels, the DNR recommends that if ground disturbance is needed for project construction, efforts should be made to ensure no erosion or sedimentation impacts the Kettle River. If it is determined that this project is likely to have impacts to

[28] eDocket Nos. 20248-209338-01 and 20248-209338-02, https://efiling.web.commerce.state.mn.us/documents/%7B40E62E91-0000-CB11-93D3-31B7DCF25B39%7D/download?contentSequence=0&rowIndex=23

the Kettle River, a survey may be required to confirm the presence of rare mussels and work toward an avoidance plan.

5 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 them were discussed above. However, even with mitigation strategies, certain impacts cannot be avoided.

Primary unavoidable temporary impacts expected during construction include:

- Aesthetic impacts to nearby residences, recreationists, and users of Interstate 35
- Increased traffic on roads in the project vicinity
- Fugitive dust
- Noise disturbance to nearby residents and recreationists
- Soil compaction
- Wildlife displacement

Primary unavoidable impacts associated with the life of the project include:

- Aesthetic impacts to nearby residences, recreationists, and users of Interstate 35
- Land use change from agricultural to solar facility
- Infrequent operations and maintenance traffic
- Re-routing of Snowmobile Trail 187

6 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 and irretrievable resource commitments are primarily related to project construction, including the use of water, aggregate, hydrocarbons, steel, concrete, wood, and other consumable resources. Some uses, like fossil fuel use, are irretrievable. Others, like water use, are irreversible. Still, others might be recyclable in part; for example, the raw materials used to construct PV panels would be an irretrievable commitment of resources, excluding those materials that may be recycled at the end of the panels' useful life. The commitment of labor and fiscal resources to develop, construct, and operate the project is considered irretrievable.

7 Cumulative Potential Effects

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,” consideration is given to 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 4.

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.

Publicly available data was reviewed, and phone conversations were had with employees from the city of Willow River and Pine County to identify planned projects. Based on this review, there are no city or county projects planned near the Iron Pine Solar project.

One planned project was identified with MnDOT, a state roadway improvement project with construction activities planned between 2023 and 2025. MnDOT will replace northbound and southbound Interstate Highway 35 bridges over the Grindstone River located 0.3 miles north of the junction of MN 48, and northbound and southbound Interstate Highway 35 bridges over the BNSF railroad located 1.2 miles north of the junction of MN 48. This project is over five miles south of the Project Site. Based on the location of these MnDOT projects, no cumulative effects are anticipated.

8 Siting and Routing Factors – Analysis and Discussion

The Commission weighs human and environmental factors in its permitting decisions as described in Section 3.3. The specific factors the Commission must weigh are specified in statute and rule. Minnesota Statutes, section 216E.03, subdivision 7 lists considerations that guide the study, evaluation, and designation of site permits and route permits. Minnesota Rules, part 7850.4100 lists the factors the Commission must consider when making a site permit or route permit decision. The analysis here applies the siting factors for the solar facility and routing factors for the gen-tie line to the project. Some factors are described in just a few words. Other factors are more descriptive and include a list of elements that, when grouped, make up the factor.

Table 14 lists factors for both the solar facility and the gen-tie line. Factor M (unavoidable impacts) and Factor N (irreversible and irretrievable resource commitments) are discussed in Chapter 5 and Chapter 6, respectively, of this EA. Factor G (application of design options) and Factor L (costs dependent on design) do not apply as the design of the proposed project is the only design under consideration.

Other factors are ranked as follows:

●	Impacts are anticipated to be negligible to minimal and able to be mitigated or consistent with factor
◓	Impacts are anticipated to be minimal to moderate and able to be mitigated in part or less consistent with factor, but nonetheless consistent
○	Impacts are anticipated to be moderate to significant and unable to be mitigated fully or consistent in part or not consistent with factor

Table 14 summarizes the potential impacts of the project with respect to the Commission's siting and routing factors.

Table 14 Application of Siting and Routing Factors

Siting / Routing Element	Solar Facility		Gen-Tie Line	
	Construction	Operation	Construction	Operation
Factor A: Human Settlement				
Aesthetics	○	○	●	●
Cultural Values	●	●	●	●
Displacement	●	●	●	●
Electronic Interference	●	●	●	●

Siting / Routing Element	Solar Facility		Gen-Tie Line	
	Construction	Operation	Construction	Operation
Land Use and Zoning	◒	◒	●	●
Noise	◒	●	◒	●
Recreation	◒	◒	●	●
Socioeconomics	●	●	●	●
Environmental Justice	●	●	●	●
Property Values	◒	◒	●	●
Public Services	●	◒	●	◒
Factor B: Public Health and Safety				
Emergency Services	●	●	●	●
Public Safety	●	●	●	●
EMF	●	●	●	●
Stray Voltage	●	●	●	●
Factor C: Land-based Economies				
Agriculture	◒	◒	◒	●
Tourism	●	●	●	●
Forestry	●	●	●	●
Mining	●	●	●	●
Factor D: Archaeological and Historic Resources				
Archeological	●	●	●	●
Historic	●	●	●	●

Siting / Routing Element	Solar Facility		Gen-Tie Line	
	Construction	Operation	Construction	Operation
Factor E: Natural Resources				
Air Quality	●	●	●	●
Climate Change	●	●	●	●
Geology and Groundwater	●	●	●	●
Soils	●	●	●	●
Surface Water	●	●	●	●
Wetlands	●	●	●	●
Vegetation	●	●	●	●
Wildlife	●	●	●	●
Factor F: Rare and Unique Resources				
Rare and Unique Resources	●	●	●	●
Factor H: Paralleling Division Line				
Existing Boundaries	NA	NA	◒	◒
Factor I: Use of Existing Generating Plants				
Existing Generating Plants	◒	◒	NA	NA
Factor J: Use of Existing Electrical Transmission Systems				
Existing Electrical Transmission Systems	NA	NA	◒	◒
Factor K: Electrical System Reliability				
Electrical System Reliability	●	●	●	●

8.1 Factor A: Human Settlement

8.1.1 Aesthetics

Visual impacts are subjective. Thus, potential impacts are unique to the individual and can vary widely. Man-made structures would be introduced into the existing landscape and would be visible from local roads and nearby residences. Despite the project being visible from Interstate Highway 35 and CSAH 61 and the Willard Munger Hinckley-Carlton State Trail, the impact level along these thoroughfares is anticipated to be minimal. For landowners with greater viewer sensitivity, such as those within or immediately adjacent to the Project Site, the impact level is anticipated to be moderate to significant. Impacts are anticipated to be short- and long-term and localized. Potential impacts are unavoidable but can be mitigated in part, e.g., through visual screening.

8.1.2 Cultural Values

The value residents put on the character of the landscape within which they live is subjective, meaning its relative value depends upon the perception and philosophical or psychological responses unique to individuals. Because of this, construction of the project might—for some residents—change their perception of the area's character thus potentially eroding their sense of place. On whole, impacts to cultural values are anticipated to be minimal.

8.1.3 Displacement

There are no residences, business, or structures such as barns or sheds located within the Development Area, and none will be displaced by the project. There are two residences located outside the Development Area but within the Project Site who are participating landowners. These two residences will not be displaced.

8.1.4 Electronic Interference

No impacts to electronic devices are anticipated and if unanticipated impacts do occur, the applicant would be required to restore services.

8.1.5 Land Use and Zoning

Development of the solar facility would temporarily change the land use from predominantly agricultural use to energy generation for the life of the project. The change of land use will have a minimal to moderate impact on the rural character of the surrounding area, and a minimal impact on the county character as a whole. Development of the gen-tie line will result in land use change for some land use types. The change of land use will have minimal impact to the character of the surrounding area and county as a whole. The project design is generally consistent with the Pine County Zoning Ordinance.

8.1.6 Noise

Distinct noises are associated with the different phases of project construction. These impacts will be temporary and intermittent and range from negligible to moderate depending on the construction equipment used and the location of the listener. Noise sources during operation would primarily include the solar facility's inverters and substation. No exceedances of the state noise standards are anticipated during construction or operation of the solar facility or gen-tie line. Impacts are anticipated to be minimal during operation and potentially moderate at specific times during construction.

8.1.7 Recreation

Snowmobile Trail 187 (Pine Trails 1, 2, & 3) currently crosses through the western and northwestern portions of the Solar Project Area and would need to be rerouted. Impacts are anticipated to be minimal to moderate with mitigation (re-routing the trail around the solar facility). The Solar Project Area is within the Kettle River Wild and Scenic River District; however, it does not cross the Kettle River or its banks and would likely not be visible from the river. There are negligible anticipated impacts to recreational fishing, hunting, or other recreational resources. The gen-tie line would not be close to the recreational resources identified above and would not be expected to impact recreational opportunities.

8.1.8 Socioeconomics

The socioeconomic impacts to Pine County and the local area are anticipated to be short-term, positive, and minimal to moderate. For example, local businesses would likely see an increase in revenues during the construction phase of the project due to an increase in construction workers in the area. There will be some long-term positive impacts. During operation, benefits would include up to seven employees to support the project, and approximately $560,000 to $640,000 annually in production tax revenue to Pine County, and $140,000 to $160,000 annually to Kettle River Township, depending on the final design.

8.1.9 Environmental Justice

The project is not anticipated to have disproportionately high or adverse human or environmental effects on low-income, minority, or tribal populations.

8.1.10 Property Values

Based on analysis of other utility-scale solar projects, minimal to moderate property value impacts could occur. To the extent that negative impacts do occur, they are expected to be within one-half mile of the solar facility and to decrease with distance from the project and with time. Aesthetic impacts that might affect property values would be limited to residences and parcels where the solar panels are easily visible.

8.1.11 Public Services

During construction of the project, a temporary increase in local traffic is expected. During operation, traffic impacts are expected to be very low. The project would require tree removal within its southern boundary, which MnDOT noted could create a new blowing snow problem and therefore, trigger the need for extra snow fencing if the existing vegetation is disturbed. These impacts could be minimal to moderate and can be mitigated. The solar facility and gen-tie line are not expected to impact railroads or airports. Long-term impacts would be limited to the presence of the gen-tie crossing Interstate Highway 35.

8.2 Factor B: Public Safety

8.2.1 Emergency Services

The inflow of temporary construction personnel could increase demand for emergency and public health services. Although no road closures are anticipated during construction, any temporary closures could impede police, fire, and other rescue vehicle's access to the site of an emergency. Mitigation would include coordination with local emergency responders.

8.2.2 Public Safety

Public safety concerns are primarily associated with unauthorized entry to the project. The project would be fenced to prevent unauthorized access.

8.2.3 EMF

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. Accordingly, no human health impacts are anticipated.

8.2.4 Stray Voltage and Induced Voltage

Constructing the project to NESC standards and Commission route permit requirements would mitigate stray voltage and induced voltage concerns. Therefore, potential impacts from stray voltage and induced voltage are anticipated to be minimal.

8.3 Factor C: Land-based Economies

8.3.1 Agriculture

The solar facility would permanently convert approximately 1,666.7 acres of farmland into solar facilities; impacts are anticipated to be minimal to moderate. None of this land is mapped as prime farmland or farmland of statewide importance. Construction would temporarily limit the usage of agricultural land within the Gen-tie Line Project Area.

8.3.2 Tourism

One snowmobile trail would need to be re-routed as a result of the project. This re-routing would not be anticipated to impact the tourism economy. Due to construction, there will be short-term increases in traffic, noise, and dust that could potentially impact outdoor recreational activities in close proximity to the Project Site. However, impacts would be temporary and minimal. No significant long-term impacts to tourism are anticipated.

8.3.3 Forestry

Though forested areas are present within the Project Site, no commercial forestry resources would be impacted.

8.3.4 Mining

There are no anticipated impacts to mining.

8.4 Factor D: Archaeological and Historic Resources

A finding of No Historic Properties Effected was recommended as a result of a Phase 1 Archeological Survey and historic architectural survey conducted by Stantec. Potential impacts to cultural resources are anticipated to be minimal.

8.5 Factor E: Natural Resources

8.5.1 Air Quality

Air emissions are expected during project construction and have the potential to create a temporary impact to air quality. After construction, there would be a reduction in emissions. Air quality impacts during project operation are not anticipated.

8.5.2 Climate Change

Construction activities would result in short-term increases in GHG emissions. However, on whole, the project is expected to decrease energy-sector GHG emissions over its lifetime and have a positive impact on climate change.

8.5.3 Geology and Groundwater

Construction and operation of solar facilities can impact geology and groundwater through temporary, construction-related impacts and/or long-term impacts. Impacts to geology and groundwater are anticipated to be minimal and would be mitigated in part by following required setbacks for an onsite septic system, if required.

8.5.4 Soils

Impacts to soils may occur during both construction and operation and could include soil compaction, soil mixing, and rutting during construction, and compaction during operation. Minimal impacts to soils are anticipated during construction of the gen-tie line. Soils would be managed during construction of the solar facility in accordance with the AIMP. Soil compaction would be mitigated by regrading and tilling these areas following construction. Soil mixing would be minimized to the degree possible by separately stockpiling topsoil from the underlying subsoil. Construction impacts to soils would be minimized through the implementation of the SWPPP, AIMP, and VMP.

8.5.5 Surface Waters and Wetlands

The Project Site includes several NWI wetlands and wetland complexes, most of which are farmed. Four waterways (one of which is a PWI waterway) and human-made ditches are present within the Project Site. The Kettle River (which is designated as a Wild and Scenic River and ORVW) is immediately west of the Project Site. Most impacts to wetlands would be temporary, and impacts would be permitted through the applicable agencies. No direct impacts to waterways are anticipated; indirect impacts would be minimized through BMPs and through applicable permit conditions.

The review of the FEMA NFHL viewer indicated there is an area identified as a designated floodplain with a one-percent chance of annual flooding (or a 100-year FEMA flood zone). This zone is classified as an “area of minimal flood hazard” by the viewer module. No project components would be located within the designated floodplain; impacts are anticipated to be minimal.

8.5.6 Vegetation

During solar facility construction, temporary and permanent vegetation removal would occur to accommodate solar arrays, access roads, laydown yards, and other infrastructure. The construction and operation of the gen-tie line would alter the existing vegetation within the gen-tie project area. To accommodate the switchyard facilities, all vegetation, including trees, in the proposed switchyard areas would be permanently removed and the ground surfaced with gravel. The applicant has developed a Vegetation Management Plan (VMP) and committed to several measures to mitigate impacts to vegetation for the duration of the project.

8.5.7 Wildlife

Noise and human activity associated with project construction would likely result in the temporary displacement of wildlife inhabiting the area. Although habitat disruption may occur during construction, wildlife species are likely to adapt by using adjacent natural areas. During operation, some species may be impacted by fencing for the solar farm and the gen-tie line switchyard. These impacts are anticipated to be minimal. Switching from annual to perennial vegetation in the solar facility will improve food and shelter for some wildlife species.

8.6 Factor F: Rare and Unique Resources

Several sensitive ecological resources are located adjacent to the Project Site. To the west of the Project Site, these include DNR Sites of Biodiversity Significance ranked outstanding and moderate and a DNR native plant community (dry barrens oak savanna (south) Jack pine subtype. The Kettle River Banning State Park Important Bird Area is located just south of the Project Site. However, there are no rare and unique resources within the Project Site. Thus, direct impacts to these resources are not anticipated. Mitigation measures for vegetation and wildlife would generally address the potential for indirect impacts to nearby rare and unique resources.

8.7 Factor H: Paralleling Division Lines

The use or paralleling of existing survey lines, natural division lines, and agricultural field boundaries (collectively referred to as division lines) is applicable solely to the gen-tie line. The gen-tie line is not routed to use or parallel existing division lines. However, the gen-tie line is relatively short in length, and the ability to parallel existing division lines is limited. Thus, the project is consistent with this routing factor only in part.

8.8 Factor I: Use of Existing Generating Plants

The use of an existing generating plant site is applicable solely to the solar farm. The project is not proposed to be located on the site of an existing generating plant. This is primarily due to the nature of the project's energy generation, i.e., producing energy through solar irradiance. Solar farms are generally not compatible with other generating plant sites. Thus, the project is consistent with this siting factor only in part.

8.9 Factor J: Paralleling Existing Infrastructure

The paralleling of existing transportation and energy infrastructure is applicable solely to the gen-tie line. The gen-tie line is not routed to parallel existing infrastructure. However, the gen-tie line is relatively short in length, and the ability to parallel infrastructure is limited. Further, the gen-tie line route is limited by the necessity of interconnecting with the Minnesota Power 230 kV Arrowhead-Bear Creek transmission line. Thus, the project is consistent with this routing factor only in part.

8.10 Factor K: Electrical System Reliability

The project would 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. No impacts to electrical reliability are anticipated.

9 References

1. U.S. ENVIRONMENTAL PROTECTION AGENCY. Permit Program under CWA Section 404. Online. 17 March 2015. [Accessed 5 December 2024]. Available from: https://www.epa.gov/cwa-404/permit-program-under-cwa-section-404Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands.

2. U.S. ENVIRONMENTAL PROTECTION AGENCY. Spill Prevention, Control, and Countermeasure (SPCC) for the Upstream (Oil Exploration and Production) Sector. Online. 25 September 2014. [Accessed 9 December 2024]. Available from: https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations/spill-prevention-control-and-countermeasure-19The SPCC rule requires facilities to develop, maintain, and implement an oil spill prevention plan, called an SPCC Plan. These plans help facilities prevent oil spill, as well as control a spill should one occur.

3. MINNESOTA DEPARTMENT OF TRANSPORTATION. Determine if you need a permit - Oversize/Overweight Permits. Online. [Accessed 5 December 2024]. Available from: https://www.dot.state.mn.us/cvo/oversize/determine.htmlFind information on whether you need an oversize/overweight permit

4. MINNESOTA POLLUTION CONTROL AGENCY. Construction stormwater. *Water Permits*. Online. [Accessed 5 December 2024]. Available from: https://www.pca.state.mn.us/business-with-us/construction-stormwaterMPCA issues coverage to construction site owners and their operators to prevent stormwater pollution during and after construction, and protect Minnesota's water resources.

5. U.S. ENVIRONMENTAL PROTECTION AGENCY. Overview of CWA Section 401 Certification. Online. 9 April 2019. [Accessed 5 December 2024]. Available from: https://www.epa.gov/cwa-401/overview-cwa-section-401-certificationProvide background information on CWA section 401

6. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. *Minnesota's watershed basins*.

7. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. *Ecological Classification System*.

8. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. Mille Lacs Uplands Subsection. .

9. BOERBOOM, T. J. *Sinkhole Distribution, Depth to Bedrock, and Bedrock Topography*. . [map]. Minnesota Geological Survey, 2001. County Atlas Series C-13, Part A Plate 6: Geologic Atlas of Pine County, Minnesota.

10. JIRSA, Mark A., BOERBOOM, Terrence J., CHANDLER, V. W., MOSSLER, John H., RUNKEL, Anthony C. and SETTERHOLM, Dale R. *MN Geological Survey_2011_Geologic Map of MN Bedrock Geology*. . [map]. 2011.

11. MINNESOTA DEPARTMENT OF TRANSPORTATION. *In the Matter of the Application of Iron Pine Solar, LLC for a Site Permit for the up to 100MW Iron Pine Solar Project and 230kV Transmission Line in Pine County, Minnesota. PUC Docket Numbers: IP7114/GS-23-414 (Site Permit) and IP7114/TL-23-415 (Route Permit)*. 7 August 2024.

12. MINNESOTA DEPARTMENT OF COMMERCE. *Iron Pine Scoping Decision Final*. 3 September 2024.

13. SHADDIX & ASSOCIATES. *Iron Pine Solar, Public Information and Environmental Assessment Scoping Meeting*. 24 July 2024.

14. MILLE LACS BAND OF OJIBWE and PINE COUNTY, MINNESOTA. *Statement of Principles on Government-to-Government Relations Between the Mille Lacs Band of Ojibwe and Pine County Minnesota*. 26 July 2016.

15. U.S. CENSUS BUREAU. B04001: FIRST ANCESTRY REPORTED - Census Bureau Table [Pine County, Minnesota]. Online. Available from: https://data.census.gov/table/ACSDT5Y2013.B04001?q=pine%20county&t=Ancestry:Populations%20and%20People

16. CITY OF PINE COUNTY, MINNESOTA. *City of Pine County Calendar and Events*.

17. CITY OF WILLOW RIVER, MINNESOTA. *City of Willow River Community Information*.

18. CITY OF WILLOW RIVER, MINNESOTA. *City of Willow River Northern Pine Riders Snowmobile Club Information*.

19. U.S. GEOLOGICAL SURVEY. *National Land Cover Database (NLCD) 2019*.

20. *Pine County Township and City Ordinance Jurisdiction Contacts*. 13 June 2024.

21. CITY OF PINE COUNTY, MINNESOTA. *Pine County, MN Planning and Zoning Information Page*.

22. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. *Kettle River Wild and Scenic Ordinance*. October 1998.

23. PINE COUNTY PLANNING & ZONING DEPARTMENT. *2022 Pine County Zoning Ordinance*. 29 April 2022.

24. *Pine County Tourism*.

25. U.S. CENSUS BUREAU. *Iron Pine, MN Community Survey, Economic Characteristics*. 2022.

26. MINNESOTA DEPARTMENT OF EMPLOYMENT AND ECONOMIC DEVELOPMENT. *Economic Development Region 7E: East Central*. August 2023.

27. MINNESOTA DEPARTMENT OF EMPLOYMENT AND ECONOMIC DEVELOPMENT. *Pine County Population Characteristics*. MnDEED.

28. U.S. ENVIRONMENTAL PROTECTION AGENCY. Environmental Justice. Online. Available from: https://www.epa.gov/environmentaljustice

29. U.S. ENVIRONMENTAL PROTECTION AGENCY. Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses. *U.S. Environmental Protection Agency*. Online. April 1998. [Accessed 7 July 2015]. Available from: http://www.epa.gov/environmentaljustice/resources/policy/ej_guidance_nepa_epa0498.pdf

30. U.S. ENVIRONMENTAL PROTECTION AGENCY. EJScreen: Environmental Justice Screening and Mapping Tool. Online. [Accessed 11 July 2024]. Available from: https://www.epa.gov/ejscreen

31. CHALMERS, James. *High Voltage Transmission Lines (HVTL) and Residential Property Values in New England*. 30 October 2019.

32. ELMALLAH, Salma, HOEN, Ben, FUJITA, K. Sydny, ROBSON, Dana and BRUNNER, Eric. Shedding light on large-scale solar impacts: An analysis of property values and proximity to photovoltaics across six U.S. states. *Elsevier Ltd.* Online. Available from: https://doi.org/10.1016/j.enpol.2023.113425

33. COHNREZNICK LLP. *REAL ESTATE ADJACENT PROPERTY VALUE IMPACT REPORT: Academic and Peer Authored Property Value Impact Studies, Research and Analysis of Existing Solar Facilities, and Market Participant and Assessor Interviews*. 2022.

34. CLEAN ENERGY RESOURCE TEAMS (EXCERPT FROM CHISAGO COUNTY PRESS ARTICLE). *Chisago County Board's real estate update shows solar has no impact on property values*.

35. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. *Kettle River management rules Wild & Scenic Rivers Legislation: Kettle RiverManagement*.

36. MINNESOTA POLLUTION CONTROL AGENCY. *What's In My Neighborhood - Willow River*. . [map]. [no date].

37. MINNESOTA POLLUTION CONTROL AGENCY. *2017 Toxics and Pollution Prevention Evaluation Report*. 2018.

38. NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES. Electric & Magnetic Fields. Online. [Accessed 28 June 2024]. Available from: https://www.niehs.nih.gov/health/topics/agents/emf

39. U.S. ENVIRONMENTAL PROTECTION AGENCY. *Electric and Magnetic Fields from Power Lines*.

40. NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES - NATIONAL INSTITUTE OF HEALTH. *Electric and Magnetic Fields Associated with the Use of Electric Power: Questions & Answers*. Online. June 2002. Available from: https://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

41. NATIONAL CANCER INSTITUTE. Electromagnetic Fields and Cancer. Online. [Accessed 14 February 2024]. Available from: https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet

42. THE MINNESOTA STATE INTERAGENCY WORKING GROUP ON EMF ISSUES. *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options*. September 2002.

43. MINNESOTA RURAL ELECTRIC ASSOCIATION. *Minnesota Stray Voltage Guide: A Guide Addressing Stray Voltage Concerns*. September 2015.

44. WISCONSIN PUBLIC SERVICE COMMISSION. *Underground Electric Transmission Lines*. . 2011.

45. GOLDER ASSOCIATES INC. *Induced Voltage and Current Report: A Review of Public Hazards Associated with High-Voltage Transmission Lines*. February 2013.

46. U.S. DEPARTMENT OF AGRICULTURE. 2017 Census of Agriculture County Profile: Pine County, Minnesota. Online. 2017. [Accessed 1 December 2024]. Available from: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Minnesota/cp27115.pdf

47. NATURAL RESOURCES CONSERVATION SERVICE. Soil Data Access (SDA) Prime and other Important Farmlands. Online. [Accessed 8 December 2024]. Available from: https://efotg.sc.egov.usda.gov/references/public/LA/Prime_and_other_Important_Farmland.html

48. U.S. DEPARTMENT OF AGRICULTURE. 2022 Census of Agriculture State Profile: Minnesota. Online. [Accessed 26 December 2024]. Available from:

https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/Minnesota/cp99027.pdf

49. NATIONAL PARK SERVICE. *National Park Service Office of Policy_ NPS-28, Cultural Resource Management (Chapter 6)*.

50. MINNESOTA HISTORICAL SOCIETY - HERITAGE PRESERVATION DEPARTMENT. *Historic and Architectural Survey Manual*. August 2017.

51. U.S. DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE. *National Register Bulletin: Guidelines for Evaluating and Documenting Traditional Cultural Properties*. 1998.

52. MINNESOTA DEPARTMENT OF ADMINISTRATION. Office of the State Archaeologist (OSA) Portal. Online. [Accessed 13 October 2023]. Available from: https://osaportal.gisdata.mn.gov/

53. STATE OF MINNESOTA. *Minnesota's Statewide Historic Inventory Portal (MnSHIP)*.

54. *Iron Pine Solar Project - Request for Project Review by the State Historic Preservation Office (SHPO)*.

55. VERMEER, Andrea and TERRELL, Michelle. *An Investigation of Minnesota's Unrecorded Historical Cemeteries*. 2011.

56. *Saint Mary's Catholic Church Cemetery, Willow River, MN*. Online. [Accessed 27 November 2024]. Available from: https://www.findagrave.com/cemetery/2195899/saint-marys-catholic-cemetery

57. FLATT, Jason and HIGGINS, Holly. *Historical Architectural Survey, Iron Pine Solar Project*. 2023.

58. VAN VLEET, Miranda. *Minnesota Architecture - History Inventory Form, Property: Willard Munger State Trail, Barnum, Carlton County, Minnesota*. [no date].

59. MINNESOTA STATE HISTORIC PRESERVATION OFFICE. *SHPO Manual for Archaeological Projects in Minnesota*. July 2005.

60. MINNESOTA POLLUTION CONTROL AGENCY. *The air we breathe The state of Minnesota's air quality in 2021* Online. 2023. Available from: https://www.pca.state.mn.us/sites/default/files/lraq-2sy21.pdf

61. MINNESOTA DEPARTMENT OF HEALTH. *MDH Air Quality Index*.

62. U.S. ENVIRONMENTAL PROTECTION AGENCY. *Determination of Coronal Ozone Production by High Voltage Power Transmission Lines*. 1973.

63. U.S. ENVIRONMENTAL PROTECTION AGENCY CENTER FOR CORPORATE CLIMATE LEADERSHIP. *Emission Factors for GHG Inventories (June 2024 data)*. 5 June 2024.

64. STATE OF MINNESOTA OFFICE OF THE REVISOR OF STATUTES. *Sec. 216H.02 MN Statutes 2024*. Online. Available from: https://www.revisor.mn.gov/statutes/cite/216h.02

65. MINNESOTA POLLUTION CONTROL AGENCY DATA SERVICES. Minnesota's GHG emissions 2005-2020 and goals from the Next Generation Energy Act and Climate Action Framework. *Greenhouse gas emissions data*. Online. 27 January 2023. Available from: https://data.pca.state.mn.us/views/Greenhousegasemissionsdata/GHGsummarystory?%3Aembed=y&%3AisGuestRedirectFromVizportal=y

66. UNITED NATIONS. *What Is Climate Change - United Nations*. Online. [Accessed 5 December 2024]. Available from: https://www.un.org/en/climatechange/what-is-climate-change

67. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. Minnesota Climate Explorer. Online. [Accessed 31 July 2024]. Available from: https://arcgis.dnr.state.mn.us/climateexplorer/main/historical

68. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. *Historic mega-rain events in Minnesota*. Online. [Accessed 5 December 2024]. Available from: https://www.dnr.state.mn.us/climate/summaries_and_publications/mega_rain_events.html

69. FIRST STREET TECHNOLOGY, INC. *Pine County, MN Flood Map and Climate Risk Report _ First Street*. Online. [Accessed 5 December 2024]. Available from: https://firststreet.org/county/pine-county-mn/27115_fsid/flood

70. NATIONAL DROUGHT MITIGATION CENTER, UNIVERSITY OF NEBRASKA-LINCOLN. *Pine County, MN _ U.S. Drought Monitor*. Online. [Accessed 5 December 2024]. Available from: https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?fips_27115

71. FEDERAL EMERGENCY MANAGEMENT AGENCY. Map | National Risk Index. Online. [Accessed 26 December 2024]. Available from: https://hazards.fema.gov/nri/map

72. LUSARDI, Barbara A., GOWAN, Angela S., MCDONALD, Jennifer M., MARSHALL, Katherine J., MEYER, Gary N. and WAGNER, Kaleb G. *Geologic Map of Minnesota Quaternary Geology (State Map Series S-23)*. Online. [map]. University of Minnesota, Minnesota Geological Survey, 2019. Available from: https://hdl.handle.net/11299/208552

73. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. Karst Feature Inventory. Online. [Accessed 6 January 2023]. Available from: https://arcgis.dnr.state.mn.us/portal/apps/webappviewer/index.html?id=9df792d8f86546f2aafc98b3e31adb62

74. U.S. GEOLOGICAL SURVEY. Frequency of Damaging Earthquake Shaking Around the U.S. Online. Available from: https://www.usgs.gov/media/images/frequency-damaging-earthquake-shaking-around-us

75. U.S. GEOLOGICAL SURVEY. *Landslides in Minnesota*. March 2022.

76. U.S. GEOLOGICAL SURVEY SOUTHWESTERN WYOMING PROVINCE ASSESSMENT TEAM and ESRI. *USGS Landslide Inventory*. . [map]. [no date].

77. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. Minnesota groundwater provinces 2021. Online. [Accessed 6 June 2024]. Available from: https://www.dnr.state.mn.us/groundwater/provinces/index.html

78. ADAMS, Roberta. *Minnesota Hydrogeology Atlas: Depth to Water Table*. . [map]. Minnesota Department of Natural Resources, 2016. Minnesota Hydrogeology Atlas Series Atlas HG-03, Plate 2 of 2 Depth to Water Table.

79. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. *Minnesota Spring Inventory*. . [map]. [no date].

80. U.S. ENVIRONMENTAL PROTECTION AGENCY. *Sole Source Aquifers*. . [map]. [no date].

81. MINNESOTA DEPARTMENT OF HEALTH. Minnesota Well Index (MWI). Online. [Accessed 21 November 2024]. Available from: https://mnwellindex.web.health.state.mn.us/

82. MINNESOTA DEPARTMENT OF HEALTH. Source Water Protection Web Map Viewer. *Source Water Protection (SWP)*. Online. [Accessed 21 November 2024]. Available from: https://mdh.maps.arcgis.com/apps/View/index.html?appid=8b0db73d3c95452fb45231900e977be4

83. MINNESOTA DEPARTMENT OF HEALTH. *Special Well and Boring Construction Areas map*. . [map]. [no date].

84. BERG, James A. *Sensitivity to Pollution of the Uppermost Bedrock Aquifers*. . [map]. Geologic Atlas of Pine County, Minnesota : Minnesota Department of Natural Resources, 2004. County Atlas.

85. U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)*. Vicksburg, MS : U.S. Army Corps of Engineers, 2012. ERDC/EL TR-12-1.

86. MINNESOTA BOARD OF WATER AND SOIL RESOURCES. *Guidance on Reviewing Solar Panel Projects for Wetland Conservation Act (WCA) Compliance*. Online. 14 May 2021. Available from: https://bwsr.state.mn.us/sites/default/files/2021-05/Solar%20Project%20guidance%20doc%205-14-21.pdf

87. U.S. ENVIRONMENTAL PROTECTION AGENCY. Integrated Vegetation Management Fact Sheet. *Pesticide Environmental Stewardship Program*. Online. Available from: https://www.epa.gov/sites/default/files/2016-03/documents/ivm_fact_sheet.pdf

88. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. *Minnesota's Wildlife Action Plan 2015-2025*. Online. 2016. Division of Ecological and Water Resources, Minnesota Department of Natural Resources. Available from: https://www.dnr.state.mn.us/mnwap/index.html

89. HERPMAPPER.ORG, BELL MUSEUM OF NATURAL HISTORY, and MINNESOTA HERPETOLOGICAL SOCIETY. Minnesota Amphibian & Reptile Survey of Minnesota. Online. [Accessed 16 December 2024]. Available from: https://www.mnherps.com/

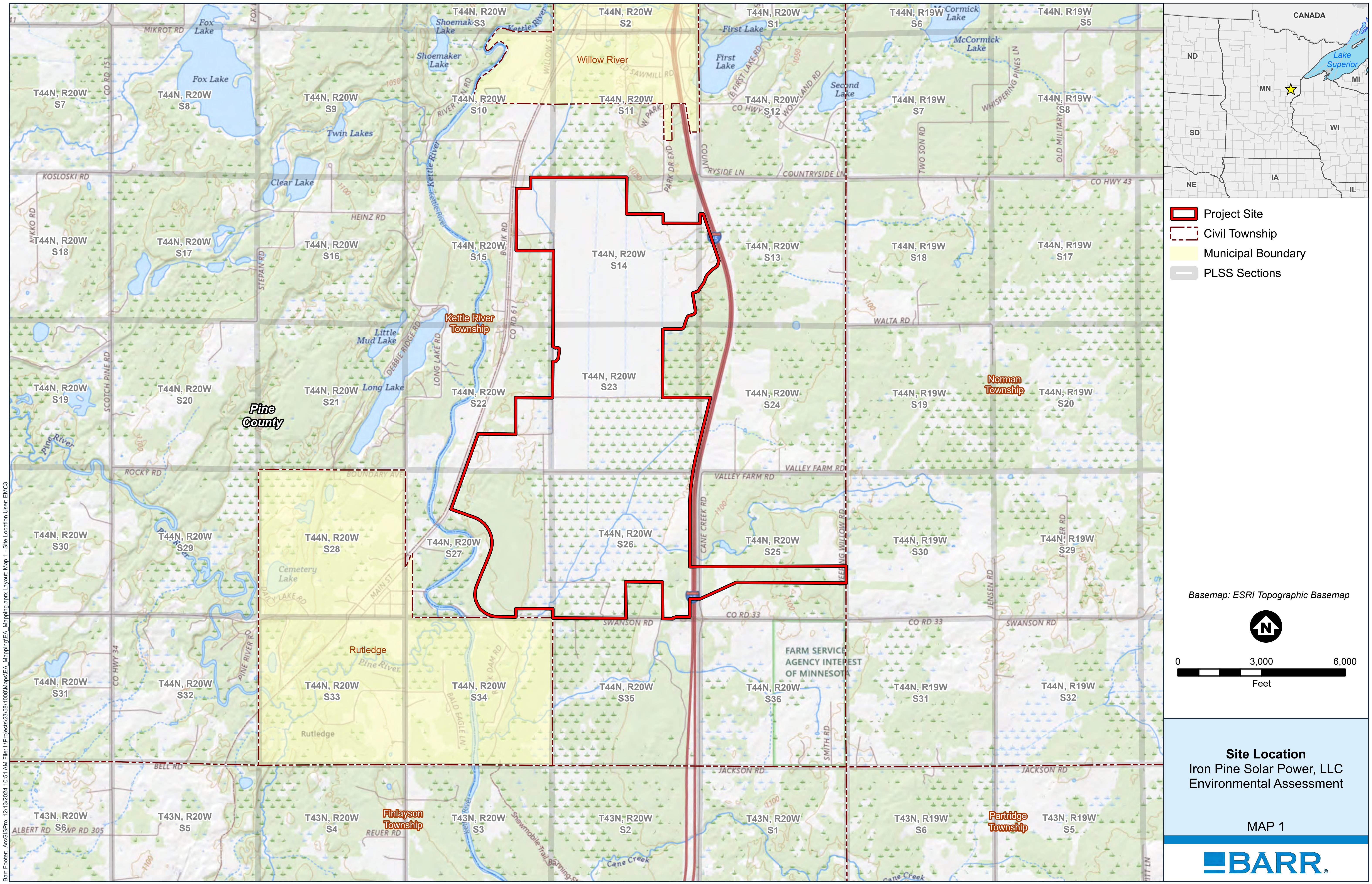
90. AUDUBON MINNESOTA. Minnesota Important Bird Areas. Online. [Accessed 12 December 2024]. Available from: https://mn.audubon.org/node/4281

91. HANOPHY, Wendy. *Fencing with Wildlife in Mind*. Online. 2009. Colorado Parks and Wildlife. Available from: https://wildlifefriendly.org/wp-content/uploads/2015/09/fencingwithwildlifeinmind_coloradodow.pdf

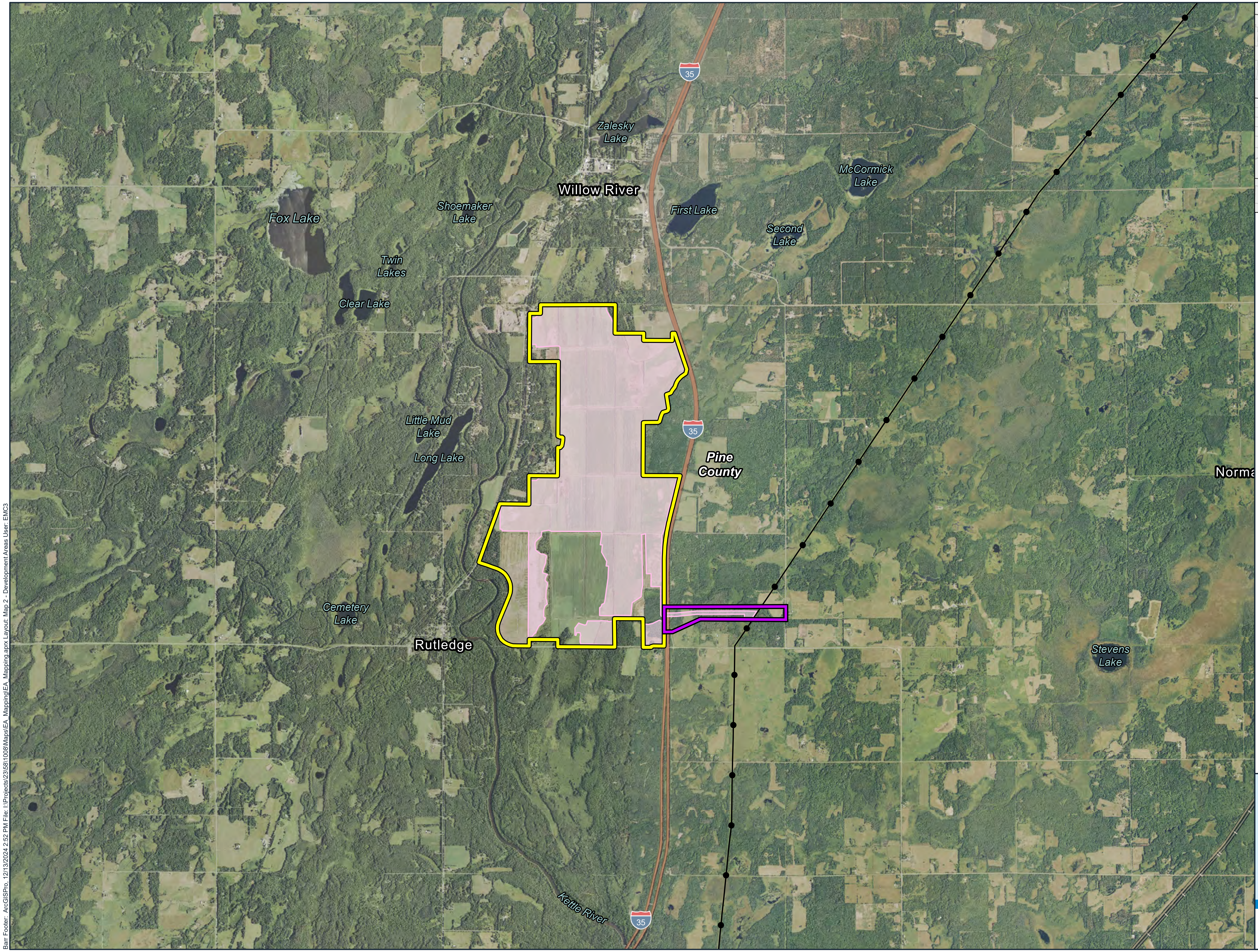
92. U.S. DEPARTMENT OF ENERGY. Artificial Intelligence Camera Captures Bird Behavior Around Solar Panels to Inform Siting and Conservation—Success Story. *Energy.gov*. Online. Available from: https://www.energy.gov/eere/solar/articles/artificial-intelligence-camera-captures-bird-behavior-around-solar-panelsTo support ecologically responsible solar deployment, Argonne National Laboratory developed a camera powered by artificial intelligence to see how birds interact with solar panels.

93. MINNESOTA DEPARTMENT OF NATURAL RESOURCES. Commercial Solar Siting Guidance. . February 2023.

Maps



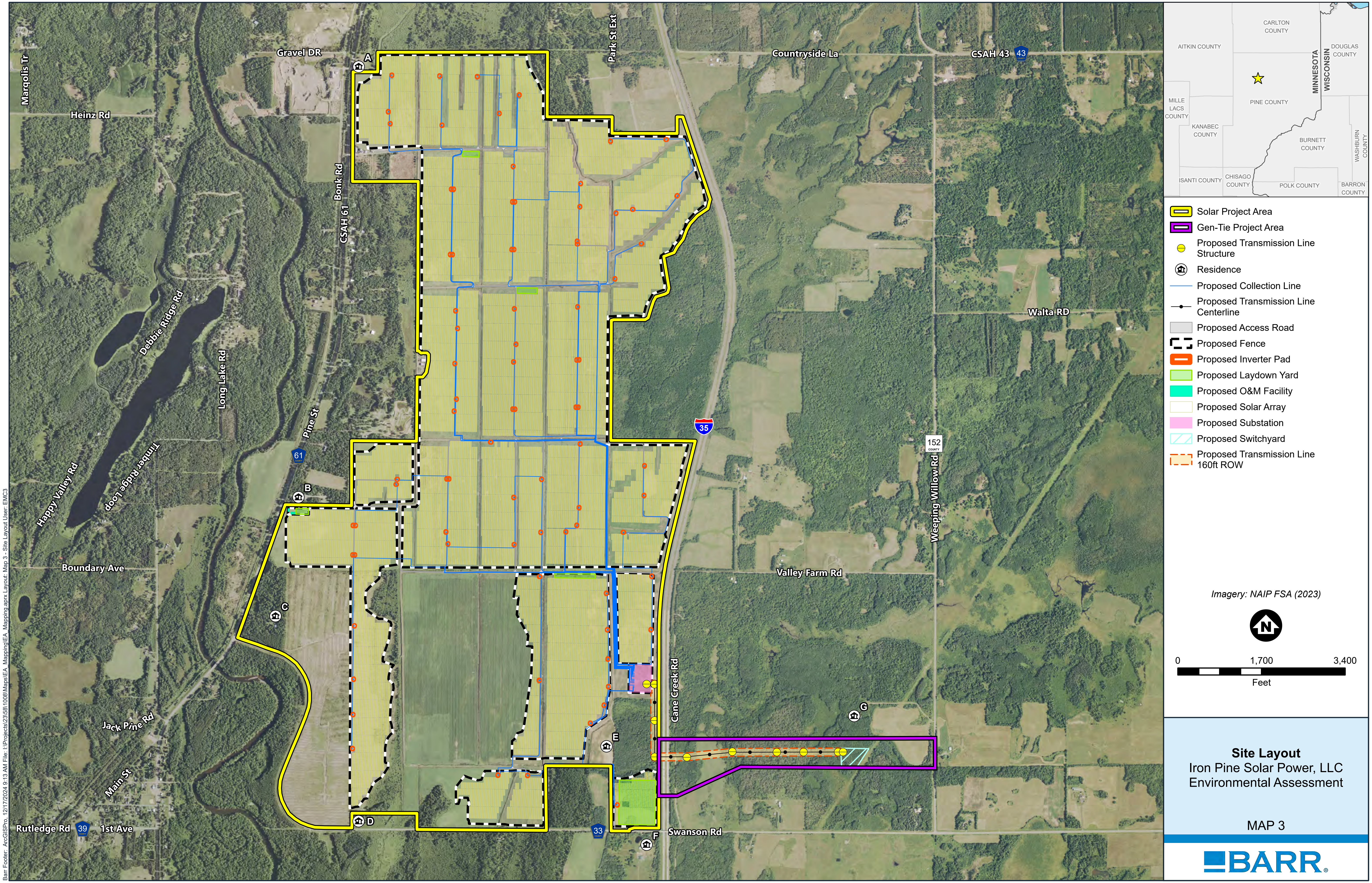
Project Site
Civil Township
Municipal Boundary
PLSS Sections
Basemap: ESRI Topographic Basemap
0
3,000
6,000
Feet
Willow River
Kettle River Township
Norman Township
Pine County
Rutledge
Finlayson Township
Partridge Township
FARM SERVICE AGENCY INTEREST OF MINNESOTA
Site Location
Iron Pine Solar Power, LLC
Environmental Assessment
MAP 1
Barr Footer: ArcGISPro, 12/13/2024 10:51 AM File: I:\Projects\23\58\1008\Maps\EA_Mapping\EA_Mapping.aprx Layout: Map 1 - Site Location User: EMC3



Development Areas
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 2

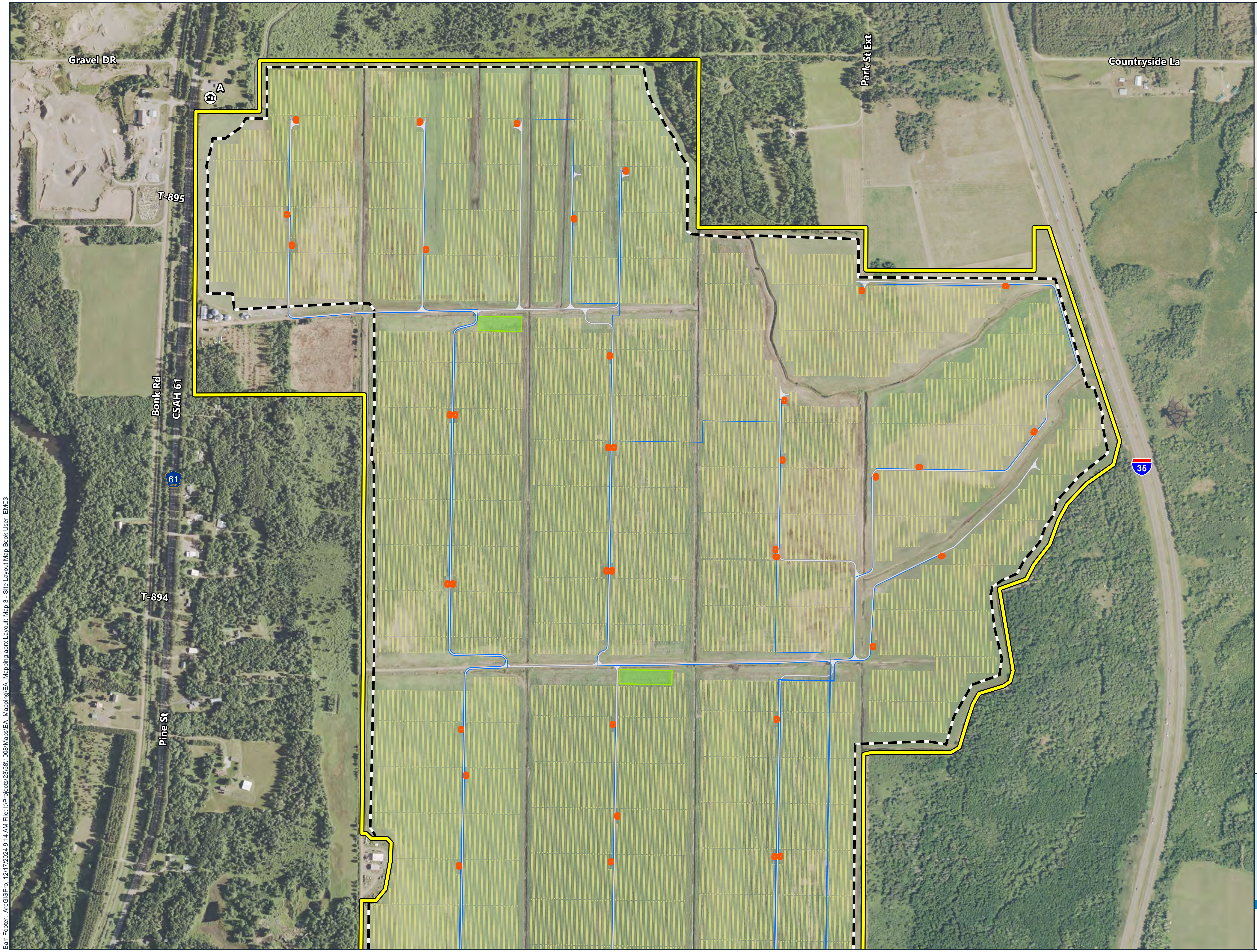
BARR

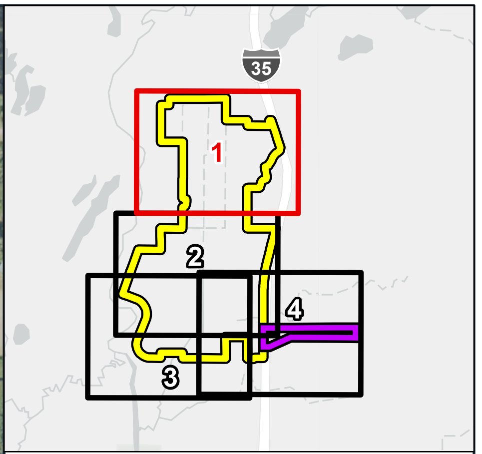


Site Layout
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 3

BARR





Solar Project Area
Residence
Proposed Collection Line
Proposed Access Road
Proposed Fence
Proposed Inverter Pad
Proposed Laydown Yard
Proposed Solar Array

Imagery: NAIP FSA (2023)

0 500 1,000
Feet

Site Layout
Iron Pine Solar Power, LLC
Environmental Assessment

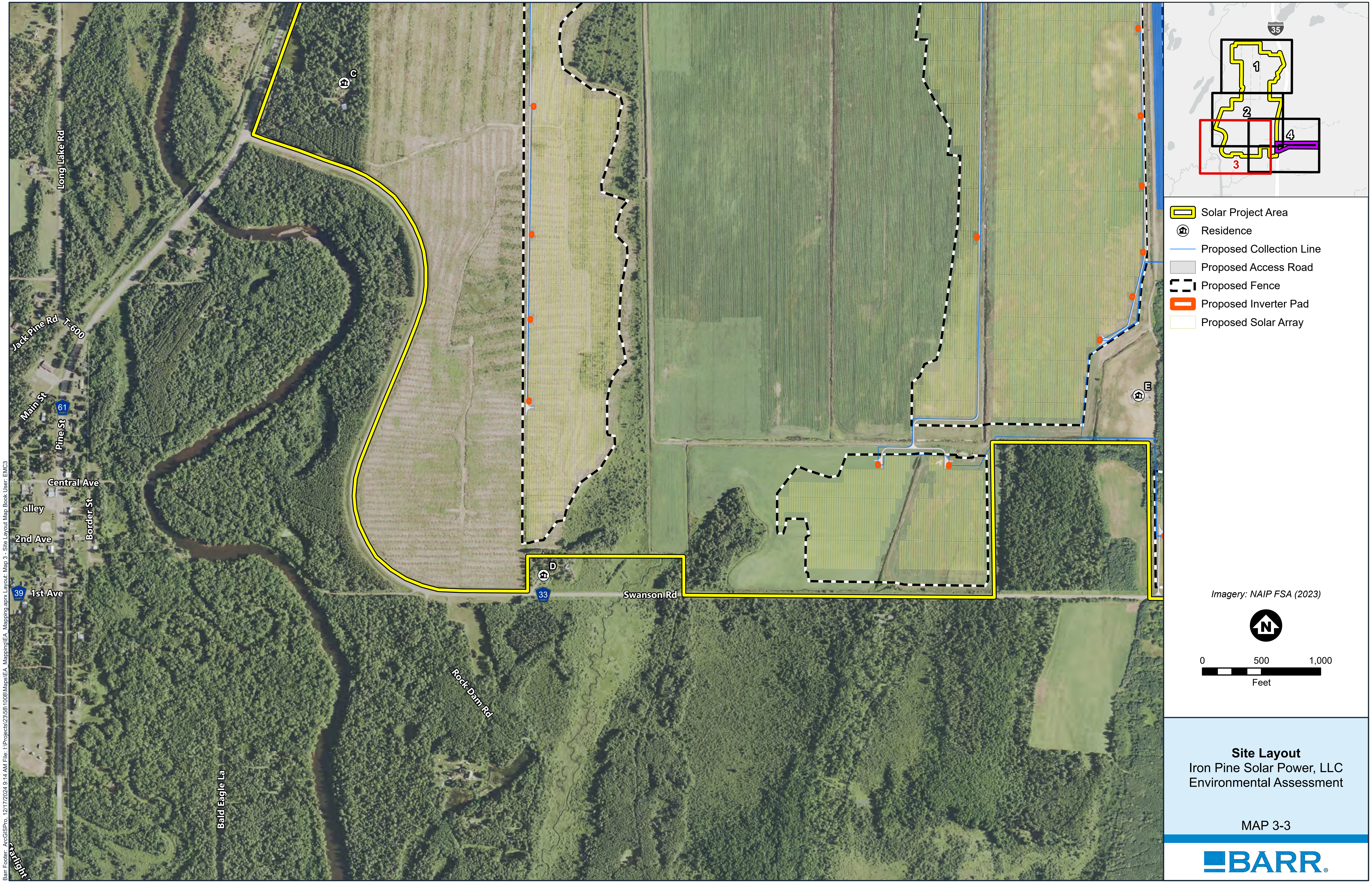
MAP 3-1

BARR

Site Layout
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 3-2

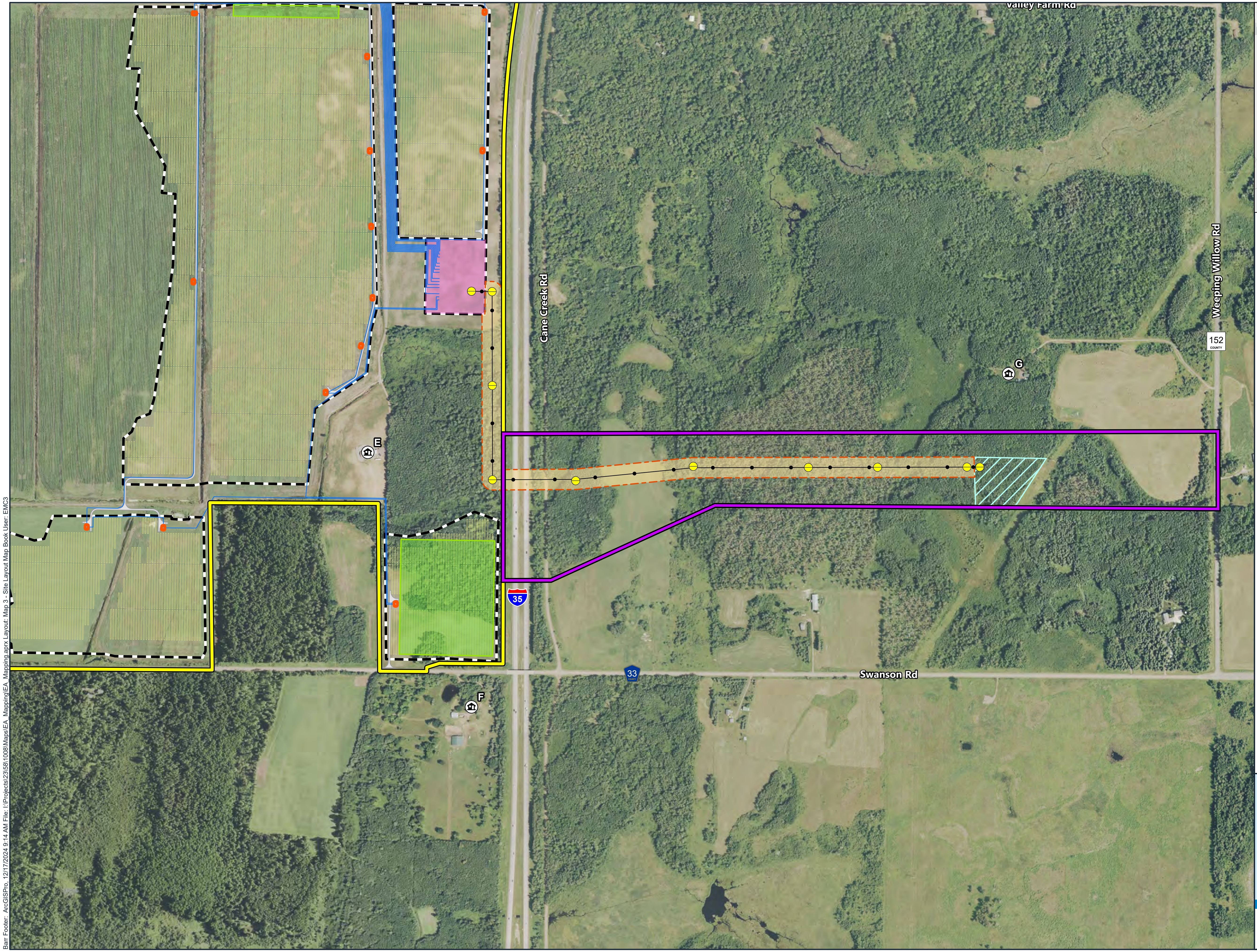
BARR

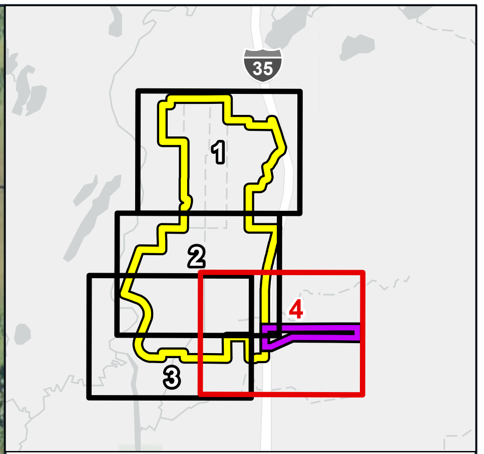


Site Layout
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 3-3

BARR





- Solar Project Area
- Gen-Tie Project Area
- Proposed Transmission Line Structure
- Residence
- Proposed Collection Line
- Proposed Transmission Line Centerline
- Proposed Access Road
- Proposed Fence
- Proposed Inverter Pad
- Proposed Laydown Yard
- Proposed Solar Array
- Proposed Substation
- Proposed Switchyard
- Proposed Transmission Line 160ft ROW

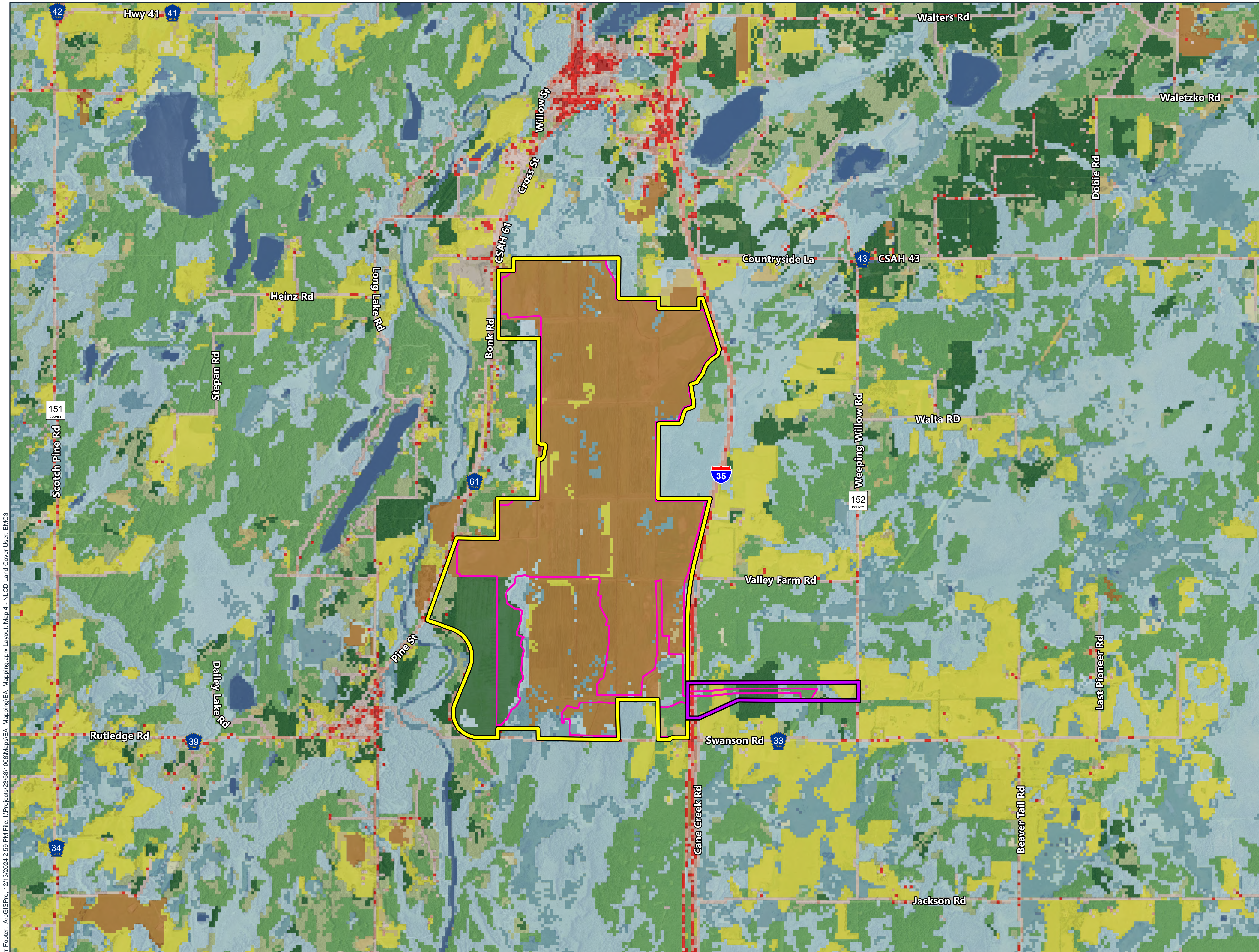
Imagery: NAIP FSA (2023)

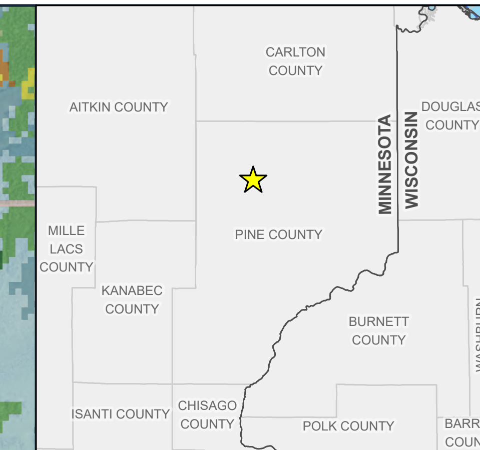
0 500 1,000
Feet

Site Layout
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 3-4

BARR





Solar Project Area
Gen-Tie Project Area
Development Area

National Land Cover, 2021

Barren Land
Cultivated Crops
Deciduous Forest
Developed, High Intensity
Developed, Low Intensity
Developed, Medium Intensity
Developed, Open Space
Emergent Herbaceous Wetlands
Evergreen Forest
Hay/Pasture
Herbaceous
Mixed Forest
Open Water
Shrub/Scrub
Woody Wetlands

Imagery: NAIP FSA (2023)

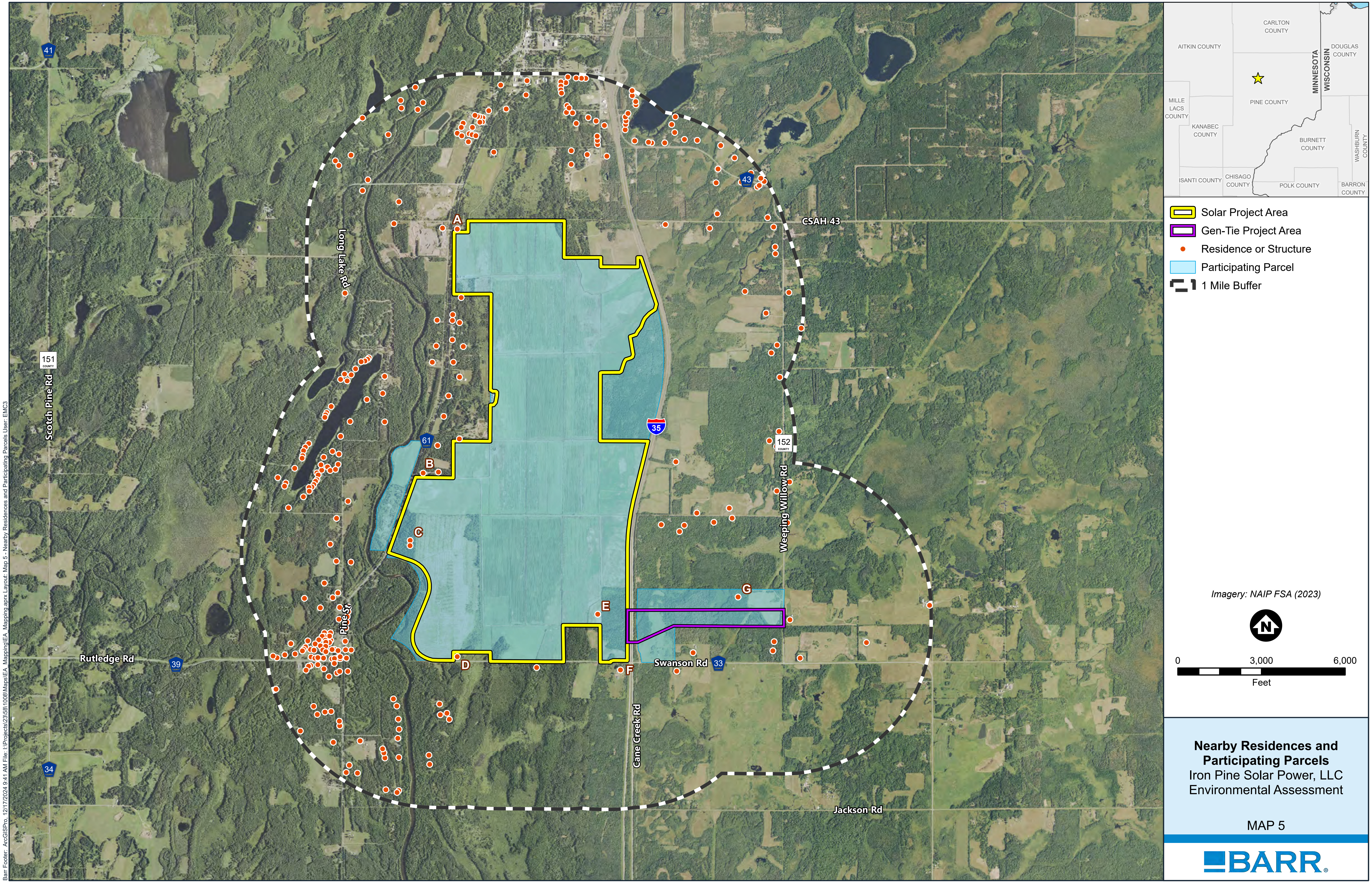
N

0 3,000 6,000
Feet

National Land Cover
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 4

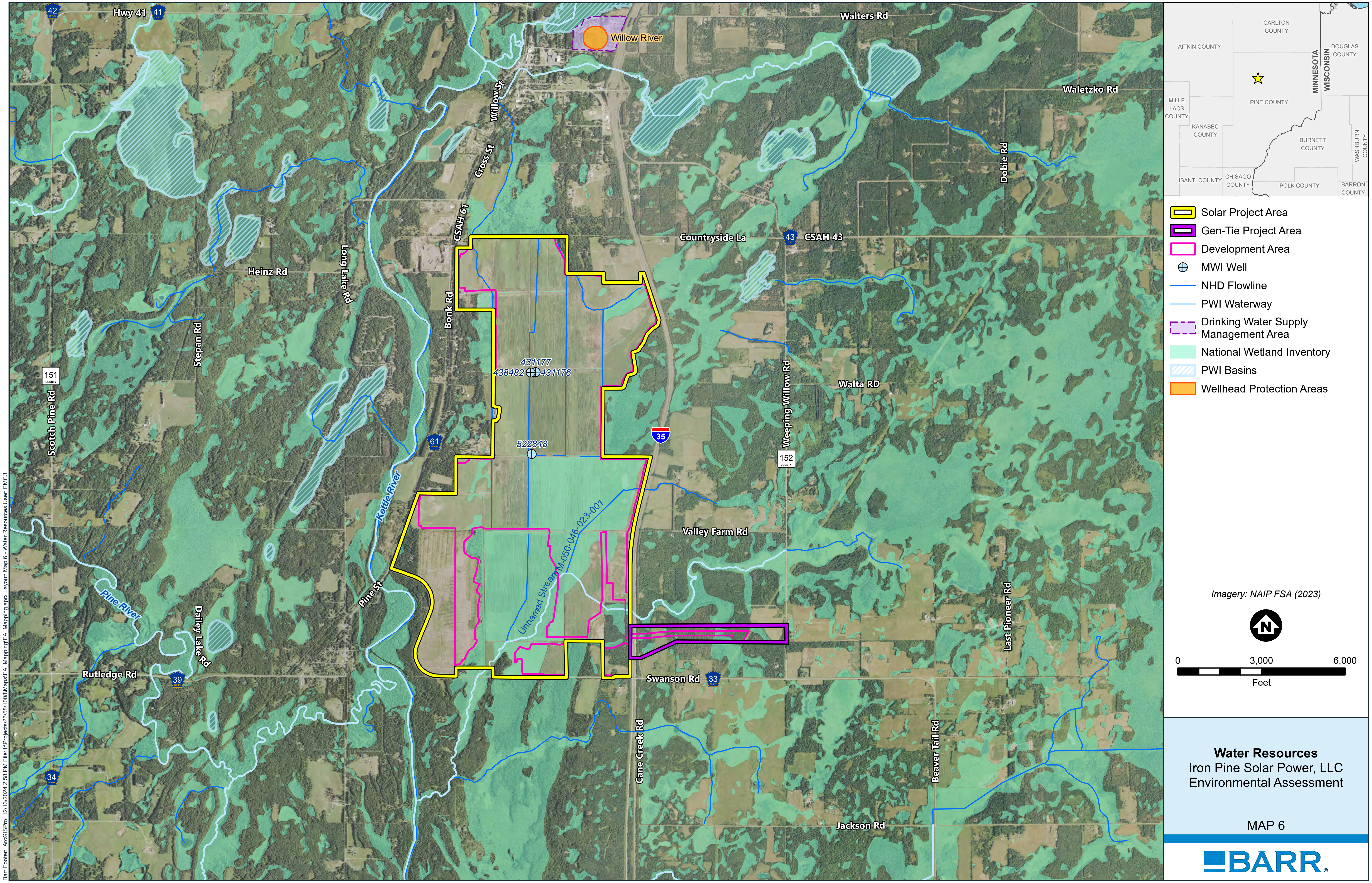
BARR



Nearby Residences and Participating Parcels
Iron Pine Solar Power, LLC
Environmental Assessment

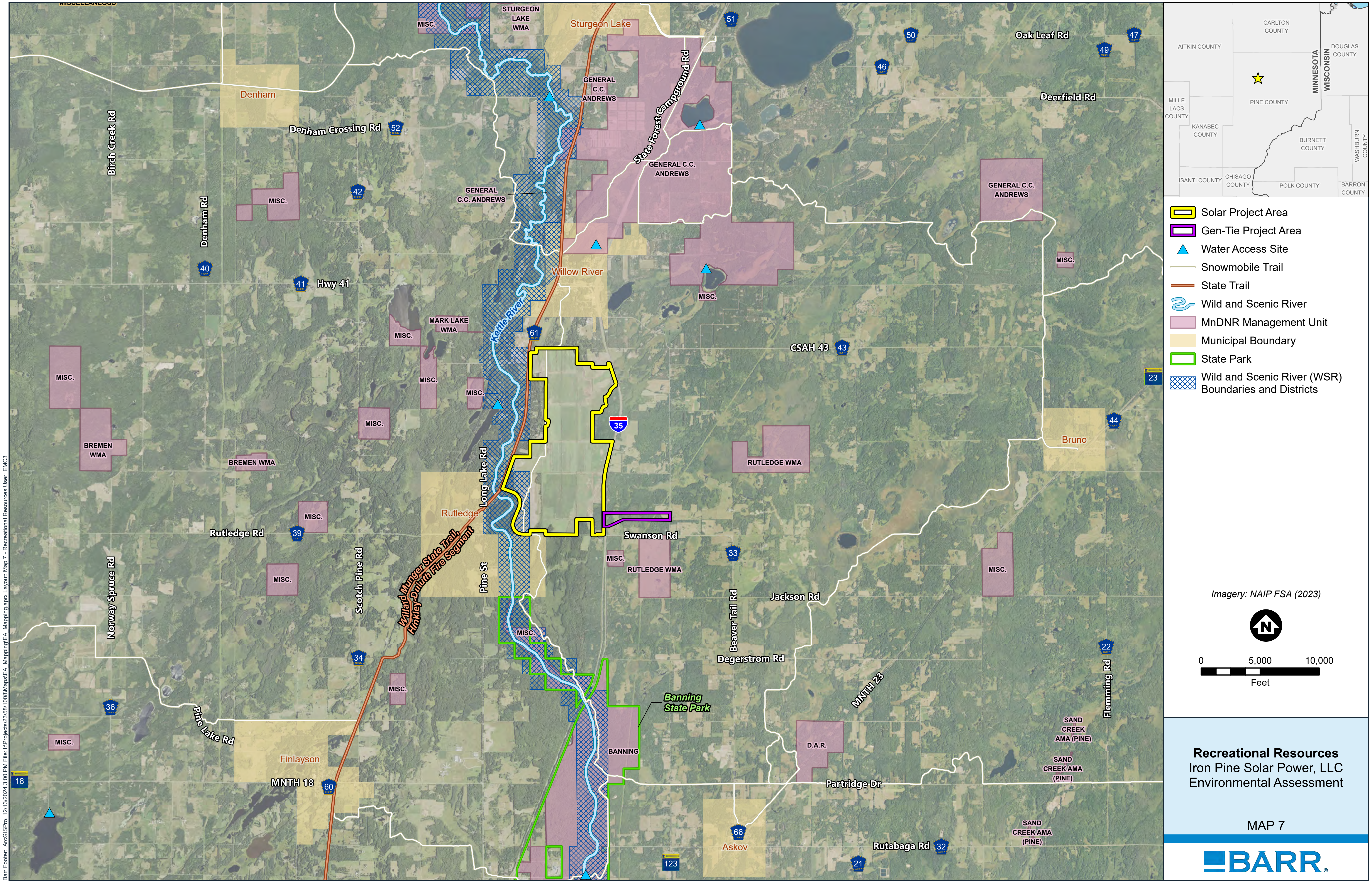
MAP 5

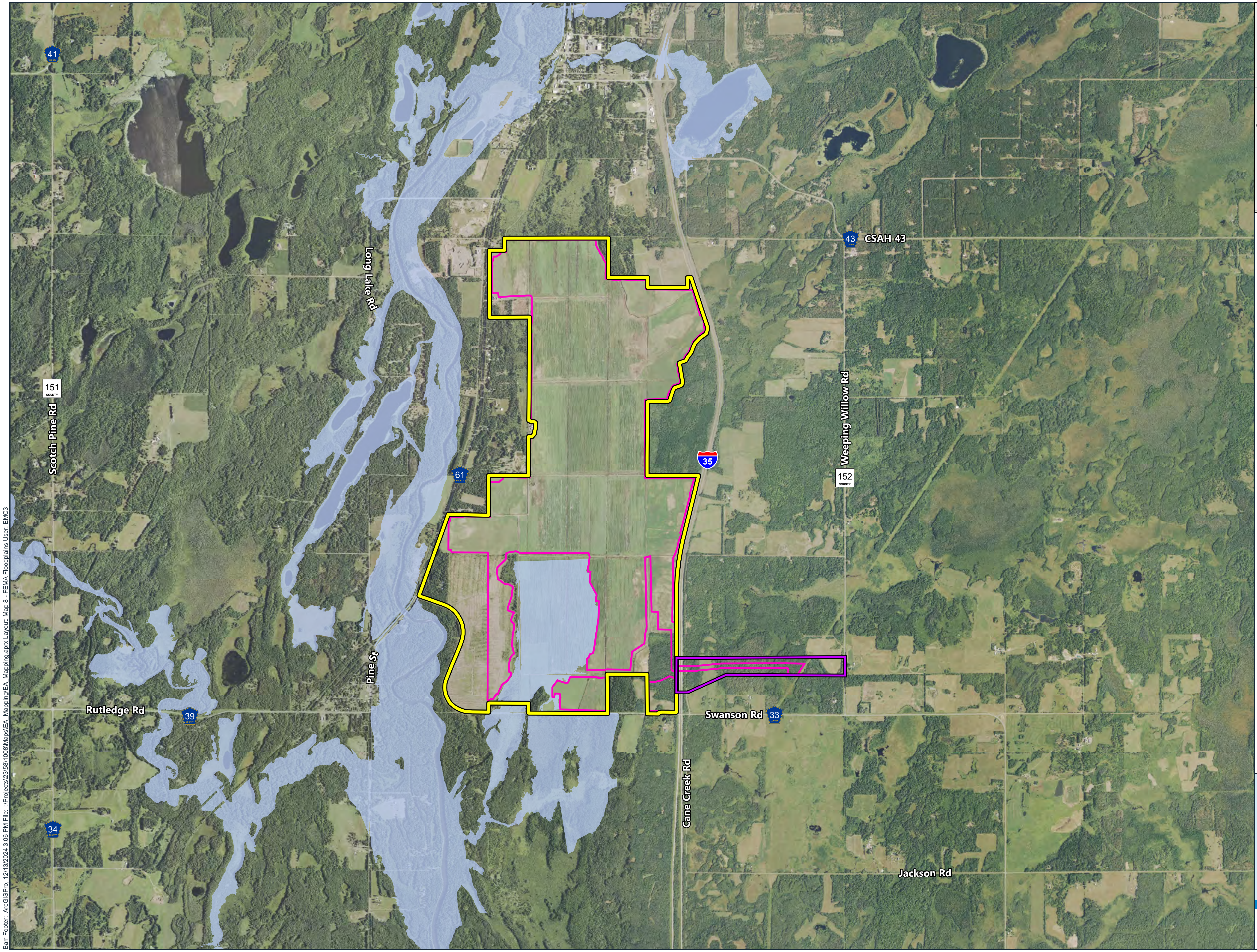
BARR

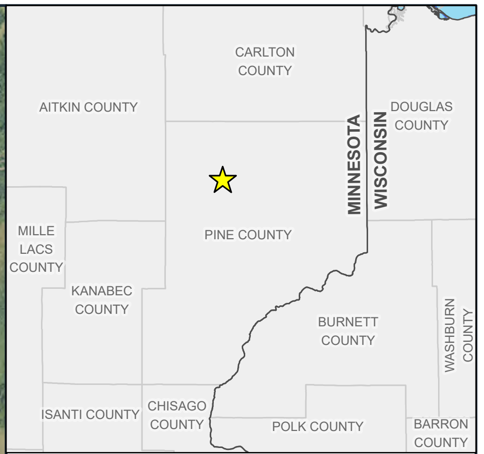


Water Resources
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 6


Solar Project Area
Gen-Tie Project Area
Water Access Site
Snowmobile Trail
State Trail
Wild and Scenic River
MnDNR Management Unit
Municipal Boundary
State Park
Wild and Scenic River (WSR) Boundaries and Districts
Imagery: NAIP FSA (2023)
0
5,000
10,000
Feet
AITKIN COUNTY
CARLTON COUNTY
DOUGLAS COUNTY
MINNESOTA
WISCONSIN
MILLE LACS COUNTY
PINE COUNTY
KANABEC COUNTY
BURNETT COUNTY
WASHBURN COUNTY
ISANTI COUNTY
CHISAGO COUNTY
POLK COUNTY
BARRON COUNTY
Sturgeon Lake
STURGEON LAKE WMA
Denham
Denham Crossing Rd
Birch Creek Rd
Denham Rd
Oak Leaf Rd
Deerfield Rd
State Forest Campground Rd
GENERAL C.C. ANDREWS
MISC.
Willow River
Hwy 41
Kettle River
MARK LAKE WMA
CSAH 43
BREMEN WMA
RUTLEDGE WMA
Bruno
Rutledge
Long Lake Rd
Rutledge Rd
Swanson Rd
Willard Munger State Trail, Hinckley-Duluth Fire Segment
Norway Spruce Rd
Scotch Pine Rd
Pine St
Beaver Tail Rd
Jackson Rd
Degerstrom Rd
MNTH 23
Flemming Rd
Banning State Park
BANNING
Pine Lake Rd
Finlayson
MNTH 18
D.A.R.
Partridge Dr
SAND CREEK AMA (PINE)
Askov
Rutabaga Rd
Recreational Resources
Iron Pine Solar Power, LLC
Environmental Assessment
MAP 7
BARR





Solar Project Area
Gen-Tie Project Area
Development Area
FEMA Flood Hazard Zone

Imagery: NAIP FSA (2023)

N

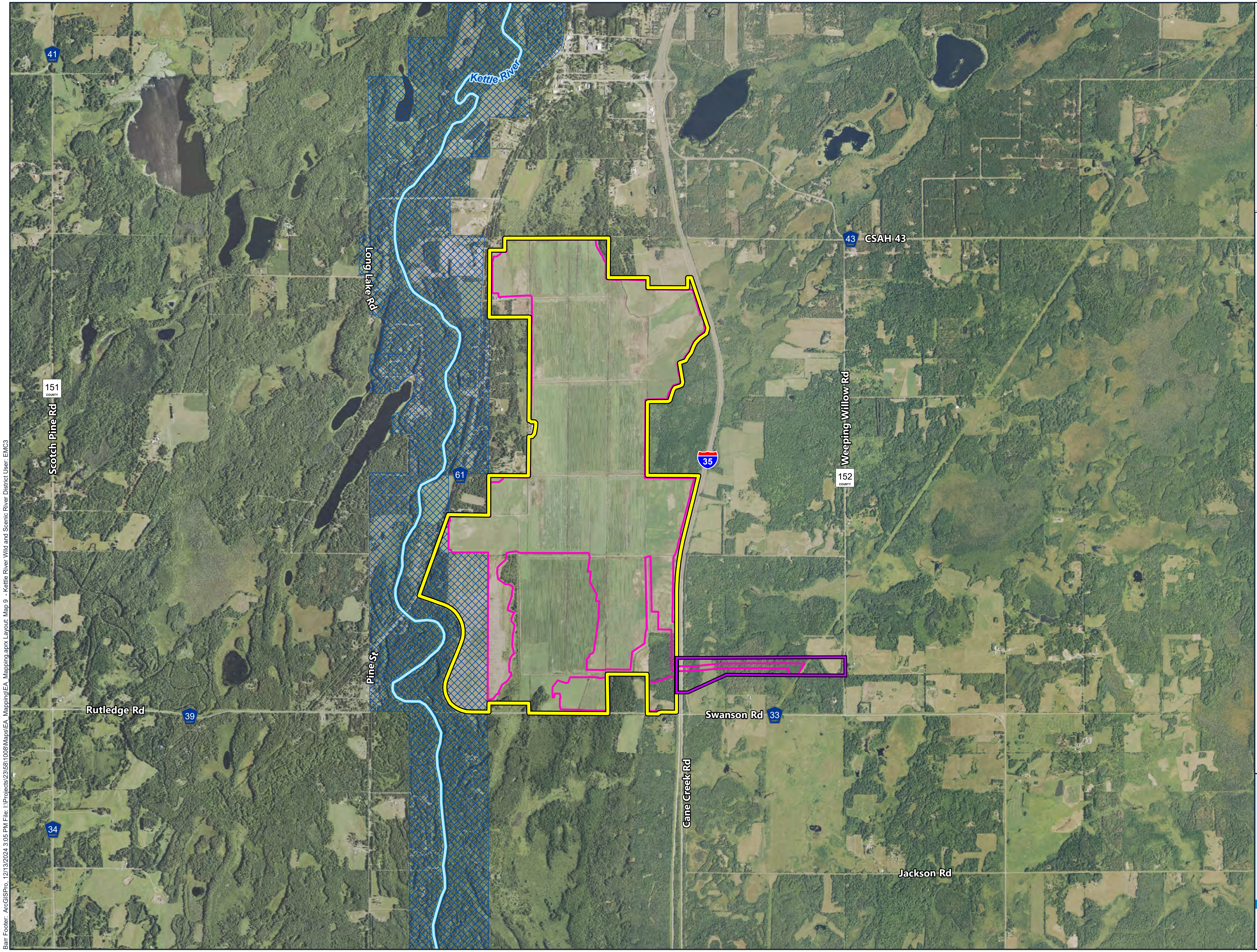
0 3,000 6,000
Feet

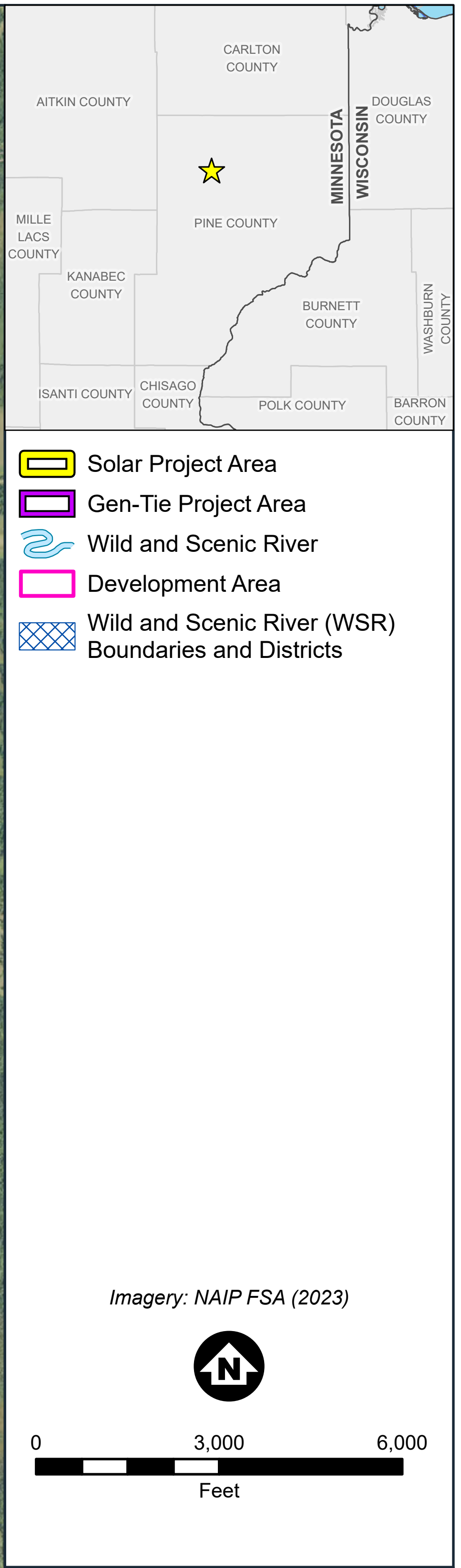
FEMA Floodplains
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 8

BARR

Barr Footer: ArcGISPro, 12/13/2024 3:06 PM File: I:\Projects\23\58\1008\Maps\EA_Mapping\EA_Mapping.aprx Layout: Map 8 - FEMA Floodplains User: EMC3

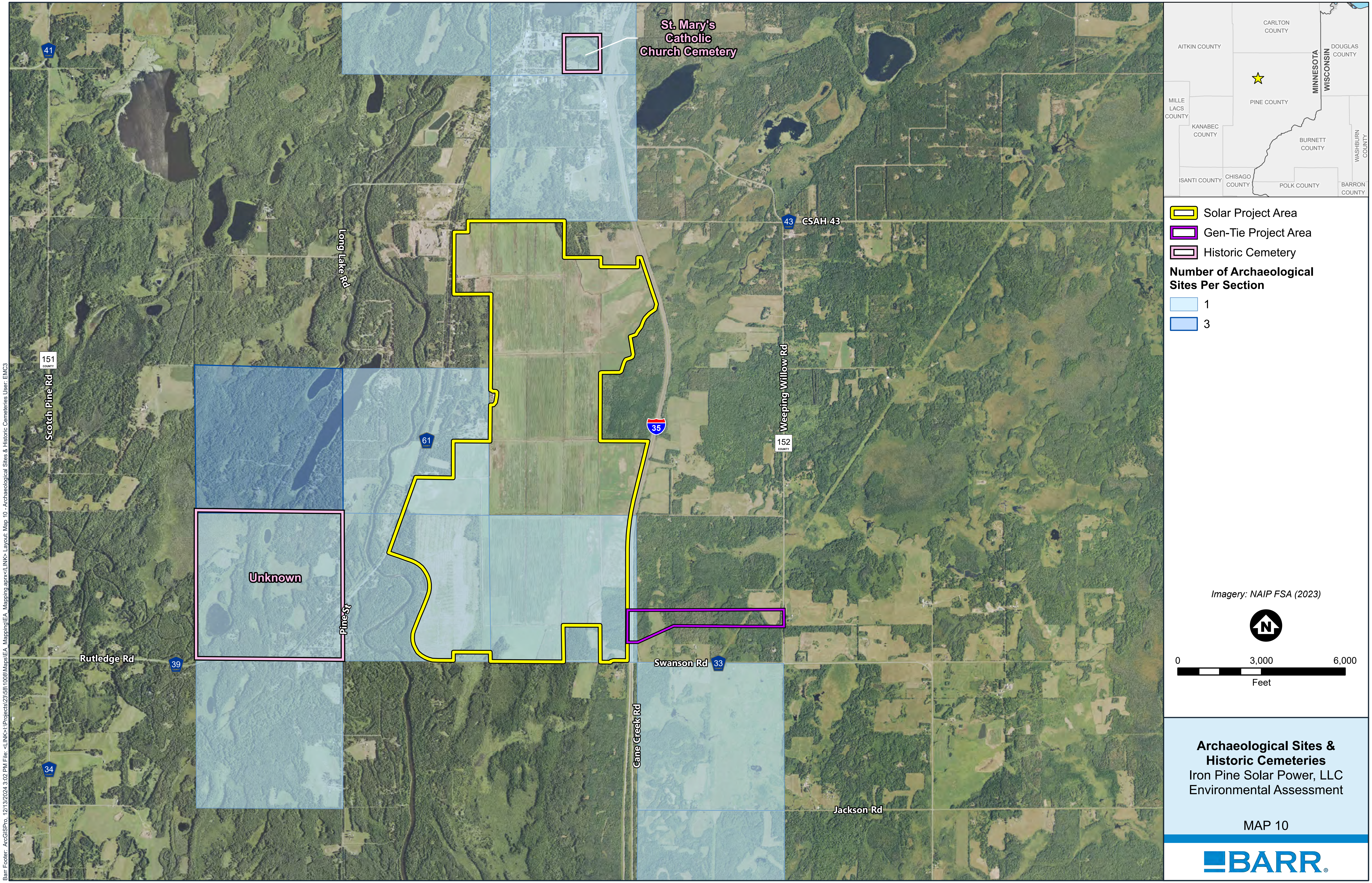




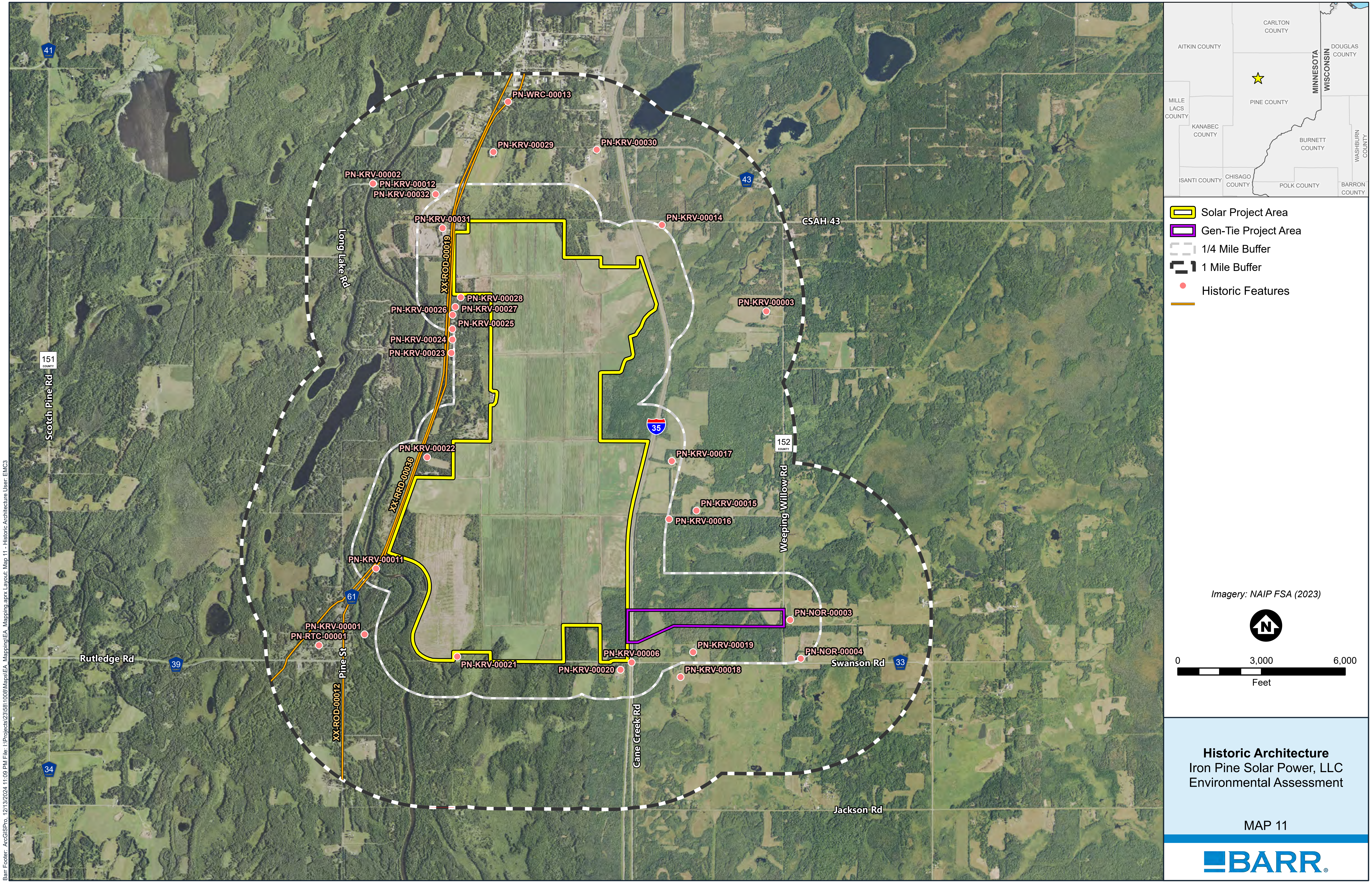
Kettle River Wild and Scenic River District
Iron Pine Solar Power, LLC
Environmental Assessment

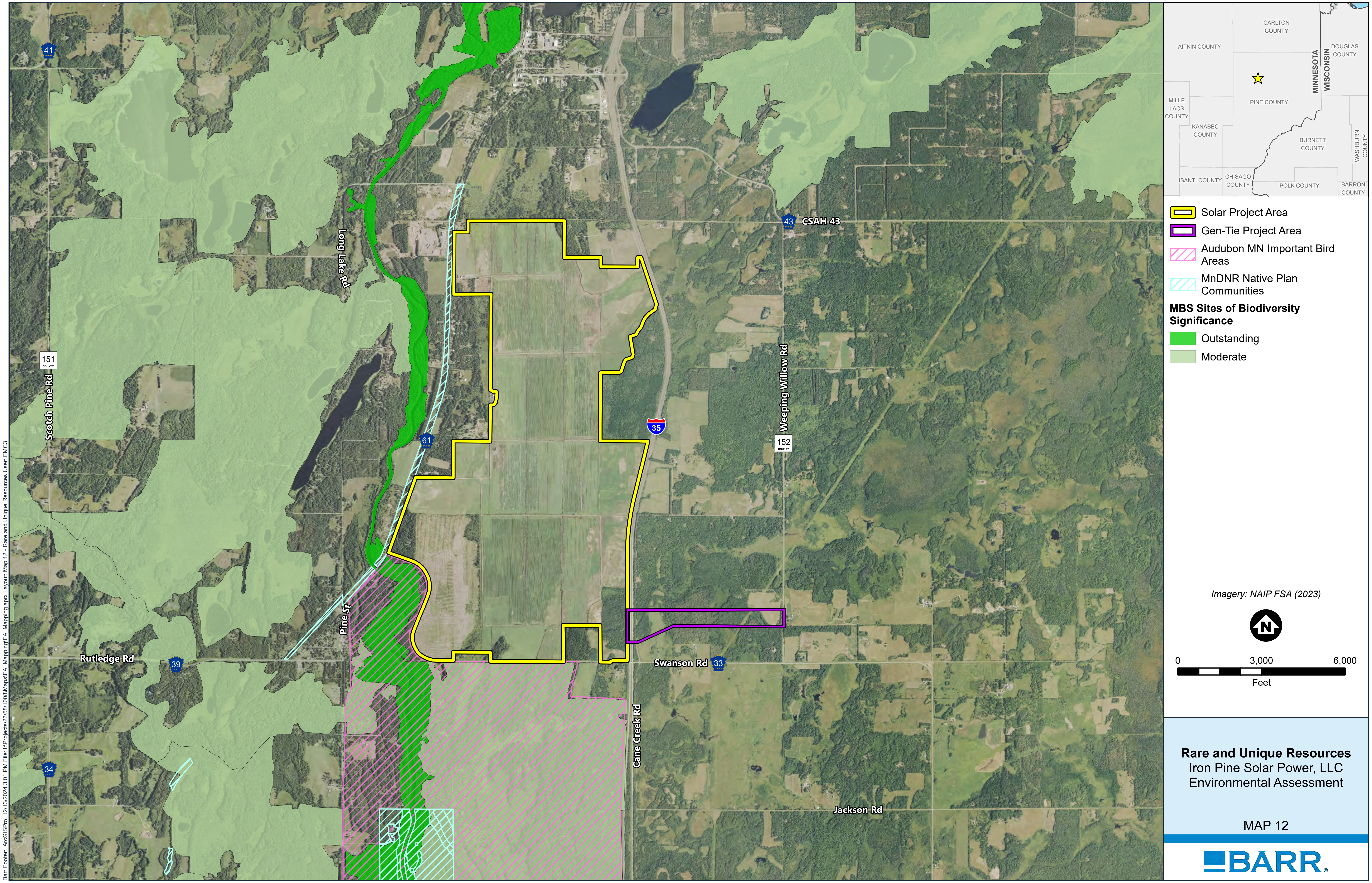
MAP 9

BARR



St. Mary's Catholic Church Cemetery
Unknown
Long Lake Rd
Scotch Pine Rd
Pine St
Rutledge Rd
Swanson Rd
Cane Creek Rd
Weeping Willow Rd
CSAH 43
Jackson Rd
41
151
61
39
33
34
35
43
152
CARLTON COUNTY
AITKIN COUNTY
DOUGLAS COUNTY
MINNESOTA
WISCONSIN
PINE COUNTY
MILLE LACS COUNTY
KANABEC COUNTY
BURNETT COUNTY
WASHBURN COUNTY
ISANTI COUNTY
CHISAGO COUNTY
POLK COUNTY
BARRON COUNTY
Solar Project Area
Gen-Tie Project Area
Historic Cemetery
Number of Archaeological Sites Per Section
1
3
Imagery: NAIP FSA (2023)
N
0
3,000
6,000
Feet
Archaeological Sites & Historic Cemeteries
Iron Pine Solar Power, LLC
Environmental Assessment
MAP 10
BARR


CARLTON COUNTY
AITKIN COUNTY
DOUGLAS COUNTY
MINNESOTA
WISCONSIN
MILLE LACS COUNTY
PINE COUNTY
KANABEC COUNTY
BURNETT COUNTY
WASHBURN COUNTY
ISANTI COUNTY
CHISAGO COUNTY
POLK COUNTY
BARRON COUNTY
Solar Project Area
Gen-Tie Project Area
1/4 Mile Buffer
1 Mile Buffer
Historic Features
Imagery: NAIP FSA (2023)
0
3,000
6,000
Feet
PN-WRC-00013
PN-KRV-00029
PN-KRV-00030
PN-KRV-00002
PN-KRV-00012
PN-KRV-00032
PN-KRV-00031
PN-KRV-00014
CSAH 43
43
41
Long Lake Rd
XX-ROD-00019
PN-KRV-00028
PN-KRV-00026
PN-KRV-00027
PN-KRV-00025
PN-KRV-00024
PN-KRV-00023
PN-KRV-00003
151
Scotch Pine Rd
35
152
PN-KRV-00022
PN-KRV-00017
XX-RRD-00036
PN-KRV-00015
PN-KRV-00016
Weeping Willow Rd
PN-KRV-00011
61
PN-NOR-00003
PN-KRV-00001
PN-RTC-00001
PN-KRV-00019
PN-NOR-00004
Rutledge Rd
39
Pine St
PN-KRV-00006
PN-KRV-00021
PN-KRV-00020
PN-KRV-00018
Swanson Rd
33
XX-ROD-00012
Cane Creek Rd
34
Jackson Rd
Historic Architecture
Iron Pine Solar Power, LLC
Environmental Assessment
MAP 11
BARR



Rare and Unique Resources
Iron Pine Solar Power, LLC
Environmental Assessment

MAP 12

BARR

Appendices

Appendix A

Scoping Decision

COMMERCE DEPARTMENT

In the Matter of the Application of Iron Pine Solar, LLC for a Site Permit and Route Permit for the up to 325 MW Iron Pine Solar Project and 230 kV Transmission Line in Pine County, Minnesota

ENVIRONMENTAL ASSESSMENT SCOPING DECISION

DOCKET NOS. IP-7114/GS-23-414, TL-23-415

The above matter has come before the Commissioner of the Department of Commerce (Department) for a decision on the scope of the environmental assessment (EA) to be prepared for Iron Pine Solar, LLC's proposed 325 megawatt (MW) solar energy project and 230 kilovolt (kV) transmission line in Pine County, Minnesota.

Project Description

On May 15, 2024, Iron Pine Solar Power, LLC (Iron Pine Solar) submitted a joint site and route permit application to the Minnesota Public Utilities Commission (Commission) to construct the Iron Pine Solar Project, an up to 325 MW alternating current photovoltaic solar energy generating facility and connect it to the existing electrical grid.[1]

The project would occupy approximately 1,537 acres in Kettle River Township, south of the town of Willow River and northeast of the town of Rutledge in Pine County, Minnesota. The project would use photovoltaic solar panels mounted on single axis tracking systems. Underground collection cables would gather and direct the electric power generated by the solar panels to a project substation. Iron Pine Solar would construct a new 230 kV transmission line and switching station to connect the project substation to the existing Minnesota Power 230 kV Arrowhead-Bear Creek transmission line, approximately one mile from the project substation.[2]

Construction is anticipated to begin in 2026 and operation anticipated to start in late 2027.[3]

Project Purpose

The Iron Pine Solar Project would generate up to 325 MW of energy at the Iron Pine solar facility and deliver the power to the Midcontinent Independent System Operator (MISO). The applicant is proposing to construct this facility to sell energy, capacity, and renewable energy credits, either bundled or unbundled, to one or more electric utilities or commercial customers. Iron Pine Solar is actively marketing the project to a number of potential off-takers and may sell the power in the form of a Power Purchase Agreement, virtual power purchase agreement, or similar contract, or the project could be owned directly by a utility.[4]

---

[1] Iron Pine Solar Project Joint Application to the Minnesota Public Utilities Commission for a Site Permit for a Solar Large Electric Generating Facility and a Route Permit for a High Voltage Transmission Line, May 15, 2024, eDockets Document Nos. 20245-206772-03 through 20245-206772-20; 20245-206773-01 through 20245-206773-20; 20245-206777-01 through 20245-206777-12; and 20245-206778-01 through 20245-206778-18 (Application).

[2] Application, Section 1.0.

[3] Ibid.

[4] Application, Section 1.1.

Regulatory Background

Per Minnesota Statute 216E.03, no person may construct a large electric generating plant in Minnesota without a site permit from the Commission.[5] As proposed, the Iron Pine Solar facility would be capable of operating at up to 325 MW and would require a site permit from the Commission. Because the project is powered by solar energy, the site permit application qualifies for Commission review under the alternative permitting process described in Minnesota Statute 216E.04.[6]

Additionally, no person may construct a high voltage transmission line in Minnesota without a route permit from the Commission.[7] As proposed, the transmission line would consist of approximately one mile of new 230 kV transmission line and therefore requires a route permit from the Commission. Transmission line projects greater than 200 kV and less than 5 miles in length qualify for the alternative permitting process.[8]

Minnesota Statue 216B.243 precludes construction of any large energy facility without a certificate of need (CN) from by the Commission.[9] Solar energy generating systems proposed by an independent power producer are exempt from a CN.[10] Transmission lines operating at a voltage of 230 kV and less than 10 miles in length do not require a CN.[11] Thus, the Iron Pine Solar Project does not require a CN.

Department of Commerce, Energy Environmental Review and Analysis (EERA) staff is responsible for conducting environmental review for site permit and route permit applications submitted to the Commission.[12] EERA staff will prepare an environmental assessment (EA) for the project. An EA contains an overview of the resources affected by the project. It also discusses potential human and environmental impacts and possible mitigation measures. Under the alternative permitting process, an EA is the only required state environmental review document.[13]

Scoping Process

Scoping is the first step in the environmental review process. The scoping process has two primary purposes: (1) to gather public input as to the impacts and mitigation measures to study in the EA and (2) to focus the EA on those impacts and mitigation measures that will aid in the Commission's decision on whether to issue a site permit and route permit for the project.

Staff use the information gathered during scoping to inform the content of the EA. EERA staff gathered input on the scope of the EA through public meetings and an associated comment period. This scoping decision identifies the impacts and mitigation measures that will be analyzed in the EA.

---

[5] Minn. Stat. 216E.03 Subd. 1.
[6] Minn. Stat. 216E.04 Subd. 2 (8).
[7] Minn. Stat. 216E.03 Subd. 2.
[8] Minn. Stat. 216E.04 Subd. 2 (4).
[9] Minn. Stat. 216B.243 Subd. 2.
[10] Minn. Stat. 216B.243, Subd. 8 (7).
[11] Minn. Stat. 216B.2421, Subd. 2.
[12] Minnesota Rule 7850.3700.
[13] Minnesota Statute 216E.04, subd. 5; Minn. Rule 7850.3700, subp. 4.

Public Information and Scoping Meetings

On July 24, 2024, Commission and EERA staff jointly held a public information and scoping meeting in Sandstone, Minnesota, and an on-line meeting was held on July 25, 2024.[14] Approximately 40 people attended the in-person public meeting and five people offered oral comments.[15] Three people attended the on-line meeting and one public agency requested information from the applicant.[16] In addition to the oral comments received at the public meetings, EERA received written comments from three persons.

At the in-person meeting on July 24, 2024:

- James LeBlanc spoke about aesthetics, construction noise, and property values.
- Nancy Banta expressed similar concerns about aesthetics, construction noise, and property values. She also noted concerns regarding public health and loss of wildlife. She questioned who would be using the electricity, what would be the effect on rates, if there would be a financial benefit to the adjacent landowners, and if the land was being leased.
- Rod Eslinger spoke about property values, heat generated from panels affecting adjacent landowners, and the weather.
- Pete Derungs asked about any hazardous materials in solar panels and the potential to affect groundwater.
- Girard Bennet, Willow River Fire Department, asked about local tax funding for the project, fire department access outside the perimeter fence, the potential for a wildfire on site to spread to town; and on-site staff availability in cases of emergency.

Scoping Comment Letters

A comment period ending on August 7, 2024, provided the public with an opportunity to provide written comments on the scope of the EA.

The Minnesota Department of Transportation (MnDOT) submitted a comment letter[17] to bring attention to the following areas of concern:

- Maintaining a visual barrier along I-35 to reduce motorist visual distractions and address other important safety concerns;
- The effect of the project's vegetation removal on the performance of an existing structural snow fence;
- MnDOT's required height clearances for transmission line crossing of trunk highway and Interstate rights-of-way modify those published in the National Electric Safety Code and must be adhered to;
- Installation of electrical transmission triggers the need to protect existing structural snow fences by installing further grounding measures, as per MnDOT 2557 Standard Specification Book; and

---

[14] Notice, eDockets Document Nos. 20247-208526-01 and 20247-208526-02.
[15] Public Comments, eDocket Document Nos. 20248-209565-01 and 20248-209565-02.
[16] Public Comments, eDocket Document Nos. 20248-209565-03 and 20248-209565-04.
[17] Comments, eDockets Document Nos. 20248-209326-01 and 20248-209326-02.

- Coordination with MnDOT by the applicant for a Utility Permit and other permissions will be required.

LIUNA Minnesota and North Dakota submitted a letter[18] requesting the EA assess the extent to which construction, operation and maintenance jobs are created or preserved by the proposed facility, including priorities recently established by the legislature:

- Employ Minnesota residents and/or individuals who permanently reside within 150 miles of the facility ("local workers" as defined in statute) vs. non-local workers;
- Provide "wages that support families" and respect "the rights of workers to organize and unionize"; and
- Support participation by residents of environmental justice areas and individuals that live in or near facility host communities.

The Minnesota Department of Natural Resources (DNR) submitted a letter[19] requesting the EA assess the project's potential impacts to the following resources:

- Recreation:
  - The Willard Munger State Trail;
  - Kettle River State Water Trail; and
  - Grant-in-Aid snowmobile trails that pass through the project area, such as trail 187 that runs north to south within the west side of the project area.
- Wildlife, Habitat, and Rare Species:
  - Wild and Scenic River considerations, as the project is adjacent to the Kettle River Wild and Scenic River District;
  - Protection of Wood and Blanding's turtles, with particular attention to fencing;
  - Protection of State-threatened mussels, including preparation of an avoidance plan, if the project impacts the Kettle River;
  - Bird collision and mortality from concentrated solar thermal devices and collision with transmission lines; and
  - Vegetation management plan, as it relates to chemicals, fertilizers, pollinators, mowing, grazing livestock, and planting of native seed mixes.

Applicant's Response to Public Comments

On August 7, 2024, Iron Pine Solar responded to comments received prior to August 5, and submitted reply comments on August 14, 2024.[20] Iron Pine Solar provided two project updates:

[18] Comments, eDockets Document Nos. 20248-209335-01 and 20248-209335-02.
[19] Comments, eDockets Document Nos. 20248-209338-01 and 20248-209338-02.
[20] Iron Pine Comments and Reply Comments, eDocket Nos. 20248-209331-01, 20248-209331-02, 20248-209484-01, and 20248-209484-02.

1. The MISO interconnection process is experiencing delays. Iron Pine Solar is continuing to evaluate the impact of MISO delays on the anticipated timeframe for execution of a Generator Interconnection Agreement. As part of that evaluation, Iron Pine Solar is analyzing battery storage at the point of interconnection. Adding battery storage to the project scope may require additional permits and approvals for the facility.

2. Iron Pine Solar determined that there is a narrow parcel of tax forfeit land between the road right-of-way and a participating parcel that is crossed by the proposed 230 kV transmission line for which Iron Pine Solar did not previously have an easement or other land rights. Iron Pine Solar is coordinating with Pine County to obtain the rights needed for the transmission line crossing of this parcel.

In addition, Iron Pine Solar provided responses to verbal comments made at the public meetings and to written public comments received:

- Iron Pine Solar does not object to the following being studied in the EA:
  - Effects to recreational trails in the area;
  - Maintaining existing vegetation between the project and the I-35 right-of-way; and
  - Considerations identified by LIUNA.

- Iron Pine Solar committed to ongoing coordination with:
  - Neighboring landowners regarding potential visual impacts and construction impacts;
  - Local authorities regarding emergency response;
  - The Northern Pine Riders, the club responsible for maintaining the snowmobile trail MDNR referenced, to re-route the existing snowmobile trail;
  - With MDNR, regarding protected species;
  - The appropriate wildlife agencies to identify locations where marking devices, including avian flight diverters, may be installed; and
  - With MnDOT to minimize the project's impact on blowing snow.

- Iron Pine Solar referenced their joint application regarding the following items:
  - The implementation and maintenance of effective erosion and sediment control measures to protect downstream water quality, including the Kettle River.
  - The project's Vegetation Management Plan includes pollinator-friendly vegetation management practices.

Iron Pine Solar also clarified the project would use photovoltaic modules and would not use concentrated solar thermal devices.

Commission Review

After close of the public comment period, EERA staff provided a letter to the Commission stating no alternative sites were identified for the Iron Pine Solar facility nor alternative routes for the associated

230 kV transmission line.[21] On August 27, 2024, the Commission authorized EERA to include in the scoping decision for the EA solely the site and route for the project identified by Iron Pine Solar.[22]

HAVING REVIEWED THE MATTER, consulted with EERA staff, and in accordance with Minnesota Rule 7850.3700, I hereby make the following scoping decision:

MATTERS TO BE ADDRESSED

The EA will describe the project and the human and environmental resources of the project area. It will provide information on the potential impacts of the project as they relate to the topics outlined in this scoping decision and possible mitigation measures. It will identify impacts that cannot be avoided and irretrievable commitments of resources, as well as permits from other government entities that may be required for the project. The EA will discuss the relative merits of the proposed project with respect to the siting and routing factors in Minnesota Rule 7850.4100.

The topics listed below will be analyzed in the EA for the project. This outline is not intended to serve as a table of contents for the document itself.

I. GENERAL DESCRIPTION OF THE PROJECT
- A. Project Description
- B. Project Purpose
- C. Project Costs

II. REGULATORY FRAMEWORK
- A. Site Permit
- B. Route Permit
- C. Environmental Review Process
- D. Other Permits and Approvals

III. ENGINEERING, DESIGN, AND CONSTRUCTION
- A. Solar Arrays
- B. Electrical Collection Systems
- C. Substation
- D. Transmission Structures
- E. Switching Station
- F. Construction
- G. Restoration

IV. OPERATION AND DECOMMISSIONING
- A. Maintenance
- B. Vegetation Management

[21] Letter, eDockets Document No. 20248-209570-01 and 20248-209570-02.
[22] Order, eDockets Document No. 20248-209792-01, 20248-209792-02.

C. Repowering and Decommissioning

V. AFFECTED ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATIVE MEASURES

The EA will include a discussion of the human and environmental resources potentially impacted by the project. Potential impacts of the project will be described and characterized. Based on the impacts identified, the EA will describe mitigation measures that could reasonably be implemented to reduce or eliminate the identified impacts. The EA will describe any unavoidable impacts resulting from implementation of the project.

Data and analyses will be commensurate with the level of impact for a given resource and the relevance of the information to consider mitigation measures. EERA staff will consider the relationship between the cost of data and analyses and the relevance and importance of the information in determining the level of detail of information to be prepared for the EA. Less important material may be summarized, consolidated, or simply referenced.

If relevant information cannot be obtained within timelines prescribed by statute and rule, the costs of obtaining such information is excessive, or the means to obtain it is unknown, EERA staff will include in the EA a statement that such information is incomplete or unavailable and the relevance of the information in evaluating potential impacts or mitigation.

A. Environmental Setting
B. Human Settlement
    1. Noise
    2. Aesthetics
    3. Displacement
    4. Property Values
    5. Zoning and Land Use Compatibility
    6. Cultural Values
    7. Transportation and Public Services
        a) Snow Fences
C. Socioeconomics
    1. Environmental Justice
    2. Local Economies
D. Public Health and Safety
    1. Electric and Magnetic Fields
    2. Emergency Services
E. Land Based Economies
    1. Agriculture
    2. Forestry
    3. Mining
    4. Recreation and Tourism
        a) State Recreation Trails
F. Archaeological and Historic Resources
G. Natural Environment
    1. Water Resources
    2. Wild and Scenic Rivers
    3. Soils

4. Geology
5. Wildlife
6. Air Quality
7. Climate Change / Climate Resiliency
8. Threatened / Endangered / Rare and Unique Natural Resources

H. Adverse Impacts that Cannot be Avoided
I. Irreversible and Irretrievable Commitments of Resources

ISSUES OUTSIDE THE SCOPE OF THE EA

The EA will not address the following topics:

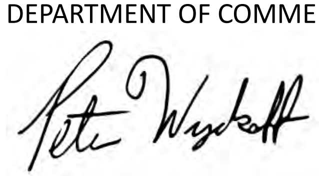
- Any site or route other than the project site and route proposed by the applicant.
- Any system alternative (an alternative to the proposed generation or transmission component).
- Potential impacts of specific energy sources.
- The manner in which landowners are compensated for the project.

SCHEDULE

The EA is anticipated to be completed and available in January 2025. Upon completion, it will be noticed and made available for review. Public hearings will be noticed and held in the project area after issuance of the EA. Comments on the EA may be submitted into the hearing record.

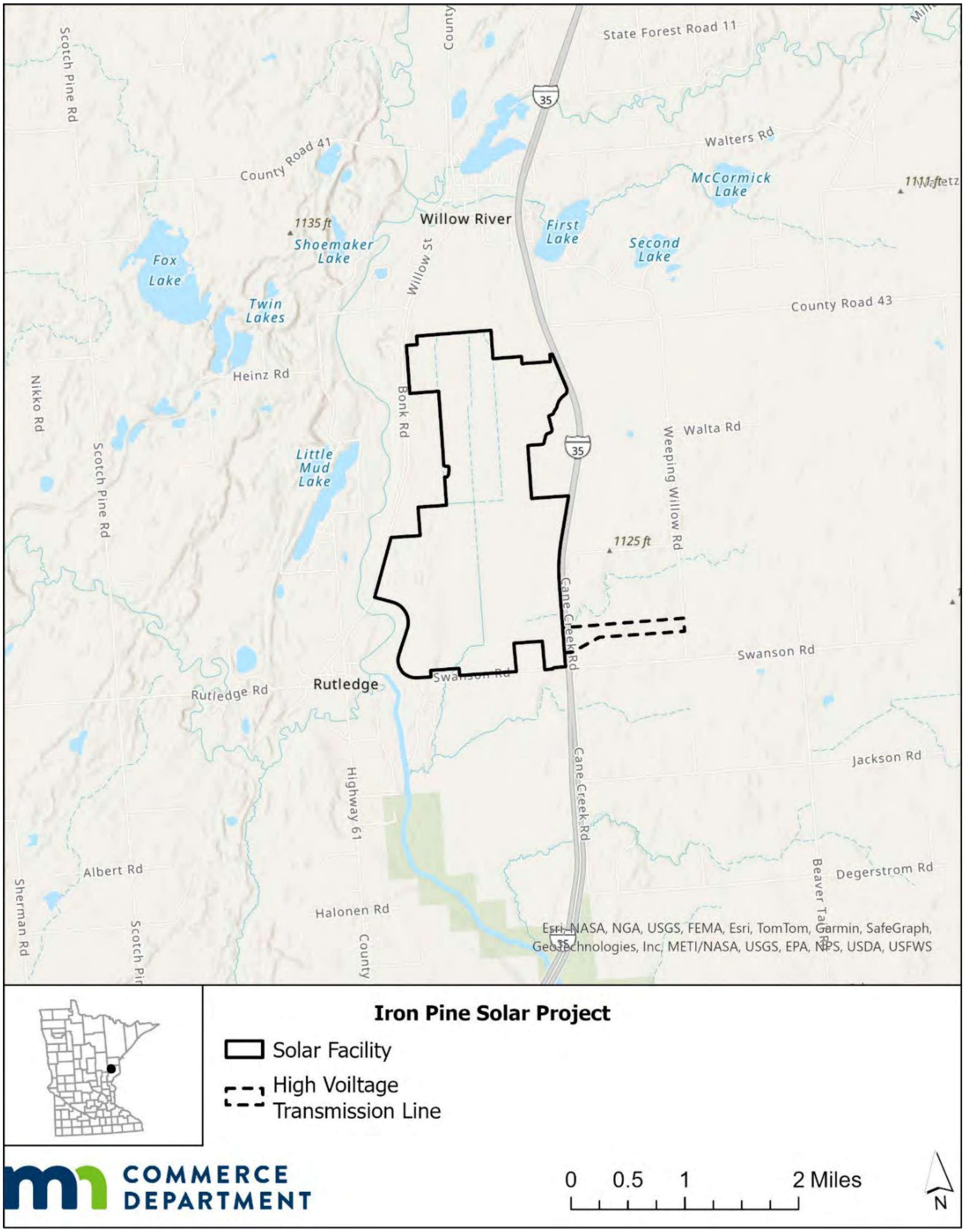
Signed this 3rd day of September, 2024

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE



____
Pete Wyckoff, Assistant Commissioner

Iron Pine Solar Project Overview Map



Appendix B

Draft Site Permit

STATE OF MINNESOTA PUBLIC UTILITIES COMMISSION

SITE PERMIT FOR
~~[PROJECT NAME~~IRON PINE SOLAR PROJECT]

A SOLAR ENERGY GENERATING SYSTEM

IN
~~[COUNTY]~~PINE COUNTY

ISSUED TO
~~[PERMITTEE]~~IRON PINE SOLAR POWER, LLC

PUC DOCKET NO. ~~[Docket Number]~~IP-7114/GS-23-414

In accordance with the requirements of Minnesota Statutes Chapter 216E and Minnesota Rules Chapter 7850 this site permit is hereby issued to:

~~[Permittee]~~IRON PINE SOLAR POWER, LLC

~~[Permittee]~~Iron Pine Solar Power, LLC is authorized by this site permit to construct and operate ~~[Provide a description of the project authorized by the Minnesota Public Utilities Commission]~~the Iron Pine Solar Project, an up to 325 megawatt solar energy generating system in Pine County, Minnesota.

The solar energy generating system shall be constructed and operated within the site identified in this site permit and in compliance with the conditions specified in this site permit.

This site permit shall expire ~~[xx]~~30 years from the date of this approval.

Approved and adopted this ____ day of [Month, Year]

BY ORDER OF THE COMMISSION

____

Will Seuffert,
Executive Secretary

CONTENTS

ATTACHMENTS

1 SITE PERMIT

The Minnesota Public Utilities Commission (Commission) hereby issues this site permit to ~~[Permittee Name]~~Iron Pine Solar Power, LLC (Permittee) pursuant to Minnesota Statutes Chapter 216E and Minnesota Rules Chapter 7850. This site permit authorizes the Permittee to construct and operate ~~a [Provide a description of the project as authorized by the Commission]~~an up to 325 megawatt solar energy generating system in Pine County (~~[Project Name, if applicable]~~Iron Pine Solar Project, henceforth known as Project). The solar energy generating system shall be constructed and operated within the site identified in this site permit and in compliance with the conditions specified in this site permit.

1.1 Pre-emption

Pursuant to Minn. Stat. § 216E.10, this site permit shall be the sole site approval required for the location, construction, and operation of the solar energy generating system and this site permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose governments.

2 PROJECT DESCRIPTION

~~[Provide a description of the Project as authorized by the Commission]~~ The Project is an up to 325 megawatt solar energy generating facility to be located on approximately 2,207 acres in Kettle River Township in Pine County, Minnesota. The solar energy generating system will utilize approximately 1,537 acres. The primary components of the solar electric generating system include photovoltaic panels affixed to a linear ground-mounted, single-axis tracking system, solar inverters, a belowground electrical collection system, security fencing, access roads, up to 12 weather stations, and a 34.5/230 kilovolt substation. The substation will include two 230 kV circuit breakers, two 34.5 kV/230 kV generator step-up transformers, relays, and telecommunication and metering equipment.

The Project is located in the following:

County	Township Name	Township	Range	Section
Pine	Kettle River	44	20	13, 14, 15, 22, 23, 24, 26, and 27

2.1 Project Ownership

At least 14 days prior to the pre-construction meeting, the Permittee shall file a description of its ownership structure, identifying, as applicable:

(a) the owner(s) of the financial and governance interests of the Permittee;
(b) the owner(s) of the majority financial and governance interests of the Permittee's owners; and
(c) the Permittee's ultimate parent entity (meaning the entity which is not controlled by any other entity).

The Permittee shall notify the Commission of:

(a) a change in the owner(s) of the majority* financial or governance interests in the Permittee; or
(b) a change in the owner(s) of the majority* financial or governance interests of the Permittee's owners; or
(c) a sale which changes the ultimate parent entity of the Permittee

* When there are only co-equal 50/50 percent interests, any change shall be considered a change in majority interest.

Also, in the event of an ownership change, the new Permittee must provide the Commission with a certification that it has read, understands and is able to comply with the conditions of this permit.

3 DESIGNATED SITE

The site designated by the Commission for the Project is depicted on the site maps attached to this site permit (Designated Site). The site maps show the approximate location of photovoltaic tracker rows and associated facilities within the Designated Site and identify a layout that seeks to minimize the overall potential human and environmental impacts of the Project, as they were evaluated in the permitting process.

The Designated Site serves to provide the Permittee with the flexibility to make minor adjustments to the layout to accommodate requests by landowners, local government units, federal and state agency requirements, and unforeseen conditions encountered during the detailed engineering and design process. Any modification to the location of a photovoltaic tracker row or associated facility shall be done in such a manner as to have human and environmental impacts that are comparable to those associated with the layouts on the maps attached to this site permit. The Permittee shall identify any modifications in the Site Plan pursuant to Section 8.3.

4 GENERAL CONDITIONS

The Permittee shall comply with the following conditions during construction and operation of the solar energy generating system over the life of this site permit.

4.1 Site Permit Distribution

Within 30 days of issuance of this site permit, the Permittee shall provide all affected landowners with a copy of this site permit and the complaint procedures. An affected landowner is any landowner or designee that is within or adjacent to the permitted site. In no case shall a landowner receive this site permit and complaint procedures less than five days prior to the start of construction on their property. The Permittee shall also provide a copy of this site permit and the complaint procedures to the applicable regional development commissions, county environmental offices, and city and township clerks. The Permittee shall file with the Commission an affidavit of its site permit and complaint procedures distribution within 30 days of issuance of this site permit.

4.2 Access to Property

The Permittee shall notify landowners prior to entering or conducting maintenance within their property, unless otherwise negotiated with the landowner. The Permittee shall keep records of compliance with this section and provide them upon the request of Minnesota Department of Commerce (Department of Commerce) staff or Commission staff.

4.3 Construction and Operation Practices

The Permittee shall comply with the construction practices, operation and maintenance practices, and material specifications described in the permitting record for this Project unless this site permit establishes a different requirement in which case this site permit shall prevail.

4.3.1 Field Representative

The Permittee shall designate a field representative responsible for overseeing compliance with the conditions of this site permit during construction of the Project. This person shall be accessible by telephone or other means during normal business hours throughout site preparation, construction, cleanup, and restoration.

The Permittee shall file with the Commission the name, address, email, phone number, and emergency phone number of the field representative at least 14 days prior to the pre-construction meeting. The Permittee shall provide the field representative’s contact information to affected landowners, local government units and other interested persons at least 14 days prior to the pre-construction meeting. The Permittee may change the field representative at any time upon notice to the Commission, affected landowners, local government units and other interested persons. The Permittee shall file with the Commission an affidavit of distribution of its field representative's contact information at least 14 days prior to the pre-construction meeting and upon changes to the field representative.

4.3.2 Site Manager

The Permittee shall designate a site manager responsible for overseeing compliance with the conditions of this site permit during the commercial operation and decommissioning phases of the Project. This person shall be accessible by telephone or other means during normal business hours for the life of this site permit.

The Permittee shall file the name, address, email, phone number, and emergency phone number of the site manager with the Commission within 14 days prior to the pre-operation meeting. The Permittee shall provide the site manager's contact information to landowners within or adjacent to the Project Boundary, local government units and other interested persons at least 14 days prior to the pre-operation meeting. The Permittee may change the site manager at any time upon notice to the Commission, landowners within or adjacent to the Project Boundary, local government units, and other interested persons. The Permittee shall file with the Commission an affidavit of distribution of its site manager's contact information at least 14 days prior to the pre-operation meeting and upon changes to the site manager.

4.3.3 Employee Training - Site Permit Terms and Conditions

The Permittee shall train and educate all employees, contractors, and other persons involved in the construction and ongoing operation of the solar energy generating system of the terms and conditions of this site permit. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.4 Independent Third-Party Monitoring

Prior to any construction, the Permittee shall propose a scope of work and identify an independent third-party monitor to conduct Project construction monitoring on behalf of the Department of Commerce. The scope of work shall be developed in consultation with and approved by the Department of Commerce. This third-party monitor will report directly to and will be under the control of the Department of Commerce with costs borne by the Permittee. Department of Commerce staff shall keep records of compliance with this section and will ensure that status reports detailing the construction monitoring are filed with the Commission in accordance with scope of work approved by the Department of Commerce.

4.3.5 Public Services, Public Utilities, and Existing Easements

During Project construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur the Permittee shall work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this site permit.

The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.6 Temporary Workspace

The Permittee shall select temporary workspace and equipment staging areas that limit the removal and impacts to vegetation. The Permittee shall not site temporary workspace in wetlands or native prairie as defined in sections 4.3.13 and 4.3.14. The Permittee shall site temporary workspace to comply with standards for development of the shorelands of public waters as defined in Section 4.3.13. The Permittee shall obtain temporary easements outside of the authorized Project Boundary from affected landowners through rental agreements. Temporary easements are not provided for in this site permit.

4.3.7 Noise

The Permittee shall comply with noise standards established under Minn. R. 7030.0010 to 7030.0080, at all times and at all appropriate locations during operation of the Project. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable.

4.3.8 Aesthetics

The Permittee shall consider input pertaining to visual impacts from landowners and the local unit of government having direct zoning authority over the area in which the Project is located. The Permittee shall use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Project during construction and operation.

4.3.9 Topsoil Protection

The Permittee shall implement measures to protect and segregate topsoil from subsoil on all lands utilized for Project construction unless otherwise negotiated with affected landowner.

4.3.10 Soil Compaction

The Permittee shall implement measures to minimize soil compaction of all lands during all phases of the Project's life and shall confine compaction to as small an area as feasible. The Permittee shall use soil decompaction measures on all lands utilized for Project construction and travelled on by heavy equipment (*e.g.*, cranes and heavy trucks), even when soil compaction minimization measures are used.

4.3.11 Soil Erosion and Sediment Control

The Permittee shall implement those erosion prevention and sediment control practices recommended by the Minnesota Pollution Control Agency (MPCA) Construction Stormwater Program. If construction of the Project disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.

The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Project shall be returned to pre-construction conditions.

4.3.12 Public Lands

In no case shall photovoltaic tracker rows and associated facilities including foundations, access roads, underground cable, and transformers, be located in the public lands identified in Minn. R. 7850.4400, subp. 1, or in federal waterfowl production areas. Photovoltaic tracker rows and associated facilities shall not be located in the public lands identified in Minn. R. 7850.4400, subp. 3, unless there is no feasible and prudent alternative.

4.3.13 Wetlands and Water Resources

The Permittee shall not place the solar energy generating system or associated facilities in public waters and public waters wetlands, as shown on the public water inventory maps prescribed by Minnesota Statutes Chapter 103G, except that electric collector or feeder lines may cross or be placed in public waters or public waters wetlands subject to permits and approvals by the Minnesota Department of Natural Resources (DNR) and the United States Army Corps of Engineers (USACE), and local units of government as implementers of the Minnesota Wetlands Conservation Act. The Permittee shall locate the solar energy generating system and associated facilities in compliance with the standards for development of the shorelands of public waters as identified in Minn. R. 6120.3300, and as adopted, Minn. R. 6120.2800, unless there is no feasible and prudent alternative.

The Permittee shall construct in wetland areas during frozen ground conditions, to the extent feasible, to minimize impacts. When construction during winter is not possible, wooden or composite mats shall be used to protect wetland vegetation. The Permittee shall contain and manage soil excavated from the wetlands and riparian areas in accordance with all applicable wetland permits. The Permittee shall access wetlands and riparian areas using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts.

The Permittee shall restore wetland and water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements. The Permittee shall meet the USACE, DNR, Minnesota Board of Water and Soil Resources, and local government wetland and water resource requirements.

4.3.14 Native Prairie

The Permittee shall not place the solar energy generating system or associated facilities in native prairie, as defined in Minn. Stat. § 84.02, subd. 5, unless addressed in a prairie protection and management plan and not located in areas enrolled in the Native Prairie Bank Program. The Permittee shall not impact native prairie during construction activities, as defined in Minn. Stat. § 216E.01, unless addressed in a prairie protection and management plan.

The Permittee shall prepare a prairie protection and management plan in consultation with the DNR if native prairie, as defined in Minn. Stat. § 84.02, subd. 5, is identified within the Project Boundary. The Permittee shall file the prairie protection and management plan with the Commission at least 30 days prior to submitting the Site Plan required by Section 8.3 of this site permit. The prairie protection and management plan shall address steps that will be taken to avoid impacts to native prairie and mitigation to unavoidable impacts to native prairie by restoration or management of other native prairie areas that are in degraded condition, by conveyance of conservation easements, or by other means agreed to by the Permittee, the DNR, and the Commission.

4.3.15 Vegetation Removal

The Permittee shall disturb or clear vegetation within the Designated Site only to the extent necessary to assure the safe construction, operation, and maintenance of the Project. The Permittee shall minimize the number of trees removed within the Designated Site specifically preserving to the maximum extent practicable windbreaks, shelterbelts, and living snow fences.

4.3.16 Beneficial Habitat

The Permittee shall implement site restoration and management practices that provide for native perennial vegetation and foraging habitat beneficial to gamebirds, songbirds, and pollinators; and that enhances soil water retention and reduces storm water runoff and erosion. To ensure continued management and recognition of beneficial habitat, the Permittee is encouraged to meet the standards for Minnesota's Habitat Friendly Solar Program by submitting project plans, seed mixes, a completed project planning assessment form, and any other applicable documentation used to meet the standard to the Board of Water and Soil Resources (BWSR). If the Permittee chooses to participate in Minnesota's Habitat-Friendly Solar Program, it shall file documents required to be filed with BWSR for meeting and maintaining Habitat Friendly Solar Certification with the Commission.

4.3.17 Vegetation Management Plan

The Permittee shall develop a vegetation management plan (VMP), in coordination with the Department of Commerce, and the Vegetation Management Working Group (VMWG), using best management practices established by the DNR and BWSR. The Permittee shall file the VMP and documentation of the coordination efforts between the Permittee and the coordinating agencies with the Commission at least 14 days prior to the pre-construction meeting.

Landowner-specific vegetation requests resulting from individual consultation between the Company and a landowner need not be included in the VMP. The Permittee shall provide all landowners within the Designated Site copies of the VMP. The Permittee shall file with the Commission an affidavit of its distribution of the VMP to landowners at least 14 days prior to the pre-construction meeting.

The VMP must include the following:

(a) management objectives addressing short term (year 0-5, seeding and establishment) and long term (year 5 through the life of the Project) goals;
(b) a description of planned restoration and vegetation management activities, including how the site will be prepared, timing of activities, how seeding will occur (*e.g.*, broadcast, drilling, etc.), and the types of seed mixes to be used;

(c) a description of how the site will be monitored and evaluated to meet management goals;
(d) a description of the management tools used to maintain vegetation (*e.g.*, mowing, spot spraying, hand removal, fire, grazing, etc.), including the timing and frequency of maintenance activities;
(e) identification of the third-party (*e.g.*, consultant, contractor, site manager, etc.) contracted for restoration, monitoring, and long-term vegetation management of the site;
(f) identification of on-site noxious weeds and invasive species (native and non-native) and the monitoring and management practices to be utilized; and
(g) a marked-up copy of the Site Plan showing how the site will be revegetated and that identifies the corresponding seed mixes.

Best management practices should be followed concerning seed mixes, seeding rates, and cover crops.

4.3.18 Agricultural Impact Mitigation Plan

The Permittee shall develop an agricultural impact mitigation plan (AIMP) in coordination with the Minnesota Department of Agriculture (MDA). The Permittee shall provide landowners within the Designated Site a copy of the AIMP. The Permittee shall file with the Commission the AIMP and an affidavit of the AIMP distribution to landowners at least 14 days prior to the pre-construction meeting.

4.3.19 Application of Pesticides

The Permittee shall restrict pesticide use to those pesticides and methods of application approved by the MDA, DNR, and the U.S. Environmental Protection Agency (EPA). Selective foliage or basal application shall be used when practicable. All pesticides shall be applied in a safe and cautious manner so as not to damage adjacent properties including crops, orchards, tree farms, apiaries, or gardens. The Permittee shall contact the landowner at least 14 days prior to pesticide application on their property. The Permittee may not apply any pesticide if the landowner requests that there be no application of pesticides within the landowner's property. The Permittee shall provide notice of pesticide application to landowners and beekeepers operating known apiaries within three miles of the pesticide application area at least 14 days prior to such application. The Permittee shall keep pesticide communication and application records and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.20 Invasive Species

The Permittee shall employ best management practices to avoid the potential introduction and spread of invasive species on lands disturbed by Project construction activities. The Permittee shall develop an Invasive Species Prevention Plan and file it with the Commission at least 14 days prior to the pre-construction meeting. The Permittee shall comply with the most recently filed Invasive Species Prevention Plan.

4.3.21 Noxious Weeds

The Permittee shall take all reasonable precautions against the spread of noxious weeds during all phases of construction. When utilizing seed to establish temporary and permanent vegetative cover on exposed soil the Permittee shall select site appropriate seed certified to be free of noxious weeds. To the extent possible, the Permittee shall use native seed mixes. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.22 Roads

The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Project. Where practical, existing roadways shall be used for all activities associated with construction of the Project. Oversize or overweight loads associated with the Project shall not be hauled across public roads without required permits and approvals.

The Permittee shall locate all perimeter fencing and vegetative screening in a manner that does not interfere with routine road maintenance activities and allows for continued safe travel on public roads.

The Permittee shall construct the fewest number of site access roads required. Access roads shall not be constructed across streams and drainage ways without the required permits and approvals. Access roads shall be constructed in accordance with all necessary township, county or state road requirements and permits.

The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.23 Archaeological and Historic Resources

The Permittee shall make every effort to avoid impacts to archaeological and historic resources when constructing the Project. In the event that a resource is encountered, the Permittee shall consult with the State Historic Preservation Office (SHPO) and the State Archaeologist. Where feasible, avoidance of the resource is required. Where not feasible, mitigation must include an effort to minimize Project impacts on the resource consistent with SHPO and State Archaeologist requirements.

Prior to construction, the Permittee shall 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 human remains are encountered during construction, the Permittee shall immediately halt construction and promptly notify local law enforcement and the State Archaeologist. The Permittee shall not resume construction at such location until authorized by local law enforcement or the State Archaeologist. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.24 Interference

If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Project, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the Project. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.25 Drainage Tiles

The Permittee shall avoid, promptly repair, or replace all drainage tiles broken or damaged during all phases of the Project's life unless otherwise negotiated with the affected landowner. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.26 Restoration

The Permittee shall restore the areas affected by construction of the Project to the condition that existed immediately before construction began to the greatest extent possible. The time period to complete restoration may be no longer than 12 months after the completion of construction, unless otherwise negotiated with the affected landowner. Restoration shall be compatible with the safe operation, maintenance, and inspection of the Project. Within 60 days after completion of all restoration activities, the Permittee shall file with the Commission a Notice of Restoration Completion.

4.3.27 Cleanup

The Permittee shall remove and properly dispose of all construction waste and scrap from the right-of-way and all premises on which construction activities were conducted upon completion of each task. The Permittee shall remove and properly dispose of all personal litter, including bottles, cans, and paper from construction activities daily.

4.3.28 Pollution and Hazardous Wastes

The Permittee shall take all appropriate precautions to protect against pollution of the environment. The Permittee shall be responsible for compliance with all laws applicable to the generation, storage, transportation, clean up and disposal of all waste generated during construction and restoration of the Project.

4.3.29 Damages

The Permittee shall fairly restore or compensate landowners for damage to crops, fences, private roads and lanes, landscaping, drain tile, or other damage sustained during construction. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

4.3.30 Public Safety

The Permittee shall provide educational materials to landowners within and adjacent to the Designated Site and, upon request, to interested persons about the Project and any restrictions or dangers associated with the Project. The Permittee shall also implement any necessary safety measures such as placing warning signs and gates for traffic control or restricting public access. The Permittee shall file with the Commission an affidavit of its public safety notifications at least 14 days before the pre-construction meeting.

The Permittee shall submit the location of all underground facilities, as defined in Minn. Stat. § 216D.01, subd. 11, to Gopher State One Call following the completion of the construction of the Project.

4.3.31 Site Identification

The Permittee shall mark the solar energy generating system with a clearly visible identification number and or street address.

4.3.32 Security Fencing

The Permittee shall design the security fence surrounding the solar energy generating system to minimize the visual impact of the Project while maintaining compliance with the National Electric Safety Code. The Permittee shall develop a final fence plan for the specific site in coordination with the Department of Commerce and the DNR. The final fence plan shall be submitted to the Commission as part of the Site Plan pursuant to Section 8.3.

4.4 Feeder Lines

The Permittee may use overhead or underground feeder lines to carry power from an internal Project interconnection point to the Project substation or interconnection point on the electrical grid. The Permittee shall place overhead and underground feeder lines that parallel public roads within the public right-of-way or on private land immediately adjacent to the road. The Permittee shall obtain approval from the landowner or government unit responsible for the affected right-of-way.

The Permittee shall locate feeder lines in such a manner as to minimize interference with agricultural operations including but not limited to existing drainage patterns, drain tile, future tiling plans, and ditches. The Permittee shall place safety shields on all guy wires associated with overhead feeder lines. The Permittee shall submit the engineering drawings of all collector and feeder lines with the Site Plan pursuant to Section 8.3.

4.5 Other Requirements

4.5.1 Safety Codes and Design Requirements

The Permittee shall design the solar energy generating system and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and North American Electric Reliability Corporation requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, right-of-way widths, and permit requirements. The Permittee shall keep records of compliance with these standards and provide them upon the request of Department of Commerce staff or Commission staff.

4.5.2 Other Permits and Regulations

The Permittee shall comply with all applicable state statutes and rules. The Permittee shall obtain all required permits for the Project and comply with the conditions of those permits unless those permits conflict with or are preempted by federal or state permits and regulations.

At least 14 days prior to the pre-construction meeting, the Permittee shall file with the Commission an Other Permits and Regulations Submittal that contains a detailed status of all permits, authorizations, and approvals that have been applied for specific to the Project. The Other Permits and Regulations Submittal shall also include the permitting agency name; the name of the permit, authorization, or approval being sought; contact person and contact information for the permitting agency or authority; brief description of why the permit, authorization, or approval is needed; application submittal date; and the date the permit, authorization, or approval was issued or is anticipated to be issued.

The Permittee shall demonstrate that it has obtained all necessary permits, authorizations, and approvals by filing an affidavit stating as such and an updated Other Permits and Regulations Submittal prior to commencing Project construction. The Permittee shall provide a copy of any such permits, authorizations, and approvals at the request of Department of Commerce staff or Commission staff.

5 SPECIAL CONDITIONS

The special conditions shall take precedence over other conditions of this permit should there be a conflict.

5.1 Visual Screening Plan

The Permittee shall develop a site-specific Visual Screening Plan. The Visual Screening Plan shall be designed and managed to mitigate visual impacts to adjacent residences. The Visual Screening Plan shall at a minimum include: (a) objectives for screening of nearby residences; and (b) a description of the types of trees and shrub species to be used, the location of plantings, and plans for installation, establishment, and maintenance. The location of trees and shrubs included in the Visual Screening Plan that are located within the Permittee's site control shall be included in the Site Plan filed under Section 8.3. The Permittee is required to maintain and ensure the successful growth, health, and maintenance of the vegetation for 3 years.

At least 14 days prior to the pre-construction meeting, the Permittee shall file:

(a) the Visual Screening Plan;
(b) documentation of coordination with landowners within 500 feet of the project site; and
(c) an affidavit of its distribution of the Visual Screening Plan to landowners within 500 feet of the project site.

5.2 Kettle River Wild and Scenic River District

If temporary workspace is required and permitted within the Kettle River Wild and Scenic River District, then the Permittee must consult with Pine County and complete all work in accordance with the Pine County Kettle River Wild and Scenic River Ordinance. The Permittee shall keep records of compliance with this permit condition and provide them upon the request of Department of Commerce staff or Commission staff.

5.3 Snowmobile Trail 187

The Permittee shall coordinate with the Northern Pine Riders snowmobile club to reroute snowmobile trail 187 and any other snowmobile trails impacted by the project.

5.4 Vegetation and Blowing Snow Control

The Permittee shall coordinate with the Minnesota Department of Transportation (MnDOT) regarding existing vegetation between the project area and Interstate 35. The Permittee shall retain or plant vegetation, as requested by MnDOT, necessary to reduce potential driver distraction, solar glare, and blowing snow.

The Permittee shall coordinate with MnDOT regarding vegetative, structural, and/or other snow fence designs necessary to ensure the safe operation of Interstate 35. The Permittee shall provide documentation of its coordination with MnDOT and illustrate the snow fence design for the project in the Site Plan filed under Section 8.3.

6 DELAY IN CONSTRUCTION

If the Permittee has not commenced construction or improvement of the site within four years after the date of issuance of this site permit the Permittee shall file a Failure to Construct Report and the Commission shall consider suspension of this site permit in accordance with Minn. R. 7850.4700.

7 COMPLAINT PROCEDURES

At least 14 days prior to the pre-construction meeting, the Permittee shall file with the Commission the complaint procedures that will be used to receive and respond to complaints. The complaint procedures shall be in accordance with the requirements of Minn. R. 7829.1500 or Minn. R. 7829.1700, and as set forth in the complaint procedures attached to this site permit.

Upon request, the Permittee shall assist Department of Commerce staff or Commission staff with the disposition of unresolved or longstanding complaints. This assistance shall include, but is not limited to, the submittal of complaint correspondence and complaint resolution efforts.

8 COMPLIANCE REQUIREMENTS

Failure to timely and properly make compliance filings required by this site permit is a failure to comply with the conditions of this site permit. Compliance filings must be electronically filed with the Commission.

8.1 Pre-Construction Meeting

Prior to the start of construction, the Permittee shall participate in a pre-construction meeting with Department of Commerce staff and Commission staff to review pre-construction filing requirements, scheduling, and to coordinate monitoring of construction and site restoration activities. Within 14 days following the pre-construction meeting, the Permittee shall file with the Commission a summary of the topics reviewed and discussed and a list of attendees. The Permittee shall indicate in the filing the anticipated construction start date.

8.2 Pre-Operation Meeting

At least 14 days prior to commercial operation of the Project, the Permittee shall participate in a pre-operation meeting with Department of Commerce staff and Commission staff to coordinate field monitoring of operation activities for the Project. Within 14 days following the pre-operation meeting, the Permittee shall file a summary of the topics reviewed and discussed and a list of attendees with the Commission.

8.3 Site Plan

At least 14 days prior to the pre-construction meeting, the Permittee shall file with the Commission, and provide the Department of Commerce, and the counties where the Project will be constructed with a Site Plan that includes specifications and drawings for site preparation and grading; specifications and locations of the solar energy generating system and associated facilities; and procedures for cleanup and restoration. The documentation shall include maps depicting the Designated Site, solar energy generating system, and associated facilities layout in relation to that approved by this site permit.

The Permittee may not commence construction until the earlier of (i) 30 days after the pre-construction meeting or (ii) or until the Commission staff has notified the Permittee in writing that it has completed its review of the documents and determined that the planned construction is consistent with this site permit.

If the Commission notifies the Permittee in writing within 30 days after the pre-construction meeting that it has completed its review of the documents and planned construction, and finds that the planned construction is not consistent with this site permit, the Permittee may submit additional and/or revised documentation and may not commence construction until the

Commission has notified the Permittee in writing that it has determined that the planned construction is consistent with this site permit.

If the Permittee intends to make any significant changes in its Site Plan or the specifications and drawings after submission to the Commission, the Permittee shall notify the Commission, the Department of Commerce, and county staff at least five days before implementing the changes. No changes shall be made that would be in violation of any of the terms of this site permit.

8.4 Status Reports

The Permittee shall file with the Commission monthly Construction Status Reports beginning with the pre-construction meeting and until completion of restoration. Construction Status Reports shall describe construction activities and progress, activities undertaken in compliance with this site permit, and shall include text and photographs.

If the Permittee does not commence construction of the Project within six months of this site permit issuance, the Permittee shall file with the Commission Pre-Construction Status Reports on the anticipated timing of construction every six months beginning with the issuance of this site permit until the pre-construction meeting. The status updates shall include information on the Project's Midcontinent Independent System Operator (MISO) interconnection process, if applicable.

8.5 Labor Statistic Reporting

The Permittee shall file quarterly Labor Statistic Reports with the Commission within 45 days of the end of the quarter regarding construction workers that participated in the construction of the Project. The Labor Statistic Reports shall:

(a) detail the Permittee's efforts and the site contractor's efforts to hire Minnesota workers; and
(b) provide an account of:
   i. the gross number of hours worked by or full-time equivalent workers who are Minnesota residents, as defined in Minn. Stat. § 290.01, subd. 7;
   ii. the gross number of hours worked by or full-time equivalent workers who are residents of other states, but maintain a permanent residence within 150 miles of the Project; and
   iii. the total gross hours worked or total full-time equivalent workers.

Permittee shall work with its contractor to determine the suitable reporting metric. The report may not include personally identifiable data.

8.6 Prevailing Wage

The Permittee, its contractors, and subcontractors shall pay no less than the prevailing wage rate as defined in Minn. Stat. § 177.42 and shall be subject to the requirements and enforcement provisions under Minn. Stat. §§ 177.27, 177.30, 177.32, 177.41 to 177.435, and 177.45. The Permittee shall keep records of contractor and subcontractor pay and provide them at the request of Department of Commerce staff or Commission staff.

8.7 In-Service Date

At least three days before the Project is to be placed into service, the Permittee shall notify the Commission of the date on which the Project will be placed into service and the date on which construction was completed.

8.8 As-Builts

Within 90 days after completion of construction, the Permittee shall submit to the Commission copies of all final as-built plans and specifications developed during the Project construction.

8.9 GPS Data

Within 90 days after completion of construction, the Permittee shall submit to the Commission, in the format requested by the Commission, geo-spatial information (*e.g.*, ArcGIS compatible map files, GPS coordinates, associated database of characteristics) for all structures associated with the Project.

8.10 Right of Entry

The Permittee shall allow Commission designated representatives to perform the following, upon reasonable notice, upon presentation of credentials and at all times in compliance with the Permittee's site safety standards:

(a) To enter upon the facilities easement of the property for the purpose of obtaining information, examining records, and conducting surveys or investigations.
(b) To bring such equipment upon the facilities easement of the property as is necessary to conduct such surveys and investigations.
(c) To sample and monitor upon the facilities easement of the property.
To examine and copy any documents pertaining to compliance with the conditions of this site permit.

8.11 Project Energy Production

The Permittee shall, by February 1st following each complete or partial year of Project operation, file a report with the Commission on the monthly energy production of the facility including:

(a) the installed nameplate capacity of the permitted facility;
(b) the total daily energy generated by the facility in MW hours;
(c) the total monthly energy generated by the facility in MW hours;
(d) the monthly capacity factor of the facility;
(e) yearly energy production and capacity factor for the facility;
(f) the average monthly and average annual solar strength gradient measured in kWh/m²/Day observed at the facility;
(g) the operational status of the facility and any major outages, major repairs, or performance improvements occurring in the previous year; and
(h) any other information reasonably requested by the Commission.

The Permittee shall file this information in a format recommended by the Department of Commerce. This information shall be considered public and must be filed electronically.

8.12 Emergency Response

The Permittee shall prepare an Emergency Response Plan (ERP) in consultation with the emergency responders having jurisdiction over the Project prior to construction. The Permittee shall file the ERP, along with any comments from emergency responders to the Commission at least 14 days prior to the pre-construction meeting and a revised ERP, if any, at least 14 days prior to the pre-operation meeting. At least 14 days prior to the pre-operation meeting the Permittee shall file with the Commission an affidavit of the distribution of the ERP to emergency responders and Public Safety Answering Points (PSAP) with jurisdiction over the Project. The Permittee shall obtain and register the Project address or other location indicators acceptable to the emergency responders and PSAP having jurisdiction over the Project.

8.13 Extraordinary Events

Within 24 hours of discovery of an occurrence, the Permittee shall notify the Commission of any extraordinary event. Extraordinary events include but shall not be limited to fires, solar panel collapse, acts of sabotage, collector or feeder line failure, and injured worker or private person. The Permittee shall, within 30 days of the occurrence, file a report with the Commission describing the cause of the occurrence and the steps taken to avoid future occurrences.

8.14 Wildlife Injuries and Fatalities

The Permittee shall report any wildlife injuries and fatalities to the Commission quarterly.

9 DECOMMISSIONING AND RESTORATION

9.1 Decommissioning Plan

The Permittee shall comply with the provisions of the most recently filed and accepted Decommissioning Plan. The initial version of the Decommissioning Plan was submitted for this Project as ~~[Identify Decommissioning Plan, *e.g.*, Appendix XX to the Site Permit Application]~~Appendix H to the site permit application. The Permittee shall file an updated Decommissioning Plan incorporating comments and information from the permit application process and any updates associated with the final construction plans with the Commission at least fourteen 14 days prior to the pre-construction meeting. The Permittee shall update and file the Decommissioning Plan with the Commission every five years following the commercial operation date.

The Decommissioning Plan shall provide information identifying all surety and financial securities established for decommissioning and site restoration. The Decommissioning Plan shall provide an itemized breakdown of costs of decommissioning all Project components, which shall include labor and equipment. The Decommissioning Plan shall identify cost estimates for the removal of solar panels, racks, underground collection cables, access roads, transformers, substations, and other Project components. The Decommissioning Plan may also include anticipated costs for the replacement of panels or repowering the Project by upgrading equipment.

The Permittee shall also submit the Decommissioning Plan to the local unit of government having direct zoning authority over the area in which the Project is located. The Permittee shall ensure that it carries out its obligations to provide for the resources necessary to fulfill its requirements to properly decommission the Project at the appropriate time. The Commission may at any time request the Permittee to file a report with the Commission describing how the Permittee is fulfilling this obligation.

9.2 Site Final Restoration

Upon expiration of this site permit or upon termination of operation of the Project, the Permittee shall have the obligation to dismantle and remove from the site all solar panels, mounting steel posts and beams, inverters, transformers, overhead and underground cables and lines, foundations, buildings, and ancillary equipment in accordance with the most recently filed and accepted decommissioning plan. To the extent feasible, the Permittee shall restore and reclaim the site to pre-project conditions. Landowners may require the site be returned to agricultural production or may retain restored prairie vegetation, or other land uses as agreed to between the landowner and the Permittee. All access roads shall be removed unless written approval is given by the affected landowner requesting that one or more roads, or portions thereof, be retained. All such agreements between the Permittee and the affected landowner shall be filed with the Commission prior to commencing restoration activities. The Permittee shall restore the site in accordance with the requirements of this condition and file a Notification of Final Restoration Completion to the Commission within 18 months of termination of operation of the Project.

9.3 Abandoned Solar Installations

The Permittee shall notify the Commission of any solar equipment that is abandoned prior to termination of operation of the Project. Equipment shall be considered abandoned after one year without energy production and shall be decommissioned and the land shall be restored pursuant to sections 9.1 and 9.2, unless a plan is submitted to and approved by the Commission outlining the steps and schedule for returning the equipment to service.

10 COMMISSION AUTHORITY AFTER SITE PERMIT ISSUANCE

10.1 Final Designated Site Boundaries

After completion of construction the Commission shall determine the need to adjust the final boundary of the Designated Site required for the Project. This site permit may be modified, after notice and opportunity for hearing, to represent the actual Designated Site required by the Permittee to operate the Project authorized by this site permit.

10.2 Expansion of Designated Site Boundaries

No expansion of the site boundary described in this site permit shall be authorized without the approval of the Commission. The Permittee may submit to the Commission a request for a change in the boundary of the site for the Project. The Commission will respond to the requested change in accordance with applicable statutes and rules.

10.3 Periodic Review

The Commission shall initiate a review of this site permit and the applicable conditions at least once every five years. The purpose of the periodic review is to allow the Commission, the Permittee, and other interested persons an opportunity to consider modifications in the conditions of this site permit. No modification may be made except in accordance with applicable statutes and rules.

10.4 Modification of Conditions

After notice and opportunity for hearing this site permit may be modified or amended for cause, including but not limited to the following:

(a) violation of any condition in this permit;
(b) endangerment of human health or the environment by operation of the Project; or
(c) existence of other grounds established by rule.

10.5 More Stringent Rules

The issuance of this site permit does not prevent the future adoption by the Commission of rules or orders more stringent than those now in existence and does not prevent the enforcement of these more stringent rules and orders against the Permittee.

11 SITE PERMIT AMENDMENT

This site permit may be amended at any time by the Commission. Any person may request an amendment of the conditions of this site permit by submitting a request to the Commission in writing describing the amendment sought and the reasons for the amendment. The Commission will mail notice of receipt of the request to the Permittee. The Commission may amend the conditions after affording the Permittee and interested persons such process as is required under Minn. R. 7850.4900.

12 TRANSFER OF SITE PERMIT

The Permittee may request at any time that the Commission transfer this site permit to another person or entity (transferee). In its request, the Permittee must provide the Commission with:

(a) the name and description of the transferee;
(b) the reasons for the transfer;
(c) a description of the facilities affected; and
(d) the proposed effective date of the transfer.

The transferee must provide the Commission with a certification that it has read, understands and is able to comply with the plans and procedures filed for the Project and all conditions of this site permit.

The transferee must provide the Commission with the name and contact information for the site manager, as described in Section 4.3.2, and either a current version with eDocket reference, or a revised version of the following:

(a) VMP as described in Section 4.3.17;
(b) complaint procedures, as described in Section 7 and Attachment 1;
(c) ERP, as described in Section 8.12; and
(d) Decommissioning Plan, as described in Section 9.1.

The Commission may authorize transfer of the site permit after affording the Permittee, the transferee, and interested persons such process as is required under Minn. R. 7850.5000.

13 REVOCATION OR SUSPENSION OF SITE PERMIT

The Commission may initiate action to revoke or suspend this site permit at any time. The Commission shall act in accordance with the requirements of Minn. R. 7850.5100, to revoke or suspend this site permit.

14 EXPIRATION DATE

This site permit shall expire ~~[xx]~~30 years after the date this site permit was approved and adopted.

Appendix C

Agricultural Impact Mitigation Plan

Agricultural Impact Mitigation Plan

Iron Pine Solar Project

Pine County, Minnesota

Stantec Project #:193708962

February 27, 2023

Prepared for:

Iron Pine Solar Power, LLC
470 Atlantic Avenue, Suite 601
Boston, MA 02210

Prepared by:

Stantec Consulting Services Inc.
3303 Fiechtner Dr
Suite 100
Fargo ND 58013

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

APPENDIX A

Abbreviations

AC	Alternating current
AIMP	Agricultural Impact Mitigation Plan
BMP	best management practices
DC	direct current
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Risk Map
EPC	engineering, procurement, and construction contractor
GIS	Geographic Information System
LCC	Land Capability Class
MPCA	Minnesota Pollution Control Agency
MNBWSR	Minnesota Board of Soil and Water Resources
MNDPH	Minnesota Department of Public Health
MNDNR	Minnesota Department of Natural Resources
MV	medium voltage
Mw	Megawatt
NEC	National Electric Code
NESC	National Electric Safety Code
NRCS	Natural Resources Conservation Service
POI	point of interconnection
Project	Iron Pine Solar Project
PV	photovoltaic
Stantec	Stantec Consulting Services Inc.

Stormwater General Permit	General Permit to Discharge under a National Pollutant Discharge Elimination System (NPDES) Permit
SSURGO	Soil Survey Geographic Database
Iron Pine Solar	Iron Pine Solar Energy
UDO	Unified Development Ordinance
VMP	Vegetation Management Plan

1.0 PURPOSE AND APPLICABILITY OF PLAN

The objective of this Agricultural Impact Mitigation Plan (AIMP) is to identify measures that Iron Pine Solar Power, LLC (Iron Pine Solar) and its contractors will take to avoid, mitigate, repair, and/or compensate for potential agricultural impacts that may result from the construction, operation, and eventual decommissioning of the Iron Pine Solar (Project). A 2,296-acre Project Area was analyzed for this AIMP as shown on Figure 1, Site Location Map (Appendix A). Although agricultural operations would temporarily cease on most of the land on which the Project is constructed during the life of the Project, this Plan outlines measures to ensure the land may be returned to future agricultural use following decommissioning of the Project. This AIMP describes the Best Management Practices (BMPs) that will be used during construction, operation, and decommissioning to minimize long-term impacts to soil.

Iron Pine Solar will obtain authorization under the Minnesota Pollution Control Agency (MPCA) Construction Stormwater General Permit under a National Pollutant Discharge Elimination System (NIPDES) Permit (MNR100001) prior to the commencement of construction. The NPDES permit will be provided to Pine County prior to any ground disturbance. Temporary stormwater BMPs will be used during Project construction, and construction will be completed in accordance with the MPCA General Permit and a site-specific Erosion Control and Storm Water Management Plan to be developed for the Project.

The site-specific Vegetation Management Plan (VMP) developed for the Project describes the vegetation management practices, including seed mixtures, planting plans and methodologies, and maintenance practices to be conducted during the construction and operational phases of the Project. Permanent perennial vegetative cover will be established throughout the Project Area to manage erosion and increase stormwater infiltration within the Project Area.

This AIMP is separated into six sections: Section 2 provides an overview of the proposed Project and its components. Section 3 identifies soil limitations and suitability within the Project Area; Section 4 describes the BMPs that will be used during construction and operation of the Project; Section 5 summarizes key components of the Vegetative Management Plan in relation to agricultural impact mitigation; Section 6 describes Project Decommissioning and restoration/reclamation of the site.

2.0 PROJECT OVERVIEW

The Iron Pine Solar Project ("the Project") consists of a 325-megawatt (MW) photovoltaic (PV)) solar power generating facility and a 230 kilovolt (kV) high voltage transmission line ("Gen-Tie Line". The Gen-Tie Line will connect the Project collector substation to a switchyard located at the point of interconnection (POI) to the Minnesota Power Arrowhead-Bear Creek 230 kV transmission line. The Project is sited on approximately 2,296 acres of primarily agricultural land located approximately 0.5 miles south of the Town of Willow River, Pine County, Minnesota.

Iron Pine Solar selected this site due to land use and availability, capacity at the point of interconnection ("POI"), existing transmission facilities, existing road infrastructure, environmental considerations, and constructability (i.e., restrictions due to slopes, soils, wetlands, and waterways).

Iron Pine Solar is responsible for all land acquisition, lease agreements, and easements required to build the Project facilities within the Project Area.

2.1 PROJECT COMPONENTS

Table 1 summarizes the major components' acreages within the Project Area.

Table 1. Major Project Components and Associated Acreages

Component	Acreage
Solar Project	
Solar Arrays (fenced area)	1,526.0
Access Roads	24.0
Buried Electrical Collection Lines	5.6
Inverters	0.3
O&M Facility	0.1
Project Substation	6.4
Laydown Yard	19.6
Developed Solar Area Total[1]	**1,536.7**
Undeveloped Solar Array Area[2]	**670.1**
Solar Area Total	**2,206.8**
Transmission Line Right-of-Way[3]	19.4
Switch Yard	3.9
Access Road to Switchyard	0.8

Developed Gen-Tie Line Area Total	**24.1**
Undeveloped Gen-Tie Line Area	**64.7**
Gen-Tie Line Area Total	**88.8**
Project Total	**2,295.6**

[1] The Solar Project Development Area includes the area within the Solar Project that is hosting solar equipment and will be surrounded by a fence. The Development Area includes access roads and buried electrical collection lines (including those extending beyond the Solar Project boundary), inverters, an O&M Facility, Project Substation, and temporary laydown yards for a total of 1,536.7 acres.
[2] The Undeveloped Area includes all areas outside the fenced area but within the Solar Project.
[3]The Gen-Tie Line ROW acreage reflects a 160-foot ROW.

2.1.1 Solar Panels, Arrays, and Racking

The PV module selected for the Project will have crystalline modules and will be a plate glass module with an aluminum frame with approximate dimensions of 3.9 feet by 7.5 feet (1.2 meters by 2.3 meters), or thin-film technology (cadmium telluride [CdTe]). A total of approximately 570,622 modules are estimated for the basis of design for this application. This estimated number of modules is approximate and is subject to change based on the final design for construction.

The PV modules will be connected in series for up to 1500V operation and will be mounted on a tracker system in-line and oriented such that the long side of the module is facing adjacent modules on racking which tracks east to west to follow the sun throughout the day. The final selection of the PV module and inverters will be made at a future date based on the available market offering. The Canadian Solar 690W module and the SUNGROW 4400kVA central inverter used as the basis of the preliminary Project design.

The trackers are arranged in circuits and blocks, that are separated by roads or AC collection system corridors. The piles will run north to south along the row of modules that are mounted on rails affixed to torque tubes mounted on the piles and this steel structure will likely include an integrated cable management solution in order to support the insulated copper DC string wire which interconnects each of the PV modules.

The PV modules will be installed using industry standard, best practices. Upon completion of the final site design, pile lengths will be specified to allow the PV module racking system and tracker to be constructed at a minimum height above surrounding grade in order to account for average snow accumulation at the Project area.

Foundations or supports will be installed to an appropriate depth following a field investigation and delineation of soil types to minimize impacts from freezing and thawing conditions. Exact embedment depth for the driven pile on which the solar panels are mounted will be determined with final engineering.

2.1.2 Electrical Collection System

The current configuration for the collector system contains a bulk total of approximately thirty-five miles of cables consisting of three single conductor cables running in a bundle (one circuit) or a single cable containing all three conductors.

The collector circuits are planned as an underground system with direct buried cables or cables installed in direct buried ducts. The preliminary design assumes the conductor will be aluminum. The collection system will either be buried at a depth of at least 36 inches to the top of the cables or will be enclosed within a conduit and buried at a depth of at least 24 inches. These depths meet minimum cover requirements as specified in table 300.5 of National Electric Code (NEC) 2017, Chapter 3 “Wiring Methods and Materials.” The trench for a single cable will be eighteen inches wide. Where multiple cables are installed parallel to each other, the cable separation will be up to eight feet apart, therefore the width of the trench will vary depending on the number of circuits within the trench.

Installation of the collection system will be by use of a vibratory plow or trenching method in upland areas. The vibratory plow directly impacts an area approximately 12 inches wide and a trench method impacts an area approximately 18 inches wide. Underground horizontal directional drilling (HDD) will be utilized in environmentally sensitive areas, such as nonfarmed wetlands and natural waterways, to avoid impacts to these resources. Trenching methods will be used for installation of the collection system through farmed wetlands and the agricultural drainage ditches within the Project. There are several underground HDD drilling areas that will be used to cross culverts.

2.1.3 Gen-Tie Line

The Applicant proposes the construction of approximate one-mile long single circuit 230 kV (AC) Gen-Tie Line using weathering steel monopoles (poles or structures). The poles will be installed to facilitate the connection between the Project Substation and the to-be-built switchyard to tie-in to the Minnesota Power Arrowhead to Bear Creek 230 kV line.

2.1.4 Access Roads

Gravel access roads will connect the facility to existing public roads and provide access to Project equipment during facility operations and maintenance as well as to accommodate emergency access. Permanent internal access roads within the Project Area are expected to be approximately 16.3 miles (86,197 feet) in total length and are approximately 12 feet wide. These roads may temporarily be wider during construction to accommodate construction equipment access where necessary. Aggregate materials will be used to develop the access roads. In these areas, topsoil will be stripped and stored for use during reclamation. Geotextile matting will be installed prior to placement of aggregate to prevent mixing with native subsoil. The aggregate would be maintained for the life of the Project. During decommissioning at the end of the Project’s life, these areas may be restored unless the host landowner requests that they remain in place. Restoration activities typically include removing the aggregate, decompacting the soil if required, restoring the topsoil and either seeding to permanent perennial vegetation or returning the area to agricultural production.

2.1.5 Switchyard, Inverters, Substation

Approximately 82 inverters will be installed throughout the Project area. The final number of inverters for the Solar Project will depend on the inverter size, inverter and module availability, as well as the final array configuration. The inverters are typically part of a skid assembly with the inverter and the assembly being mounted on a driven pile foundation and associated concrete pads. These concreted pads provide the foundation for the inverter, transformer, and the SCADA system. The concrete pads will be poured onsite or precast and assembled off-site. Each inverter pad includes one transformer to which the inverters will feed electricity.

The Project Substation will be located outside the fenced solar arrays and is estimated to occupy approximately 6.4 acres. In addition, a storm water detention facility approximately 0.78 acre in size will be located adjacent to the Project substation. The Project Substation location will be graded and overlain with crushed rock to minimize vegetation growth in the area and reduce fire risk.

A typical construction sequence for the Project Substation involves, in order: site grading work, below-grade foundation installation, above-grade physical construction of buswork and installation of major electrical equipment, wiring and completion of all terminations, followed by testing, commissioning, and ultimately energization. A site-specific construction specification and schedule will be developed closer to the start of construction. All contractors will be required to follow the Storm Water Pollution Prevention Plan, as well as adhere to any site-specific environmental requirements including erosion and dust control.

The switchyard is currently forested and covers approximately 3.9 acres. The location and footprint of these facilities within the Project Area for the preliminary design is shown in Figure 1.

2.1.6 Security Fencing

Iron Pine Solar will utilize fencing around the PV solar arrays that is consistent with all applicable codes, including NEC and North American Electric Reliability Council Critical Infrastructure Protection requirements. Fencing is required to safeguard the public health. Array fencing will consist of seven- to eight-foot-high woven-wire exclusion fence with wood fenceposts. The Project Substation will require a seven to eight-foot-high chain link fence, which may include three strands of barb wire at the top. Fenceposts will be driven into the ground. No concrete foundations will be used for the fenceposts.

2.2 CONSTRUCTION

The Project will be designed in conformance with the version of the International Building Code as required by the authority having jurisdiction, state, and local requirements. The Project will select an engineering, procurement, and construction contractor (EPC) to manage engineering, procurement, and construction of the Project; subcontractors will be selected to perform all necessary work to construct the Project. Project construction follows a construction sequence in accordance with a construction plan, which will be developed and finalized prior to the start of construction, in conjunction with the selected contractors. The construction plan will be submitted to Pine County prior to commencement of construction. The following provides a general description of the staging and construction sequence for the Project:

- Tracking pads at construction entry and exit points, and erosion control and stormwater best management practices (BMPs) will be installed as outlined in the SWPPP prepared for the Project.
- Vegetation removal (crop removal) will start in areas where initial staging and lay-down areas will be located. Vegetation removal will continue across the site, sequenced to proceed in an organized and cost-efficient manner. Limited brush clearing will commence in a similar fashion. Bare ground will be re-seeded, if necessary, in accordance with the VMP and SWPPP prepared for the Project and MPCA requirements.
- Staging and lay-down areas will be developed to receive and store construction materials and equipment. The lay-down areas will also house trailers and parking for personnel and construction-related vehicles.
- Installation of access roads to facilitate continued clearing operations and construction of the facility (limited grading is anticipated as roads will be constructed at grade when possible).
- Delivery of equipment, including piles, aluminum supports/mounting structures, tracking systems, and inverters. The Project will be constructed in blocks and multiple blocks will be constructed simultaneously over time. Deliveries will continue over time in advance of construction of the blocks.
- Solar block construction in sequence, starting with driving pile foundations, then installing aluminum supports/mounting structures onto the piles.
- Delivery of collection system equipment and installation via trenching and directional drilling.
- Delivery and installation of solar PV modules.
- Stabilization and revegetation of disturbed areas will occur in stages as construction of the solar blocks and collection trenches are completed. Bare ground will be re-seeded, if necessary, in accordance with the SWPPP and MPCA requirements.
- Connect Project Switchgear and Metering and Lone Tree substation and transmission infrastructure.
- Conduct interconnection inspections and testing and Project commissioning.

Site access will be controlled for personnel and vehicles. Permanent security fencing will be installed in advance of or in conjunction with site preparation activities (e.g., grading, mowing, etc.) in advance of large component deliveries. All temporary disturbance areas will be restored in accordance with the Project specific Vegetation Management Plan.

During construction, temporary utilities will serve the construction offices, laydown area, and Project Area. Temporary construction power before the construction of permanent distribution power will either be provided via a local distribution line extended to the Project Area or by temporary diesel generators. Temporary area lighting will be provided and strategically located for safety and security.

The Project on-site workforce will consist of laborers, craftsmen, supervisory personnel, support personnel, and construction management personnel. The construction crews will have approximately 200 to 375 direct workers for the Project. Construction of the Project will generally occur between 7:00 a.m. and 5:00 p.m., Monday through Friday. Additional hours may be necessary to make up schedule deficiencies or to complete critical construction activities. During the start-up phase of the Project, some activities (such as equipment and system testing) may continue 24 hours per day, 7 days per week. Construction hours will comply with local permit requirements.

Construction of the Project is currently expected to require approximately 14-18 months, which includes mobilization, construction/installation, and commissioning/testing to achieve the targeted commercial operations date of Q1 2027.

The Project will require different equipment types depending on the phase of construction. The first phase consisting of civil work and road building will require dozers, motor graders, and rollers. The pile-driving phase will utilize pile drivers. After pile driving, the installation of racking and panels will be supported mainly by skid steers and telehandlers. Directional drilling equipment, vibratory plows, or trenching equipment for installation of the collection line will be mobilized to the site on low-profile flatbed trailers. For other Project components including the transformers, and inverters; small cranes, bucket trucks, and forklifts will be used to place equipment. Other support equipment such as skid steers, ATVs, and forklifts will also be used.

Delivery trucks will consist of standard, legal load (88,000 pounds or less) over-the-road flatbed and box trucks and will have standard turning radii. Vehicles used inside the arrays will be suitable for the engineered internal access roads and turn-arounds. Equipment typically used in construction and operation of utility scale solar facilities are generally similar in weight or less than equipment typically used in annual agricultural operations. Construction equipment distributes loads widely resulting in similar tire pressure distribution and contact pressures. During construction of a solar facility, the number of vehicle passes in the same wheel tracks is limited, with the exception of vehicles on internal access roads. During construction there will be a concentration of vehicle passes near the site entrances.

2.2.1 Site Preparation and Clearing

The Solar Development Area refers to the portion of the Solar Project on which the solar equipment will be located and constitutes a total of 1,537 acres within the proposed fence and access roads and underground cables located outside the fence. The remaining 670 acres will not be developed for the Project and will remain in their current land use of primarily cultivated cropland and woodland. The Solar Development Area include the panels and associated facilities such as inverters, access roads, and underground collector lines. The portion of the Gen-Tie Line extending from the Project Substation that is on the west is of Interstate 35 is included in this area. The portion of the Gen-Tie Line and Switchyard located on the east side of I-35 is not within agricultural land and consists of woodland and wetland and a small amount of developed land

Under existing conditions, the Solar Development Area consists of primarily of active agriculture under row crop production as well as hay/pasture land, woodland and emergent herbaceous wetlands. Prior to the commencement of construction, site vegetation will be evaluated to determine which areas will be mowed, left undisturbed or will require pre-seeding. Areas with limited vegetation due to past farming operations or disruption of vegetation due to civil construction activities will be seeded and stabilized in a timely manner. Portions of the site not utilized for the Project facilities or not impacted during construction will remain vegetated however may be overseeded to promote additional vegetation as described in the VMP.

Anti-tracking pads will be installed at the construction exits. Temporary perimeter sediment controls and diversions will be installed concurrent with the progress of land clearing and grubbing activities. Prior to any clearing, the limit of disturbance will be surveyed and marked in the field. This limit constitutes the limit of soil disturbance. Work will not be conducted within the stream corridor, the wetland, or their buffers unless authorized by Pine County and by permit from the MN Department of Natural Resources (MNDNR), Minnesota Wetland Conservation Act (WCA) Local Government Unit (LGU), which for this Project is Pine County, and U.S. Army Corps of Engineers, as applicable. Based on the preliminary design, the wetland and the stream corridor within the Project Area have been avoided and no impacts to wetlands or waterways or their buffers are proposed or authorized.

A land surveyor will obtain or calculate Project benchmark, grades, elevations and alignment data from final design plans and detail drawings which inform control staking to establish the Project alignments in advance of construction commencement. During construction, these alignment control points will be reestablished as needed.

2.2.2 Grading

Site grading activities will only occur in select areas where elevations need to be modified to accommodate tracker/racking system slope tolerances, site drainage, access roads, laydown areas; and foundations for the inverters, Project Substation, and Switchyard. This approach to grading minimizes impacts and/or preserves existing soil and root structures, topsoil nutrients, seed base, and pre-construction site hydrology.

Grading consists of excavation and soil stabilization of earth as required to meet solar array design load requirements. Grading within the solar array area will match existing grades as closely as possible, however some existing contours may require smoothing for access purposes. To the extent practical, grading of an area will take place shortly before trenching and then again post installation of Project components to minimize the area of open, uncovered ground present at all times during construction. The portions of the Project Area that need to be graded are expected to result in a balanced cut-and-fill quantity of grading to maintain the existing conditions to the extent practical for the protection of the equipment and facilities. Where grading occurs on site, topsoil will be salvaged in areas where cut will be greater than the topsoil depths and those areas where subsoil fill will be placed. Once all cut/fill is completed the topsoil will be replaced.

Materials suitable for soil stabilization and backfill will be stockpiled at designated locations using appropriate segregation and erosion control methods. Materials unsuitable for compaction, such as debris and large rocks, will be stockpiled at designated locations for disposal at an acceptable off-site location. Contaminated materials are not anticipated, but if any are encountered during excavation, they will be disposed of in accordance with applicable laws, ordinances, regulations, and standards.

2.2.3 Access Road Construction

Permanent access roads will consist of an improved aggregate base. Roads will be constructed as close to existing grade as possible so that existing sheet flow and drainage patterns are maintained. Erosion control devices will be maintained throughout grading and stabilization according to the SWPPP. Permanent access roads will be maintained for the life of the Project.

Permanent aggregate base access roads will be constructed by first removing the topsoil and organic material, compacting the subgrade, and constructing the road according to civil design requirements. Topsoil will be windrowed to the edges of the road area and distributed along the roadway edge after fill and aggregate installation. Geotextile matting will be installed prior to placement of aggregate to prevent mixing with native subsoil. A layer of road base will then be added and compacted. Road aggregate or fill will be a local pit run aggregate material. Upon completion of detailed engineering, the aggregate specifications will be available for construction quality assurance.

2.2.4 Solar Array Construction

Once grading activities are complete, the racking system supports will be constructed using steel piles driven into the ground. Driven steel pile foundations are typically used where high load bearing capacities are required. The pile is driven using a pile driver (hydraulic ram), which requires two workers. Soil disturbance would be restricted to the hydraulic ram machinery, about the size of a small tractor, temporarily disturbing soil at each pile insertion location.

Tracker mounting assemblies may be assembled at the Project laydown yard and transported to the array blocks prepared for installation; they can also be assembled at the point of installation. Tracker mounts are then fixed to prepared support foundations using forklifts and tractors. During array and racking assembly, multiple crews and various types of vehicles will be working within the Project Area.

These vehicles include flatbed trucks for transporting array components, small all-terrain vehicles, and pick-up trucks used to transport equipment and workers throughout the Project Area. Modules will be staged in advance throughout the Project Area and be brought to specific work areas for installation by wagon-type trailers pulled by skid steers. The Solar modules will be installed by multiple crews using hand tools.

2.2.5 Electrical Collection System

Collection system cabling will be installed in upland areas using one of three methods as needed: a chain-driven trenching machine, excavator, cable laying plow, MV cable trailer, or plow equipment pulled by a bulldozer. The trencher will cut an exposed trench approximately 1 foot wide by 3 to 4 feet deep depending on the type of cable installation. Soil disturbance from the trenching machines would be restricted to the trenching machine tracks. Once cables are installed, the trenches would be backfilled using a grader or small bulldozer and a compaction machine. See Section 4.6 for further description of BMP measures to be implemented during trenching activities.

The horizontal directional drill method will be used to install collection system and will not cross any public roads, as described in Section 4.7.

2.2.6 Inverter, Switchyard, Substation

The inverters, Switchyard, Project Substation, will be placed on footers with gravel pad foundations that will be designed to specifications necessary to meet the local geotechnical conditions. Each component will sit on top of a slab foundation with rebar on center in each direction. A pull box for cable penetrations will be located directly under the inverter to facilitate through-floor cable connections. After the collection system is installed and foundations are poured, the inverters will be installed into position and will be lifted by crane and set directly onto the pre-poured foundation.

The Contractor will use an appropriately sized rough-terrain crane to lift and set each unit. After the unit is properly set and anchored, the Contractor will feed the collection cabling previously installed in the adjacent trenches to the unit.

2.2.7 Project Security Fencing

Array fencing will consist of seven- to eight-foot-high woven-wire exclusion fence with wood fenceposts. The Project Substation will require a seven to eight-foot-high chain link fence, which may include three strands of barb wire at the top. Fenceposts will be driven into the ground. No concrete foundations will be used for the fenceposts. Final fence and post specifications will be determined by the EPC.

3.0 SOIL LIMITATIONS AND SUITABILITY WITHIN THE SITE

Soil varies considerably in its physical and chemical characteristics that strongly influence the suitability and limitations that soil has for construction, reclamation, and restoration. Major soil properties include:

- soil texture;
- soil slope;
- drainage and wetness;
- fertility and topsoil characteristics; and
- presence of stones, rocks, and shallow bedrock.

Interpretative limitations and hazards for construction and reclamation are based to a large degree on the dominant soil properties, and include:

- prime farmland status;
- hydric soil status;
- compaction and rutting potential;
- susceptibility to wind and water erosion;
- susceptibility to compaction;
- fertility and plant nutrition; and
- drought susceptibility and revegetation potential.

3.1 IMPORTANT SOIL CHARACTERISTICS

The Soil Survey Geographic Database (SSURGO) is the digitized county soil survey and provides a Geographic Information System (GIS) relating soil map unit polygons to component soil characteristics and interpretations. Generally, soil map unit polygons in the SSURGO database are clipped to the Project Area and major Project components including:

- Solar Array Area
- Electrical Collection Line
- Generator Tie Line
- Access Roads
- Switchyard and Metering
- Inverters, Switchyard, and Substation

Modern SSURGO datasets for the Project Area are not publicly available because of denied access from the landowner of the proposed Iron Pine Solar facility. One 1935 Pine Couty soil map is available and included in Appendix A, but was not used in quantifying soil impacts or limitations as there has been numerous soil survey recorrelations over the past 89 years that has resulted in non-existent soil series, soil series that still exist but are no longer found in or around the Project Area, and improved organic soil classification methods. Because of obsolete historic data, and unavailable modern soil spatial data, the acreage of major Project components could not be determined by spatial query of SSURGO to make soil property interpretations important for construction, use, revegetation, and reclamation. Instead, soil types mapped in the proximity of and adjacent to the Project Area were analyzed and assumed to be present in the Project Area for the purpose of this report. Notes from the 1935 County Soil Survey were included for discussion where suitable.

This report utilized abutting and adjacent soil map units due to expected similar characteristics of the soils within and outside of the Project Area. Soil genesis theories generally suggest soils that formed on similar landscape positions and climates with similar vegetation and parent material will often have similar characteristics (i.e. be the same). On-site investigations noted landscape positions, vegetation, hydrologic regimes, and parent material within the Project Area that extended beyond the proposed Project boundaries. Soil borings conducted during the field wetland delineations showed similar soil types were consistent to NRCS soil mapping of the surrounding landscape. Limitations of the soils anticipated in the Project Area are explored in the following sections since specific NRCS map unit limitations and acreages couldn't be quantified. A Custom Soil Resource Report for the Project Area which includes a SSURGO Map and descriptions of each map unit is provided Appendix A. Future soil investigations are planned to better classify the soil to provide geotechnical information for site design and construction methods.

3.1.1 Physical Characteristics

Selected physical characteristics of adjacent soils that are anticipated to be within the Project Area are shown in Table 1.

Soil texture affects water infiltration and percolation, drought tolerance, compaction, rutting, and revegetation among other things. Soil texture is described by the soil textural family which indicates the range of soil particle sizes averaged for the whole soil. According to the 1935 soil survey, 1,141.8 acres of the Project Area were classified as Peat and indicate soils dominated by organic material rather than mineral particles. The NRCS soil survey and on-site soil borings also suggest most of the soils anticipated within the Project Area are classified as muck or peat (organic soils). These soils likely reside on the central flat, open, poorly drained extents of the Project Area. Soils are expected to transition to sand and loamy sands as elevation increases on the eastern and western portions of the Project Area near the Kettle River.

Slope affects constructability, water erosion, revegetation, compaction and rutting, among other properties. Soils within the majority of the solar array footprint are anticipated to be within the 0 to 5 percent slope range, based off the surrounding soils on similar landforms. However, steeper slopes are anticipated to occur on the southwest and southeastern portions of the Project Area due to elevation increases and surrounding map units that contain greater slope ranges.

Soil drainage indicates the wetness in the soil profile along with the speed at which internal water moves. Soil Drainage affects constructability, erosion by wind and water, and revegetation success. A majority of the soils observed during on-site soil borings noted organic soils which develop in very poorly drained areas with hydric moisture regimes. The poorly drained designation reflects the flat topography on the site that inhibits water drainage either laterally or vertically. A minor extent of the Project Area is anticipated to be well to excessively well drained and is likely to be in sand-dominated soils such as the Mahtomedi and Grayling sands. Field investigations revealed extensive constructed surface drains throughout the Project Area that has likely altered natural soil drainage properties to support conventional crop production.

Topsoil depth affects soil plant nutrition and surface soil structure. To maintain soil productivity, soils with thick topsoil will require larger areas for storage of larger volume of topsoil stripped from permanent infrastructure footprints such as permanent access roads, inverters and the Project Substation. According to SSURGO mapping, approximately eight soil map units occurring adjacent to the Project Area contains topsoil 0 to 6 inches deep and include the Mahtomedi and Grayling soils. The Greenwood map unit is anticipated to have topsoil ranging from 6 to 12 inches. Lastly, the organic Bowstring, Lougee, and Rifle soils are designated as contain deep O and A horizons that extend beyond the 12 to 18 inches range. Topsoil depth is also correlated to soil order. The most abundant soil order within the Project Area are Histosols and are organic soil that lack mineral soil particles and is consistent with the 1935 Pine County soil survey map. Histosols are typically deep, dark, and contain hydric conditions in undisturbed conditions.

The presence of bedrock near the soil surface and rocks and stones in the soil profile affects constructability and revegetation. No soils in the Project Area are anticipated to be shallow to bedrock but gravel and/or rocks may be common in the profile.

Table 2. Soil Physical Characteristics by Adjacent Soil Map Units

Soil Map Unit	Textural Class[1]	Slope Range (%)[2]	Drainage Class[3]							Topsoil Thickness[4]
			E	SE	W	MW	SP	P	VP	
Bowstring and Fluvaquents, 0 to 2 percent slopes	Mucky	0 – 2							X	>12 – 18
Grayling sand	Muck over Sand	0 – 3 0 – 7 2 – 17 17 – 35	X							0 – 6
Greenwood peat, 0 to 1 percent slopes	Mucky peat	0 - 1							X	6 – 12
Lougee peat, 0 to 1 percent slopes	Sandy or Sandy-Skeletal	0 – 1							X	>12 – 18
Mahtomedi sand	Sandy	0 – 2 0 – 7 2 – 17 17 – 35	X							0 – 6
Rifle mucky peat, 0 to 1 percent slopes, occasionally ponded	Mucky peat	0 - 1							X	>12 - 18
Udifluvents, loamy, 0 to 2 percent slopes, occasionally flooded	undesignated	0 – 2								0 – 6

[1] Total acres of Project features that are anticipated to be disturbed by supporting construction equipment traffic, excavation, and grading. Data obtained by merging project facility polygons with the SSURGO spatial data in ArcGIS.
[2] Data available directly from the Natural Resources Conservation Service SSURGO2 spatial or attribute database via geospatial query of the spatial or attribute data.
[3] Representative slope values are taken directly from the SSURGO database. The SSURGO2 database provides representative slope values for all component soil series. Slope classes represent the slope class grouping in percent that contains the representative slope value for a major component soil series. For example, a soil mapped in the 2-6% slope class has an average slope of 4%, which is within the 0-5% slope range.
[4] Drainage class as taken directly from the SSURGO database: “E” Excessively drained; “SE” Somewhat excessively drained; “W” Well drained, “MW” Moderately well drained; “VP” Very poorly drained; “P” Poorly drained; “SP” Somewhat poorly drained.
[5] Topsoil thickness is the aggregate thickness of the A horizons (in inches) described in the SSURGO database.

3.1.2 Selected Soil Classification

Selected classification information for soils with the vicinity of the Project Area is presented in Table 2. Natural Resources Conservation Service (NRCS)-designated prime farmland soils have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. No soil within or adjacent to the Project Area is designated as Prime farmland.

The NRCS 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. One adjacent soil map unit was designated as Farmland of Statewide Importance, but the soil resides on the floodplains of a stream and is not anticipated within the Project Area.

Land Capability Class (LCC) is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time. Capability classes are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

- Class 1 soils have slight limitations that restrict their use.
- Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.
- Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.
- Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.
- Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.
- Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.
- Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

- Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are designated by adding a letter, e, w, s, or c, to the class numeral. The letter e shows the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation; s shows limitation due to shallow, droughty, or stony soil; and c, shows limitation due to climate that is very cold or very dry. In class 1 there are no subclasses because the soils of this class have few limitations.

Soils surrounding and adjacent to the Project Area are in LCC 2w, 4s, 7s, and 7w. The soil type anticipated to be predominant in the Project Area are Histosols and they contain the greatest limitations with LCC values of 7w and 8w. These limited soils include the Bowstring, Greenweed, Lougee, and Rifle series and they are anticipated to occur on the flatter areas of the Project Area. The Mahtomedi and Grayling soil series contain LCC ratings of 4s but LCC values increase to 7s in the steeper sloped map units and likely occur in the western and eastern portions of the Project Area.

Soil map units are rated based on the proportion that meets the criteria for a hydric soil and the ratings include hydric, predominantly hydric, partially hydric, predominantly non-hydric, and non-hydric. Hydric soils also generally correspond to soil map units with in poorly drained to very poorly drained drainage classes. Hydric soils are a component of regulated wetlands and can be used to indicate areas with potential jurisdictional wetlands. There is a high concentration of hydric soils along the south and north Project Area extents and suggest a high potential of hydric soil within the Project Area. Field investigations that examined hydric soils as part of a wetland delineation revealed there is at least 290 acres of functioning hydric soil present. However, the presence of constructed field drains throughout the site suggests natural hydrological regimes have been altered resulting in soils that should be rated as hydric no longer functioning as such.

Table 3. Selected Soil Classifications

Soil Map Unit	Prime Farmland[1]	Farmland of Statewide Importance	Land Capability Class[3]					Hydric Soil[4]
			2w	4s	7s	7w	8w	
Bowstring and Fluvaquents, 0 to 2 percent slopes	Not Prime Farmland	Not Farmland of Statewide Importance					X	Yes
Grayling sand	Not Prime Farmland	Not Farmland of Statewide Importance		X	X			No
Greenwood peat, 0 to 1 percent slopes	Not Prime Farmland	Not Farmland of Statewide Importance				X		Yes
Lougee peat, 0 to 1 percent slopes	Not Prime Farmland	Not Farmland of Statewide Importance				X		Yes
Mahtomedi sand	Not Prime Farmland	Not Farmland of Statewide Importance		X	X			No
Rifle mucky peat, 0 to 1 percent slopes, occasionally ponded	Not Prime Farmland	Not Farmland of Statewide Importance					X	Yes
Udifluvents, loamy, 0 to 2 percent slopes, occasionally flooded	Not Prime Farmland	Farmland of Statewide Importance	X					No

1 Data available directly from the NRCS SSURGO2 spatial or attribute database via geospatial query of the spatial or attribute data. Includes all areas Prime Farmland and Prime farmland if drained or irrigated.

2 Capability subclasses are designated by adding a letter, e, w, s, or c, to the class numeral. The letter e shows the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation; s shows limitation due to shallow, droughty, or stony soil; and c, shows limitation due to climate that is very cold or very dry.

3 Data available directly from the NRCS SSURGO2 spatial or attribute database via geospatial query of the spatial or attribute data. Includes Hydric, Predominantly hydric, and Partially hydric soil.

3.1.3 Construction-Related Interpretations

Selected construction-related interpretative data for site soils are broken down by acreage within the Project Area in Table 3.

For the purposes of this report, a highly erodible rating consists of soils with an NRCS Soil Erodibility Factor (Kw) rating of 0.4 to 0.69. Soil Erodibility Factor (Kw) describes the susceptibility of soil detachment by water runoff or raindrop impact and predicts long-term average soil loss from sheet and rill erosion. The Kw is affected by soil texture, organic matter content, size and stability of soil aggregates, permeability, and depth to a restrictive layer. Soil erosion potential is also influenced by slope and exposure to erosion mechanisms. Soil erosion increases in inverse proportion to the effectiveness of vegetation cover (i.e., soils with denser vegetation cover are less susceptible to erosion). Removal of vegetation associated with construction activities, whether by direct stripping or by other mechanical means, greatly increases erosion potential. The soil types existing around and likely throughout the Project Area are not anticipated to be severely susceptible to water erosion.

Wind erosion was evaluated using the wind erodibility group. Highly wind erodible soils are medium textured, relatively well drained soils with poor soil aggregation, resulting in soils with soil surfaces dominated by particles that can be dislodged and carried by the wind. Three soil types identified as adjacent to the Project Area are designated as highly wind erodible and are the Mahtomedi sands, Grayling sands, and Bowstring and Fluvaquents soils.

Soils prone to compaction and rutting are subject to adverse changes in soil porosity and structure as a result of mechanical deformation caused by loading by equipment during construction. Factors considered are soil texture, soil organic matter content, soil structure, rock fragment content, and the existing bulk density. Each of these factors contributes to the soil's ability to resist compaction and rutting. Only the Udifluvent soils (if present) are anticipated to be susceptible to compaction. Organic soils that are likely extensive are not as compressible as a typical mineral soil. Despite low compaction risks, all of the soil anticipated to be within the Project Area is severely susceptible to rutting.

Two basic methods for installing ground-based solar array systems are installation via pilings or anchoring via precast footing or ballasted trays. The penetrating method includes driven piles, screw augers, or concrete piers to provide a stable foundation. The ease of installation and general site suitability of soil-penetrating anchoring systems depends on soil characteristics such as rock fragment content, soil depth, soil strength, soil corrosivity, shrink-swell tendencies, and drainage. The anchoring system utilizes precast ballasted footings or ballasted trays on the soil surface to make the arrays too heavy to move. The site considerations that impact both basic systems are slope, slope aspect, wind speed, land surface shape, flooding, and ponding. Project Area site conditions and cost dictate which method is employed. Installation of these systems requires some power equipment for hauling components and either driving piles, turning helices, or boring holes to install the anchoring apparatus. As described in Section 2.1.1 and Section 2.2.4, driven steel piles are planned to be used for installation of the racking system for the Project.

SSURGO provides interpretive rating classes for soil suitability ratings for "Ground-based Solar Panel Arrays." SSURGO soil suitability ratings for both Ground-based Solar Panel Arrays include “Not Limited”, “Somewhat Limited”, or “Very Limited”, depending on the type of solar array construction methods. Overall, all adjacent soil map units are rated as “Very Limited” and suggest the anticipated solar panel array suitability in the Project Area will be “Very Limited”. The limitations are due low soil strength, a shallow depth to a saturated zone, frost action, and ponding. A geotechnical or high-intensity soil survey conducted by a qualified firm can determine the most suitable installation method.

The final analyzed soil limitation is drought susceptibility. Even under relatively normal precipitation, some soils are prone to having drought stress occur in the plants growing on them. Soil may have an inherently low ability to store water which is typical of sandy or shallow soils or soils having a high content of rock fragments. Drought ratings include severely drought vulnerable, drought vulnerable, moderately drought vulnerable, somewhat drought vulnerable, and slightly drought vulnerable.

In the severely drought vulnerable rating, the soil and site properties are such that the plants growing on the soil must be very drought tolerant even in years with normal amounts of rainfall. The soil may have very low water storage capacity. In the drought vulnerable rating, drought conditions generally occur every year and the soil may have low water storage capacity. Under moderately drought vulnerable soils, annual precipitation is generally adequate for plant growth. In dry years some water stress may occur. Slightly drought vulnerable soils are either in low-lying parts of the landscape where plant roots may exploit near-surface ground water or are in areas where precipitation is much higher than potential evapotranspiration. In an extremely dry year plants may be water stressed on these soils.

Soils susceptible to drought include coarse textured soils in moderately well to excessive drainage classes. Revegetation during seed germination and early seedling growth is severely compromised during dry periods on droughty soils. Most of the surrounding soils were slightly drought vulnerable, with only the sand-dominated Mahtomedi and Grayling soils being rated as drought vulnerable.

Table 4. Soils in Selected Construction-related Interpretations

Project Facility	Kw[1]	Wind Erodibility[2]	Compaction Prone[3]	Rutting Hazard[4]		Solar Array[5]	Drought Vulnerable[6]		
	Moderate	High		Moderate	Severe	Very Limited	Slightly Vulnerable	Moderately Vulnerable	Drought Vulnerable
Bowstring and Fluvaquents, 0 to 2 percent slopes		X			X	X	X		
Grayling sand		X		X		X			X
Greenwood peat, 0 to 1 percent slopes					X	X	X		
Lougee peat, 0 to 1 percent slopes					X	X	X		
Mahtomedi sand		X		X		X			X
Rifle mucky peat, 0 to 1 percent slopes, occasionally ponded					X	X	X		
Udifluvents, loamy, 0 to 2 percent slopes, occasionally flooded	X		X		X	X		X	

1 Erosion Factor Kw indicates the susceptibility of a whole soil to sheet and rill erosion by water, and is a function of percent silt, sand, organic matter, soil structure, and hydraulic conductivity (Ksat). For the purposes of this report, values range from 0.02 and 0.69. A rating of 0.0-0.24 is Low, a rating of 0.25-0.40 is Moderate, and a rating of 0.40-0.69 is High.

2 Highly Erodible Wind Includes soils in wind erodibility groups 1 and 2.

3 Soils are rated Low, Medium, or High based on their susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. For soils with a Low rating, the potential for compaction is insignificant. For soil with a Medium rating, the potential for compaction is significant and the growth rate of seedlings may be reduced following compaction. For soil with a High rating, the potential for compaction is significant and the growth rate of seedlings will be reduced following compaction. Soils with a Medium or High rating are represented in this table.

4 Rutting potential hazard based on the soil strength as indicated by engineering texture classification, drainage class, and slope. In general, soils on low slopes in wetter drainage classes, and comprised of sediments with low strength will have potential rutting hazards.

5 Soils are placed into interpretive rating classes of Not limited, Somewhat limited, or Very limited.

6 Soils are rated Slightly vulnerable, Somewhat drought vulnerable, Moderately drought vulnerable, Drought vulnerable, and Severely drought vulnerable. Soils rated as Somewhat drought vulnerable and Moderately drought vulnerable are represented in this table. No soils within the Project Area are rated as Drought vulnerable, and Severely drought vulnerable.

3.1.4 Summary of Major Soil Limitations

3.1.4.1 Wind Erodibility

The predominant rating for soil susceptibility to wind erosion was severe and is a result of organic soils and fine sand textured soils. These soils may have low vegetative cover, an expansive area, or lower particle cohesive forces that detach and erode easily with wind. Exposed topsoil, whether on stockpiles, nearby areas, or slopes, may be lost and transported into waterways or wetlands furthering potential environmental impairment. Therefore, protecting the soil surface via plant residues, perennial plant cover, soil binding agents, or soil wetting must be implemented. Soil erosion and other BMPs that can mitigate impacts to wind (and water) erodible soils are described in Section 4.10 and the Project-specific SWPPP. Initial post-construction revegetation efforts and maintenance of vegetation during operations and maintenance will need to consider selecting appropriate vegetation to grow quickly and include regular inspections of erosion controls after precipitation events as described in the VMP.

3.1.4.2 Land Capability Classification

The predominant LCC surrounding the Project Area is 7w-8w, suggesting potentially severe limitations to land use and conservation practices and an added susceptibility to excess water below and above the ground, agreeing with Section 3.1.4.3. These soil interpretations underline the importance of utilizing suitable revegetation and soil conservation methods as described in the VMP.

3.1.4.3 Solar Arrays

The predominant anticipated soil texture/type in the Project Area is muck or peat, followed by sands. The primary limitations for these soil types during construction, operations and maintenance, and decommissioning include low soil strength, saturated soil, frost action, and ponding. A geotechnical and soils investigation would identify appropriate methods required for installation of the racking systems and foundations within these soil types. As described in Section 2.1.1, the racking system supports will be determined following an on-site soil survey and will depend on delineated soil types.

3.1.4.4 Compaction & Rutting

Iron Pine Solar will design construction access and manage construction passes to minimize the number of trips occurring on a given soil and will implement wet weather procedures any time that rutting is observed. Deep compaction is not anticipated to be a significant problem as the number of construction equipment passes over a given area is limited, and construction equipment consists of smaller, low-ground- pressure tracked vehicles. Practices to be implement to decompact soils are described in Section 4.2 and the project specific VMP. Factors to be considered regarding wet weather conditions are described in Section 4.3. Rutting will be avoided by use of temporary construction matting as described in Section 4.9. No rutting will occur within the wetland as impact to the wetland has not been proposed or authorized by the USACE or Pine County. Based on the preliminary design, the wetland and one stream within the Project Area have been avoided and no impacts to wetlands are proposed.

4.0 BMPS DURING CONSTRUCTION AND OPERATION

The Project will be constructed and operated on property leased by Iron Pine Solar. No direct impacts to adjacent land are expected. The Project is located on farmland occupying a flat to gently sloping floodplain/wetland complex on the east side of Kettle River. Most of the farmland has been drained via constructed ditches to support crop production prior to 1985. The farmland is not designated as prime farmland or farmland of statewide importance.

The prevailing topography of the Project Area will not be substantially changed by construction activities, including installation of the foundations for the tracking systems and trenching for the collection system. It is anticipated that panel arrays will be designed and constructed to conform to the existing flat topography to minimize the need for significant grading. However, some localized grading may be necessary to meet racking tolerances and to construct other project facilities such as the transformer, switchgear, MV power station, and metering. Access roads will be constructed as close to existing grade as possible, maintaining preconstruction hydrologic flow patterns. Upon completion of construction activities, the areas temporarily impacted due to construction activities will be returned to their pre-construction topography.

A final grading plan will be submitted to the MPCA as part of the Stormwater Polluction Prevention Plan (SWPPP) submitted for closer to construction, but prior to site disturbance. The final grading plan will show existing and proposed contours for any areas that will require grading. The final grading plan will show the location of perimeter erosion control measures to be used throughout construction, location of stockpiles, location of bore pits, and location and dimensions of road drainage ditches, if proposed.

The sections below describe the best management practices that Iron Pine Solar will implement to maintain soil health, slope stabilization, and infiltration and avoid sedimentation, erosion, spill-related impacts, and encroachment of noxious weeds within the Project Area due to construction and operation of the Project.

4.1 ENVIRONMENTAL MONITOR

Iron Pine Solar will engage a weekly inspection onsite to monitor earthmoving activities during the initial phase of Project construction to ensure appropriate measures are taken to properly segregate and handle the topsoils. The Monitor will have a variety of duties, including but not limited to:

- Perform regular inspections during the major earthmoving phases of Project construction, including trenching, and during activities in the below bullets;
- Observe construction crews and activities to ensure that topsoil is being segregated and managed appropriately;

- Monitor the site for areas of potential soil compaction (except within access roads) and make specific recommendations for decompaction;
- Make recommendations to Iron Pine Solar's construction manager;
- Assist in determining if weather events have created "wet weather" conditions and provide recommendations to the construction manager on the ability to proceed with construction; and
- Submit reports of Iron Pine Solar's adherence to soil BMPs during the major earthmoving phase of Project construction and upon completion of earthmoving activities to document SWPPP compliance.

Potential issues with BMPs will be reported directly to Iron Pine Solar's construction manager who will use discretion to either correct the activity or stop work.

4.2 SOIL SEGREGATION AND DECOMPACTION

During construction, Iron Pine Solar will work to protect and preserve topsoil within the Project Area. Site preparation will include clearing and grubbing, where needed, prior to any topsoil stripping. Topsoil will be separated from subgrade/subsoil materials when earthmoving activities or excavation are conducted during grading, road construction, cable installation, and foundation installation. The depth of the topsoil to be stripped will be a maximum depth of 12 inches or actual depth of topsoil if less than 12 inches or as agreed upon with the landowner.

The stored topsoil and subsoil will have sufficient separation to prevent mixing during the storage period. A thin straw mulch layer or geotextile fabric may be used as a buffer between the subsoil and topsoil to facilitate separation of the subsoil and topsoil during the excavation backfill process. Topsoil will not be used to construct field entrances or drives, will not be stored or stockpiled at locations that will be used as a traveled way by construction, or be removed from the property.

During the activities that require temporary excavations and backfilling (i.e., trenching activities) the subgrade material will be replaced into the excavations first and compacted as necessary, followed by replacement of topsoil to the approximate locations from which it was removed. Topsoil will then be graded to the approximate pre-construction contour. Iron Pine Solar will avoid compaction in other areas where it is not required by the design.

Following grading activities that require segregation of topsoils/subsoils, topsoil materials will be 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 would be re-spread within the Project Area at pre-established locations and not relocated off-site. The location and amount of topsoil will be documented to facilitate re-spreading of topsoil after decommissioning.

Stripped topsoil and subsoil that will be necessary for future reclamation for components such as access road installation and the transformer, switchgear, MV power station, and metering will be removed to suitable locations near the site of removal and spread across existing topsoil for storage.

4.3 WET WEATHER CONDITIONS

Construction in wet soil conditions will not commence or continue at times when or locations where the passage of heavy construction equipment may cause rutting to the extent that the topsoil and subsoil are mixed, or underground drainage structures may be damaged.

During construction, certain activities may be suspended in wet soil conditions, based on consideration of the following factors:

- extent of surface ponding;
- extent and depth of soil erosion, rutting, compaction, and mixing of soil horizons;
- areal extent and location of potential rutting and compaction (i.e., can traffic be rerouted around wet area);
- damage to drain tiles if present; and
- type of equipment and nature of the construction operations proposed for that day.

If adverse wet weather construction impacts cannot be minimized to the satisfaction of Iron Pine Solar, the EPC will cease work in the applicable area until Iron Pine Solar determines that site conditions are such that work may continue.

4.4 INITIAL GRADING/ROAD CONSTRUCTION/ARRAY CONSTRUCTION

A final grading plan will be developed closer to construction, but prior to site disturbance. The final grading plan will show existing and proposed contours for any areas that will require grading. The final grading plan will show the location of perimeter erosion control measures to be used throughout construction, location of stockpiles, location of bore pits, and location and dimensions of road drainage ditches, if proposed.

Micro-grading or site leveling will likely be necessary prior to array installation to accommodate slope tolerances allowed for by the solar array design. The appropriate depth of topsoil that should be stripped and segregated from other materials during initial grading activities is described in Section 4.2.

During civil work, topsoil will be removed from the cut/fill areas and stored in designated locations for later use. Once topsoil is removed from the cut/fill areas, the sub-grade materials will be removed as required from higher ground elevations and relocated on-site at lower elevations. Prior to relocating sub-grade materials to the lower elevations, topsoil in the low areas will be stripped and set aside before the fill is added, then respread over the new fill. The stored topsoil will be re-spread over the reconditioned sub-grade areas. Newly spread topsoil will be loosely compacted and/or "tracked" and the erosion and sedimentation prevention BMPs will be implemented as described in Section 4.10 and in accordance with the Project SWPPP.

After the majority of the micro-grading activities have been completed, internal access roads will be constructed. Topsoil will be stripped from the roadbeds to a depth of at least 12 inches and will be windrowed to the edges of the roadbed. Windrowing will consist of pushing materials into rows of spoil piles adjacent to the road which will be loosely compacted and/or "tracked" with stormwater and wind erosion BMPs in place. The sub-grade materials will then be compacted. Roads shall be constructed at grade to allow for existing sheet flow so that existing drainage patterns are maintained. Previously windrowed topsoil material will be respread around the new gravel material along the road shoulders.

Once grading and road construction is complete, the Contractor can begin the installation of foundation piles for the PV array racking system as described in Section 2.1.1 and 2.2.4. This work will consist of directly driving the pile into the soil with pile drivers. These vehicles would operate on the existing surface of the ground and impacts would be limited to what is typical when vehicles drive over the soil surface. Very little soil disturbance is expected from this activity.

Dust abatement measures may include restriction of vehicle speeds, watering of active areas, watering of stockpiles, watering on public roadways, the application of calcium chloride (or other similarly approved product), track-out control at site exits, and other measures.

4.5 FOUNDATIONS

The skids for the inverters will likely be installed on driven pier foundations but could be placed on concrete foundations if required by soil and geotechnical conditions as described in Section 2.1.4. The Contractor will strip topsoil off the area for the foundation, install the pier-type foundations, compact sub-grade materials, re-grade spoils around the foundation area, and then install clean washed rock on the surface. All topsoil stripped from these areas will be pushed outside of the work area and collected into designated spots for later use. These topsoil piles will be windrowed or piled and loosely compacted and/or “tracked” with stormwater and wind erosion BMPs in place. Once construction is advanced, the topsoil piles would be distributed in a thin layer adjacent to the foundation area.

If concrete foundations are used, the foundations will be dug using a rubber-tire backhoe and then rebar and concrete installed and left to cure. After cure and testing of concrete strength is completed, the subgrade spoils will be compacted around the foundations. After the solar equipment is set, the adjacent topsoil will be re-spread around the foundation.

4.6 TRENCHING

Construction of the Project may require trenching for the installation of both DC and AC collection lines. The typical burial depth for collector circuits is 36 inches. The trench for a single cable will be eighteen inches wide. Where multiple cables are installed parallel to each other, the cable separation will be up to eight feet apart, therefore the width of the trench will vary depending on the number of circuits within the trench.

During trenching, topsoil and subgrade materials would be excavated from the trench using typical excavating equipment or backhoes and segregated as described in Section 4.2. The bottom of each trench may be lined with clean fill to surround the cables. Iron Pine Solar anticipates that native subsoil will be rock free, and that no foreign fill will be necessary. After cables have been installed on top of bedding materials in the trench, 1 foot of screened, native backfill will be placed on the cables followed by additional 2 feet of unscreened native backfill trench spoil. This material would be compacted as necessary. The last 1 foot of each trench will then be backfilled with topsoil material only to return the surface to its finished grade.

4.7 HORIZONTAL DIRECTIONAL DRILL

Underground horizontal directional drilling (HDD) will be utilized in environmentally sensitive areas, such as nonfarmed wetlands and natural waterways, to avoid impacts to these resources. Bore pits will be setback at least 10 feet from stream corridor and wetland buffer boundaries. Based on the preliminary design, the non-farmed wetlands within the Project Area have been avoided and no impacts to wetlands are proposed. One MDNR Public Watercourse, which has been previously altered from its natural course where it crosses through the Development Area will be crossed via collection line cable in two locations based on the current design. These crossings will be conducted via HDD and will not impact the waterway. Proper sediment, erosion control, and invasive species control Best Management Practices (BMPs) will be installed/utilized prior to and during construction activities.

Horizontal directional drill boring equipment will be stored either in the Project laydown yard or near the location of the proposed boring. If the boring cannot be completed in one day, overnight storage of equipment will be in upland agricultural areas within 50 feet of the bore pits. Appropriate BMPs and contaminant management (oil absorbent booms, etc.) materials will be put in place prior to leaving the boring area for the day.

A typical bore pit is approximately 10 feet by 20 feet by 6 feet deep. Approximately 1,200 cubic feet (45 cubic yards) of material may be excavated for each pit. The boring will require two bore pits, one on each side of the road being crossed. All materials removed from bore pits will be stored adjacent to the boring with appropriate BMPs installed. Once the boring is completed, the excavated material will be reused as backfill of the pit. Once a final grade is reached, the area will be seeded with a cover crop and permanent seed mixture with appropriate erosion control devices installed (silt fence, erosion matting, etc.), if necessary.

4.8 DEWATERING

Dewatering may be required for excavations such as bore pits. Iron Pine Solar will develop a Dewatering Plan and provide training to personnel directly involved with discharge activities. Iron Pine Solar shall ensure that on-site personnel directly involved with discharge activities have access to the Dewatering Plan at all times while at the discharge location(s). Dewatering will be performed in accordance with applicable appropriation and discharge permits, and at a minimum, will comply with the following procedures:

- Floats will be placed on pump intakes.

- The excavation will be dewatered into a well-vegetated upland area with an appropriate energy-dissipation device. Whenever possible, the slope at the point of discharge will be away from any streams or wetlands. Soils in the vicinity of the discharge point will be assessed before discharge. Topography between the discharge point and the nearest receiving waters will be evaluated for erosion potential.
- If the flow of a discharge cannot be kept out of streams, wetlands, drainage ditches, etc., the discharge shall be filtered by one of the methods described below. Dewatering discharge will be directed into a sediment filter bag or a straw bale/silt fence dewatering structure which discharges into a vegetated area to prevent heavily silt-laden water from flowing into wetlands and waterbodies.
- Only non-woven fabric filter bags will be used for dewatering.
- Filter bags and dewatering structures must be maintained in a functional condition throughout dewatering activity (e.g., clogged or ripped bags must be replaced) and will be attended at all times during active pumping. Accumulated sediment from the filter bags shall be spread in an approved upland location.
- Iron Pine Solar will comply with applicable permit requirements, including tracking volumes of water pumped, obtaining water samples (if needed) for testing, and taking necessary measures to meet effluent limitations.

4.9 TEMPORARY EROSION AND SEDIMENT CONTROL

Iron Pine Solar will prevent excessive soil erosion on lands disturbed by construction by adhering to an SWPPP required under the NPDES permitting requirement that will be administered by the MPCA. Prior to construction, the Project’s Engineer of Record will outline the reasonable methods for erosion control and prepare the SWPPP.

These measures would primarily include silt fencing on the downside of all hills and near wetlands and surface drains. This silt fencing would control soil erosion via stormwater. Check dams and straw waddles will also be used to slow water during rain events in areas that have the potential for high volume flow. In addition, the Contractor can use erosion control blankets on any steep slopes, although given the site topography, this BMP will not likely be required. Lastly, as outlined above, topsoil and sub-grade material will be piled and loosely compacted and / or “tracked” while stored. The BMPs employed to mitigate wind and stormwater erosion on these soil stockpiles will include installing silt fence on the downward side of the piles as needed and installation of straw waddles if these spoil piles are located near waterways.

The SWPPP will designate onsite SWPPP inspectors to be employed by the Contractor for routine inspections as well as for inspections after storm events per the plan outlined in the SWPPP. The SWPPP will consider wind erodibility and best practices as such including methods such as wetting exposed soils to minimize dust during construction activity and maintaining good vegetative cover (both cover crops and permanent vegetation).

The SWPPP will be submitted to the MPCA prior to construction start and designated onsite SWPPP inspectors will be employed by the Contractor for routine inspections as well as for inspections after storm events per the plan outlined in the SWPPP.

4.10 DRAIN TILE IDENTIFICATION, AVOIDANCE AND REPAIR

Iron Pine Solar or its EPC contractor will work to identify any existing non-abandoned drain tile systems within the Project Area and may include the use of local drain tile contractor. Existing non-abandoned tile will be located by analyzing existing documentation, reviewing aerial photography, and interviewing Project participating landowners and adjacent landowners to identify approximate or expected locations of the tile lines. If the location of the existing tile system is not accurately determined, a physical tile location effort may be undertaken. Physical location of tile may be attempted using ground penetrating radar in the areas of suspected tile locations, or GPS-enabled line scope. If visible surface inlets are identified, a tile probe may be used to locate the tile line and determine its direction from the inlet. The tile line will then be mapped with a GPS locator so it can be avoided during construction.

Care will be taken during construction to: a) avoid drain tile locations within the Project Area, b) re-route drain tile away from locations which could be damaged during construction, or c) in the case of fields with pattern tile networks, work with applicable landowners to establish acceptable criteria for rerouting, replacing or abandoning in place drain tile that is within a photovoltaic (PV) array.

If non-abandoned drain tile is damaged, the damaged segment will be repaired in place or, if necessary, relocated as required by the condition and location of the damaged tile. In the event drain tile damage becomes apparent after commercial operation of the Project, the drain tile will be repaired in a manner that restores the operating condition of the tile at the point of repair and will have the capacity, depth, and appropriate slope to ensure the new tile line performs adequately for the line it is replacing. All repair, relocation, or rerouting referenced above will be consistent with these policies: a) materials will be of equal or better quality to those removed or damaged; b) work will be completed as soon as practicable, taking into consideration weather and soil conditions; c) work will be performed in accordance with industry-accepted, modern methods; and d) in the event water is flowing through a tile when damage occurs, temporary repairs will be promptly installed and maintained until such time that permanent repairs can be made. Iron Pine Solar will minimize interruption of any drainage on site or on any neighboring farms that may drain through the property.

Repairs or rerouting will be performed using a small to mid-sized excavator. Laser equipment will be used to ensure proper grading of the tile. In the event a line of significant size and length needs to be rerouted or installed; a commercial drainage plow could be used. The drainage plow typically utilizes GPS-grade control to ensure tile is installed to specified slopes. The following considerations will also apply:

- Tiles will be repaired with materials of the same or better quality as that which was damaged.
- Tiles repairs will be conducted in a manner consistent with industry-accepted methods.

- Before completing permanent tile repairs, tiles will be examined within the work area to check for tile that might have been damaged by construction equipment. If tiles are found to be damaged, they will be repaired so they operate as well after construction as before construction began.
- Iron Pine Solar will make efforts to complete permanent tile repairs within a reasonable timeframe, considering weather and soil conditions.

4.11 CENTER-PIVOT IRRIGATION WELL IDENTIFICATION AND AVOIDANCE

Where center-pivot irrigation systems are present within the Project Area, the systems and the water/utility lines servicing them within the Project Area will be decommissioned and left in place. If wells are located within the solar array area, they will either be marked with flagging and a five-foot buffer around them will be fenced to protect these structures, or fully decommissioned. If Iron Pine Solar identifies a need for wells during operations, these wells may be uncapped or new wells may be installed. Any new wells will be permitted in accordance with Pine County and/or MN Department of Health standards.

5.0 VEGETATIVE MANAGEMENT PLAN

Iron Pine Solar is committed to minimizing impacts to soil within the Project Area so that the site may be returned to active agricultural production upon decommissioning. In accordance with the VMP, Iron Pine Solar will establish a permanent vegetative cover throughout the Project Area including areas beneath and around arrays. This will manage erosion by increasing stormwater infiltration and reducing runoff. Stormwater infiltrates soil at a higher rate on perennially vegetated ground cover than on cultivated cropland. The transition to permanent perennial vegetation will manage additional runoff resulting from the solar modules and access roads. Permanent perennial vegetative cover also provides connectivity to existing adjacent wildlife habitats.

6.0 CONTROLLING SPREAD OF UNDESIRABLE SPECIES

During construction and operation, appropriate BMPs will be used to manage and limit the spread of invasive and noxious weed species. Invasive and noxious weed control practices to be conducted during pre-construction, construction and operation of the project, soil handling, and equipment cleaning are described in the VMP.

Equipment will be cleaned before mobilization to the site to prevent introduction of invasive species from off-site sources. The equipment will be manually cleaned of plant materials between work zones within the Project Site. Project Plan details can be found in the Vegetation Management Plan developed for the Project.

7.0 DECOMMISSIONING

The Project will operate for at least 30 years and the useful life of the Project may be 35 or 40 years based on current forecasts for modern equipment. At the end of the useful life of the Project, Iron Pine Solar will be responsible for removing all of the solar arrays and other associated facilities and restoring the site to its prior use. At the end of the anticipated Site Permit, the Applicant reserves the right to extend operations of the Project by applying for an extension of the permit to continue operation. Should the Applicant decide to continue operation, a decision would be made as to whether the Project would continue with the existing equipment or to upgrade the facilities with newer technologies. In general, the majority of decommissioned equipment and materials will be recycled. Materials that cannot be recycled with be disposed of at approved facilities.

At the end of the Project's useful life, the Project would cease operation. At that time, the facilities would be decommissioned and dismantled and the site restored in accordance with the Decommissioning Plan developed for the Project.

7.1 RESTORATION/RECLAMATION OF FACILITY SITE

Once the solar facilities are removed, the site would be restored to agricultural use or to another use if the economic conditions and landowner intentions at that time indicate another use is appropriate for the site. Restoration activities will be conducted in accordance with the Decommissioning Plan and VMP.

After steel pier foundations, fence posts, concrete foundations, re-claimed access road corridors and other equipment are removed the site will be returned to original the original topography to the extent practicable and will be restored with either stockpiled soil or by supplemental soil. Soils will be decompacted if necessary. The method of decompaction will depend on how compacted the soil has become. Soils will be de-compacted by using a tractor and disc to a 12-inch depth or a tractor and a deep subsoiler, if necessary. Grading and other soil disturbance activities conducted during decommissioning will be minimized to the extent necessary to effectively decommission the site and to maintain the soil benefits realized during the long-term operation of the Project.

APPENDIX A

Appendix A

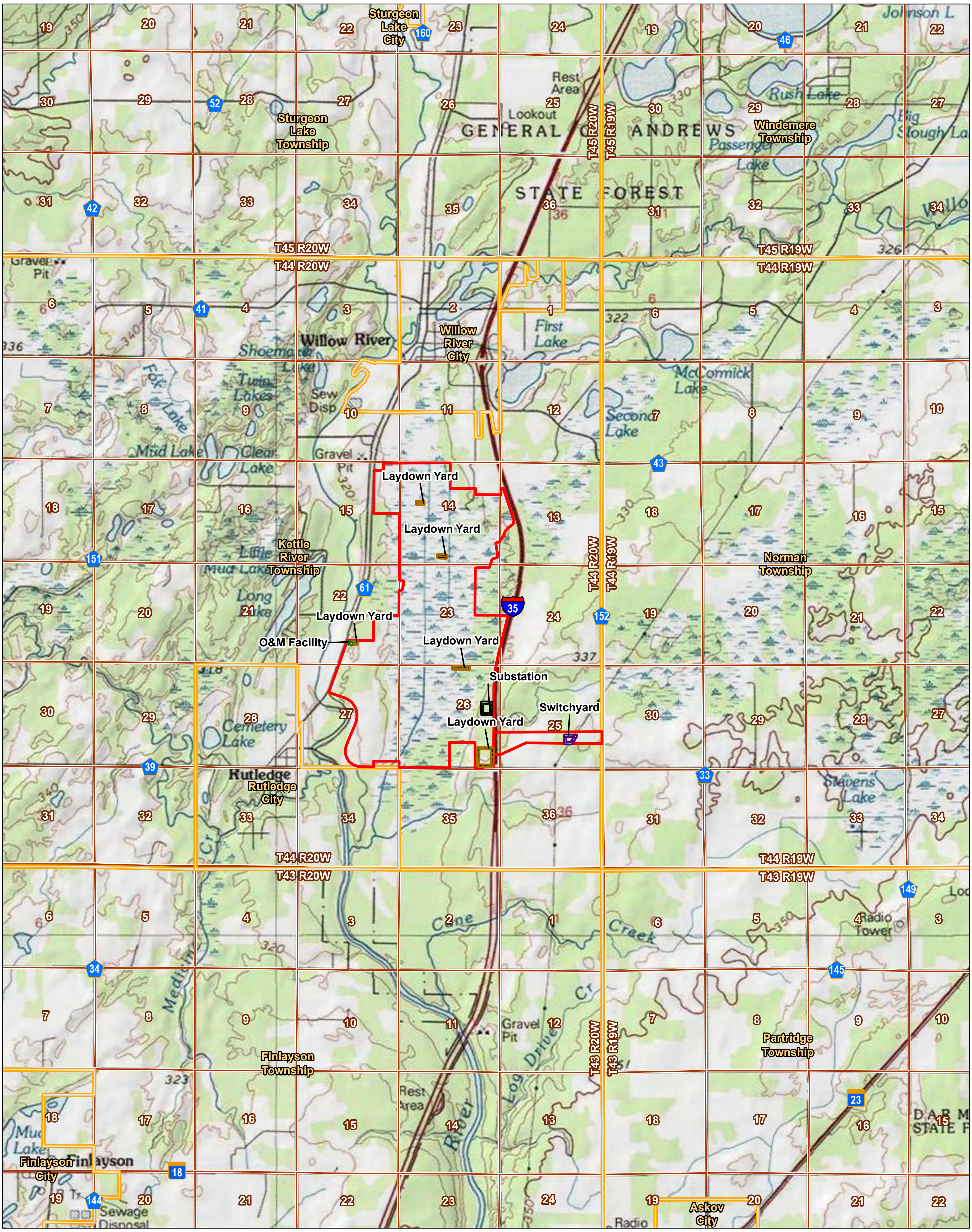
A.1 SITE LOCATION MAP

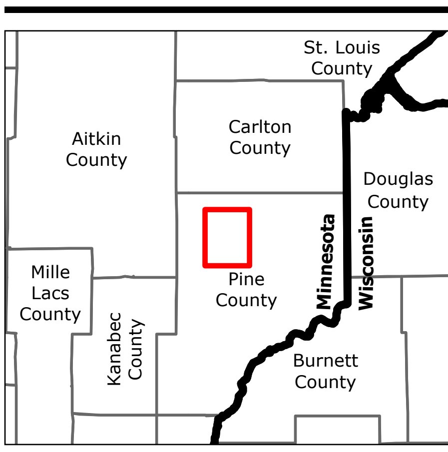
A.2 USDA NRCS SOIL SURVEY MAP

A.3 GRADING PLAN (To be inserted based on final design)

A.4 SITE PLAN (To be inserted based on final design)

A.5 1935 PINE COUNTY SOIL SURVEY MAP





Legend
- Project Area Boundary
- Proposed Laydown Yard
- Proposed O&M Facility
- Proposed Substation
- Proposed Switchyard
- County Subdivision
- Township, Range & Section Boundary

0 0.5 1 Miles
(At original document size of 11x17)
1:63,360

N

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Swift Current Energy, Stantec, MnGeo, MnDOT
3. Background: USGS Quadrangle

Stantec

Project Location
Kettle River Township
Pine County, Minnesota

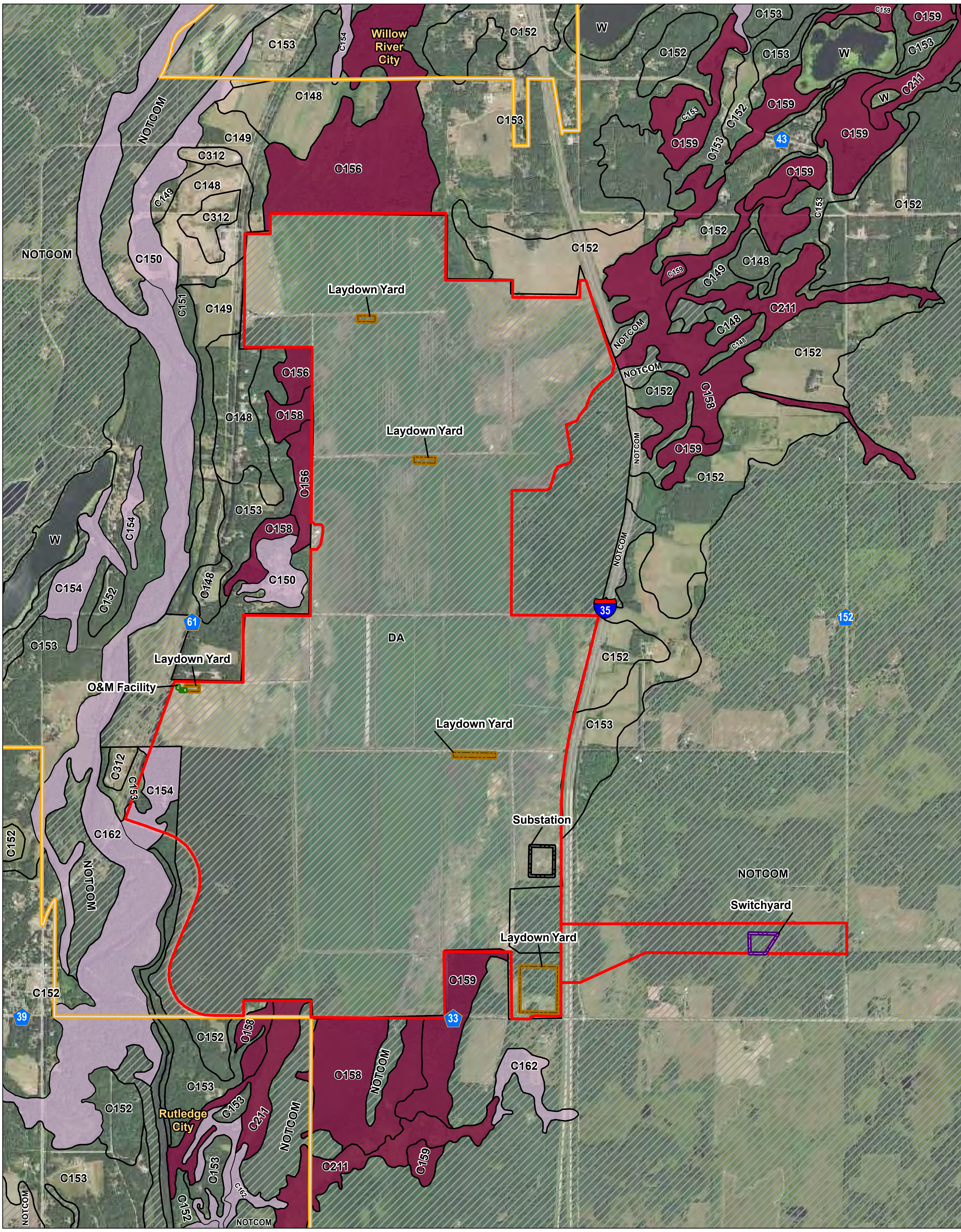
Prepared by KJM on 2024-02-21

Client/Project
193708962
Iron Pine Solar, LLC
Iron Pine Solar Project
MnPUC Site Permit Application

Map No.
A.1

Title
Project Location

V:\1937\Active\193708962\03_data\gis_cad\gis\mxds\193708962_iron_pine_mnpuc\193708962_iron_pine_mnpuc.aprx Revised: 2024-02-21 By: kjmueller



Legend

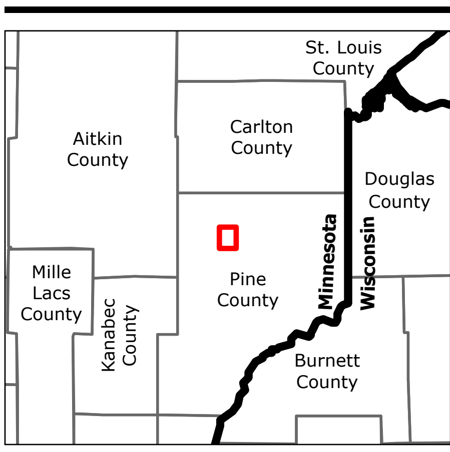
- Project Area Boundary
- Municipal Boundary

NRCS Soil Survey Data*

Hydric Soil Rating

- Hydric
- Predominantly Non-Hydric
- Non-Hydric
- Denied Access / No Digital Data Available

*Available NRCS data incomplete for significant portion of project area.



0 1,000 2,000 Feet

(At original document size of 11x17) 1:24,000

N

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Swift Current Energy, Stantec, ESRI, MnGeo, MnDOT, NRCS
3. Background: 2021 NAIP

Stantec

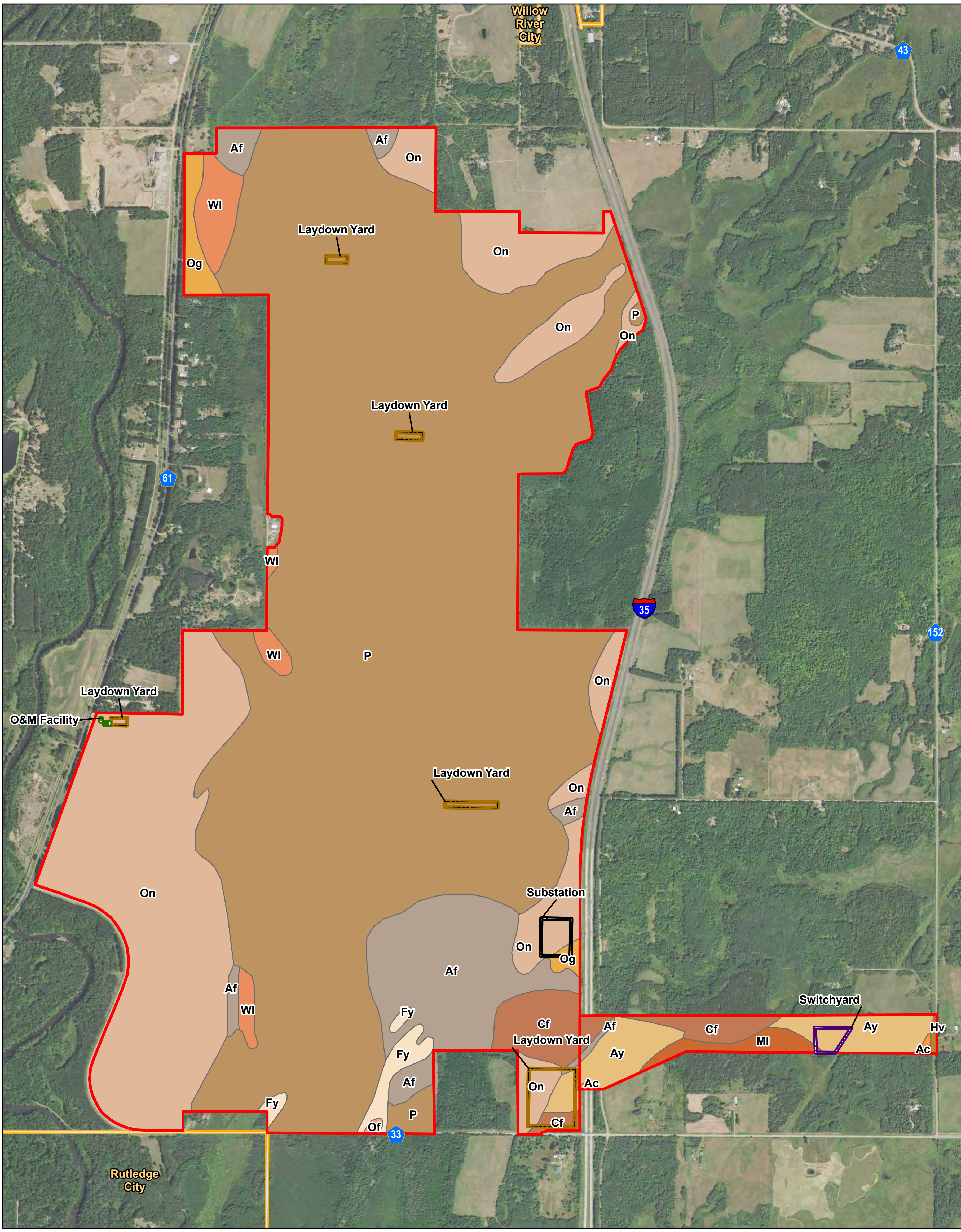
Project Location Prepared by KJM on 2024-01-25
Kettle River Township
Pine County, Minnesota

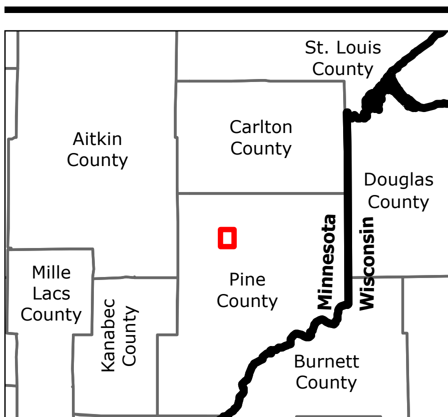
Client/Project 193708962
Iron Pine Solar, LLC
Iron Pine Solar Project
MnPUC Site Permit Application

Figure No.
A.2

Title
Soil Resources - NRCS

V:\1937\Active\193708962\03_data\gis_cad\gis\mxds\193708962_iron_pine_mnpuc\193708962_iron_pine_mnpuc.aprx Revised: 2024-01-25 By: kjmueller





Legend

- Project Area Boundary
- Municipal Boundary

Pine Co. 1935 Soils Map

- Ac - Adolph silty clay loam
- Af - Adolph fine sandy loam
- Ay - Askov fine sandy loam
- Cf - Cloquet fine sandy loam
- Fy - Freer fine sandy loam
- Hv - Hibbing very fine sandy loam
- Ml - Milaca loam
- Of - Onamia fine sandy loam
- Og - Omega gravelly loamy fine sand
- On - Omega loamy fine sand
- P - Peat
- Wl - Warman loamy fine sand

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Swift Current Energy, Stantec, ESRI, MnGeo, MnDOT, NRCS
3. Background: 2021 NAIP

0 800 1,600 Feet

(At original document size of 11x17)
1:19,200

N

Stantec

Project Location
Kettle River Township
Pine County, Minnesota

Prepared by KJM on 2024-01-25

Client/Project
193708962
Iron Pine Solar, LLC
Iron Pine Solar Project
MnPUC Site Permit Application

Figure No.
11b

DRAFT

Title
Soil Resources - Pine Co Soils Map 1935

V:\1937\Active\193708962\03_data\gis_cad\gis\mxds\193708962_iron_pine_mnpuc\193708962_iron_pine_mnpuc.aprx Revised: 2024-01-25 By: kjmueller

Appendix D

Greenhouse Gas Emissions Estimates

Table 1. Summary of Construction GHG Emissions

Emission Source	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e (metric tons)
Direct Sources				
Off Road Mobile Combustion	3,889.01	3.85E-01	3.58E-01	3,994.67
On Road Mobile Combustion	80.39	1.80E-03	1.24E-01	113.26
Temporary Land Use Change	--	--	--	2,856.43
TOTAL - ALL SOURCES	**3,969.40**	**0.39**	**0.48**	**6,964.36**

Table 2. Summary of Operations GHG Emissions

Emission Source	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO_2e (metric tons/year)
Direct Sources				
Mobile Combustion	2.90	2.61E-06	3.96E-07	2.90
Land Use Change	--	--	--	6,237.78
TOTAL - ALL SOURCES	**2.90**	**0.00**	**3.96E-07**	**6,240.68**

Table 3. Summary of Decommissioning GHG Emissions

Emission Source	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO_2e (metric tons/year)
Direct Sources				
Off Road Mobile Combustion	2,222.29	0.22	0.20	2,282.67
On Road Mobile Combustion	45.94	0.00	0.07	64.72
TOTAL - ALL SOURCES	**2,268.23**	**0.22**	**0.28**	**2,347.39**

Table 4. Conversions

Unit	Amount	Unit
1 US ton	2000	lbs
1 US ton	0.907185	metric tons
1 US ton	907.185	kg
1 US ton	907185	grams
1 lb	0.453592	kg
1 lb	453.592	grams
1 MWh	1000	kWh
1 hectare	2.47105	acres
1 MJ	0.372506136	hp-h
US gallon (diesel)[1]	144.945	MJ
US gallon (diesel)	53.9929019	hp-h
US gallon (gasoline)[1]	126.833	MJ
US gallon (gasoline)	47.24606261	hp-h

[1] US Energy Information Administration, 2024. https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php

Table 5. Global Warming Potentials

Greenhouse Gas Name	CAS Number	Chemical Formula	Global Warming Potential (100-yr.)[1]
Carbon dioxide	124–38–9	CO_2	1
Methane	74–82–8	CH_4	28
Nitrous oxide	10024–97–2	N_2O	265

[1] Global Warming Potentials from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024.
https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Table 6. Construction Emissions from Off-Road Fuel Combustion Sources

Equipment Type[1]	Fuel Type[1]	Number of Units[1]	Annual Operating Time per Unit[2] (hours)	Estimated Horsepower [3]	CO_2 Emission Factor[4] (kg/gal)	CH_4 Emission Factor[5] (g/gal)	N_2O Emission Factor[5] (g/gal)	CO_2 Emission Factor[4] (lb/hr)	CH_4 Emission Factor[5] (lb/hr)	N_2O Emission Factor[5] (lb/hr)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e[6] (metric tons)
Crane	Diesel	0	2,080	0	10.21	1.01	0.94	0.00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	-
Backhoe	Diesel	0	2,080	0	10.21	1.01	0.94	0.00	0.00E+00	0.00E+00	-	0.00E+00	0.00E+00	-
Loaders	Diesel	4	2,080	350	10.21	1.01	0.94	145.91	1.44E-02	1.34E-02	550.66	5.45E-02	5.07E-02	565.62
Bulldozer	Diesel	5	2,080	350	10.21	1.01	0.94	145.91	1.44E-02	1.34E-02	688.32	6.81E-02	6.34E-02	707.02
Excavators	Diesel	5	2,080	400	10.21	1.01	0.94	166.76	1.65E-02	1.54E-02	786.65	7.78E-02	7.24E-02	808.02
Skid Steer	Diesel	5	2,080	100	10.21	1.01	0.94	41.69	4.12E-03	3.84E-03	196.66	1.95E-02	1.81E-02	202.01
TOTAL	--	--	--	--	--	--	--	--	--	--	**3,889.01**	**0.38**	**0.36**	**3,994.67**

[1]Based on information in Appendix M of the Joint Permit Application.

[2] Operating hours are estimated based on information from similar projects.

[3] hp units were based on information from the Joint Permit Application.

Equipment Type	Estimated Horsepower
Crane	0
Backhoe	0
Excavators	400
Bulldozer	350
Loaders	350
Skid Steer	100

[4] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO_2 Emission Factor (kg/gal)
Diesel Fuel	10.21
Motor Gasoline	8.78

[5] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for construction/mining equipment, Table 5: Mobile Combustion CH_4 and N_2O for Non-Road Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Fuel Type	CH4 Emission Factor (g/gal)	N2O Emission Factor (g/gal)
Construction/Mining Equipment	Diesel Equipment	1.01	0.94
Construction/Mining Equipment	Gasoline (4 stroke)	2.85	1.47

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Construction Duration:	1.75	years

Table 7. Construction Emissions from On-Road Fuel Combustion Sources

Vehicle Type[1]	Fuel Type[1]	Vehicles per Day[1]	Miles per Vehicle per Day[1]	Number of Days[1]	Total Miles Traveled	Fuel Efficiency[2] (miles/gal)	Fuel Used (gal)	CO_2 Emission Factor[3] (kg/gal)	CH_4 Emission Factor[4][5] (g/vehicle-mile)	N_2O Emission Factor[4][5] (g/vehicle-mile)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e[6] (metric tons)
Light Duty Vehicles - Laborers (commute)	Gas	25	20	260	130,000	24.8	5,232	8.78	0.0079	0.0012	45.94	1.03E-03	7.08E-02	64.72
Light Duty Vehicles - Laborers (commute)	Diesel	25	20	260	130,000	24.8	5,232	10.21	0.0290	0.0214	53.42	3.77E-03	1.26E+00	387.93
Heavy Duty Trucks - Dump Trucks (onsite and offsite)	Diesel	5	20	260	26,000	7.9	3,279	10.21	0.0095	0.0431	33.48	2.47E-04	5.08E-01	168.19
Heavy Duty Trucks - Semis (onsite and offsite)	Diesel	8	20	50	8,000	6.9	1,157	10.21	0.0095	0.0431	11.82	7.60E-05	1.56E-01	53.26
TOTAL	--	--	--	--	--		--	--	--	--	**80.39**	**0.00**	**0.12**	**113.26**

[1] Based on information in Appendix M of the Joint Permit Application.

[2] Fuel efficiency from 2022 values from U.S. Department of Transportation, Federal Highway Administration, Highway Statistics (Washington, DC: Annual Issues), Table VM-1. https://www.fhwa.dot.gov/policyinformation/statistics/2022/vm1.cfm

Vehicle Type	Average Fuel Consumption (miles/gal)
Light Duty Vehicles Short WB 2/	24.85
Single-Unit Trucks	7.93
Combination Trucks	6.91

[3] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO2 Emission Factor (kg/gal)
Motor Gasoline	8.78
Diesel Fuel	10.21

[4] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road gasoline vehicles, Table 3: Mobile Combustion CH_4 and N_2O for On-Road Gasoline Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Gasoline Light-Duty Trucks	2021	0.0079	0.0012

[5] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road diesel vehicles, Table 4: Mobile Combustion CH_4 and N_2O for On-Road Diesel and Alternative Fuel Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Light-Duty Trucks	2007-2021	0.0290	0.0214
Medium- and Heavy-Duty Trucks	2007-2021	0.0095	0.0431

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Construction Duration:	1.75	years

Table 8. Construction Land Use Change GHG Emissions

Temporary Land Use Change[1]	Area of Land Change[1] (acres)	2022 Net CO_2 Flux for Converted Land Type[2][3] (M metric tons CO_2e)	2022 Total US Land Use Change to Settlement[4] (thousands of hectares)	CO_2e Emission Factor (metric tons CO_2e/acre)	CO_2e[5][6] (metric tons)
Forest Land to Settlement	280.85	58.6	440	53.90	2,488.26
Cropland to Settlement	1,664.75	2.9	1,228	0.96	261.53
Wetlands to Settlement	191.49	0.1	14	2.89	90.99
Grassland to Settlement	51.68	7.5	1,648	1.84	15.65
Settlement remaining Settlement	15.14	15.4	43,748	0.14	0.35
TOTAL	**2,203.91**	**84.50**	**47,078.00**	**59.58**	**2,856.43**

[1] Estimated from development area delineation files and NLCD land cover estimates.

[2] Table 6-136: Net CO2 Flux from Soil, Dead Organic Matter and Biomass Carbon Stock Changes for Land Converted to Settlements, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[3] Table 6-119: Net CO2 Flux from Soil C Stock Changes in Settlements Remaining Settlements, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.

[4] Table 6-5: Land Use and Land-Use Change for the U.S. Managed Land Base for All 50 States, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[5] Emissions are calculated for an assumed 60-day duration of temporary disturabance.

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Table 9. Operations Emissions from Fuel Combustion Sources

Source[1]	Fuel Type[1]	Fuel Consumption[1] (gallons/year)	CO_2 Emission Factor[2] (kg/gallon)	CH_4 Emission Factor[3] (g/gallon)	N_2O Emission Factor[3] (g/gallon)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO_2e[4] (metric tons/year)
Mobile Source Equipment	Gasoline	330	8.78	0.0079	0.0012	2.90	2.61E-06	3.96E-07	2.90
TOTAL	--	--	--	--	--	**2.90**	**2.61E-06**	**3.96E-07**	**2.90**

[1] Estimated using provided fuel consumption of 1.32 gal/day and 250 operating days/year in Appendix M of the Join Permit Application.

[2] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO2 Emission Factor (kg/gal)
Motor Gasoline	8.78

[3] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road gasoline vehicles, Table 3: Mobile Combustion CH_4 and N_2O for On-Road Gasoline Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Gasoline Light-Duty Trucks	2021	0.0079	0.0012

[4] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Table 10. Operations Land Use Change GHG Emissions

Land Use Change[1]	Area of Land Change[1] (acres)	2022 Net CO_2 Flux for Converted Land Type[2][3] (M metric tons CO_2e)	2022 Total US Land Use Change to Settlement[4] (thousands of hectares)	CO_2e Emission Factor (metric tons CO_2e/acre)	CO_2e[5] (metric tons/year)
Forest Land to Settlement	86.85	58.6	440	53.90	4,680.85
Cropland to Settlement	1358.25	2.9	1,228	0.96	1,298.07
Wetlands to Settlement	66.07	0.1	14	2.89	190.99
Grassland to Settlement	36.85	7.5	1,648	1.84	67.87
Settlement remaining Settlement	1.03	15.4	43,748	0.14	0.15
TOTAL	**1,549.05**	**84.50**	**47,078.00**	**59.58**	**6,237.78**

[1] Estimated from development area delineation files and NLCD land cover estimates.

[2] Table 6-136: Net CO2 Flux from Soil, Dead Organic Matter and Biomass Carbon Stock Changes

[3] Table 6-119: Net CO2 Flux from Soil C Stock Changes in Settlements Remaining Settlements, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[4] Table 6-5: Land Use and Land-Use Change for the U.S. Managed Land Base for All 50 States, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[5] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Iron Pine Solar Power, LLC
Iron Pine Solar Project
GHG Calculations

Table 11. Decommission Emissions from Off-Road Fuel Combustion Sources

Equipment Type[1]	Fuel Type[1]	Number of Units[1]	Operating Time per Unit[2] (hours)	Estimated Horsepower [3]	CO_2 Emission Factor[4] (kg/gal)	CH_4 Emission Factor[5] (g/gal)	N_2O Emission Factor[5] (g/gal)	CO_2 Emission Factor[4] (lb/hr)	CH_4 Emission Factor[5] (lb/hr)	N_2O Emission Factor[5] (lb/hr)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e[6] (metric tons)
Crane	Diesel	0	2,080	250	10.21	1.01	0.94	104.22	1.03E-02	9.60E-03	-	-	-	-
Backhoe	Diesel	0	2,080	0	10.21	1.01	0.94	-	-	-	-	-	-	-
Loaders	Diesel	4	2,080	350	10.21	1.01	0.94	145.91	1.44E-02	1.34E-02	550.66	5.45E-02	5.07E-02	565.62
Bulldozer	Diesel	5	2,080	350	10.21	1.01	0.94	145.91	1.44E-02	1.34E-02	688.32	6.81E-02	6.34E-02	707.02
Excavators	Diesel	5	2,080	400	10.21	1.01	0.94	166.76	1.65E-02	1.54E-02	786.65	7.78E-02	7.24E-02	808.02
Skid Steer	Diesel	5	2,080	100	10.21	1.01	0.94	41.69	4.12E-03	3.84E-03	196.66	1.95E-02	1.81E-02	202.01
TOTAL	--	--	--	--	--	--	--	--	--	--	**2,222.29**	**0.22**	**0.20**	**2,282.67**

[1] Based on information in Appendix M of the Joint Permit Application.

[2] Operating hours are estimated based on information from similar projects.

[3] hp units were based on information from the Joint Permit Application.

Equipment Type	Estimated Horsepower
Crane	250
Backhoe	0
Excavators	400
Bulldozer	350
Loaders	350
Skid Steer	100

[4] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO_2 Emission Factor (kg/gal)
Diesel Fuel	10.21
Motor Gasoline	8.78

[5] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for construction/mining equipment, Table 5: Mobile Combustion CH_4 and N_2O for Non-Road Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Fuel Type	CH4 Emission Factor (g/gal)	N2O Emission Factor (g/gal)
Construction/Mining Equipment	Diesel Equipment	1.01	0.94
Construction/Mining Equipment	Gasoline (4 stroke)	2.85	1.47

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Table 12. Decommission Emissions from On-Road Fuel Combustion Sources

Vehicle Type[1]	Fuel Type[1]	Vehicles per Day[1]	Miles per Vehicle per Day[1]	Number of Days[1]	Total Miles Traveled	Fuel Efficiency[2] (miles/gal)	Fuel Used (gal)	CO_2 Emission Factor[3] (kg/gal)	CH_4 Emission Factor[4][5] (g/vehicle-mile)	N_2O Emission Factor[4][5] (g/vehicle-mile)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e[6] (metric tons)
Light Duty Vehicles - Laborers (commute)	Gas	25	20	260	130,000	24.8	5,232	8.78	0.0079	0.0012	45.94	1.03E-03	7.08E-02	64.72
Light Duty Vehicles - Laborers (commute)	Diesel	25	20	260	130,000	24.8	5,232	10.21	0.0290	0.0214	53.42	3.77E-03	1.26E+00	387.93
Heavy Duty Trucks - Dump Trucks (onsire and offsite)	Diesel	5	20	200	20,000	7.9	2,522	10.21	0.0095	0.0431	25.75	1.90E-04	3.91E-01	129.37
Heavy Duty Trucks - Semis (onsite and offsite)	Diesel	8	20	50	8,000	6.9	1,157	10.21	0.0095	0.0431	11.82	7.60E-05	1.56E-01	53.26
TOTAL	--	--	--	--	--		--	--	--	--	**45.94**	**1.03E-03**	**0.07**	**64.72**

[1] Based on information from Appendix M of the Joint Permit Application.

[2] Fuel efficiency from 2022 values from U.S. Department of Transportation, Federal Highway Administration, Highway Statistics (Washington, DC: Annual Issues), Table VM-1. https://www.fhwa.dot.gov/policyinformation/statistics/2022/vm1.cfm

Vehicle Type	Average Fuel Consumption (miles/gal)
Light Duty Vehicles Short WB 2/	24.85
Single-Unit Trucks	7.93
Combination Trucks	6.91

[3] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO2 Emission Factor (kg/gal)
Motor Gasoline	8.78
Diesel Fuel	10.21

[4] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road gasoline vehicles, Table 3: Mobile Combustion CH_4 and N_2O for On-Road Gasoline Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Gasoline Light-Duty Trucks	2021	0.0079	0.0012

[5] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road diesel vehicles, Table 4: Mobile Combustion CH_4 and N_2O for On-Road Diesel and Alternative Fuel Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Light-Duty Trucks	2007-2021	0.0290	0.0214
Medium- and Heavy-Duty Trucks	2007-2021	0.0095	0.0431

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Table 13. Avoided GHG Emissions

Fuel	Energy Production[1] (MWh/year)	eGRID State	CO_2 Emission Factor[2] (lb/MWh)	CH_4 Emission Factor[2] (lb/MWh)	N_2O Emission Factor[2] (lb/MWh)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO_2e[3][4] (metric tons/year)
State Average Emission Rate	647,000	Minnesota	768.241	0.082	0.012	225,459.03	24.06	3.52	227,066.09
Coal	647,000	Minnesota	2210.327	0.2402	0.0349	648,674.27	70.49	10.24	653,362.26

[1] Energy production value based on data provided by Iron Pine Solar, LLC.

[2] U.S. eGrid Factors 2022 data, Total Output Emissions Rates for Minnesota, lb/MWh; https://www.epa.gov/egrid/download-data

[3] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Iron Pine Solar Power, LLC
Iron Pine Gen Tie Line Project
GHG Calculations

Table 1. Summary of Construction GHG Emissions

Emission Source	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e (metric tons)
Direct Sources				
Off Road Mobile Combustion	1,183.91	1.17E-01	1.09E-01	1,216.08
On Road Mobile Combustion	37.74	2.76E-04	5.68E-01	188.25
Temporary Land Use Change	--	--	--	427.73
TOTAL - ALL SOURCES	**1,221.65**	**0.12**	**0.68**	**1,832.05**

Table 2. Summary of Operations GHG Emissions

Emission Source	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO_2e (metric tons/year)
Direct Sources				
Mobile Combustion	2.90	2.61E-06	3.96E-07	2.90
Land Use Change	--	--	--	572.93
TOTAL - ALL SOURCES	**2.90**	**2.61E-06**	**3.96E-07**	**575.83**

Table 3. Conversions

Unit	Amount	Unit
1 US ton	2000	lbs
1 US ton	0.907185	metric tons
1 US ton	907.185	kg
1 US ton	907185	grams
1 lb	0.453592	kg
1 lb	453.592	grams
1 MWh	1000	kWh
1 hectare	2.47105	acres
1 MJ	0.372506136	hp-h
US gallon (diesel)[1]	144.945	MJ
US gallon (diesel)	53.9929019	hp-h
US gallon (gasoline)[1]	126.833	MJ
US gallon (gasoline)	47.24606261	hp-h

[1] US Energy Information Administration, 2024.
https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php

Table 4. Global Warming Potentials

Greenhouse Gas Name	CAS Number	Chemical Formula	Global Warming Potential (100-yr.)[1]
Carbon dioxide	124–38–9	CO_2	1
Methane	74–82–8	CH_4	28
Nitrous oxide	10024–97–2	N_2O	265

[1] Global Warming Potentials from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024.
https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Iron Pine Solar Power, LLC
Iron Pine Gen Tie Line Project
GHG Calculations

Table 5. Construction Emissions from Off-Road Fuel Combustion Sources

Equipment Type[1]	Fuel Type[1]	Number of Units[1]	Operating Time[2] (hours)	Estimated Horsepower [3]	CO_2 Emission Factor[3] (kg/gal)	CH_4 Emission Factor[4] (g/gal)	N_2O Emission Factor[4] (g/gal)	CO_2 Emission Factor[5] (lb/hr)	CH_4 Emission Factor[5] (lb/hr)	N_2O Emission Factor[5] (lb/hr)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e[6] (metric tons)
Crane	Diesel	1	2,080	320	10.21	1.01	0.94	133.41	1.32E-02	1.23E-02	125.86	1.25E-02	1.16E-02	129.28
Backhoe	Diesel	1	2,080	100	10.21	1.01	0.94	41.69	4.12E-03	3.84E-03	39.33	3.89E-03	3.62E-03	40.40
Loaders	Diesel	1	2,080	350	10.21	1.01	0.94	145.91	1.44E-02	1.34E-02	137.66	1.36E-02	1.27E-02	141.40
Bulldozer	Diesel	1	2,080	350	10.21	1.01	0.94	145.91	1.44E-02	1.34E-02	137.66	1.36E-02	1.27E-02	141.40
Excavator	Diesel	1	2,080	400	10.21	1.01	0.94	166.76	1.65E-02	1.54E-02	157.33	1.56E-02	1.45E-02	161.60
Skid Steer	Diesel	2	2,080	100	10.21	1.01	0.94	41.69	4.12E-03	3.84E-03	78.67	7.78E-03	7.24E-03	80.80
TOTAL	--	--	--	--	--	--	--	--	--	--	**1,183.91**	**1.17E-01**	**1.09E-01**	**1,216.08**

[1]Based on information in Appendix M of the Joint Permit Application.

[2] Operating hours are estimated based on information from similar projects.

[3] hp units were based on information from the Joint Permit Application.

Equipment Type	Estimated Horsepower
Crane	320
Backhoe	100
Excavator	400
Bulldozer	350
Loaders	350
Skid Steer	100

[4] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO_2 Emission Factor (kg/gal)
Diesel Fuel	10.21
Motor Gasoline	8.78

[5] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for construction/mining equipment, Table 5: Mobile Combustion CH_4 and N_2O for Non-Road Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Fuel Type	CH4 Emission Factor (g/gal)	N2O Emission Factor (g/gal)
Construction/Mining Equipment	Diesel Equipment	1.01	0.94
Construction/Mining Equipment	Gasoline (4 stroke)	2.85	1.47

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Construction Duration:	1.75	years

Iron Pine Solar Power, LLC
Iron Pine Gen Tie Line Project
GHG Calculations

Table 6. Construction Emissions from On-Road Fuel Combustion Sources

Vehicle Type[1]	Fuel Type[1]	Vehicles per Day[1]	Miles per Vehicle per Day[1]	Number of Days[1]	Total Miles Traveled	Fuel Efficiency[2] (miles/gal)	Fuel Used (gal)	CO_2 Emission Factor[3] (kg/gal)	CH_4 Emission Factor[4][5] (g/vehicle-mile)	N_2O Emission Factor[4][5] (g/vehicle-mile)	CO_2 (metric tons)	CH_4 (metric tons)	N_2O (metric tons)	CO_2e[6] (metric tons)
Light Duty Vehicles - Laborers (commute)	Gas	0	20	260	-	24.8	-	8.78	0.0079	0.0012	-	0.00E+00	0.00E+00	-
Light Duty Vehicles - Laborers (commute)	Diesel	0	20	260	-	24.8	-	10.21	0.0290	0.0214	-	0.00E+00	0.00E+00	-
Heavy Duty Trucks - Dump Trucks (onsire and offsite)	Diesel	3	20	260	15,600	7.9	1,968	10.21	0.0095	0.0431	20.09	1.48E-04	3.05E-01	100.91
Heavy Duty Trucks - Semis (onsite and offsite)	Diesel	1	20	50	1,000	6.9	145	10.21	0.0095	0.0431	1.48	9.50E-06	1.95E-02	6.66
TOTAL	--	--	--	--	--		--	--	--	--	**37.74**	**0.00**	**0.57**	**188.25**

[1] Based on information in Appendix M of the Joint Permit Application.

[2] Fuel efficiency from 2022 values from U.S. Department of Transportation, Federal Highway Administration, Highway Statistics (Washington, DC: Annual Issues), Table VM-1. https://www.fhwa.dot.gov/policyinformation/statistics/2022/vm1.cfm

Vehicle Type	Average Fuel Consumption (miles/gal)
Light Duty Vehicles Short WB 2/	24.85
Single-Unit Trucks	7.93
Combination Trucks	6.91

[3] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO2 Emission Factor (kg/gal)
Motor Gasoline	8.78
Diesel Fuel	10.21

[4] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road gasoline vehicles, Table 3: Mobile Combustion CH_4 and N_2O for On-Road Gasoline Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Gasoline Light-Duty Trucks	2021	0.0079	0.0012

[5] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road diesel vehicles, Table 4: Mobile Combustion CH_4 and N_2O for On-Road Diesel and Alternative Fuel Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Light-Duty Trucks	2007-2021	0.0290	0.0214
Medium- and Heavy-Duty Trucks	2007-2021	0.0095	0.0431

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Construction Duration:	1.75	years

Table 7. Construction Land Use Change GHG Emissions

Temporary Land Use Change[1]	Area of Land Change[1] (acres)	2022 Net CO_2 Flux for Converted Land Type[2][3] (M metric tons CO_2e)	2022 Total US Land Use Change to Settlement[4] (thousands of hectares)	CO_2e Emission Factor (metric tons CO_2e/acre)	CO_2e[5][6] (metric tons)
Forest Land to Settlement	46.93	58.6	440	53.90	415.79
Cropland to Settlement	-	2.9	1,228	0.96	-
Wetlands to Settlement	11.75	0.1	14	2.89	5.58
Grassland to Settlement	20.99	7.5	1,648	1.84	6.35
Settlement remaining Settlement	9.12	15.4	43,748	0.14	0.21
TOTAL	**88.79**	**84.50**	**47,078.00**	**59.58**	**427.73**

[1] Estimated from development area delineation files and NLCD land cover estimates.

[2]Table 6-51: Net CO2 Flux from Soil, Dead Organic Matter and Biomass Carbon Stock Changes for Land Converted to Grassland (MMT CO2 Eq.)s, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[3] Table 6-43: Net CO2 Flux from Soil C Stock Changes in Grasslands Remaining Grasslands, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[4] Table 6-5: Land Use and Land-Use Change for the U.S. Managed Land Base for All 50 States, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[5] Emissions are calculated for an assumed 60-day duration of temporary disturabance.

[6] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Table 8. Operations Emissions from Fuel Combustion Sources

Source[1]	Fuel Type[1]	Fuel Consumption[1] (gallons/year)	CO_2 Emission Factor[2] (kg/gallon)	CH_4 Emission Factor[3] (g/gallon)	N_2O Emission Factor[3] (g/gallon)	CO_2 (metric tons/year)	CH_4 (metric tons/year)	N_2O (metric tons/year)	CO_2e[4] (metric tons/year)
Light Duty Vehicle	Gasoline	330	8.78	0.0079	0.0012	2.90	2.61E-06	3.96E-07	2.90
TOTAL	--	--	--	--	--	**2.90**	**2.61E-06**	**3.96E-07**	**2.90**

[1] Estimated using provided fuel consumption of 1.32 gal/day and 250 operating days/year in Appendix M of the Join Permit Application.

[2] CO_2 emissions calculated using the EPA CCCL emission factors for mobile combustion, Table 2: Mobile Combustion CO_2, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Fuel Type	CO2 Emission Factor (kg/gal)
Motor Gasoline	8.78

[3] CH_4 and N_2O emissions calculated using the EPA CCCL emission factors for on-road gasoline vehicles, Table 3: Mobile Combustion CH_4 and N_2O for On-Road Gasoline Vehicles, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Vehicle Type	Model Year	CH4 Emission Factor (g/vehicle-mile)	N2O Emission Factor (g/vehicle-mile)
Gasoline Light-Duty Trucks	2021	0.0079	0.0012

[4] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Table 9. Operation Land Use Change GHG Emissions

Land Use Change[1]	Area of Land Change[1] (acres)	2022 Net CO_2 Flux for Converted Land Type[2][3] (M metric tons CO_2e)	2022 Total US Land Use Change to Grasslands[4] (thousands of hectares)	CO_2e Emission Factor (metric tons CO_2e/acre)	CO_2e[5] (metric tons/year)
Forest Land to Grassland	13.07	46.8	440	43.04	562.49
Cropland to Grassland	-	(12.5)	1,228	(4.12)	-
Wetlands to Grassland	1.53449	0.1	14	2.89	4.44
Grassland remaining Grassland	1.822857	13.4	1,648	3.29	6.00
Settlement to Grassland	1.08	(0.8)	43,748	(0.01)	(0.01)
TOTAL	**17.51**	**47.00**	**47,078.00**	**45.11**	**572.93**

[1] Estimated from development area delineation files and NLCD land cover estimates.

[2]Table 6-51: Net CO2 Flux from Soil, Dead Organic Matter and Biomass Carbon Stock Changes for Land Converted to Grassland (MMT CO2 Eq.)s, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[3] Table 6-43: Net CO2 Flux from Soil C Stock Changes in Grasslands Remaining Grasslands, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[4] Table 6-5: Land Use and Land-Use Change for the U.S. Managed Land Base for All 50 States, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2022. https://www.epa.gov/system/files/documents/2024-04/us-ghg-inventory-2024-main-text_04-18-2024.pdf

[5] CO_2e calculated by multiplying the GWP for each pollutant by the potential pollutant emissions. GWPs from EPA CCCL Emission Factors for Greenhouse Gas Inventories, 2024. https://www.epa.gov/system/files/documents/2024-02/ghg-emission-factors-hub-2024.pdf

Appendix E

Vegetation Management Plan

Vegetation Management Plan

Stantec Project No: 193708962

February 9, 2024

Prepared for:

Iron Pine Solar Power, LLC
480 Atlantic Avenue, Suite 601
Boston, MA 02210

Prepared by:

Stantec Consulting Services Inc.
One Carlson Parkway, Suite 100
Plymouth, Minnesota 55447

This document entitled Vegetation Management Planwas prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Iron Pine Solar Power, LLC (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment considering the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others.

Prepared by ______________________________
(signature)

Jennifer Kamm, Associate, Senior Environmental Scientist

Reviewed by ______________________________
(signature)

David DeAngelo, Senior Environmental Scientist

TABLE OF CONTENTS

List of Figures

List of Tables

LIST OF APPENDICES

Executive Summary

Introduction

Iron Pine Solar Power, LLC is developing the Iron Pine Solar Project in Pine County, Minnesota (Figure 1). The proposed project area is approximately 2,296 acres. The total acres for the Project are 2,296 acres, with approximately 2,207-acres designated for the Solar Project and a Gen-Tie Line spanning roughly one-mile in length with a ROW width of 160 feet (Figure 2). Iron Pine Solar Power, LLC has developed a Vegetation Management Plan (VMP) to guide vegetation and soil management for the project area from the pre-construction phase through post-construction operation. If approved, the facility would operate under a site permit and route permit issued by the Minnesota Public Utilities Commission. The VMP covers site preparation, installation of seed materials, management activities during the vegetation establishment and maintenance phases along with annual monitoring.

Land use within the proposed project area is primarily row-crop agriculture. As a result of the construction of the Iron Pine Solar Project, based off of the preliminary design, more than 1,560 acres will be converted and/or managed for perennial, regionally appropriate vegetation for the course of the permit lifetime (approximately 30 years). Areas to be converted to perennial vegetation include all areas within facility fence lines including underneath and between panels and areas outside perimeter of the facility fence lines within the Project Area that will not continue to be used for agricultural production and excluding areas that already consist of perennial vegetation.

For the purpose of this VMP, “regionally appropriate” was defined as having one or more of the following characteristics:

- Native to the region and the state prior to large scale agricultural development.
- Commonly occurs within the landscape of the project area and is not considered to have invasive plant species characteristics that can negatively impact existing plant communities.
- Not listed by the Minnesota Department of Agriculture as a Noxious Weed.

The VMP sets vegetation goals and provides guidance on steps recommended and required to achieve goals in a manner that are consistent with regulatory standards, economic and operationally feasible, and provides environmental benefits. The VMP will be used for internal communication between teams and contractors as a guide and reference document to successfully achieve the vegetation goals for the Iron Pine Solar Project.

The site has three goals for vegetation including 1) establishing low-growing, regionally appropriate grasses within the arrays and associated buffers, 2) minimizing the presence of noxious weeds and 3) protecting adjacent natural areas from impacts during construction and operation of the Project facility.

1 Vegetation Establishment and Management Plan Overview

1.1 Introduction

Iron Pine Solar Power, LLC (Iron Pine Solar) is developing the Iron Pine Solar Project (Project) in Pine County, Minnesota (**Figure 1**). The proposed Project Area is approximately 2,296 acres. Of the 2,296 acres, approximately 1,560 acres are currently designated as a possibility to host proposed Project facilities (**Figure 2**). Iron Pine Solar has developed this Vegetation Management Plan (VMP) to establish and maintain vegetation at the Iron Pine Solar Project in a manner that allows for safe and reliable solar energy generation while providing environmental benefits during operation of the Project. Iron Pine Solar will apply for a site permit for the Project from the Minnesota Public Utilities Commission. The purpose of the VMP is to provide goals and guidelines for successfully establishing and maintaining vegetative cover within the Project Area for the life of the Project.

The VMP was developed during the Project planning phase for the Iron Pine Solar Project using the most current information available. The VMP is intended to be a living document that is updated as needed to reflect changes in on-site conditions, clarifications of previous assumptions, and incorporation of gained knowledge that provides for better management of the Project's vegetation. Upon completion of final construction, the VMP will be reviewed and updated to reflect final construction conditions.

The site has three goals for vegetation including 1) establishing low-growing, regionally appropriate grasses within the arrays and associated buffers, 2) minimizing the presence of noxious weeds and 3) protecting adjacent natural areas from impacts during construction and operation of the Project facility.

1.2 Goals and Objectives for Vegetation Establishment and Management

The following are goals and objectives for vegetation establishment and management associated with the Project:

<u>Goal 1: Perennial Vegetation within Arrays and Associated Buffers</u>

Establish and maintain low-growing regionally appropriate grass-dominated vegetation within the array fields and along the perimeter areas to stabilize the soil.

Objective(s)

- Establish and maintain low-growing regionally appropriate grass-dominated vegetation within the array field and along buffers to meet or exceed requirements of the Project National Pollutant Discharge Elimination System (NPDES) permit. Short-term and long-term vegetation management will be guided by performance standards outlined in this VMP.
- Use maintenance practices that are consistent with typical industry standard practices including periodic mowing and spot herbicide treatment.
- Establish as many acres of perennial vegetation as possible during the pre-construction and construction phases of the Project to provide soil stabilization, meet NPDES and the Project-specific Stormwater Pollution Prevention Plan (SWPPP) requirements, and minimize post-construction re-vegetation efforts.

Goal 2: Noxious and Invasive Plant Species

Minimize the presence and abundance of plant species listed on the Minnesota Department of Agriculture's (MDA's) Noxious Weeds List.

Objective(s)

- Use Integrated Vegetation Management to reduce and eliminate MDA Noxious Weed-listed species.
- In areas within the Project boundary not developed for energy generation (i.e. outside of most fence lines and substations), maintain agricultural and other land uses.

Goal 3: Natural Areas Within and Adjacent to Perimeter Fencing

Protect existing natural areas within and adjacent to the perimeter fence including streams, drainages, wetlands, and native plant communities through site evaluation and mapping, implementation of best practices during construction, revegetation in accordance with practices outlined in the VMP and Minnesota Department of Natural Resource (MNDNR) *Prairie Establishment and Maintenance Technical Guidance for Solar Projects* (MNDNR 2020).

Objectives(s)

- Evaluate and map existing natural areas within and adjacent to perimeter fencing to establish baseline conditions. Periodically update information during inspection and/or monitoring activities so current conditions can be compared against baseline conditions.
- Avoid disturbance to any areas outside of the perimeter fence buffers during construction using flagging and signage as shown on the civil site plans in **Appendix A**, contractor education, and erosion and sediment controls.
    - Wetlands within and adjacent to the perimeter fence will be protected from unauthorized fill and sediment during construction and operation of the Project in accordance with the SWPPP developed for the Project.
- Establish and maintain vegetation within the Project Area that meets the desired conditions outlined in the VMP, which uses pre-dominantly regionally appropriate grasses to achieve permanent cover while minimizing the percent cover of MDA-listed noxious weeds and invasive species.
- Select regionally appropriate seed mixes based on local site conditions including hydrology and soil type.
- Protect adjacent native plant communities and wetlands from impacts due to facility construction and operation.
    - Avoid disturbance to all native plant communities and wetlands outside of the perimeter fence.

- o Apply herbicides within the perimeter fence and vegetated buffer in the appropriate manner that minimizes drift to adjacent plant and wildlife habitats as described in Section 7.6.
- o Prioritize invasive species control in management units adjacent to native prairie and other natural communities through seasonal inspections, Early Detection Rapid Response, and collaborating with landowners adjacent to natural areas.

1.3 Monitoring and Implementation Technical Expertise

The implementation of the VMP including pre-construction through monitoring and maintenance period activities will be completed by qualified vegetation management professionals. For the purposes of the VMP and the Project, a qualified vegetation management professional includes individuals or contractors that have one or more of the following qualifications:

- Five or more years implementing and management natural vegetation with specific experience in applying techniques to establish and maintain regionally appropriate grassland communities and vegetation.
- Knowledge of plant identification with an emphasis on regionally appropriate vegetation.
- Post-secondary education or training in the field of natural resources such as degrees, course work, or certification programs.
- Applicable state certifications such as pesticide applicator, erosion control inspector, or erosion control installer.
- Uses specialized equipment characteristic of the tools of the trade for natural resource management.

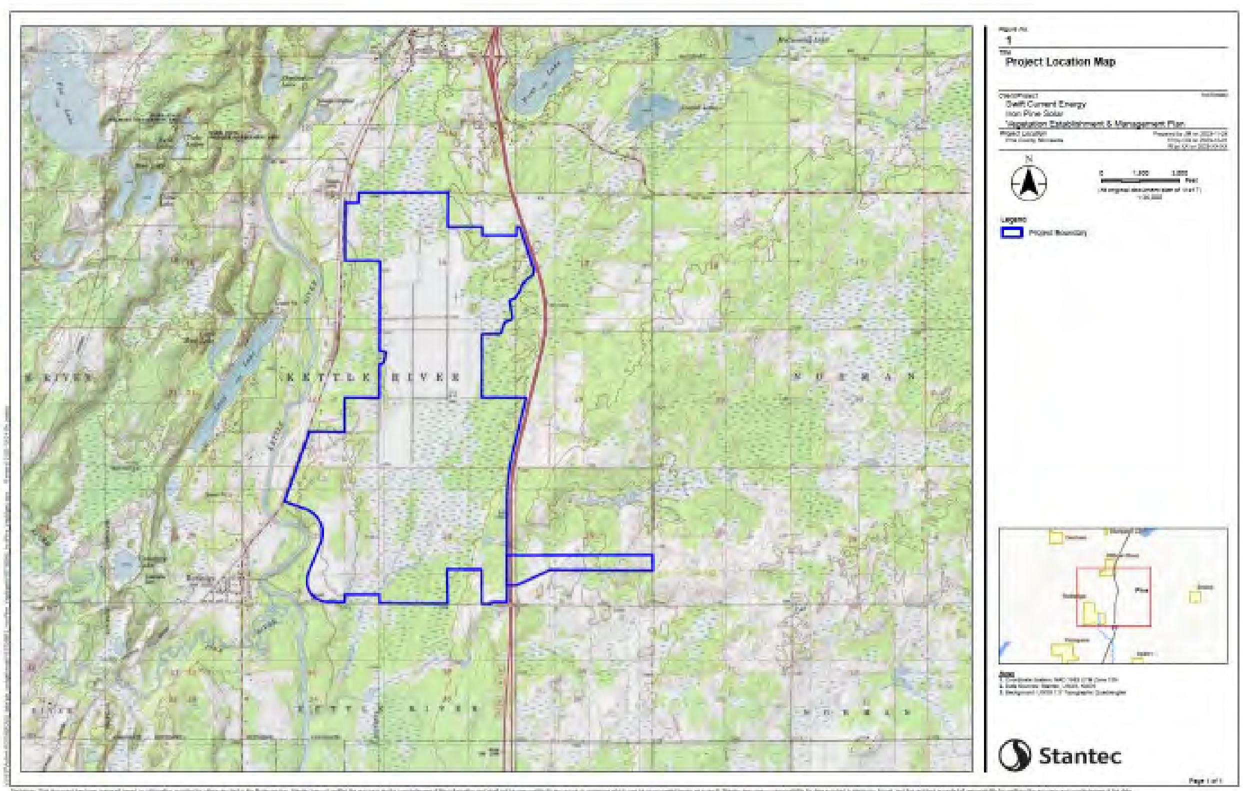
Qualified vegetation management professionals may be internal staff from Iron Pine Solar future facility owners, facility operators, or hired contractors. Likely over the course of the lifetime of the Project, it will be a combination of multiple entities implementing one or more portions of the VMP. The role of the VMP and its associated programs such as adaptive management and monitoring will be to provide a consistent basis for how vegetation will be managed for the lifetime of the Project.

2 Site Description

2.1 Project Location and Description

The Project is located in Section 13, 14, 15, 22, 23, 24, 25, 26, 27, Township 44, North Range 20 West, in Kettle River Township, Pine County, Minnesota a shown in **Figure 1**. The City of Rutledge, Minnesota is located approximately 0.5 miles west of the southwestern boundary, and the City of Willow River, Minnesota is located approximately one mile north of the northern boundary of the Project area.

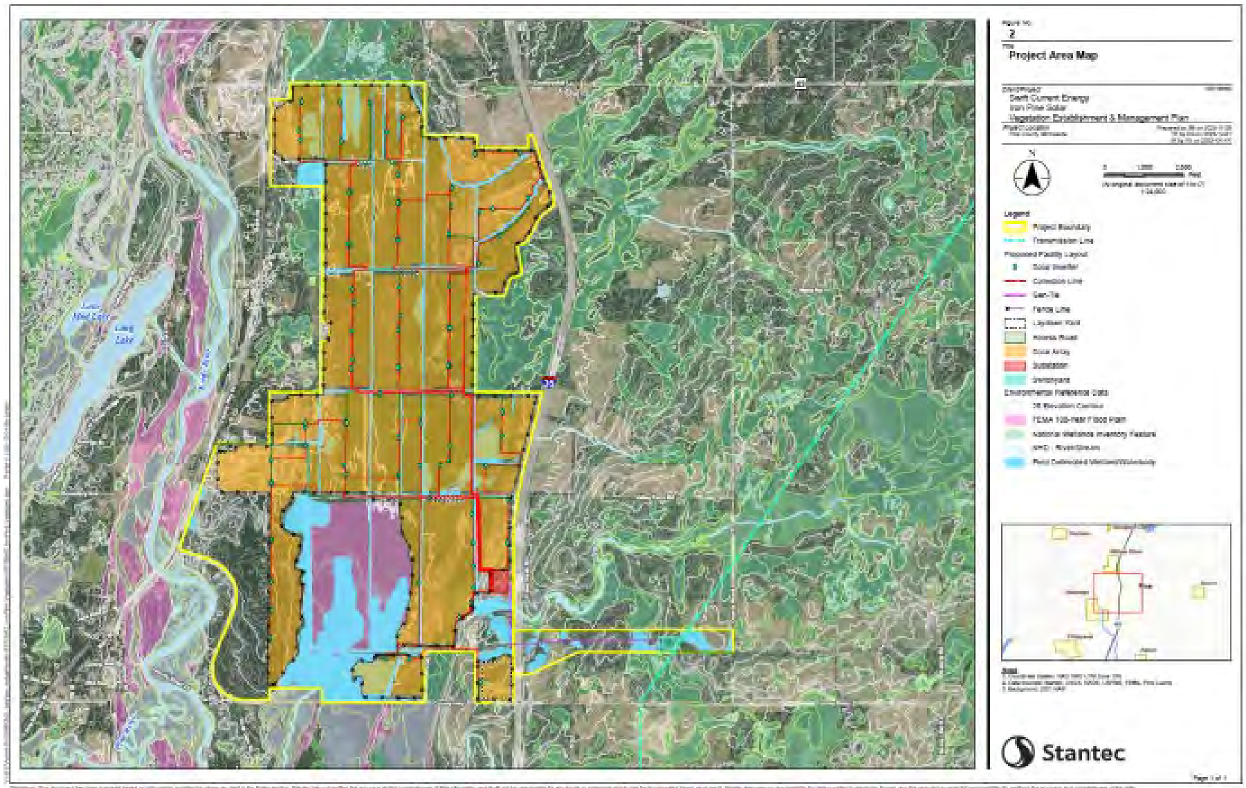
Figure 1. Site Location Map



The solar facility will occupy the portion of the Project Area that is west of Interstate 35 and the Gen-Tie Line project area will commence from a Project Substation within the solar facility area adjacent to the west rightA single-axis tracking system will allow the solar panels to track the sun from east to west maximizing energy production. Energy from the solar panels is directed through an underground electrical collection system to inverters where the power is converted from direct current to alternating current power. The power is then transmitted to a step-up transformer located at the Project substation from 34.5 kilovolt (kV) to 230 kV. The Solar Project will interconnect to the grid via a proposed approximately 1-mile long aboveground 230-kV transmission line and associated facilities that is needed to interconnect the solar Project's collector substation to the point of interconnection to the grid at Minnesota Power's Arrowhead-Bear Creek 230 kV transmission line. Solar panels will be accessible via a network of gravel access roads for maintenance purposes, and the portions of the Project occupied by equipment will be surrounded by security fencing. Stormwater from the site will be managed through a series of planned stormwater ponds and drainage swales.

Subject to final design, solar arrays and Gen-Tie Line will be laid out generally as depicted on **Figure 2** and in a manner that minimizes site grading and length of underground collection; avoids various constraints, including wetlands; and maximizes energy production. Subject to final design, the site and grading plan for the Project is shown in **Appendix A**.

Figure 2. Project Area Map



2.2 Project Size and Boundary Description

Within the Project Area, the solar array area will comprise approximately 2,207 acres, of which approximately 1,537 will be comprised of solar equipment. Within the Project Area, the Gen-Tie Line area will comprise approximately 89 acres, of which approximately 24 acres will be maintained for the right-of-way, **Figure 2**. The project is surrounded by agricultural, forested, and rural residential areas. The site is intersected by **I**-35 on the east, bordered on the west by CTH 61, on the south by County Road 33/Swanson Rd, and on the east by CTH 152, or Valley Farm Rd.

2.3 Historic and Current Vegetation and Land use

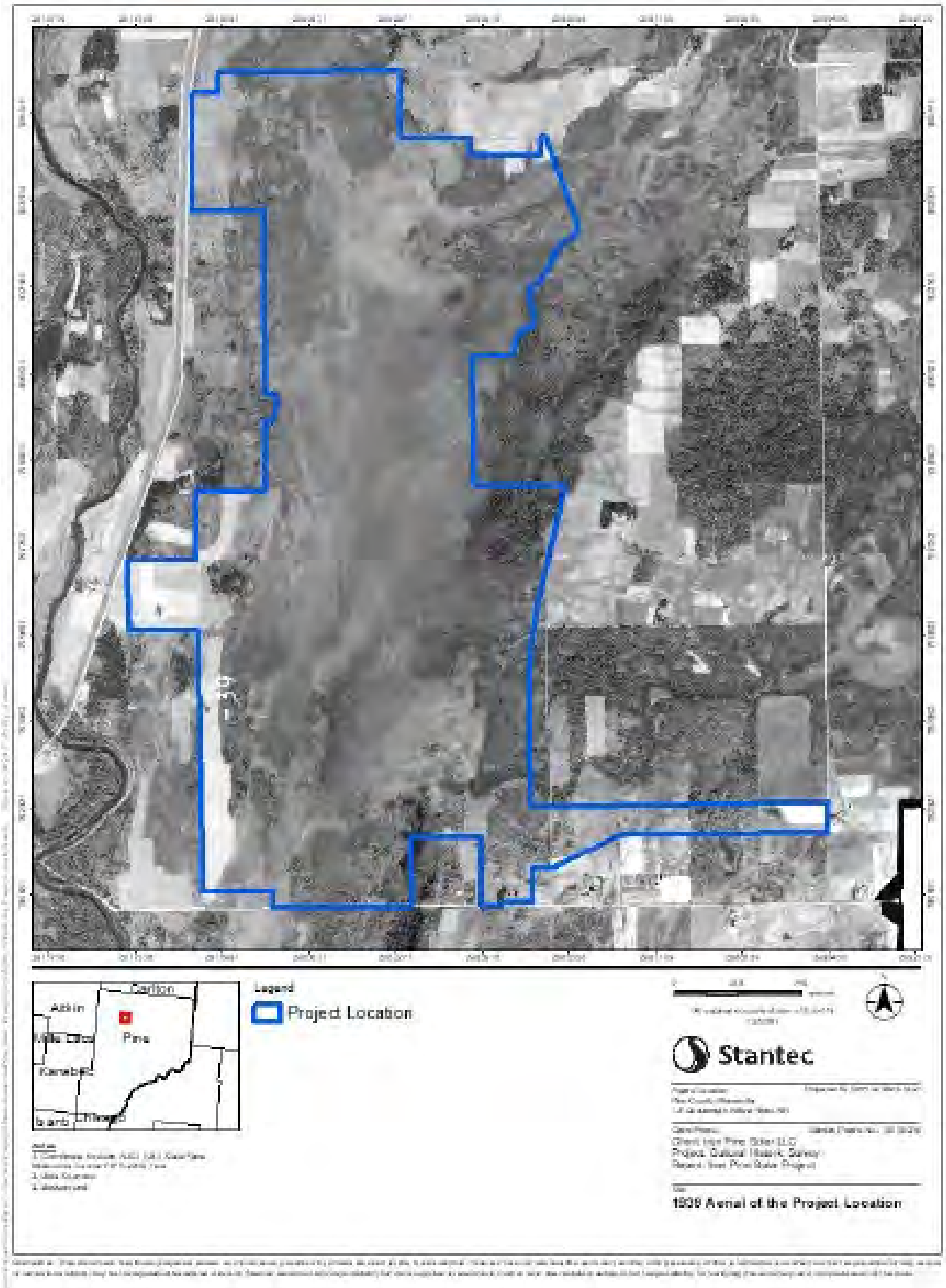
Historic Vegetation and Land Use

According to the MNDNR Ecological Classification System, the Project Area is within the Mille Lacs Uplands (212Kb) Subsection of the Western Superior Uplands Section of the Laurentian Mixed Forest Province. Within the vicinity of Project Area, a mix of conifer, hardwood and mixed conifer-hardwood forests and peatland areas inhabited by sedge-fen, black spruce-sphagnum, or white cedar-black ash communities were the historic vegetative cover of the Project Area prior to agricultural land conversion in the late 1800's.

According to the Natural Resources Conservation Service (NRCS) Land Resource Region and Major Land Resource Area (MLRA), the Project is located in the Northern Lake States Forest and Forage Region and the Wisconsin and Minnesota Thin Loess and Till (USDA, 2022). LLRs are a group of geographically associated major land resource areas, and MLRAs are geographically associated land resource units. This MLRA is part of the recently glaciated till and outwash plains. This area was covered with loamy alluvium or loess after glaciation. Lakes, ponds, and marshes are common throughout the area, and streams generally have a dendritic pattern (USDA, 2022).

The University of Minnesota's online collection of aerial photographs includes aerial images of this site in 1939 and 1965. Historic Aerials (historicaerials.com) includes aerial images of this site in 1952, 1957, 1977, and later years. The 1939 photo shows this land with only a few small areas of trees, see **Figure 3**. There are no significant changes to be seen on the 1952, 1957, and 1965 aerial views, which all show the land remaining in a similar state. Notably, construction of I-35, which defines portions of the eastern edge of the project site as shown in the 1965 aerial view, was first authorized in 1956 and is depicted as under construction on the 1961 USGS Topographic Map for Moose Lake, MN, Quadrangle. This 1961 Topographic map also shows the bulk of the project area as marshland, just as it was when first surveyed in 1864. The 1977, 1981, and 1988 aerial photographs show the bulk of the center of the project area used for agriculture (with drainage ditches then present), and the 1981 topographical map for Willow River shows a matching decrease of marshland area. This agricultural area later expanded to the south, as shown on the 1991 aerial view, and to the north, as shown on the 2003 aerial view.

Figure 3. Historical Aerial from 1939



Current Vegetation and Land Use

The Project Area is within the St. Croix Major Watershed Basin, which includes four subwatersheds: St. Croix River-Upper, Kettle River, Snake River, and St. Croix River-Stillwater. The project is located within the watershed of the Kettle River which is approximately 0.15 mile west of the Project Area at its closes point. The Kettle River is in the Minnesota Wild and Scenic River system. The Kettle River is designated as Scenic from the Carlton-Pine county line downstream to the Kettle River dam site at Sandstone. Scenic rivers are those rivers that exist in a free-flowing state and with adjacent lands that are largely undeveloped (i.e., adjacent lands still present an overall natural character, but in places may have been developed for agricultural, residential, or other land uses.)

Several agricultural drainage ditches bisect the portion of the Project Area west of Interstate Highway 35. The agricultural drainage ditches in the northern portion of the project Area flow generally north and west and the ditches in the southern portion flow generally south and west. One stream is crossed by the transmission line and is a Minnesota Public Waters Inventory (PWI) mapped waterway (Unnamed Stream M-050-046-023-001). All ditches and the stream discharge to the Kettle River.

The existing vegetative land cover within the solar array area and Project Substation is cultivated cropland currently planted in soybeans and a network of agricultural drainage ditches. Vegetation within the transmission line corridor and switchyard consists of mixed hardwood forest, wetlands including forested, shrub, and emergent types, and hay/pastureland. Secondary vegetative communities in the immediate area include Interstate Highway 35 right-of-way, smaller utility rights-of-way, farmsteads, and residential vegetated areas to the west along County Highway 61.

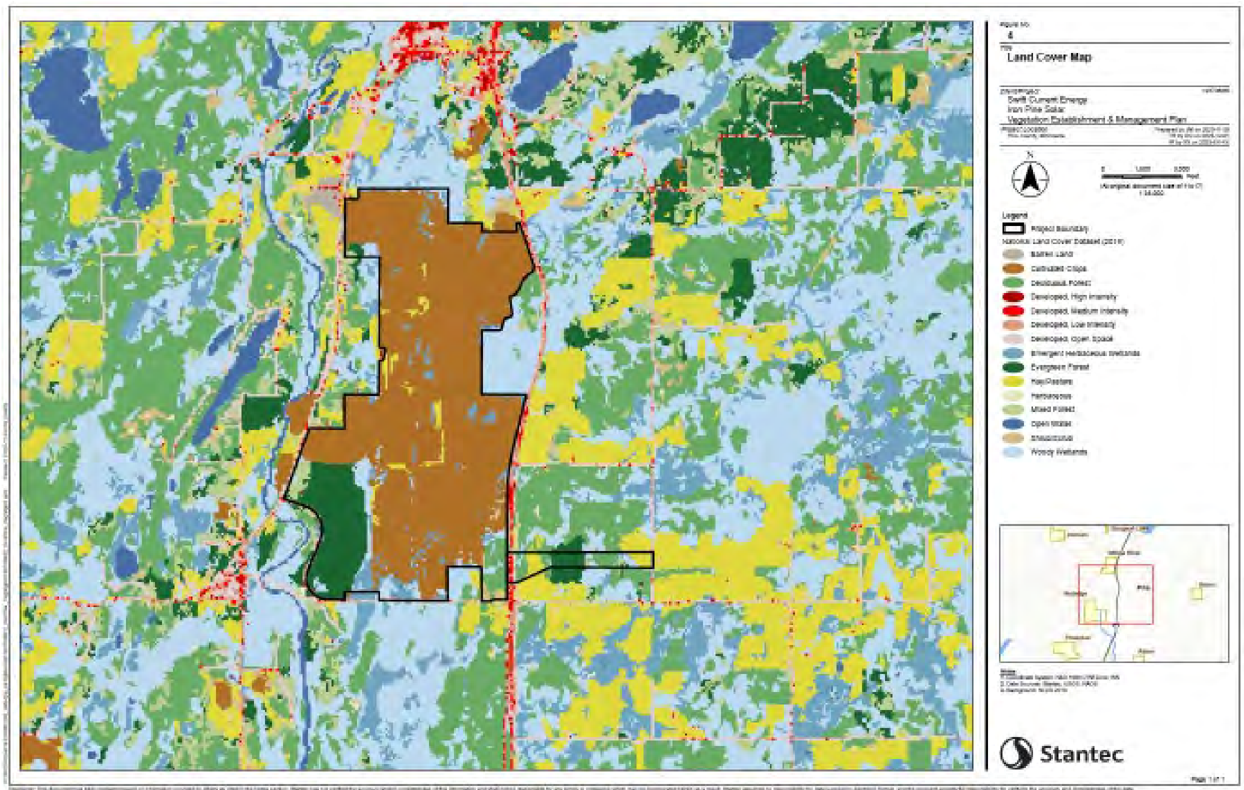
A wetland and waterway delineation field assessment was completed in September 12-16, September 19-21, and October 31, 2022 and approved by the Wetland Conservation Act (WCA) Technical Evaluation Panel (TEP) June 16, 2022 and by the U.S. Army Corps of Engineers on August 23, 2023. Forty-two wetlands (**Table 5**), four waterways and 26 channelized human-made ditches (**Table 6**) were delineated and mapped within the Project Area. Delineated wetlands and watercourses are shown on **Figure 2**. The Project has been designed to avoid temporary and permanent impacts to wetlands.

The Project is located within a rural landscape, and therefore the primary land use in the Project Area is agricultural (75.5%). The second largest portion of the Project Area consists of harvested timber (12%). The remaining identified land uses include deciduous forest, emergent herbaceous wetlands, barren land, and open water. In total, the remaining land uses comprise (8%) percent of the Project Area. Most of the agricultural land in the Project Area is subject to row-crop agriculture, such as corn and soybeans. Approximately 74 acres of the array area in the southwest corner is recently harvested timber, along with an additional 174 acres of harvested timber that will be revegetated to pollinator habitat. Developed land within the Project Area generally consists of public roads, namely County Highway 61, Swanson Road, Weeping Willow Road, Cane Creek Road, and Interstate Highway 35. Land use within the Project Area, based on U.S. Geological Survey National Land Cover Database (NLCD) mapping, is summarized in **Table 1** and a map is provided in **Figure 4**.

Table 1. NLCD Mapped Land Use within the Project Area

Land Use Type	Acres in Project Area	Percent Total Acreage
Agricultural	2,026	92%
All other land uses	178	8%
Total	**2,207**	**100%**

Figure 4. Land Cover Map



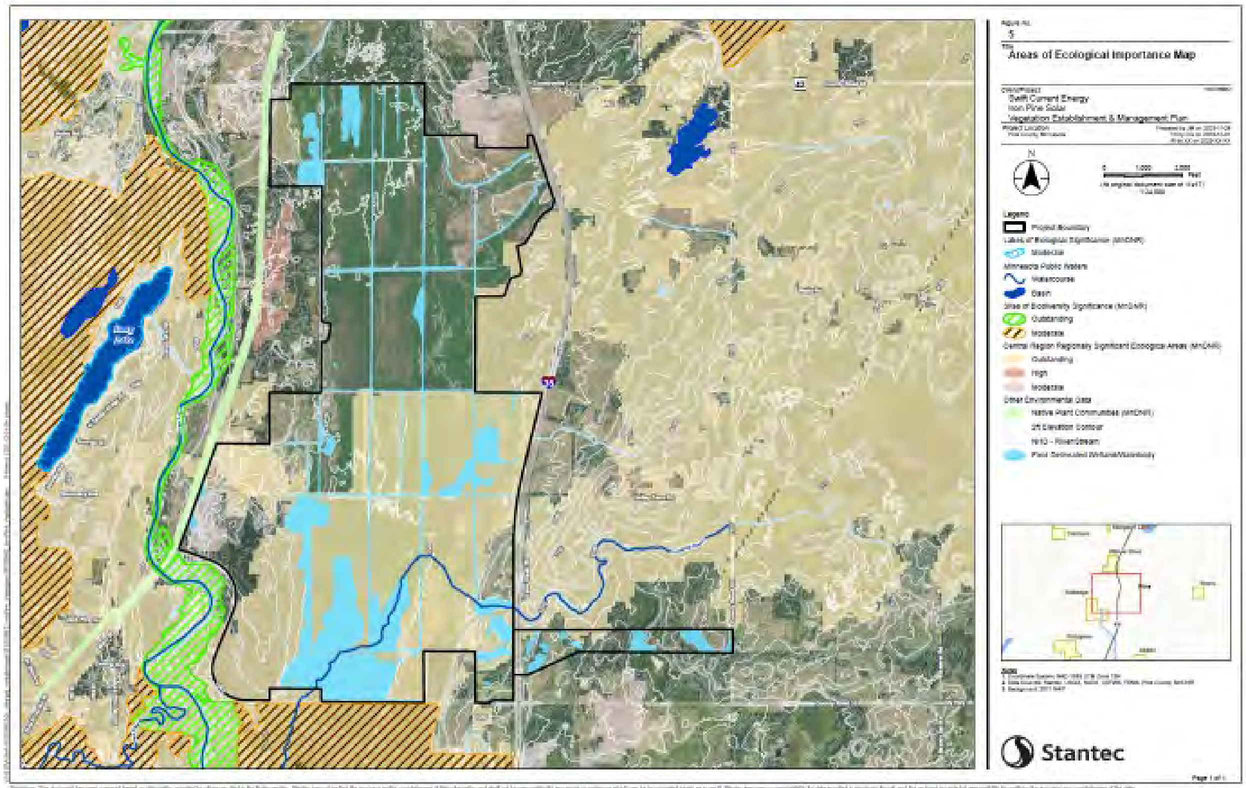
Farmsteads are sparsely scattered outside of the Project Area, generally situated near public roads. Based on review of available aerial photography, there are 34 residences located on parcels adjacent to the Project Area.

Locations of potential areas of ecological importance are shown in **Figure 5**. There are no MBS Sites of Biodiversity Significance (SBS) located within the Project Area, however there are two areas adjacent to the Project Area which have been identified as SBS. An Outstanding ranked SBS site associated with the Lower Kettle River west and south of the Project Area, and Banning North, a Moderate ranked SBS, is located south of the Project Area.

The DNR describes native plant communities as a group of native plants that are not greatly altered by modern human activity or introduced organisms and are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes including wildfires and floods (DNR 2024h). There are no MN designated NPC located within the Project Area. However, there is one

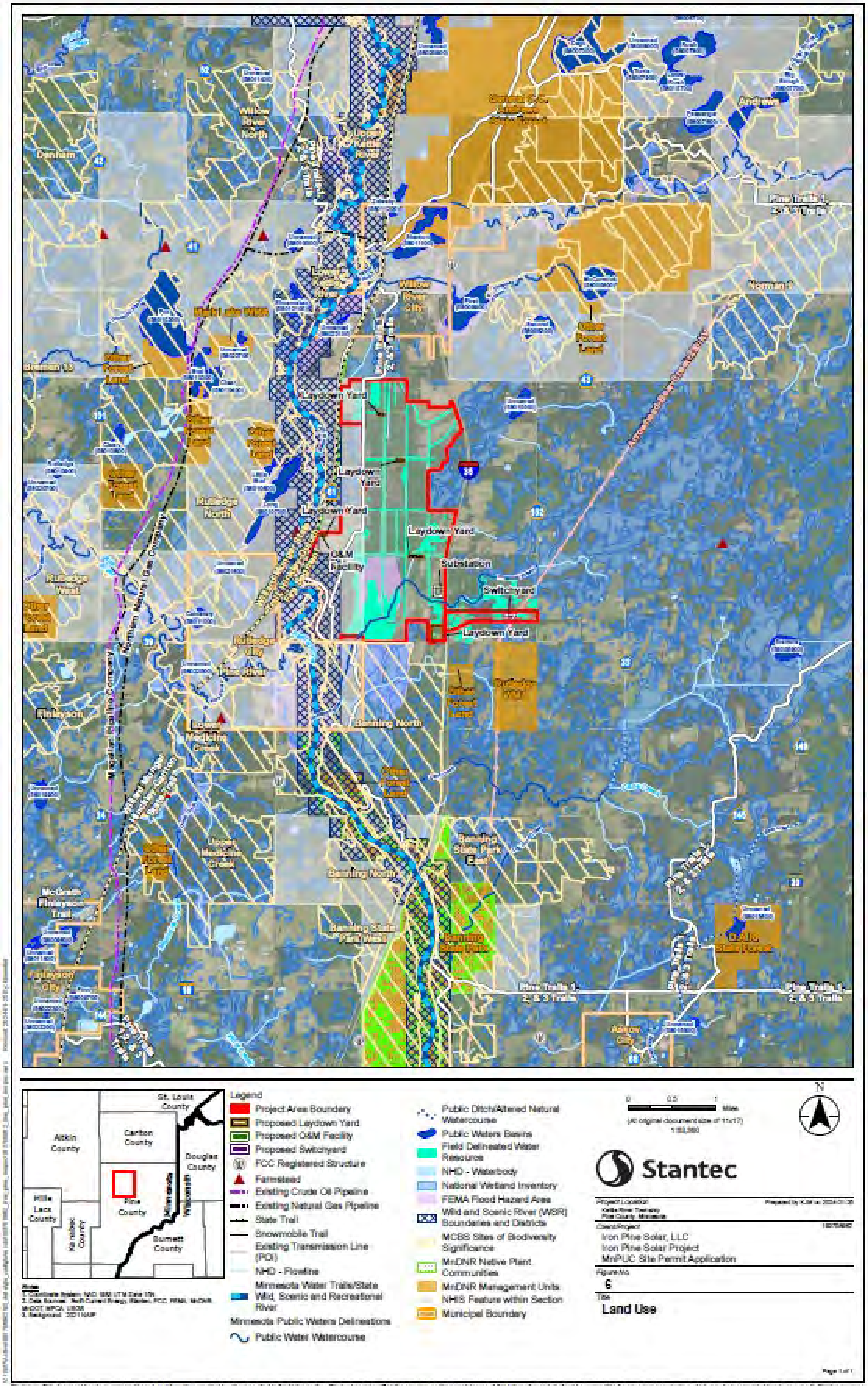
NPC, a Dry Barrens Oak Savanna (Southern) Jack Pine Subtype (UPS14a1) located directly adjacent to the west side of the Project Area and running alongside County Road 61. There is no remnant native prairie present within the Project Area. No CREP or RIM parcels or other conservation easements or land enrolled in government conservation programs known to be present within the Project Area.

Figure 5. Potential Areas of Ecological Importance



There is no public land including recreation or public conservation areas (ex. WMAs, SNAs, etc.) located within the Project Area. Public land located within a mile of the Project Area includes Rutledge WMA and state forest land parcels. The Willard Munger Hinckley-Carlton State Trail is located adjacent to the west side of the Project Area and a State Water Trail follows the Kettle River, also located west of the Project Area. Public lands in the vicinity of the Project are shown in Figure 6.

Figure 6. Land Use



2.4 Topography

The Project Area is in a relatively flat area with ground surface elevations typically between 1,040 feet above mean sea level (ft amsl) and 1,050 ft amsl. The southeastern portion of the Property, east of Interstate 35, has a ground surface elevation of up to 1,100 ft amsl (USGS, 2019a and 2019b). The solar array area is a relatively flat basin with topographic highs sloping upward along both the eastern and western boundary of the site. Drainage within the solar array area north of Valley Farm Road is directed to the north to the Kettle River, and drainage south of Valley Farm Road is directed south to the Kettle River. The topography along the proposed transmission line is gently rolling with drainage flowing north and west to an unnamed stream which flows to the Kettle River. Existing two-foot contours are shown in **Figure 2**.

2.5 Soils

Note that soils on a majority of the site were not classified by NRCS because NRCS was denied access at the time of the soil survey or no digital data is available (**Figure 7**). During Stantec's field delineation, it was found that a large portion of the site contained drained peat soils, particularly in the farmed areas. The soils deposited in the area are characteristic of glacial and post glacial activity. Planting zones and seed mixes were developed using observations from on-site fieldwork, arial and historical photographs, and descriptions of adjacent soil types. Soils, underlying bedrock formations and other geologic features were identified during desktop evaluations using applicable GIS layers for nearby soil types. Susceptible geologic features, including karst, sinkholes, shallow limestone formations, or unconfined/shallow aquifers are not known to be present in the vicinity of the Project Area. The depth to bedrock ranges from less than 50 to greater than 100 feet throughout the Project Area. Bedrock depth is shallowest in the central portion of the Project Area and increases on the east and west (Setterholm, 2001). SSURGO data from the surrounding area suggest the depth to bedrock within the entire Project Area is greater than 200 cm (78.7 in).

The Project Area resides over the Mesoproterozoic bedrock unit designated "Mss- Sandstone, siltstone, and local conglomerate" (Minnesota Geological Survey, 2011). This unit includes the Hinckley Sandstone and Solar Church and the youngest (~1,000 million years ago) detrital zones of the Fond du Lac Formations. The formations originate from deposition in eolian, fluvial, and lacustrine environments.

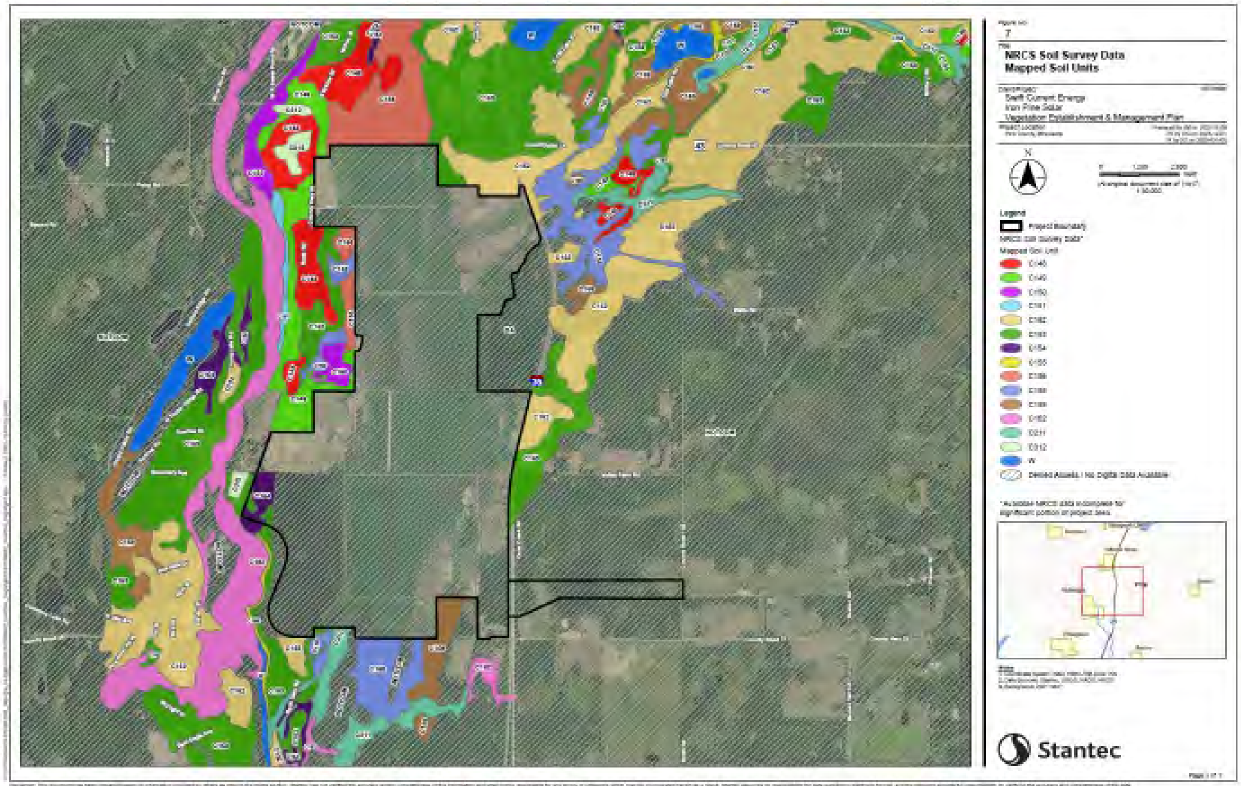
The project area contains three major quaternary geological units (Minnesota Geological Survey, 2019). They include:

- Floodplain Alluvium (al)-Gravelly sand to sandy silt; generally coarse-grained sediment (sand and gravel) in channels, and finer-grained sediment (fine-grained sand and silt) on floodplains. Deposited by modern streams.

- Barnum Formation, Mahtowa member [Split Rock phase] (bh)- loamy diamicton, red. The Barnum Formation was deposited by ice of the Superior lobe from the northeast, Superior provenance. The "h" letter designates stagnation-moraine sediment. Meaning the glacial sediment deposited at the margin of a glacier or released by the melting of glacial ice. This is composed of till, stratified glacial sediments, and glaciolacustrine sediment. These areas also form broad areas of hummocks, irregular topography, including circular, flat-topped hills, and collapsed channels.

- Cromwell Formation Outwash (cro)- Outwash from the Cromwell Formation, which was deposited by ice of the Superior lobe from the northeast, Superior provenance.

Figure 7. NRCS Soil Survey Data



Soils were characterized as hydric throughout the Project location during the wetland delineation conducted for the Project. Wetlands are associated with some of these areas (**Figure 2**), however other areas appear to be effectively drained by agricultural practices. There are no known springs or seeps at the site. None of the soils are classified as Prime farmland within the Project boundary. NRCS Soil Survey Soil Drainage Classification and Hydric Soils mapping is shown in **Figure 8** and **Figure** 9.

The primary constraint, for the purpose of vegetation, is soil moisture. Soils associated with the Iron Pine Solar Project tend to be poorly or somewhat drained in the interior portion of the site with well drained or excessively drained soils on the perimeters on the east and west side of the Project. High moisture soils are conducive for robust vegetation establishment and cover but are also susceptible to soil compaction and nutrient levels that may facilitate weed growth.

Figure 8. NRCS Soil Drainage Classification

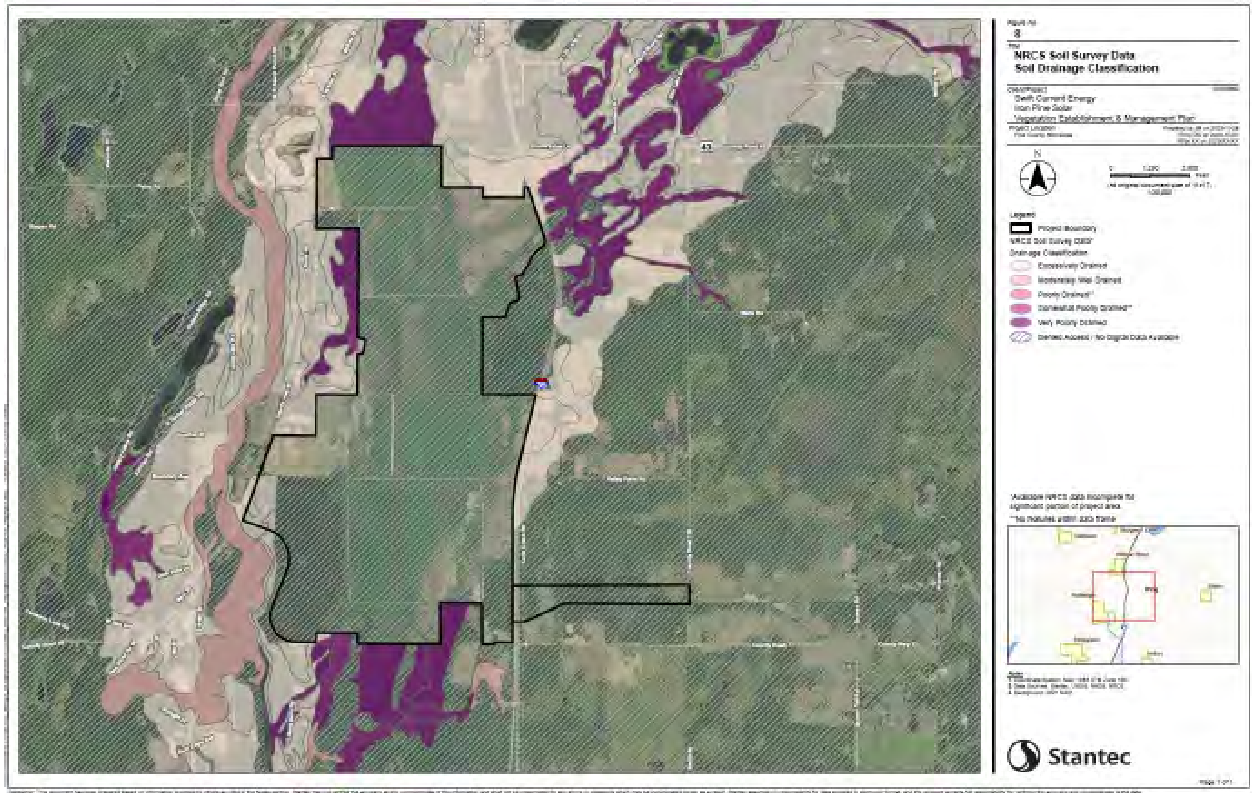
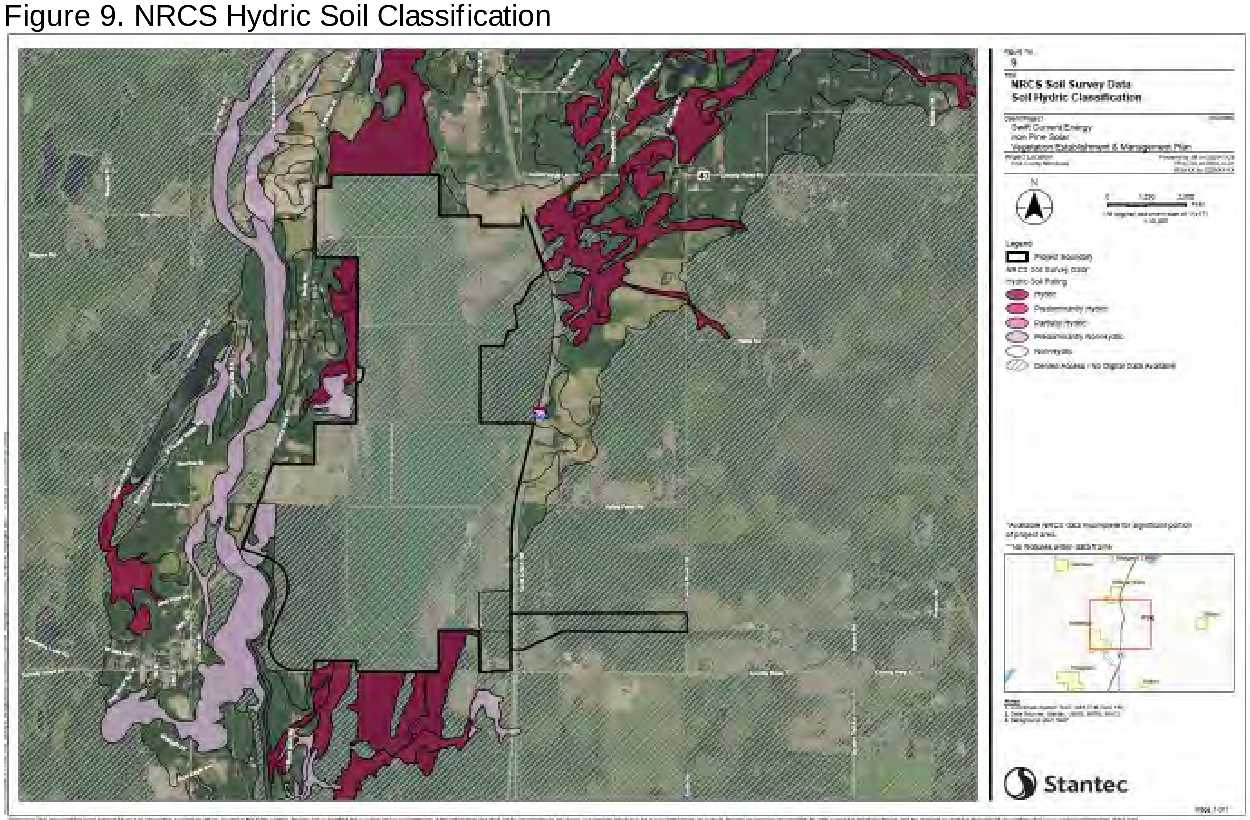


Figure 9. NRCS Hydric Soil Classification



Soil drainage and water holding characteristics are considered for seed mix design. While some soils are artificially drained by agricultural ditches, natural soil characteristics likely still sustain mesic to moist-mesic soils. Likewise, compaction during construction will also decrease drainage efficiency and increase water holding capacity, favoring species adapted to higher moisture conditions. In general, moist soils, along with a potential legacy of agricultural fertilizers, encourage robust vegetation growth. Based on existing soil drainage characteristics, past land use, and anticipated soil hydrology impacts following Project construction, three low growing solar array seed mixes have been designed that includes species that are compatible with the diversity of drainage characteristics across the site as described. These mixes are provided in **Appendix B, Table B.2, B.3, and B.4**.

Table 2. Soil Characteristic Constraints Over Vegetation

Vegetation Hydric Types	Drainage Characteristics	Modal Species	% Cover
Moist Mesic to Mesic Vegetation	Moderately to poorly drained High to moderate water holding	Marsh Bluegrass (*Poa palustris*)[1] Blue-joint Grass (*Calamagrostis canadensis*)[3] Big Bluestem (*Andropogon gerardii*)[3]	93%
Mesic Vegetation	Moderately well drained Moderate to low water holding	Big Bluestem (*Andropogon gerardii*)[3]	2%
Mesic to Dry Mesic Vegetation	Well drained to Excessively drained Low water holding capacity	Side Oats (*Bouteloua curtipedula*)[1] Little Bluestem (Schizachyrium scoparium)[2]	10%

[1] Native and highly suitable for site specific array seed mix.
[2] Dominate historic vegetation, but too tall for solar purposes.

2.6 Hydrology

The Project is located in the Kettle River Watershed Basin. One unnamed MNDNR Public Watercourse is located in the northwest corner of the Project Area. It is classified as a natural perennial watercourse. This feature is also indicated as a Flowline in the National Hydrography Dataset (NHD).

Field investigations were performed September 12-16, September 19-21, and October 31, 2022. Boundary concurrence on the delineated wetlands and waterways was provided by the WCA LGU, which is Pine County, in their Notice of Decision (NOD) dated June 8, 2023. The U.S. Army Corps of Engineers provided concurrence with the delineated aquatic resources on August 23, 2023. A total of 42 wetlands, and one excavated open water feature (**Table 3**) and four waterways and 26 channelized human-made ditches (**Table 4**) were delineated and mapped within the Project Area and the immediate vicinity. Delineated wetlands and watercourses are shown on **Figure 2**. See the Site Permit Application for more information on wetland impact avoidance and minimization measures. Wetland types and acreages and waterbody types and linear feet are summarized in **Table 3** and **Table 4** respectively.

Table 3. Delineated Wetlands Within and Immediately Adjacent to the Project Area

Wetland Type	Acres within Project Area
Farmed Wetland	163.8
Floodplain Forest	8.0
Hardwood Swamp	14.6
Sedge Meadow	0.4
Shrub-Carr	46.1
Wet Meadow	13.7
Total	**246.7**

Table 4. Delineated Watercourses within the Project Area

Waterway ID	Flow Class	Length In Study Area (linear feet)
Streams		
S1	Perennial	2,566.5
S3	Perennial	3,952.6
S4	Perennial	2,894.8
S7	Perennial	6,797.7
	TOTAL	**16,211.6**
Agricultural Drainage Ditches		
D1	Ephemeral	471.3
D2	Ephemeral	33215.5
D3	Ephemeral	9227.0
D4	Ephemeral	364.6
D5	Ephemeral	485.6
D6	Ephemeral	1387.9
D7	Ephemeral	1046.5
D8	Ephemeral	1927.9
D9	Ephemeral	1477.6
D10	Ephemeral	1644.26
D11	Ephemeral	11287.9
D12	Ephemeral	1180.6
D13	Ephemeral	1830.2
D14	Ephemeral	2382.9
D15	Ephemeral	125.3

Waterway ID	Flow Class	Length In Study Area (linear feet)
Streams		
D16	Ephemeral	1715.7
D17	Ephemeral	4017.4
D18	Ephemeral	559.1
D19	Ephemeral	865.5
D20	Ephemeral	5111.1
D21	Perennial	3660.7
D22	Perennial	587.9
D23	Perennial	2546.2
D24	Perennial	2888.5
D25	Perennial	191.7
D26	Perennial	11315.7
TOTAL		**101,514.6**

2.7 Drain Tile

Iron Pine Solar has had discussions with the participating landowner and understands that drain tiles are minimal in this area. Pre-construction farm field drain tile mapping challenges often exist on solar energy Projects. Identifying and locating drain tiles is complicated because of missing, incomplete, and inaccurate mapping. Iron Pine Solar will review available drain tile maps from participating landowners with land in the Project Area. Iron Pine Solar will attempt to avoid and/or relocate existing drainage systems as needed for construction of the Project. Drain tile or drainage system adversely affected by the Project will be identified, repaired, relocated, or replaced as needed to achieve the function and scope to its original size and capacity. Replacement or rerouting of tile will take place during construction or as it is identified in order to maintain the integrity of the drainage lines. This practice should minimize interruption of drainage on site or on neighboring farms that may drain through the Project leased property. New or modified drain tile systems installed by Iron Pine Solar will be located using Global Positioning System equipment and archived in Project construction files and the Project Decommissioning Plan.

The following considerations will also apply:

- Tiles will be repaired with materials of the same or better quality as that which was damaged.
- Tile repairs will be conducted and located in a manner consistent with industry-accepted methods.
- Before completing permanent tile repairs, tiles will be examined within the work area to check for tile that might have been damaged by construction equipment. If tiles are found to be damaged, they will be repaired.

Iron Pine Solar's design minimizes conflicts between known tile and the solar racking systems to minimize damage to tile to the extent feasible. In some areas, re-routing of the tile is necessary and this re-routing work will take place immediately prior to or during construction. Additional tile may be installed prior to or during construction to augment the existing system and to maintain the drainage profile of the site.

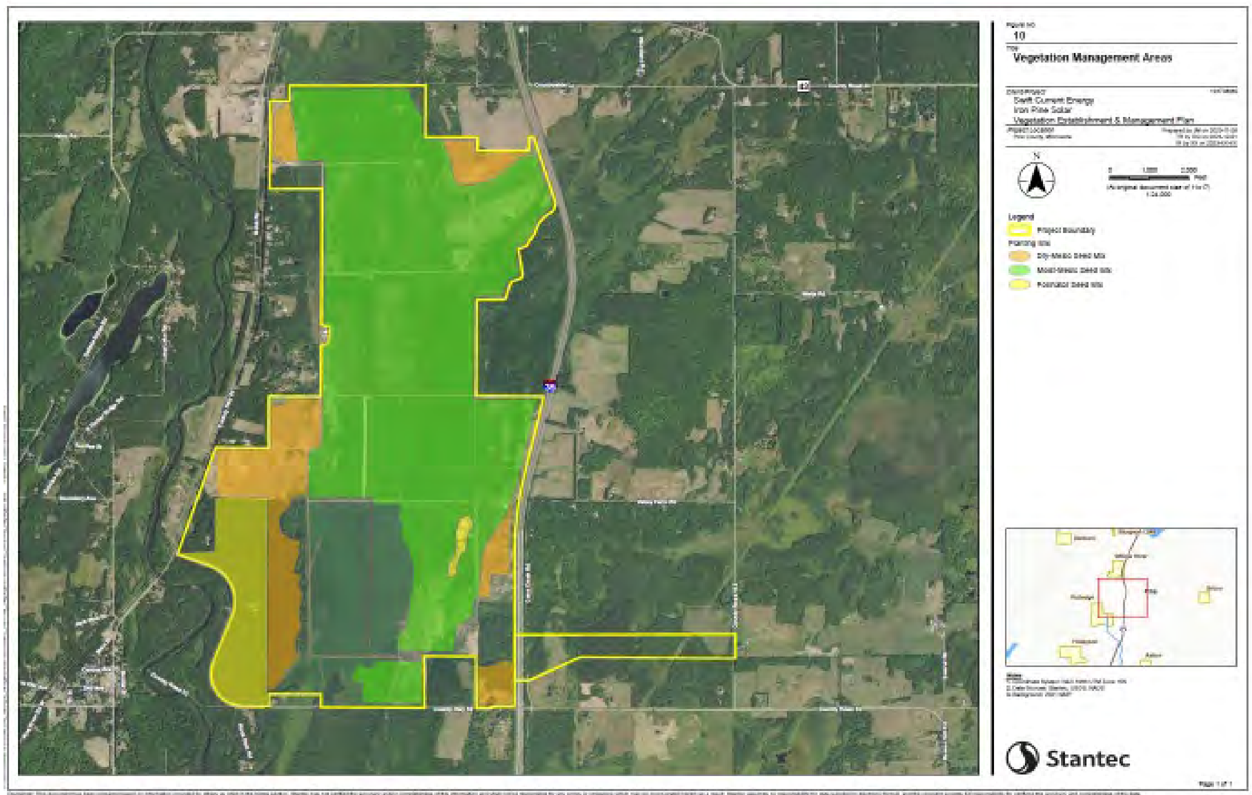
Following completion of construction, Iron Pine Solar will inspect the Project Site after significant snow melt or rainfall events for evidence that tile systems are functioning adequately. If localized wet areas or standing water are observed, it is likely the tile system is not operating as anticipated. In this situation, the Tile Contractor will be reengaged to pin-point damaged tile that may have been missed during construction. Tile would be repaired following the process outlined above.

3 Vegetation Management

3.1 Management Areas

The Iron Pine Project area consists of one main continuous block of panels with two small separate fenced in areas on the south. Due to the large majority of the units being continuous, management units across the site have been defined by the vegetation type specified for installation. They break into three broad categories including Moist-Mesic Array Low Grow, Dry-Mesic Array Low Grow, and Pollinator. Differing hydrological and vegetative conditions will require slightly different management sequencing. **Figure 10** shows a representation of the management areas. Descriptions of the steps to establish and maintain the management areas are included in the following sections.

Figure 10. Vegetation Management Areas



Moist-Mesic Array Low Grow vegetation unit are in sandy or peat soils with a high-water table. Water availability is expected to be high and is not anticipated to be a limiting factor in growth. This management unit is indicated in green on **Figure 10**. Moist-Mesic Array Low Grow vegetation unit is primarily agricultural recently planted to corn and beans.

Dry-Mesic Array Low Grow vegetation unit has well drained to excessively drained sandy soils. Water availability may be a factor in overall growth and they maintenance treatment sequencing. Indicated in Orange on **Figure 10**. Dry-Mesic Array Low Grow vegetation was also primarily agriculture planted to corn and beans with the exception of the southeastern fenced units that was partially agriculture and partially forested.

Pollinator plantings fall within a recently harvested timber lot. The soils are well drained and sandy, and the differing previous land use indicates different starting conditions that will require alternate seedbed preparation, installation and weed management steps to successfully establish.

3.2 Vegetation Management Objectives

Vegetation management objectives have been developed for the pre-construction/construction phase, as well as short-term establishment and long-term establishment for the Project Area.

Pre-construction/Construction Phase Objectives

Pre-construction is defined as the period that begins when Iron Pine Solar assumes control of parcels within the proposed Project Area to the initialization of construction activities associated with the solar facility. Construction is the period when the solar facility infrastructure is being installed. Construction activities can include, but not limited to, access road construction, array and collection cable installation, and fencing. Construction typically lasts 12-18 months and is anticipated to begin for the Project in Q3 2025, with expected completion by early 2027.

The following are the objectives for vegetation and soil management during the pre-construction phase prior to the installation of any solar facility assets or land disturbing activities:

- In areas where no civil construction (grading) is required as part of the construction activities, establish the designated Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils, Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils, or Pollinator Mix to initiate long-term perennial vegetation during the soonest available optimal seeding window to increase the probability of successful vegetation establishment.

Construction schedule and sequencing will be an important driver for the seed mixes used to meet pre-construction/construction objectives. In areas where no civil construction is required and the pre-construction period allows for the establishment of perennial vegetation prior to construction, permanent low-growing regionally appropriate seed mixes (Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils, Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils, or Pollinator Mix), **Appendix B, Tables B.2, B.3, and B.4** will be used in the locations shown in **Figure 10**. In areas where no civil construction is required and the pre-construction period does not allow for adequate permanent perennial vegetation establishment prior to construction, temporary seed mixes would be used until the completion of construction in that area. Section 6 provides greater detail on the use of temporary seed mixes for soil and erosion control throughout the construction phase of the project.

Permanent perennial seed mixes were developed by referencing the guidelines outlined in MNDNR (2020) *Prairie Establishment and Maintenance Technical Guidance for Solar Projects* and multiple Minnesota Board of Water and Soil Resources (MN BWSR) seed mixes, including low-growing array mixes suitable for conditions present within the Project Area.

Each low-growing grass-dominated seed mix has the following characteristics:

- A minimum seeding rate of 40 seeds/sq. ft.2
- At least 30% of the total seeding rate should be composed of perennial forbs.

- 5 or more native grass/sedge species with at least 2 species of bunchgrass.
- 10-15 or more native forbs with at least 3 species in each bloom period: Early (April-May), Mid (June-August), and Late (August-October).

In areas where civil construction (grading) is required as part of the construction activities, establish and maintain a designated temporary seed mix until grading is complete to provide soil stabilization and compliance with SWPPP conditions. If construction activities extend beyond the life cycle of a temporary seed mix, consider re-seeding areas, as necessary.

The following are the objectives for vegetation and soil management during the construction phase:

- In areas where perennial vegetation was established during the pre-construction phase, manage vegetation in a manner that supports remaining compliant with SWPPP conditions including mowing, herbicide applications, and re-seeding areas disturbed by construction activities.
- In areas where civil construction requires grading or land disturbance, establish the designated Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils or Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils in the locations as shown in **Figure 10** following the completion of grading activities and prior to the installation of solar facility assets such as arrays, collection cables, or fences. Use typical vegetation management practices such as mowing, spot spraying, and re-seeding to minimize establishment of MDA-listed noxious weeds.
- In areas where establishing the Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils or Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils immediately following the construction phase is not possible, use a temporary seed mix to remain compliant with SWPPP conditions and then establish permanent regionally appropriate grass-dominated vegetation during the soonest available optimal seeding window to increase the probability of successful vegetation establishment. Use typical vegetation management practices such as mowing, spot spraying, and re-seeding to minimize establishment of MDA-listed noxious weeds.

Post Construction Phase Objectives

Establishment and maintenance phases occur over the course of years. Demonstrating incremental progress towards a desired objective is important. **Table 5** provides a summary of performance criteria for the components of vegetation cover for both short-term and long-term objectives. Phase year benchmarks are included as a reference to measure during monitoring and to demonstrate trends or progress towards meeting and maintaining the long-term management objectives. Actual vegetation performance against reference year benchmarks will be used as indicator of the success of current vegetation management or the need for additional management or resources.

Table 5. Performance Criteria for Vegetation Cover

Phase	End of Growing Season Reference Year	Perennial Cover (Overall)	Perennial Cover (Regionally appropriate Species)	MDA-listed Noxious Weed Cover	Invasive Weedy Species Cover
Establishment	Year 2	>30%	>20%	<10%	<50%
	Year 4	>50%	>40%	<5%	<30%
	Year 5	>70%	>50%	<5%	<15%
Maintenance	Year 6+	>90%	>70%	<5%	<15%

Short-term Establishment Objectives

Short-term establishment objectives are defined as the desired conditions for vegetation management units in Years 0 to 5 immediately following construction activities and focus on establishing perennial regionally appropriate vegetation. Specifically, short-term establishment objectives include:

- Establish or maintain a temporary seed mix with greater than 70 percent vegetation cover during the seasonal periods each year when conditions are not conducive to establishing perennial vegetation to meet or exceed requirements of the project NDPES permit. This primarily includes areas that have not undergone initial perennial re-vegetation during pre-construction or construction phases.
- In areas that have not been re-vegetated with a perennial seed mix during the pre-construction or construction phase, install the designated regionally appropriate seed mix within the first 6 months following construction during the soonest available optimal seeding window to increase the probability of successful vegetation establishment.
- During Years 1 and 2, use mowing to reduce annual weed competition, minimize MDA-listed noxious weed species to less than 10 percent cover, minimize weedy species (See **Table 8** and **9** in Section 4.5 for a list of invasive and potentially invasive species) to less than 50 percent cover, and establish 30 percent or greater perennial vegetation cover.
- During Years 1 and 2, use seasonal inspections and annual monitoring to identify areas where re-seeding may be required. Consider modifying or supplementing seed mixes to match local-scale conditions as additional information about the site is obtained. For example, supplemental re-seed areas with the low-growing wet mesic seed mix in areas that end up being wetter than planned.
- By Year 4, establish 50 percent or greater perennial vegetation cover with less than 5 percent MDA-listed noxious weed species and less than 30 percent weedy species cover.
- Use spot-spraying with the appropriate herbicides to reduce and control weed species that cannot be controlled through mowing practices to less than 20 percent total cover.

- By the end of Year 5, perennial vegetation cover will be 70 percent or greater with 50 percent or greater cover from regionally appropriate species. MDA-listed species will be 5 percent or less of total cover and weedy species will be 15 percent or less of total cover.

- By the end of Year 5, reduce the number and need for mowing and herbicide treatments as a form of weed control, if possible, because each vegetation management unit has well-established low-growing regionally appropriate grass sod (or regionally appropriate grasses and forbs, where planned).

Long-term Management Objective

Long-term management objectives are defined as the desired conditions for vegetation management units in Year 6 to the end of the permit and will focus on maintaining regionally appropriate, perennial vegetation. Specifically, long-term management objectives include:

- Maintain 90 percent or greater perennial vegetation cover, including 70 percent or greater regionally appropriate grass-dominated vegetation cover or regionally appropriate grasses and forbs, where planned within each vegetation management unit as mapped using prescribed mowing, spot-spraying, and supplemental seeding to minimize MDA-listed noxious weed species. MDA-listed species will be 5 percent or less of total cover, and weedy species will be 15 percent or less of total cover.

- Initiate vegetation management activities if invasive weedy species cover becomes 20 percent or greater and/or MDA-listed noxious weed cover becomes 10 percent or greater to maintain meeting long-term management objectives.

4 Site Preparation and Seasonal Timing

The placement of the seed mix will be refined once the site design has been finalized, but the general approach to the installation of the planting mixes based on the current design is provided. Installation timing, construction sequencing, and site conditions at the time of installation play a large role in determining the correct steps required for successful installation. At the time of this writing, the construction sequencing is not fully developed for a detailed seeding schedule to be outlined. The proper steps to take upon development of the construction sequencing can, however, be outlined. The purpose of this section is to describe the appropriate steps for a given condition to cover a wide range of scenarios that may occur during project development and provide the steps necessary should those conditions occur.

The Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils or Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils will be installed in fenced areas and perimeter areas outside of the fence that require permanent vegetative cover (**Figure 10**). There will be no planting on the internal access roads, the substation, switchyard, or operation and management facility areas, along public road ROWs, or in areas identified as streams or wetlands where existing vegetation is present. State of Minnesota Seed Mix 33-261 Stormwater South and West Mix for vegetation of permanent stormwater ponds and a Pollinator Seed Mix for use in perimeter areas is provided in **Appendix B**.

4.1 Site Preparation

Any site preparation should maintain compliance with the SWPPP (**Appendix E**). Whether the Project requires soil preparation is dependent on preceding land use and construction activities. Typically, no site preparation is required when the preceding vegetation has been soybeans, small (cereal) grains (oat, wheat, barley, cereal-rye), or forage crops such as alfalfa or corn silage. Harvested soybean, small (cereal) grains, and forage fields provide a low crop residue, level ground, and perfect soil firmness to seeding all seed mixes associated with solar. The Plan advises working in advance with the current land manager to accommodate above mentioned crops. If site preparation is required, it may consist of removing existing biomass by haying or herbicide, and or discing, harrowing, and soil-packing to assist with installation and establishment of seed mixes.

While harvested soybean, small grains, and hayed or chopped forage crop fields require little or no site preparation, other crops, such as corn, unharvested small grains, unharvested forage crops, and weedy fallow fields may create excessive vegetation residue and soil compaction that will hinder seeding and seeding establishment. If site preparation is required, it may consist of a variety or combination of crop residue reduction methods, including haying, mowing, chemical burn down by herbicide (glyphosate), and or shallow tilling. Excessive soil compaction is often associated with corn fields and soil decompaction by shallow tilling may be required to create a viable seedbed. Fallow fields often exhibit annual weeds that can be chemically treated by glyphosate and or mowing, but in either case, treatment needs to occur before weeds produce seed.

If tillage is required, caution is advised to avoid tilling too deep. While deep tillage reduces soil compaction, it can create soils too loose for seeding native species. Grass seed may not establish if seeded deeper than 1/2 inch and many native forbs may not establish if seeded deeper than 1/8 inch. Most agricultural crops germinate from large seeds that can be planted much deeper than grass seed. Therefore, most agricultural tillage implements tend to cultivate soil too deep for grass seed. If soil preparation involves deep tillage, it is advised soils are firmly packed before seeding.

Site preparation requirements and treatments also vary based on crop type and time of year, as follows:

- Soybean fields and forage crop fields (e.g., alfalfa, corn silage) typically provide low crop residue soil surfaces suitable for seeding.
  - Soybean fields are typically harvested beginning in late-September. Harvested soybean fields may be seeded immediately after harvest, preferably before October 1. No-till drill seeded into soybean stubble is preferred. Seed may also be broadcast seeded if prepped by shallow-tillage and followed by a packer.
  - Forage crop fields, such as alfalfa-hay, are harvested throughout the year. Forage crop fields often require some level of site preparation prior to seeding, such as removal of excess residue (e.g., haying) and/or herbicide to suppress existing vegetation and potential weeds. Following herbicide treatment, and based on herbicide manufacturer's recommendations, seed can be directly no-till drilled into forage crop stubble. Seed may also be broadcast seeded but requires shallow tillage prior to broadcast seeding and followed by a packer.
  - Corn harvested for silage provides marginal conditions for seeding. Excessive crop residue following harvest makes no-till drilling seed into corn silage stubble difficult. The residue can plug the seeder double disc-openers. Broadcast seeding requires shallow discing and packing prior to seeding and for best results, packing after seeding. Even in the best-case seeding scenario, crop residue may prevent adequate germination.
- Cornfields, grown for grain, create excessive crop residues and severely compacted soils that can impede seed installation and vegetation establishment. Adequate seedbed preparation for grain corn fields includes baling stocks to remove plant residue, and shallow tillage, possibly followed by packing prior to seeding, and packing following seeding. As grain corn is the last regional crop to be harvested, usually in November, it is often too late for seed germination, including cover-crops prior to winter.

Table 6 provides guidance for a planned schedule and sequence of site preparation activities under different construction start scenarios. This table along with consultation from a qualified vegetation management professional will be used to develop the appropriate prescription based on the final project schedule. **Table 10** and Section 6.3 provide additional information about preferred annual seeding time periods for temporary and perennial seeding, respectively.

Table 6. Site Preparation Sequence and Activities Based on Construction Start Period

Pre-construction Period	Pre-construction Site Conditions – Seeding Preparation	Pre-construction Seeding	Construction Start
Spring	Previous row-crop – None Winter crop - Harvest winter crop	Perennial seed mix in optimal seeding window – Areas that will not be graded. (April 1 – June 30) Temporary seed mix (spring/fall seed mix) – Areas to be graded. (April 1 – June 1)	Summer
Summer	Terminate row-crop – Mow, disk or herbicide application	Perennial seed mix in optimal seeding window – Areas that will not be graded. (June 30 – August 1 Not recommended – Assess current seasonal weather trends; Monitor and prepare for supplemental seeding) Temporary seed mix (summer seed mix) – Areas to be graded. (May 1 – August 15)	Fall
Fall	Harvest row-crop	Perennial seed mix in optimal seeding window – Areas that will not be graded. (September 10 – October 31, less than ideal; November 1 – Frozen conditions; when soil temperature is 40°F or less) Temporary seed mix (spring/fall seed mix) – Areas to be graded. (August 1 – September 15)	Winter or spring
Winter	Previous row crop - None	Perennial seed mix in optimal seeding window – Areas that will not be graded. (February 15 – April 7 – Frost Seeding; Complete when snow depth is 1 ft or less) Temporary seed mix (winter mix) – Areas to be graded. (September 1 – November 15)	Spring

In summary, pre-existing vegetation plays a significant role in the potential to establish a desirable vegetation compatible with the Project objectives. Stantec highly recommends working with cooperating agriculture producers and construction contractors prior to construction to ensure desirable crops precede Project construction.

4.2 Soil Handling

Grading may be required to provide flat surfaces for the installation of arrays (**Appendix A**). Grading contractors will be responsible for segregating and stockpiling topsoil and grading spoils, the excess material generated from construction activities, by soil layer. Excess material will be placed in a manner that preserves soil health and integrity. Typically, this will entail spreading subsoils first and then placing topsoil material over subsoils. Excavation and grading requiring trenching (temporary disturbance of the ground to bury facility infrastructure) will segregate soil material by layer and re-fill trenches in the reverse order the soil layer was encountered so that topsoil layer is placed at the surface and depth of topsoil is maintained as much as possible. Appropriate soil handling as described in the Agricultural Impact Mitigation Plan (AIMP) (**Appendix F**) will be implemented to preserve soil health so that the Project may be returned to agricultural production after the life of the Project.

4.3 Mitigation of Soil Compaction Prior to Seeding

To minimize soil compaction, grading and facility contractors will use areas proposed as access roads as much as possible for travel. Following construction activities and prior to the installation of regionally appropriate seed mixes, areas of heavy use such as the laydown yard may be tilled or ripped to alleviate soil compaction and then disked to provide a uniform surface. Depending on a combination of soil conditions, the time elapsed between disking and seeding, and methods used for seeding, rolling the seedbed with a cultipacker may be necessary. A qualified vegetation management professional will be consulted for recommended techniques for each vegetation management unit prior to seeding.

Wet areas such as in hydric soil units will be avoided to the extent practicable to minimize compaction and de-compaction activities. The AIMP (**Appendix F**) provides greater detail regarding best management practices that may be implemented to alleviate compacted soils should they occur.

4.4 Seedbed Preparation

Potential steps for seedbed preparation are determined by the timing of the end of construction and the installation of the regionally appropriate seed mix. Prior to seeding, a survey of pesticide use by the previous farm operators should be completed to determine if potential pesticide carryover will be an issue that prevents or impacts regionally appropriate seed germination rates. In locations where carryover may be a potential, the extended use of temporary cover crops or other carryover resistant vegetation may be required until the residual effect potential has decreased. A qualified vegetation management professional should be consulted to determine the potential for pesticide carryover. **Table 7** provides potential seedbed preparation activities based on the timing and conditions of the vegetation management units post-construction.

Table 7. Seedbed Preparation Activities Based on Seedbed Conditions Prior to Seeding.

Pre-Seeding Seedbed Conditions	Potential Seedbed Activities
Not compacted, bare ground (Typical tilled row-crop field)	• Cultipacking to firm seed bed, depending on seed installation technique and equipment.

Pre-Seeding Seedbed Conditions	Potential Seedbed Activities
Harvested row-crop field	• Soybeans – None. • Corn – Mowing stalks to mulch corn stover or raking and baling to remove corn stover.
De-compacted, no existing vegetation (Areas where grading occurred)	• Disk to provide uniform surface when post-grading surface would impact seed installation or growth. • Cultipacking to firm seed bed, depending on seed installation technique and equipment.
Not compacted, temporary seed mix present, no large areas of annual or perennial weeds	• Spot spray areas of annual or perennial weeds to reduce competition and prevent weed establishment. • Depending on life stage and density of temporary seed mix, consider spraying, mowing, or rolling prior to or immediately after seeding to terminate crop, reduce competition and provide mulch layer for regionally appropriate seeding.
Not compacted, sparse to no temporary seed mix present, extensive areas of annual or perennial weeds	• Broadcast spray with a non-selective, non-residual herbicide such as glyphosate to reduce weed competition.
Existing vegetation is temporary cover crop that includes species such as winter wheat.	• Broadcast spray with a non-selective, non-residual herbicide such as glyphosate to terminate crop either prior to or immediately after seeding.
Existing vegetation is pasture/hayland, but **NOT** native sod	• Broadcast spray with a non-selective, non-residual herbicide such as glyphosate to reduce vegetation competition.
Wet areas with existing invasive vegetation or bare ground.	• Broadcast spray within a non-selective, non-residual herbicide such as glyphosate. Consult a qualified vegetation management professional to determine if a wetland-approved formulation is required based on site conditions.
Existing vegetation is NATIVE sod	• Do not impact the sod and consult a qualified vegetation management professional.

4.5 Invasive Species Prevention

Invasive plant species, including MDA-listed noxious weeds and other weedy species such as reed canary grass, can negatively impact desired vegetation establishment and management for extended periods of time and prevent accomplishing vegetation management goals and objectives. MDA-listed noxious weeds (**Table 8**) are plant species designated under state law that require some form of control or eradication by landowners, if present and requested by state or local officials. Failure to comply with a formal request to control or eradicate can result in the landowner being responsible for the financial cost of work performed by others at the request of the inspecting governmental unit.

Table 8. MDA-listed Noxious Weeds

MDA-listed Noxious Weed Species			
Eradicate – Not currently known to be present or widely distributed in the state. If found, all above and belowground parts must be destroyed. Transportation, propagation, or sale is prohibited by law.			
Black swallow-wort	Dalmatian toadflax	Japanese honeysuckle	Palmer amaranth
Brown knapweed	Diffuse knapweed	Japanese hops	Poison hemlock
Common teasel	Giant hogweed	Meadow knapweed	Tree of heaven
Cutleaf teasel	Grecian foxglove	Oriental bittersweet	Yellow starthistle
Control – Established throughout or in regions of the state. If found, control efforts shall focus on preventing the spread, maturation, and dispersal of propagating parts such as seeds, rhizomes, and root parts. Herbicide applications that reduce the local abundance or mowing that prevents seed formation would be control techniques. Transportation, propagation, or sale is prohibited by law.			
Bohemian knotweed	Giant knotweed	Non-native phragmites	Wild parsnip
Canada thistle	Japanese knotweed	Plumeless thistle	
Common barberry	Leafy spurge	Purple loosestrife	
Common tansy	Narrowleaf bittercress	Spotted knapweed	
Restricted – Widely distributed in the state and is detrimental to human and animal health or the environment, but feasible control is limited to prohibiting importation, sale and transportation. **(Presence of restricted-listed species on-site will not require management action by law; however, due to the widespread distribution and negative impact to natural communities, control or management actions for these species is highly recommended to achieve the desired vegetation conditions for the Project.)*			

MDA-listed Noxious Weed Species			
Amur honeysuckle	Crown vetch	Japanese barberry cultivars	Siberian peashrub
Bell's honeysuckle	European alder	Morrow's honeysuckle	Tatarian honeysuckle
Black locust	Garlic mustard	Multiflora rose	Wild carrot/Queen Anne's lace
Common or European buckthorn	Glossy buckthorn	Porcelain berry	

Invasive plant species are primarily non-native, but sometimes native plant species that can be aggressive and outcompete other plant species. **Table 9** provides a list of plant terrestrial plant species that MNDNR considers to be invasive to natural areas (https://www.dnr.state.mn.us/invasives/terrestrialplants/index.html#text-1-4).

Table 9. Non-native Terrestrial Plants Considered to be Potentially Invasive in Natural Areas

Flowering plants			
Birdsfoot trefoil	Cow vetch and hairy vetch	Hoary alyssum	Poison hemlock
Bull thistle	Creeping Charlie	Leafy spurge*	Queen Anne's lace*
Butter and eggs	Crown vetch or axseed*	Musk or nodding thistle	Spotted knapweed*
Canada thistle*	Erect hedgeparsley	Orange hawkweed	White and yellow sweet clover
Common tansy*	Garlic mustard*	Oxeye daisy	Wild parsnip*
Grasses			
Amur silver grass	Reed canary grass	Smooth brome grass	
Trees and shrubs			
Amur cork tree	Buckthorn*	Non-native knotweeds	Siberian pea shrub
Amur maple*	Japanese barberry*	Norway maple*	Winged burning bush*
Autumn olive	Multiflora rose*	Russian olive	
Black locust	Non-native bush honeysuckles*	Siberian elm	

*Denotes species is also an MDA-listed noxious weed, but not required to be eradicated, if found.

The best strategy is to make prevention and control from the start of construction activities a priority. Strategies to reduce invasive (weedy) species during construction include:

- Require construction equipment comes to the construction site free of soil and existing vegetation and leaves the site free of soil and existing vegetation.

  - Have contractors self-inspect all equipment arriving and departing from the site and prepared to provide proof of inspection upon request.
  - Designate wash stations for cleaning equipment and monitor cleaning areas for invasive species.

- Survey construction areas and adjacent lands prior to construction to determine the presence of MDA-listed noxious weeds, other invasive plants species, and native vegetation. Identify in project maps and with signage areas where noxious weeds or native vegetation is located to prevent equipment from picking up and spreading seed and plant parts or disturbing native vegetation to make it more susceptible to invasive species establishment.
- Monitor the site on a seasonal basis to identify, map and treat areas where invasive species are present.
  - In areas of known invasive species, make herbicide treatment a priority before regionally appropriate seed is installed.

When vegetating areas with a history of row-cropping, both annual and perennial noxious weeds and invasive plant species will be a primary threat to successfully establishing vegetation due to existing seedbanks and the potential for seed sources in adjacent row-crop areas. Mowing and herbicide treatments that are completed prior to seed development are effective means to control annual weed species and reduce the spread of perennial weed species. Well-established regionally appropriate grass-dominated vegetation (years 6+) may be less susceptible to invasive species establishment; however, it is anticipated that invasive species management will be an on-going priority for vegetation management throughout the lifetime of the project. Within the Project Area, the period between construction and vegetation maintenance is when the vegetation management units will be most vulnerable to invasive species establishment.

4.6 Soil Amendments

Soils in the Project Area have been historically cropped with nitrogen fixing legumes (soybeans) and augmented with nitrogen fertilizer for corn. Typically, the fertility is constrained by excess fertilizer rather than lack thereof. Likewise, seed mix design selects species and strains that do not require fertilizer, water, or pesticides to establish and maintain. There are no soils amendments required for the Project.

4.7 Seeding Phases and Cover Crops

Seeding of the Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils, Array Low Grow Grass and Wildflower Seed Mix for Moist- Mesic Soils, and Pollinator Mix is anticipated to be completed in phases, as follows.

4.7.1 Pre-construction

The preference is to install and establish this seed mix prior to construction. The advantages of seeding prior to construction include:

- 100 percent coverage by seeding equipment for 100 percent vegetation coverage whereas seeding post-construction prohibits drill-seeding under panels leaving a significant portion of the site inadequately seeded.
- Significantly less time consuming, therefore less expensive.
- Eliminates the potential of damage to solar infrastructure by seeding equipment.
- Additional time for establishment of the root system which facilitates better drainage that lessens mud and rutting; and
- Established turf holds down dust that is hard on construction equipment.

In summary, seeding prior to construction can facilitate more extensive vegetation cover, requires less technical operation of seeding equipment, is less expensive, minimizes damage to solar infrastructure, and improves construction conditions by making it less muddy and dusty.

There are three potential pre-construction seed installation windows, dependent on the status of the fields prior to construction:

1. If the Project Area is not cropped, then the preferred seeding window is early to mid-spring, mid-April through May to allow the seed mix to establish for a full growing season prior to start of construction.
2. If the Project Area is cropped, then seeding will occur in fall immediately following crop harvest and seedbed preparation. Soybean is recommended as the final crop to minimize seedbed preparation requirements and to allow for an early harvest to accommodate seed installation. If seeding is done immediately after crop harvest, depending on site and weather conditions, and seed installation timing, seed may germinate and grow prior to the first killing freeze, then overwinter.
3. If seed is not installed immediately after soybean harvest, then dormant seeding will be done. Seedbed preparation should occur when there is no snow cover and soils are not frozen. Seed should be installed after November 1 so it can overwinter and germinate in the spring. Dormant seeding rates should be increased by at least 20 percent.

A temporary cover crop should be installed with native seed following **Tables B.1-A – Table B.1-D (Appendix B)** to provide cover and assist with grow-in of permanent seed, as follows:

- If permanent seed is installed during the spring, the cover crop should consist of oats, at the recommended rates provided in **Table B.1-D Appendix B**.
- If permanent seed is installed during fall through winter, the cover crop should consist of winter wheat and or annual ryegrass as described in **Table B.1-B Appendix B**. Dormant seeding rates for the permanent seed should be increased by 20 percent.

The site should then be assessed in spring and any bare or thin spots remediated through additional seeding of the Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils, Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils, or Pollinator Mix and a temporary cover crop as outlined in **Appendix B, Tables B.1-A – Table B.1-D**.

4.7.2 Construction through Post-Construction

Construction activity (e.g., pile driving, access road construction, and routine traffic) in areas where the seed mix is established is expected to result in minor to moderate disturbance. Disturbed areas should be prepped and re-seeded using the Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils or Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils and a temporary cover crop for compliance with the SWPPP. If repair seeding occurs in the spring through early summer, the cover crop should consist of oats. The cover crop should be installed at a lower rate when combined with permanent seed.

Temporary seeding may also be used to temporarily stabilize soils disturbed by Project construction prior to permanent seed installation. Species selection should be based on timing and seeding rates following **Tables B.1-A – Table B.1-D (Appendix B)**. The cover crop should be installed at a higher rate when seeded alone.

For areas that are more impacted (e.g., routine traffic lanes, staging and laydown yards, etc.), soil compaction may limit vegetation establishment. If accessible, these areas should be deep tilled with an off-set disc, chisel plow or soil-ripper to fracture compacted soils. Following deep tillage, soils should be harrowed to create a smooth, firm, and friable seedbed, and then packed. Soil fracturing and harrowing is not possible in inaccessible areas (e.g., under PV panels). Seeding rates should be increased by at least 20% when re-seeding areas that are not fully prepped because they are inaccessible.

5 Seeding Methods

Seed installation methods are dependent upon existing conditions and installation timing. The three common seeding methods are: 1) drill seeding, 2) broadcast seeding, and 3) culti-packer seeding (e.g., Brillion seeder). **Appendix D** highlights comparisons between the three types of seeding.

5.1 Drill Seeding

Drilling is the preferred method for seed installation for preconstruction seeding, especially where crop residues are present. Drill seeding typically requires less soil preparation and less seed. However, drill seeding is difficult or impracticable in tight spaces (e.g., near panels) and is not viable for placing seed under PV panels. A native seed drill (e.g., Truax or Great Plains) is recommended to install native grasses and forbs. The tractor-drill operator needs to check and confirm seed placement is not deeper than ½ inch and preferably less than ¼ inch deep into the soils. It is critical that the tractor-drill operator understands how to adjust drill depth for proper seed burial depth.

5.2 Broadcast Seeding

Broadcast seeding requires soil preparation to create a friable bare soil surface. If soils are too fluffy, grass seed may sink below the 1-inch threshold for adequate germination and establishment. If the soils are deemed too fluffy for successful installation, then the soils should be packed before seeding. In almost every case, broadcasted seed should be packed following seeding to enhance seed-soil contact.

Broadcast seeding, although not preferable, provides the only method to install post-construction temporary and permanent seed mixes under PV panels. If this becomes the default seeding method, it is recommended to increase seeding rates by 20 percent. For broadcast seeding post construction, the following sequence is recommended:

1. Site preparation, including soil ripping or deep discing,
2. Firming with a drag harrow or packer,
3. Broadcast seed installation, and then
4. Finishing with an additional packing or light drag-harrowing.

Mechanical broadcasters are acceptable for sowing native seed mixes if the device manufacturer specifies use for evenly concurrently spreading seeds that are very small as well as bearded native grass seeds (those with attached appendages such as awns, pappus, hulls, etc.). Broadcasting of native seed may be done in the winter in areas of mostly bare soils without packing as seeds are likely to be incorporated into soils via natural freeze-thaw cycles.

Inert fillers, such as fine wood shavings, rice hulls, or cracked wheat may be used to assist with mixing and calibration in spreader hoppers.

Cultipacker seeding is the preferred seeding method for soils with low crop residue and finely textured soils. Cultipacker seeders are a good choice in pre-construction scenarios, for array and perimeter seed mixes blends in soybean stubble, or bare soils with little crop residue and finely tilled soils.

5.3 Seeding Depth

Caution is recommended to minimize burying seeds too deep, either during broadcasting and subsequent packing / raking or during drilling. Loose soils, such as in areas that are shallow disced prior to seeding, are prone to deep seed burial. The recommended planting depth is between 1/16 - 1/4 inches deep, especially for small seeds that comprise much of the permanent mixes. Large seed, such as cover crop seed can be seeded slightly deeper, no more than 1/2 inch deep. It is recommended to minimize vehicle and equipment traffic on recently seeded areas to minimize additional compaction and seed burial.

5.4 Mulching

Mulch may need to be applied following permanent seeding to assist with seed germination. Local sources of clean, seed-free hay of straw mulch is acceptable. Certified weed-free hay or straw is preferred. Hydromulch is a suitable substitute for hay or straw mulch. Hydromulching has the potential to incorporate seed with the mulch; therefore, seed and mulch are applied in the same procedure. Hydromulching is expensive, but sometimes necessary for seeding and stabilizing soils in areas difficult to establish with traditional seeding tactics. This often includes slopes around storm water run-off ponds and other areas prone to extensive washing following rainstorms. Mulching and other forms of erosion control should be done following the SWPPP, including provisions for materials, anchoring, and product selection.

A two-step process is recommended for hydroseeding native seed:

1. Broadcast seed at the recommended rate (increase seeding rate by 20% for broadcast seeding), then
2. Apply hydromulch material following manufacturer instructions.

6 SEED MIXES

6.1 Array and Vegetated Buffer Planting

One of the objectives for seeding within the array and buffer areas is to install a regionally appropriate grass-dominated seed mix that is influenced by the guidelines outlined in the MNDNR *Prairie Establishment and Maintenance Technical Guidance for Solar Projects* (MNDNR, 2020). To accomplish this, Iron Pine Solar is proposing to establish low-growing, regionally appropriate grass-dominated seed mixes with the following characteristics, which were informed by the 2020 MNDNR guide:

- A minimum seeding rate of 40 seeds/sq. ft.*2*
- At least 30% of the total seeding rate should be composed of perennial forbs.
- 5 or more native grass/sedge species with at least 2 species of bunchgrass.
- 10-15 or more native forbs with at least 2 species in each bloom period: Early (April-May), Mid (June-August), and Late (August-October).

Temporary and permanent seed mixes are custom designed to establish vegetation suitable to existing soil characteristics, shade created by solar facility equipment, and in strict adherence to height restrictions to prevent vegetation from competing with PV panels for sunlight. The seeding plan for this Project includes installation of permanent seed paired with quickly establishing temporary cover crop species.

Proposed seed mix tables including species name, seeding rate, and seeds/square foot are provided in **Appendix B**. As part of agency consultation in developing this VMP, Iron Pine Solar met with the Minnesota Department of Commerce (DOC) Vegetation Management Plan Working Group (VMPWG) on May 16, 2023. The VMPWG is comprised of representatives of the Minnesota Department of Commerce Energy Environmental Review and Analysis Staff, the MNDNR, the MDA, and the MN BWSR. The seed mixes provided in this VMP were developed in coordination with the DOC VMPWG and based on MN BWSR's Low Growing Solar Array Mix – Southwest seed mix and Low Growing Solar Array Moist Soils-South and various other regionally available regionally-appropriate seed mixes. **Figure 10** generally delineates where the seed mixes should be used throughout the proposed re-vegetation areas based on the current facility design.

As part of the Adaptive Management program (see Section 8.3), modifications to seed mixes, especially during the establishment phase, may be required based on greater understanding of local or micro-scale site conditions, climatic trends, individual species performance, and market availability. Decisions about potential species substitutions, additions, or subtractions will be based on a combination of the following:

- Maintaining a minimum seeding rate that has shown to be effective in establishing vegetative cover on recently disturbed surfaces.
- Maintaining species functional group composition when substitutions are required.
- Referencing recognized sources of information for acceptable substitutions and seed mix design such as MNDNR and MN BWSR.
- Integrating lessons learned about vegetation management from others within solar energy industry.

Two factors that are important to a successful seeding is the timing of the seeding and the equipment used. Based on the Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils, Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils, and Pollinator Mix proposed for the Project, MN BWSR recommends the following dates:

- February 15 to April 7, when broadcast frost seeding
- April 1 to June 30, after soil temperature is above 60^{O} F
- After November 1, in particular when soil temperatures are below 60^{O} F

Temporary seed mixes are likely to be used in areas not stabilized with permanent perennial vegetation during the pre-construction or construction phases until a regionally appropriate seeding window is available.

Seed availability through commercial vendors can vary year to year based on market demand, previous year's growing conditions, and individual species seed production. For the project, seed for designated mixes will be required over several years and include the pre-construction, construction, and vegetation establishment phases. Species substitutions based on limited availability will likely be necessary. When selecting substitutions for designated mixes, it is important to consider the plant functional group that a species belongs to and select species from same group. For example, if a warm season grass species is unavailable, a different warm season grass species with a similar plant height should be selected and not a cool season grass.

MN BWSR and Minnesota Department of Transportation (MNDOT) maintain and annually update an approved seed substitution list for many regionally appropriate species based on querying approved seed vendors. If one or more species are not available or are available at limited quantities, these lists should be referenced to select appropriate substitutions. Using the MN BWSR and MNDOT substitution lists helps to ensure that plant species substitutions are made within the same functional groups. Nurseries specializing in native plants can also provide recommendations for substitutions. Proposed substitutions will need to be approved by Iron Pine Solar staff prior to installation.

6.2 Stormwater Detention Area Planting

In areas designated a permanent stormwater detention area within the Project Area, MN BWSR's Stormwater South and West will be used (**Appendix B, Table B.5**). Vegetation management around stormwater detention areas will be similar to other vegetation management techniques; however, due to the potential for ponded water or wet conditions, equipment access may be limited with more work being conducted by hand. Qualified vegetation management professionals should have the equipment and expertise to address the needs of these areas to establish and maintain the regionally appropriate plant community.

6.3 Temporary Seed Mixes / Cover Crops

Temporary seeding of cover crops may also be planted to stabilize soils if agricultural fields are left idle or overwintered prior to permanent seeding or to temporarily stabilized soils that are disturbed during Project construction (e.g., graded soils, stockpiled soils, etc.), per the Project's SWPPP (**Appendix E**).

Temporary seed mixes / cover crops are designed to meet two primary objectives:

- Compliance with the Project's SWPPP; and
- Assist with establishment of permanent vegetation.

Cover crops are composed of annual grasses that establish quickly, provide erosion control, build soil organic matter, reduce soil compaction, and assist with weed suppression. Three annual grasses – winter wheat (*Triticum aestivum*), annual ryegrass (*Lolium multiflorum*) and seed oats (*Avena sativa*) will be utilized, depending on installation timing.

Seeding rates for temporary species are selected based installation timing, seeding methods, and whether cover crops are installed with or without permanent seed. Seed mix specifications for temporary cover crops are provided in **Appendix B, Tables B.1-A – B.1-D**. Temporary cover crop seeding rates are higher when seeded without permanent seed and when installed during the dormant season. Final cover crop seed selection should occur when seeding dates are known. Annual cover crops are terminated with regular ongoing management mowing or with killing frosts.

The success of seedings that occur between October 15 and April 1 (fall to dormant season seeding) will be dependent on seasonal weather conditions that influence soil temperature and soil moisture. Fall and dormant season temporary seed mix seedings may need to be monitored the following spring to determine germination rate and winter kill. Areas may be re-seeded, as necessary. Seeding rates should be increased by 50 percent when broadcast seeding is used and/or culti-packing or dragging is not used to incorporate the seed into the soil.

Table 20. Temporary seed mixes for areas where perennial vegetation is not immediately available.

Seed Mix	General Recommended Seeding Dates*
Spring-Fall Season	April 1 – June 1 August 1 – September 15
Summer Season	May 1 – August 15
Winter Season	September 1 – November 15
*Determine appropriate mix based on seasonal trends and conditions.	

To reduce competition from temporary cover crops to perennial vegetation germination, cover crops should be terminated with a non-selective, non-residual herbicide such as glyphosate prior to seed installation or immediately after installation.

6.4 Pesticide Drift

The Project Area is located within a rural landscape but borders few additional agricultural areas. Though limited to a small stretch in the northeast corner and the interior boundary of the central block, there is the potential for landowner use of pesticides outside of vegetation management units. Impacts due to pesticide drift to the vegetation within the arrays are reduced using the following practices:

- Establish and maintain a buffer composed of regionally appropriate low growing grass-dominated buffers along the outside perimeter of the fence lines.

- Adjacent landowners will be annually notified of the importance of avoiding pesticide drift. Impacts due to pesticide drift will be recorded during seasonal inspections and annual monitoring. Landowners will be notified that repeated impacts to Project vegetation due to pesticide drift will result in the landowner paying for re-seeding and establishment costs.

6.5 Seed Mix Vendors

Seed will be purchased from local vendors that supply quality local sourced seed, or at a minimum, seed that has proven successful under the Project site environmental parameters. All seed, including temporary cover crop and permanent seed mixes, should be supplied with seed tags that indicate seed weight, pure live seed, region of origin, and noxious weed content. A list of potential seed vendors is provided in **Appendix C**.

7 Vegetation Maintenance

Properly timed mowing and spot herbicide treatments can reduce overall maintenance requirements during the Project life cycle. Maintenance can be divided into two phases: the establishment maintenance phase and the long-term maintenance phase. Establishment maintenance, consisting of mowing and herbicide treatments for noxious and invasive weeds, is critical to successful vegetation establishment during the first three years. Long-term maintenance, consisting of mowing and spot herbicide treatment, allows desirable vegetation to persist over the life of the Project.

Monitoring establishing vegetation during this period should facilitate proper timing and treatment activities to ensure early problems do not become larger issues.

Despite the clean appearance of recently harvested agricultural fields, incompatible weeds often persist and thrive. Noxious and weed species management should be conducted as needed to:

- Minimize the spread of noxious weeds from existing populations, if present,
- Prepare seeding areas for permanent vegetation to reduce competition and improve establishment and success of the permanent seed mixes (as needed), and
- Reduce vegetation impacts on PV panels and other solar facility infrastructure.

Noxious and weed species management may consist of cutting / mowing and herbicide treatments.

7.1 Cutting / Mowing

Vegetation cutting should be appropriately timed to assist with control of noxious and weedy species (e.g., mow biennial species during the flower-bud stage, and prior to seed production) and to remove vegetation to assist with site seedbed preparation. Methods should be selected based on the aerial extent of vegetation and site accessibility.

Cutting, by mowing or hand-trimming, is the primary management tool used to aid in the establishment of desirable vegetation. Cutting can reduce height, reduce flowering of undesirable vegetation, and maintain sunlight at the ground surface to encourage germination and growth of desirable species. Mowing using a deck mower is applicable in areas that are accessible with a small tractor and mower. Flail mowers are preferred but rotary mowers are acceptable if significant clumping of grass clippings is minimized. A 3-point side-mounted trimmer mower attached to a small tractor may also be used to cut vegetation around steel piles and under panels.

7.2 Frequency and Timing

The frequency and timing of cutting and mowing is dependent on the growth phase of the vegetation, with different practices required for the establishment, transition, and long-term maintenance phases. Specifications for each phase are provided below.

7.3 Pre-Construction and Construction Phase Practices (Prior to Year 0)

Construction may take one or more years to complete. However, one of the goals and objectives for the overall Project is to vegetate as many acres as possible to a perennial low-growing regionally appropriate cover type by establishing the Array Low Grow Grass and Wildflower Seed Mix for Dry-Mesic Soils, Array Low Grow Grass and Wildflower Seed Mix for Moist-Mesic Soils, and Pollinator Mix during the pre-construction phase. To accomplish this, re-vegetation will focus on areas that do not require grading prior to installing facility infrastructure. Vegetation management within areas of management units that have been seeded with a perennial seed mix during the pre-construction phase will be managed in a similar fashion to short-term establishment practices described in Section 7.4. Mowing, spot spraying, and re-seeding disturbed areas are the likely main tools that will be used. Construction activities such as running over vegetation with equipment, localized excavation to install posts for arrays, or burying collection lines may cause limited disturbance that may require additional re-seeding. The need to re-seed will be managed on a case-by-case basis.

Temporary seed mixes will be used to stabilize soil and remain compliant with SWPPP conditions in areas that require grading prior to installing facility infrastructure. The need to re-seed areas with temporary seed mixes during the construction phase is anticipated when the temporary seed mix is at the end of its life cycle and/or when ground disturbing activities occur, but the next optimal seeding window for perennial vegetation does not occur for several months.

It may be the case where within a management unit block is a mosaic of perennial vegetation, temporary seed mixes, and areas under active construction. Each vegetation type will be managed in the appropriate manner until the entire management unit can be transitioned into the short-term establishment period (Year 0).

7.4 Short-Term Establishment Practices (Years 0 – 5)

The period between regionally appropriate seed and plant installation (Year 0) through the fourth or fifth growing season (Year 5) is typically defined as the establishment period. The key priorities for establishment during this time period include:

- Reducing competition from annual weeds that shade out or smother regionally appropriate plant seedlings.
- Preventing the establishment of perennial invasive or noxious species.
- Re-seeding in areas where vegetation is not establishing or is impacted by herbicide applications necessary to control invasive species.

Understanding the expectations for vegetation during the establishment period is an important factor in success and determine vegetation management actions. Many plant species native to this area are deep-rooted to access moisture during hot, dry summer months and to store energy during the winter months.

Typically, the first growing season or two, seedlings invest a lot of energy in root growth while maintaining sparse above ground vegetation. In Years 2 and 3, there is a marked increase in above ground vegetation density and abundance increases to the point that it can shade out annual plant species and more easily compete with invasive species.

Mowing

Mowing during the establishment period is typically the most common and cost-effective strategy for controlling weed species. **Table 11** provides mowing guidelines for both timing and maintaining vegetation heights. It is important to adjust the timing of mowing based on an individual year. Spring and summer weather conditions determine when mowing should occur. Mowing too frequently or too low of a height can negatively impact regionally appropriate vegetation and make establishment more difficult. However, mowing after annual and perennial weed species have set seed is counterproductive for long-term vegetation management. The finished mowing height for each mowing event during the establishment period should be determined prior to mowing and should consider the life cycle and percent cover of weedy species present. In other words, finished mowing height should be driven by current vegetation performance. Feedback from seasonal inspections and annual monitoring will help to determine finished mowing heights during the establishment period.

A qualified vegetation contractor will have the experience and the equipment to correctly mow regionally appropriate plantings. Using a mower that does not windrow thatch that can smother regionally appropriate seedlings or can be set at the appropriate height such as a flail or rear-discharge mower is key. In the event of a build-up of thatch, raking and haying may be considered.

During the short-term establishment period, areas under the arrays will be mowed once annually at a minimum. Mowing frequency after the second growing season for areas outside of the arrays will be based on vegetation conditions and quality. Either seed mix areas may be mowed when the vegetation is at the appropriate height and mowed down to the appropriate level. In stormwater detention areas, hand trimming or low ground pressure equipment may be used to prevent rutting and ground disturbance.

Specialized mowing equipment may be used around and under arrays. Additionally, hand work using brush cutters and strip trimmers may be necessary to access difficult areas around arrays and in wet areas where equipment would cause vegetation disturbance.

During the establishment phase, mowing typically occurs throughout the entire site. Within a vegetation management unit, it may be possible that some areas require spot mowing on a more frequent basis because of the presence of fast-growing weed species. Conversely, there may areas that require less mowing due to both sparse and weedy vegetation or that desired vegetation quickly develops and becomes well-established. The vegetation will be inspected during the growing season to inform appropriate mowing and herbicide management. Frequent mowing required to manage weedy plant species in particular areas during and after the third growing will be a potential trigger to determine if supplemental seeding is required due to a lack of regionally appropriate vegetation establishment.

Table 11. Mowing Conditions and Specifications During the Short-Term Establishment Period

Initial Mowing	Mowing Height	Mowing Period	Mowing Triggers
Late spring/early summer when vegetation reaches a height of 12 – 18 inches	Finished height of 4 – 6 inches during first growing season. Continue mowing to finished height of 4 – 6 inches in Years 1 – 4, as necessary based on weed pressure. Finished height of 8 – 12 inches during Year 5, if not sooner based on weed pressure.	May – November, typically two events per growing season	Flowering annual weeds Dense annual vegetation with a height of 12 – 18 inches.

Herbicide Application

Herbicide application following seed installation and during the establishment period is likely to primarily be spot spraying to prevent large areas devoid of vegetation being created. Spot spraying consists of using low volume equipment applied manually through either backpack sprayers or equipment mounted hand sprayers. Localized broadcast spraying can occur in instances when weeds and invasive species are present in patches large enough or dense enough that off-target damage to regionally appropriate vegetation can be justified given the benefit to long-term management. Areas treated with herbicide may be mapped and accessed to determine if supplemental seeding is required.

Two important considerations to herbicide applications include herbicide selection and herbicide timing. **Table 13** provides a list of preferred herbicides to use during vegetation establishment and maintenance periods. Herbicide formulations and labeled uses are constantly being updated so **Table 13** should not be considered a comprehensive list. Herbicide applicators should read and understand the herbicide label and apply at labeled rates to labeled species. Additionally, the use of herbicides that have a residual effect should be avoided to prevent unintended impacts to perennial seed germination and persistence. None of the herbicides listed in **Table 13** are classified as neonicotinoids, a class of insecticide that is believed to have a negative impact on pollinating insects.

Since the majority of the vegetation management units will be seeded to a regionally appropriate grass-dominated seed mix, the use of broadleaf-specific herbicides will be effective against many noxious and invasive plant species while minimizing the opportunity to off-target damage to regionally appropriate grass vegetation. Herbicide applications will be timed when the plants are actively growing and with enough time prior to a precipitation event so that the herbicide can be absorbed or become rainfast. Seasonally, herbicide applications can be timed to occur early in the growing season before many regionally appropriate grass species have started to grow or after the growing season has ended for many warm season species, but while many cool season species such as reed canary grass are still actively growing. This seasonal timing helps to minimize off-target damage.

Supplemental Seeding

When perennial vegetation establishment has not reach at least 70 percent coverage, supplemental seeding will be required. Vegetation monitoring detailed in Section 8 will determine if and/or where supplemental seeding is required. The necessity for supplemental seeding does not indicate that the initial seeding was a failure. Supplemental seeding will occur during the same seeding windows as described in **Table 6**.

Potential areas that are candidates for supplemental seeding include:

- Areas where localized broadcast herbicide application occurred.
- Areas with observed hydrology requiring either wetter or drier species.

During monthly inspections and annual monitoring, areas where supplemental seeding will be required will be mapped and considered during the annual review of the adaptive management program. Repeated supplemental seedings in the same general vicinity may indicate that a change in management techniques, soil amendments, or seed mix may be required.

7.5 Long-Term Maintenance Practices (Years 6+)

In Year 6, a well-managed regionally appropriate seeding typically transitions from establishment to maintenance. The transition from the establishment phase to maintenance phase will be marked by having 70 percent or greater perennial vegetation established throughout the site. The key feature of the transition is a decrease in the amount of time and resources dedicated to working towards achieving the desired vegetation management outcomes. By Year 6, vegetation should be positively trending towards meeting the objective set in the VMP. For the Project Area, this means:

- Desired vegetation succeeding in the appropriate locations throughout the Project Area.
- Meeting or exceeding vegetation standards outlined in the long-term vegetation objectives.
- Using inspections and monitoring to trigger proactive management actions that keeps the facilities vegetation meeting the management objectives.

Year 6 through the end of the permit period is referred to as the maintenance period because regionally appropriate plant species have evolved to persist in the environment through a wide range of conditions. However, maintenance does not infer maintenance-free. Regionally appropriate vegetation in the Project Area represents a grass-dominated or prairie conditions. Grass-dominated plant communities and prairies are disturbance-dependent and help to maintain plant community health. Disturbances were historically provided by both wild and human-set fires, drought, and grazing herds of large herbivores. Mowing within the vegetation management units will likely be the main form of disturbance.

Mowing

Mowing during the long-term maintenance period varies from the establishment period in frequency and desired outcome. The desired outcome for establishment period mowing is to reduce competition. During the maintenance period it is to simulate disturbance. **Table 12** provides guidelines for mowing during the maintenance period. The mowing frequency is reduced during the maintenance period when compared to the establishment period; however, the number of mowing events in the maintenance period may increase if vegetation grows to a height that impacts solar energy capture by the arrays. Mowing that generates thatch that may be detrimental to vegetation growth will be collected as part of the mowing activity or addressed by using equipment that minimizes thatch accumulation.

Table 12. Guidelines for Mowing During the Maintenance Period

Initial Mowing	Mowing Height	Mowing Period	Mowing Triggers
Prior to May 31 and after August 1 to minimize impacts to grassland nesting birds	Finished height of 4 – 6 inches	Annually to once every 2 – 3 years	• Vegetation exceeds 18 inches, which has the potential to shade panels. • Presence of woody vegetation seedlings • Accumulation of thatch and dead stems that represent a fire hazard. • Vegetation that does not look healthy or vigorous. • Desired perennial vegetation cover is less than 70% of total vegetation cover. • Weedy or annual species compromise greater than 40% of the total vegetation cover.

Mowing one-third of a vegetation management unit every year on a rotational basis and avoiding mowing in the same area in consecutive years provides refugia for pollinator species using the thatch layers for overwintering, nesting, or egg laying while also providing habitat for grassland birds that prefer a range of cover densities and thatch thickness. Mowing only one-third of a management unit every year also reduces the overall maintenance budget.

The feasibility of setting a rotation mowing program that results in up to two-thirds of the perennially vegetated areas mowed once every three years to create refugia for pollinators and grassland birds will be evaluated several years into the maintenance period (potentially Year 7 or 8) after observations have been obtained on the typical growth height within the given site conditions. The potential to create refuges will depend on the annual growth rate, height of the vegetation, the potential to impact solar energy captured by the arrays, or the creation of unsafe working conditions for the operations personnel.

Currently grazing by livestock and haying are not proposed management activities. In the event that either is considered in the future, Iron Pine Solar will assess the current state of knowledge to determine their suitable and best management practices before implementation.

Woody Vegetation Control

The establishment of woody vegetation within the arrays and along fence line perimeter borders when not used for visual screening is a potential negative impact to facility infrastructure through shading of both the solar panels and the regionally appropriate grass vegetation.

Mowing will likely control most woody vegetation seedlings, if conducted annually during the establishment phase and every two to three years during the maintenance phase. Additional woody vegetation control techniques include:

- Hand cutting with brush saws and chainsaws around arrays and fence lines where mowing does not do an effective job and trees and shrubs are reaching waist height or greater. Many tree species will continue to re-sprout so herbicide may be applied to the cu stump.
- Applying a foliar herbicide to the leaves using a spot spray treatment technique during the growing season. This is typically an effective treatment for dense stands of small saplings that are difficult to mow and hand cut. Care will be taken to avoid overspray and off target damage to existing vegetation.

Herbicide Application

Similar to the establishment period, herbicide applications during the maintenance period are likely to primarily be spot spraying using low volume backpack sprayers and equipment-mounted hand sprayers. Herbicide selection and timing are similar between establishment and maintenance period. Regular inspections throughout each entire vegetation management unit will identify areas for treatment.

Completing multiple inspections throughout the growing season will identify species and areas needing treatment that may not have been an issue earlier in the year.

Supplemental Seeding

Ideally, supplemental seeding will be minimal during the maintenance phase because the vegetation should be well-established; however, annually, it is likely that due to herbicide applications, operation, and maintenance activities, or changing conditions, that a small amount of supplemental seeding may be required. It is important to be prepared to supplemental seed to avoid allowing invasive species to get established in bare ground or sparsely vegetated areas.

Agricultural Areas included in Project Area and Planned for Future Facility Expansion

As previously discussed, areas outside of fenced array areas and the designated vegetated buffers will likely remain in agricultural production. Iron Pine Solar will inform landowners of the importance of preventing pesticide drift onto regionally appropriate vegetation, implementing practices that protect soil health, and managing noxious and invasive plant species.

7.6 Herbicides

Herbicide treatments are recommended for management of perennial noxious species, as mowing alone is not typically sufficient for adequate control. Ongoing management of noxious species may be required for compliance with noxious and invasive plant species regulations. Herbicides are also used to remove undesirable vegetation to prepare seeding areas for permanent seed installation.

7.6.1 Herbicide Types

Three general types of herbicides are applicable to the Project: non-selective herbicides, broadleaf-selective herbicides and grass-selective herbicides. Each is detailed below.

7.6.1.1 Non-Selective Herbicides

Non-selective herbicides injure or kill all types of vegetation, including broadleaves, grasses and grass-like plants, and woody plants. Glyphosate is a non-selective herbicide that is commonly used to remove all vegetation to prepare areas for permanent seeding.

7.6.1.2 Broadleaf-Selective Herbicides

Broadleaf-selective herbicides are intended to injure or kill only broadleaf plants. There are many types of broadleaf herbicides. Two types commonly used in natural settings include 2,4-D and triclopyr. Both 2,4-D and triclopyr are used to remove broadleaf plants from grass-stands and turf lawns. Some broadleaf herbicides are highly selective, for example, the active ingredient clopyralid is very effective for controlling weedy asters (*Asteraceae,* e.g., Canada Thistle (*Cirsium arvensis*) and legumes (*Fabaceae,* e.g., sweet clover (*Melilotus spp.*). Care should be taken to avoid injury to desirable grass species by waiting to apply herbicides after grass seedlings have matured for at least 90 days or have flowered at least once. Also consult the herbicide label for application restrictions following seeding.

7.6.1.3 Grass-Selective Herbicides

Grass-selective herbicides are intended to injure or kill only grasses. The most common grass-selective herbicide is clethodim. It is used to selectively target undesirable grasses growing among desirable broadleaf plants.

7.6.2 Herbicide Application Methods and Timing

There are two primary methods to apply herbicides: low volume/spot applications and broadcast applications. Methods and timing should be based on a site-specific evaluation of target species, vegetation composition, and sensitivity of adjacent areas to herbicide applications.

7.6.2.1 Low Volume/Spot Applications

This method utilizes a hand-held sprayer mounted to small (3.5 to 25 gallon) tanks to selectively deliver herbicide to individual plants or small clumps of plants. Backpack sprayers are suitable for small areas while pistol sprayers mounted to an all-terrain vehicle or utility terrain vehicle (UTV) are suitable for larger areas or large clumps of vegetation. Wicks may also be used for ultra-low volume delivery of herbicide to undesirable plants growing in sensitive ecological areas. These methods are appropriate for managing discrete populations of weedy and invasive species after construction.

7.6.2.2 Broadcast Applications

This method utilizes a boom or boomless sprayer tanks mounted to a UTV or tractor to broadcast herbicide to large areas. This method is appropriate for large-scale site preparation to remove weedy and invasive vegetation from large areas using a non-selective herbicide.

7.6.3 Herbicide Adjuvants

Adjuvants are typically added to herbicide mixes to improve herbicide performance. Adjuvants typically used for natural areas management include hard water treatment additives, surfactants, and penetrants. Herbicide labels should be consulted for recommendations on the types of adjuvants to add to a mix. In general, aquatic-approved adjuvants should be used to minimize potential impacts on wildlife, including pollinators. Aquatic-approved adjuvants should always be used in and near areas of standing water.

7.6.4 Herbicide Standard Industry Practices

Herbicides are a valuable vegetation management tool when used according to manufacturer's instructions and following standard industry practices. The following practices are recommended when using herbicides to manage undesirable vegetation:

1. Vegetation managers should apply principles of integrated vegetation management. Herbicides should be used as one of several available 'tools in the toolbox' to manage vegetation and habitats in an ecologically sensitive manner, in addition to mechanical controls (cutting), engineering controls, cultural controls, and in unique circumstances, biological controls.

2. Herbicide labels and Safety Data Sheets should be read prior to transport, mixing, loading, and application.
3. The appropriate volume of herbicides and adjuvants necessary to complete a vegetation management task should be utilized. This includes targeted application techniques when practicable and use of properly calibrated equipment to minimize environmental effects.
4. The appropriate concentrations of herbicides and adjuvants as recommended by product labels are used to achieve intended outcomes.
5. Use of selective herbicides to limit effects on non-target plants.
6. Persistent noxious weeds typically require several treatments to adequately control re-growth and spread.
7. Herbicide applications should be conducted during favorable weather conditions to maximize herbicide efficiency and minimize off-site drift and run-off. Avoid herbicide application during persistent heat, drought, freezing or wet conditions.
8. Herbicide should be applied to plants when plants are most physiologically prone to injury by active ingredients. Plants are most prone to herbicide injury when they are actively growing. Plant life cycles targetable for herbicide application include the flower bud-stage and rosette stage. Plants that have senesced following flowering or are inactive due to high heat or drought should not be treated.

7.6.5 Herbicide Permitting

Herbicide treatments should be performed by individuals with a current Commercial Pesticide Applicator certification and license issued through the MDA (https://www.mda.state.mn.us/pesticide-fertilizer/pesticide-applicator-licensing), and in accordance with all applicable laws, regulations, and herbicide label instructions.

7.6.6 Proposed Herbicides

The herbicides that may be used in the Project are listed below in **Table 13**. These herbicides are frequently used in natural area settings to assist with management of species that would be expected to occur in the Project Area. These herbicides have a relatively short half-life and moderate to very unlikely potential to reach shallow groundwater.

Table 13. Environmental Information for Proposed Herbicides

Active Ingredient	Herbicide Type	Potential Uses	Environmental Fate[1,2]			
			Water Solubility	Soil Half-life	Mineral Soil Sorption Coefficient KOC / FAO Mobility Classification[3]	Groundwater Ubiquity Score (GUS)[4] / Potential to Reach Shallow Groundwater
Glyphosate	Non- selective systemic foliar	Non-selective treatment of grasses and broadleaf plants	Very soluble	3.6 days	40,000 in silty/loam soils / Immobile	-0.25 in silty/loam soils / Very unlikely
2,4-D	Broadleaf systemic foliar	Selective treatment of weedy and invasive broadleaf plants	Moderately soluble	2.9 days	88 in silty/loam soils / Mobile	1.13 in silty/loam soils / Unlikely
Triclopyr	Broadleaf selective foliar	Selective treatment of woody plants	Moderately soluble	13 days in unknown soil	93.5 in unknown soil / Mobile	2.26 in unknown soil / Moderate potential
Aminopyralid	Broadleaf selective foliar Species selective	Specific noxious and invasive weeds	Very soluble	81.5 days in unknown soil	2.33 in unknown soil / Highly Mobile[5]	6.94 in unknown soil / Likely[5]
Clopyralid	Broadleaf selective foliar Species selective	Specific noxious and invasive weeds Asters and legumes	Very soluble	12.8 days	2.64 in silt loam / Highly Mobile[5]	3.96 in silt loam / Likely[5]
Clethodim	Grass- selective systemic foliar	Selective treatment of weedy and invasive grasses	Very soluble	3 days in unknown soil	137.5 in unknown soil / Moderately mobile	0.89 in unknown soil / Unlikely

[1] Information from Herbicide Properties Tool at the National Pesticide Information Center – Oregon State University. Accessed online on 8/7/2020 at http://npic.orst.edu/HPT/#.
[2] Reported for silty/loam or silt loam soils unless otherwise stated in the Herbicide Properties Tool search results.
[3] Based on FAO Mobility Classification in *Guidance for Reporting on the Environmental Fate and Transport of the Stressor Concern in Problem Formulations*. Accessed online on 8/7/2020 at https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/guidance-reporting-environmental-fate-and-transport#II_C.
[4] Potential to Reach Shallow Groundwater based on discussion in the Herbicide Properties Tool search results.
5 Appropriate for low volume foliar herbicide applications targeting individual plants or clumps of plants.

8 Vegetation Monitoring and Adaptive Management

8.1 During Construction

Qualified vegetation management professionals will monitor construction practices that maintain soil health including reducing impacts due to construction such as compaction, soil erosion, soil separation and storage, and stormwater runoff. Construction will be conducted in compliance with the AIMP developed for the Project (**Appendix F**). Qualified vegetation management professionals will also be able to identify, and report weed establishment and proliferation as part of monitoring events, which will be important to avoid weed problems that negatively impact vegetation conditions outlined in the objectives section.

8.2 Post-Construction

Post-construction will focus on collecting data that indicates when the NPDES permit may be closed out and on informing establishment management activities. Specifically, the monitoring program will focus on collecting data on percent cover represented by regionally appropriate species (both seeded and volunteer), annual species, perennial species, and noxious/invasive species. The highest priority for vegetation management is to achieve and maintain 70 percent or greater perennial vegetation coverage to terminate the NPDES permit (Goal 1). Understanding the development of perennial cover over time and the species that comprise the vegetation cover will inform annual management activities such as reseeding, mowing, or spot herbicide applications.

The monitoring program will include two components: multiple inspections and annual monitoring. During the growing season, multiple inspections will occur throughout the Project Area. Inspections will be completed by a qualified vegetation management professional with the intent to determine the current state of vegetation and confirm/update vegetation management activities for the current growing season.

Inspections will be a combination of meander surveys through management units and as needed, observations to address troublesome areas. Inspection reports will be developed that include areas inspected, representative photos, outcomes of previous management activities, and prescriptions for future management activities. Inspection reports will be kept internally within the Project team; however, inspection reports will be summarized in the annual monitoring report.

Annual monitoring will consist of a timed meander survey through each vegetation management unit. The meander survey will be modified based on procedures in Bohnen and Galatowitch (2016). During the time meander survey, species observed along with an estimate of cover class will be recorded. Representative photos during each meander survey will be taken and spatially linked. Each timed meander survey route will be at least 30 minutes long. The number of routes will vary based on the size of the vegetation management unit, but will follow guidelines in Bohnen and Galatowitch (2016):

- One route for each management unit 5 acres or less.
- Two routes for each management unit between 5 and 59 acres in size.
- One route for every 30 acres in management units between 60 and 300 acres in size.
- Ten or more routes in management units 300 acres in size.

Monitoring will occur late in the growing season annually in the first five years and continue on an annual basis through the remaining period of the permit. Monitoring late in the growing season allows for an understanding of the effects of the previous and current management activities while setting the basis for the following year's work. A monitoring report will be developed by January 31 of the following year. As part of the adaptive management program, monitoring data and monitoring protocols will be evaluated every 3 to 5 years to determine if the monitoring program needs to be updated. Rationale for updating the protocol could include:

- Changes to reporting requirements for permit compliance.
- Need for different information to effectively inform management decisions.
- New developments in technology or data analysis such as unmanned aerial vehicles, artificial intelligence, and data cloud processing.

8.3 Adaptive Management

Adaptive management is the process of collecting data about the response to management actions and incorporating new information to make future decisions. An adaptive management program will consist of the following elements:

- Following annual monitoring in the first six years, if a vegetation management unit is not meeting its objectives, developing a work plan for a vegetation management unit block that includes proposed management actions to achieve the Project objectives. This could be as simple as a one-to-two-page worksheet.
- Recording management actions completed during the growing season, environmental conditions such as temperatures and rainfall, and activities that impacted vegetation.
- Incorporating changed management actions into vegetation management unit work plans in response to new information and/or techniques.

Adaptive management decisions will be informed by a qualified vegetation management professional. The impact of using an adaptive management approach will be observed based on the description of the existing site conditions in the post-construction long-term management phase.

9 References

Bohnen, J, and S Galatowitsch. “Restoration Evaluation Project Vegetation Monitoring Tool University of Minnesota”.https://www.lccmr.leg.mn/pm_info/restoration_evaluations/Restoration_Evaluation_Project_Vegetation_Monitoring_Tool.pdf.

Minnesota Department of Commerce. 2021. Guidance for Developing a Vegetation Establishment and Management Plan for Solar Facilities. https://mn.gov/eera/web/Project-file/11702/.

Minnesota Department of Natural Resources. 2020. Prairie Establishment and Maintenance Technical Guidance for Solar Projects. https://files.dnr.state.mn.us/publications/ewr/prairie_solar_tech_guidance.pdf

Oslund FT, Johnson RR, Hertel DR. 2010. Assessing Wetland Changes in the Prairie Pothole Region of Minnesota from 1980 to 2007. Journal of Fish and Wildlife Management 1(2):131–135; e1944-687X. doi: 10.3996/122009- JFWM-027.

USDA NRCS. 2018. Minnesota Agronomy Technical Note No. 33 Cover Crop Seeding Guide. https://efotg.sc.egov.usda.gov/api/CPSFile/392/340_MN_GD_Agronomy_Technical_Note_2018

USDA NRCS. 2016. Minnesota Agronomy Technical Note No. 31 Herbaceous Vegetation Establishment Guide. https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1294635&ext=pdf

APPENDIX A: CIVIL SITE PLANS

(To be inserted based on final engineering design)

APPENDIX B: SEED MIX TABLES

Table B.1-A – Table B.1-D. Temporary Cover Crop Seed Mixes*

Table B.1-A Temporary Fall (Late August – Early November) Project site Cover Crop Seed Mix without Permanent Seed*

Scientific Name	Common Name	Pounds / Acre	Seeds / Sq Ft
Triticum aestivum	Winter Wheat	128.00	44.32
Lolium multiflorum	Annual ryegrass	10.00	52.11

Table B.1-B Temporary Fall (Late August – Early November) Project site Cover Crop Seed Mix with Permanent Seed*

Scientific Name	Common Name	Pounds / Acre	Seeds / Sq Ft
Triticum aestivum	Winter Wheat	25.00	8.60
Lolium multiflorum	Annual ryegrass	5.00	26.00

Table B.1-C Temporary Spring-Summer (Mid-April – Mid-August) Project site Cover Crop Seed Mix without Permanent Seed*

Scientific Name	Common Name	Pounds / Acre	Seeds / Sq Ft
Avena sativa	Seed Oats	128.00	44.32
Lolium multiflorum	Annual ryegrass	10.00	52.11

Table B.1-D Spring-Summer and Early Fall (Mid-April – Mid-August) Project site Cover Crop Seed Mix with Permanent Seed*

Scientific Name	Common Name	Pounds / Acre	Seeds / Sq Ft
Avena sativa	Seed Oats	25.00	8.60
Lolium multiflorum	Annual ryegrass	5.00	26.00

Final cover crop seed selection should occur when tentative seeding dates are known. All seed mixes calculated at Pure Live Seed (PLS). Seeding rates are designed for drilling seed in spring through summer. Broadcasting seed and seeding during the dormant season require at least a 20% increase in PLS rates. Broadcast seed should be packed or harrowed into the soils.

Table B.2 Array Low Grow Grass and Wildflower Seed Mix Moist - Mesic Soils[1,2]

Scientific Name[3]	Common Name	Native Status[3,4] N – Native NN – Non-native B – Both native & non-native	Astronomical[5] Bloom Season Sp – Spring Su – Summer Fa - Fall	Ounces /Acre[1]	Seeds/Sq/Ft
GRAMINOIDS (Grasses)					
Calamagrostis canadensis	Blue joint grass	N	Sp – Su	0.1	0.65
Carex scoparia	Pointed Broom Sedge	N	Sp - Su	0.75	1.45
Carex stipata	Awl-fruited Sedge	N	Sp - Su	0.35	0.27
Carex vulpinoidea	Fox Sedge	N	Sp - Su	1.0	1.8
Glyceria striata	Fowl Manna Grass	N	Sp - Su	0.75	1.55
Leersia oryzoides	Rice Cut Grass	N	Su	4	3.1
Muhlenbergia mexicana	Leafy Satin Grass	N	Su	0.25	1.0
Muhlenbergia racemosa	Wild Timothy	N	Su	1.25	3.0
Pascopyrum smithii	Western Wheat Grass	N	Su	16.0	5.50
Poa palustris	Fowl Meadow Bluegrass	N	Sp	16.0	47.00
Array Grass Subtotals		**10Spp.**		**40.45**	**65.32**
FORBS (Wildflowers)					
Achillea millefolium	Yarrow	B	Sp-Fa	0.2	0.82
Allium cernuum	Nodding Onion	N	Sp	0.25	0.04
Anemone canadensis	Canada Anemone	N	Sp	0.0625	0.01
Astragalus canadensis	Milkvetch	N	Sp - Su	3.0	1.2
Blephilia hirsuta	Hairy Wood Mint	N	Su-Fa	0.05	0.28
Chamaecrista fasciculata	Partridge Pea	N	Su	2.0	0.12
Euthamia graminifolia	Grass-leaved Goldenrod	N	Su - Fa	0.1	0.8
Gallium boreale	Northern Bedstraw		Sp - Su	0.01	0.02
Gentiana andrewsii	Bottle Gentian	N	Fa	0.025	0.16
Gentiana flavida	Cream Gentian	N	Fa	0.025	0.11
Lobelia siphilitica	Blue Lobelia	N	Su – Fa	0.2	2.3
Lycopus americanus	Water horehound	N	Su – Fa	0.0725	0.22
Lythrum alatum	Winged Loosestrife	N	Sp - Fa	0.035	2.41
Mimulus ringens	Monkey Flower	N	Sp-Fa	0.075	3.96
Pycnanthemum virginianum	Virginia Mountain Mint	N	Sp-Fa	0.2	0.29
Ratibida columnifera	Long Yellow Coneflower	N	Su	0.5	0.5

Scientific Name[3]	Common Name	Native Status[3,4] **N** – Native **NN** – Non-native **B** – Both native & non-native	Astronomical[5] Bloom Season Sp – Spring Su – Summer Fa - Fall	Ounces /Acre[1]	Seeds/Sq/Ft
Rudbeckia hirta	Black–eyed Susan	N	Su	0.75	1.58
Solidago riddellii	Riddell's Goldenrod	N	Su	0.3	0.64
Sisyrinchium montanum	Stout Blue-eyed Grass	N	Sp	0.25	0.27
Symphyotrichum ericoides	Heath Aster	N	Fa	0.025	0.11
Symphyotrichum laeve	Smooth Aster	N	Su - Fa	0.2	0.25
Tradescantia ohiensis	Ohio Spiderwort	N	Sp – Su	0.1	0.018
Zizia aurea	Golden Alexander	N	Sp	1.25	0.32
Array Flower Subtotals		**22 Spp.**		**9.68**	**16.428**
Array Mix Totals		**32 Spp.**		**50.13**	**81.748**

1 Final seed selection should occur when tentative seeding dates are known, and actual species composition and rates should be based on availability at the time of procurement.

2 Species heights are selected for under 24" tall. This modeling takes into account, species in over achieve height by 50% in high nutrient high moisture conditions that are common in Midwest agriculture fields.

3 Nomenclature and nativity based on:

- Hitchcock, A. S. (1971). Manual of the grasses of the United States (Vol. 1 - 2). Courier Corporation..
- Gray, A. (2021). *Manual: The Botany, the Northern United States*. BoD–Books on Demand.
- USDA Plant Database https://plants.usda.gov/home/plantProfile?symbol=POPR
- Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. http://beta.floranorthamerica.org. Accessed 2023.
- Kartesz, J.T., The Biota of North America Program (BONAP). 2015. North American Plant Atlas. (http://bonap.net/napa). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). Accessed 2023.

4 "Both" is a nativeness category employed by USDA for circumpolar species found around the Northern Hemisphere, see Hitchcock (1971), Gray (2021), and USDA Plant Database https://plants.usda.gov/home/plantProfile?symbol=POPR. The "Both" category helps stabilize complexity associated between species, races, and strains, that were "both" Native and Introduced, have sense hybridized, which is desired, acting as a powerful selective force since the advent of sexual reproduction 500 mya.

5 Priced based on average cost between several wholesale regional seed suppliers, on 05/30/2023

6 Astronomical bloom seasons coincide with equinox and solstice events which seem to coincide with biological circadian rhythms.

Table B.3 Array Low Grow Grass and Wildflower Seed Mix Dry-Mesic Soils[1,2]

Scientific Name[3]	Common Name	Native Status[3,4] N – Native NN – Non-native B – Both native & non-native	Astronomical[5] Bloom Season Sp – Spring Su – Summer Fa - Fall	Ounces /Acre[1]	Seeds/Sq/Ft
GRAMINOIDS (Grasses)					
Bouteloua curtipedula	Side Oats	N	Su	56.0	7.71
Bouteloua gracilis	Blue Grama	N	Sp	8.0	7.35
Bromus kalmii	Kalm's Brome	N	Sp - Su	3.75	0.64
Carex bicknellii	Copper Oval Sedge	N	Su	0.25	0.1
Carex brevior	Plains Oval Sedge	N	Su	0.5	0.33
Cyperus schweinitzii	Schweitzer's Sedge	N	Su	0.2	0.11
Elymus trachycaulus	Slender Wheat Grass	N	Sp - Su	4.0	0.63
Koeleria cristata	June Grass	N	Sp	1.0	4.6
Pascopyrum smithii	Western Wheat Grass	N	Sp - Su	4.0	0.63
Schizachyrium scoparium	Little Bluestem	N	Fa	24.0	8.26
Sporobolus compositus	Rough Drop Seed	N	Fa	3.0	1.93
Sporobolus heterolepis	Northern Drop Seed	N	Su - Fa	0.5	0.18
Array Grass Subtotals		**12 Spp.**		**105.2**	**32.47**
FORBS (Wildflowers)					
Achillea millefolium	Yarrow	N	Sp - Fa	0.2	0.82
Allium stellatum	Prairie Onion	N	Sp	0.25	0.06
Amorpha canescens	Lead Plant	N	Su	0.25	0.09
Aquilegia canadensis	Columbine	N	Su	0.15	0.13
Asclepias tuberosa	Butterfly Milkweed	N	Su - Fa	0.02	0.02
Asclepias verticillata	Whorled milkweed	N	Su - Fa	0.02	0.05
Chamaecrista fasciculata[3]	Partridge Pea	N	Su	3.0	0.19
Dalea candida	White prairie clover	N	Su	1.0	0.44
Dalea purpurea	Purple prairie clover	N	Su	3.0	1.03
Drymocallis arguta	Prairie Cinquefoil	N	Su	0.2	1.06
Echinacea angustifolia	Narrow Leaf Coneflower	N	Su	0.5	0.09
Gentiana flavida	Cream Gentian	N	Fa	0.1	0.45
Heuchera richardsonii	Alumroot	N	Sp	0.025	0.4
Monarda punctata	Spotted Bee Balm	N	Su	0.25	0.52

Scientific Name[3]	Common Name	Native Status[3,4] **N** – Native **NN** – Non-native **B** – Both native & non-native	Astronomical[5] Bloom Season Sp – Spring Su – Summer Fa - Fall	Ounces /Acre[1]	Seeds/Sq/Ft
Penstemon grandiflorus	Showy penstemon	N	Sp	0.65	0.21
Ratibida columnifera	Long Yellow Coneflower	N	Su	1.0	1.0
Rudbeckia hirta[3]	Black–eyed Susan	N	Su	0.75	1.58
Solidago nermoralis	Old Field Goldenrod	N	Fa	0.35	2.41
Symphyotrichum ericoides	Heath Aster	N	Fa	0.025	0.11
Symphyotrichum oolentangiense	Sky Blue	N	Fa	0.15	0.24
Tradescantia bracteata	Long-bracted Spiderwort	N	Sp – Su	0.15	0.03
Verbena stricta	Hoary Vervain	N	Su	0.75	0.48
Zizia aptera	Heart-Leaf Golden Alexander	N	Sp - Su	0.2	0.06
Array Flower Subtotals		**22 Spp.**		**12.99**	**11.47**
Array Mix Totals		**34 Spp.**		**118.19**	**43.94**

[1] Final seed selection should occur when tentative seeding dates are known, and actual species composition and rates should be based on availability at the time of procurement.

[2] Species heights are selected for under 24" tall. This modeling takes into account, species in over achieve height by 50% in high nutrient high moisture conditions that are common in Midwest agriculture fields.

[3] Nomenclature and nativity based on:

- Hitchcock, A. S. (1971). Manual of the grasses of the United States (Vol. 1 - 2). Courier Corporation..
- Gray, A. (2021). *Manual: The Botany, the Northern United States*. BoD–Books on Demand.
- USDA Plant Database https://plants.usda.gov/home/plantProfile?symbol=POPR
- Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico [Online]. 22+ vols. New York and Oxford. http://beta.floranorthamerica.org. Accessed 2023.
- Kartesz, J.T., The Biota of North America Program (BONAP). 2015. North American Plant Atlas. (http://bonap.net/napa). Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). Accessed 2023.

[4] "Both" is a nativeness category employed by USDA for circumpolar species found around the Northern Hemisphere, see Hitchcock (1971), Gray (2021), and USDA Plant Database https://plants.usda.gov/home/plantProfile?symbol=POPR. The "Both" category helps stabilize complexity associated between species, races, and strains, that were "both" Native and Introduced, have sense hybridized, which is desired, acting as a powerful selective force since the advent of sexual reproduction 500 mya.

[5] Astronomical bloom seasons coincide with equinox and solstice events which seem to coincide with biological circadian rhythms.

Table B.4. Pollinator Perimeter Seed Mix Dry Soils

Function: Pollinator Planting Area: NE Specialization:

	Scientific Name	Common Name	Seeds /sq ft	Rate (lb/ac)	% Mix (by sqft)	% Mix (by wt)
Cover	*Avena sativa*	Oats* (See Cover crop note)	11.13	37.88		
		Total Guild:	11.13	37.88	12.95%	80.2%
Forb	*Agastache foeniculum*	Blue Giant Hyssop	2.07	0.06		
	Asclepias tuberosa	Butterfly Milkweed	0.1	0.06		
	Helianthus pauciflorus	Stiff Sunflower	0.09	0.06		
	Monarda fistulosa	Wild Bergamot	1.42	0.06		
	Oligoneuron rigidum	Stiff Goldenrod	0.83	0.06		
	Penstemon grandiflorus	Large-flowered Beard Tongue	1	0.19		
	Rudbeckia hirta	Black-eyed Susan	10.32	0.31		
	Solidago nemoralis	Gray Goldenrod	3.86	0.04		
	Symphyotrichum ericoides	Heath Aster	2.58	0.04		
	Symphyotrichum laeve	Smooth Aster	1.26	0.06		
	Verbena stricta	Hoary Vervain	2	0.19		
	Viola pedatifida	Bearded Birdfoot Violet	0.14	0.01		
		Total Guild:	25.67	1.14	29.86%	2.4%
Graminoid	*Andropogon gerardii*	Big Bluestem	2.57	0.70		
	Bromus kalmii	Kalm's Brome	6	2.04		
	Elymus canadensis	Canada Wild Rye	1.91	1.00		
	Koeleria macrantha	Junegrass	16	0.22		
	Schizachyrium scoparium	Little Bluestem	18	3.25		
	Sorghastrum nutans	Indian Grass	2.8	0.64		
		Total Guild:	47.28	7.85	55.00%	16.7%
Legume	*Dalea candida*	White Prairie Clover	0.39	0.06		
	Dalea purpurea	Purple Prairie Clover	1.5	0.27		
		Total Guild:	1.89	0.33	2.20%	0.7%
		Total Seed Mix:	85.97	47.20		

Table B.5 Stormwater Basin Seed Mix

33-361

Common Name	Scientific Name	Rate (kg/ha)	Rate (lb/ac)	% of Mix (% by wt)	Seeds/ sq ft
fringed brome	*Bromus ciliatus*	4.09	3.65	10.43%	14.75
bluejoint	*Calamagrostis canadensis*	0.06	0.05	0.13%	4.80
nodding wild rye	*Elymus canadensis*	2.24	2.00	5.71%	3.82
Virginia wild rye	*Elymus virginicus*	2.24	2.00	5.73%	3.09
tall manna grass	*Glyceria grandis*	0.18	0.16	0.44%	4.00
fowl bluegrass	*Poa palustris*	0.72	0.64	1.82%	30.40
	Total Grasses	**9.53**	**8.50**	**24.26%**	**60.86**
porcupine sedge	*carex hystericina*	0.10	0.09	0.26%	1.00
pointed broom sedge	*Carex scoparia*	0.04	0.04	0.12%	1.30
dark green bulrush	*Scirpus atrovirens*	0.30	0.27	0.76%	45.00
woolgrass	*Scirpus cyperinus*	0.11	0.10	0.27%	60.00
	Total Sedges and Rushes	**0.56**	**0.50**	**0.27%**	**107.30**
Canada anemone	*Anemone canadensis*	0.11	0.10	0.29%	0.30
marsh milkweed	*Asclepias incarnata*	0.50	0.45	1.30%	0.80
flat-topped aster	*Doellingeria umbellata*	0.11	0.10	0.29%	2.50
common boneset	*Eupatorium perfoliatum*	0.06	0.05	0.15%	3.00
grass-leaved goldenrod	*Euthamia graminifolia*	0.04	0.04	0.11%	5.00
spotted Joe pye weed	*Eutrochium maculatum*	0.17	0.15	0.42%	5.10
blue monkey flower	*Mimulus ringens*	0.02	0.02	0.07%	20.00
giant goldenrod	*Solidago gigantea*	0.02	0.02	0.06%	2.00
eastern panicled aster	*Symphyotrichum lanceolatum*	0.02	0.02	0.05%	1.00
tall meadow-rue	*Thalictrum dasycarpum*	0.06	0.05	0.16%	0.40
	Total Forbs	**1.12**	**1.00**	**2.90%**	**40.10**
Oats	*Avena sativa*	28.02	25.00	71.43%	11.14
	Total Cover Crop	**28.02**	**25.00**	**71.43%**	**11.14**
	Totals:	**39.23**	**35.00**	**100.00%**	**219.40**
Purpose:	Stormwater pond edges, temporarily flooded dry ponds, and temporarily flooded ditch bottoms.				

APPENDIX C: POTENTIAL REGIONAL SEED VENDORS

Table C.1 Potential Regional Seed Vendors

Company	Phone	Website	Specialty
Agassiz Seed	(651) 287-3400	https://www.agassizseed.com/	Native and non-native seed mixes
Agrecol Corporation	(608) 226-2544	http://www.agrecol.com/SeedMixes	Native and non-native seed mixes
Prairie Moon Nursery	(866) 417-8156	https://www.shootingstarnativeseed.com/	Native seed mixes
Shooting Star Seed Mixes	(608) 497-0655	https://www.shootingstarnativeseed.com/	Native and non-native Seed mixes

APPENDIX D: COMPARISON OF SEEDING METHODS

Table D.1 Comparison Summary Between Drill and Broadcast Seeding Methods

Circumstance	Drill Seeding	Broadcast Seeding	Culti-packer Seeder
Soil to Seed Contact	High	Low	Medium
Germination Efficiency	High	Low	Medium
Extra Seed Required to Achieve Compatibility	No	$\geq$ 20%	10%
Seedbed Preparation	Low	High	Medium
Soil Finishing (packing or rolling)	Low	High	Low
Efficiency in Tight Spaces	Low	High	Medium
Ability to Seed Under PV Panels	No	High	No
Seed Washing Potential	Low	High	Medium
Harvested Soybean Field	Yes	Yes	Yes
Harvested Corn Field (followed by mowing, baling, and light discing)	Yes	Yes	Yes
Harvested Forage (hay or silage) Field	Yes	Yes Benefits from light discing	Yes
Post-construction Seeding Within Array Field	Not advised	Advised	Advised
Potential for Second Seeding Event	Low	High	Medium
Speed (acres per hour)	Low	High	Medium
Efficiency (achieve goals / time / cost)	Low	Highly Variable	Medium

APPENDIX E: STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

(To be inserted based on final engineering design)

APPENDIX F: AGRICULTURAL IMPACT MITIGATION PLAN

Appendix F

Decommissioning Plan

Decommissioning Plan
Iron Pine Solar Project
Pine County, Minnesota

Prepared for:

Iron Pine Solar LLC
480 Atlantic Avenue
Suite 601
Boston, MA 02210

Prepared by:

Stantec Consulting Services Inc.
1165 Scheuring Road
De Pere, Wisconsin 54115

Project No: 193708962
February 12, 2024

This document entitled Decommissioning Plan – Iron Pine Solar Project, Pine County, Minnesota, was prepared by Stantec Consulting Services Inc. ("Stantec") for the use of Iron Pine Solar LLC and Swift Current Energy (the "Client"). The material in this document reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in this document are based on conditions and information existing at the time this document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others.

Melanie Needham

Melanie Needham, PE
Environmental Engineer

Mike Gerhart

Michael Gerhart
Civil Engineer

JoAnne J Blank

JoAnne J Blank
Senior Associate

Table of Contents

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Iron Pine Solar LLC (Iron Pine Solar) is proposing to construct and operate the Iron Pine Solar Project (Project) immediately south of the City of Willow River, Pine County, Minnesota. The Project footprint encompasses approximately 1,526 acres within perimeter fencing. The maximum generating capacity of the Project photovoltaic system will be up to 360 megawatts (MW), alternating current (AC) with 325 $MW_{[AC]}$ at the point of interconnection (POI).

This Decommissioning Plan (Plan) provides a description of the decommissioning and restoration phase of the Project. Start-of-construction is planned for the third quarter of 2025, with a projected Commercial Operation Date anticipated in first quarter 2027. Major components of the Project include solar modules and associated trackers and steel piles; inverter stations; access roads; perimeter fencing; electrical collection system and substations (Figure 1).

This Plan is applicable to the decommissioning/deconstruction and restoration phases of the Project and has been prepared as a summary of the activities and financial commitments required by the Minnesota Public Utilities Commission (MPUC). Iron Pine Solar is committed to completing the decommissioning of the Project according to the conditions described within the Minnesota Department of Commerce Energy Environmental Review and Analysis (EERA) Application Guidance for Site Permitting of Solar Farms (Guidance).

A summary of the components to be removed is provided in Section 1.1. Summaries of the estimated costs and potential salvage value associated with decommissioning the Project are provided in Section 4.

1.1 FACILITY COMPONENTS

The main components of the Project include:

- Solar modules and associated electrical cabling
- Tracking system and steel piles
- Inverter and transformer stations
- Electrical cabling and conduits (above and below ground)
- Perimeter fencing
- Site access and internal roads
- Operations and maintenance structure
- Project substation and overhead transmission generation tie-in line

1.2 TRIGGERING EVENTS AND EXPECTED LIFETIME OF PROJECT

Project decommissioning may be triggered by events such as the expiration of lease agreement(s), abandonment, or when the Project reaches the end of its operational life. Abandonment of a solar facility is typically defined as when a facility ceases to transfer energy on a continuous basis for 12 months.

The anticipated lifetime of the Project is approximately 30 years. At the end of the Project's useful life, the modules and associated components will be decommissioned and removed from the Project site. Iron Pine Solar will be the party responsible for decommissioning and restoring the site.

Components of the facility that have resale value may be sold in the wholesale market. Components with no wholesale value will be salvaged and sold as scrap for recycling or disposed of at an approved offsite licensed solid waste disposal facility (landfill). Decommissioning activities will include removal of the solar arrays, and associated components as listed in Section 1.1 and described in Section 2 and restoration activities as described in Section 3.

1.3 DECOMMISSIONING SEQUENCE

Decommissioning activities are anticipated to begin within twelve (12) months of the Project ceasing operation and be completed within 12 months from start of decommissioning. Notice to landowners and applicable units of government will be sent at least 90 days prior to the start of decommissioning. Monitoring and site restoration may extend beyond the 12-month decommissioning period to achieve successful revegetation and rehabilitation. The anticipated sequence of decommissioning and removal is described below; however, overlap of activities is expected.

- Obtain required permits prior to the start of any onsite activities.
- Reinforce access roads, if needed, and prepare site for component removal.
- Install erosion control materials and other best management practices (BMPs) to protect sensitive resources and control erosion during decommissioning activities.
- De-energize solar arrays.
- Dismantle and remove panels and above-ground wiring.
- Remove tracking equipment and piles.
- Remove inverter/transformer stations along with support system and foundation pads.
- Remove above ground electrical cables
- Remove solar array and substation perimeter fence.
- Remove access roads and grade site (as required).
- De-energize and make the substation safe for removal.
- Coordinate with transmission owner to disconnect from grid at the POI.
- Remove substation and associated overhead transmission tie-in line.
- De-compact subsoils as needed, restore, and revegetate disturbed land to allow for pre-construction land use.

2.0 PROJECT COMPONENTS AND DECOMMISSIONING ACTIVITIES

The solar facility components and decommissioning activities necessary to restore the Project area to allow for land use similar to the use prior to Project construction.

2.1 OVERVIEW OF FACILITIES

Iron Pine Solar anticipates utilizing approximately 570,622 bifacial solar modules, with a total generating capacity of approximately 395.88 MW direct current (DC) with a maximum of 325 $MW_{[AC]}$ at the POI. The Project footprint encompasses approximately 1,526 acres of predominantly agricultural land within perimeter fencing as shown on Figure 1.

All foundations and steel piles will be removed. Electric cabling and conduit installed below the soil surface will be abandoned in place. Access roads and fence may be left in place if requested and/or agreed to by the landowner; however, for purposes of this assessment, all access roads are assumed to be removed. Iron Pine Solar will communicate with the appropriate local agency to coordinate the repair of damaged or modified public roads during the decommissioning and reclamation process, and will coordinate with appropriate federal, state and/or local agencies for necessary permit approvals prior to decommissioning activities.

Estimated quantities of materials to be removed and sold, salvaged, or disposed of are included in this section. Many of the materials described have salvage value, although there are some components that will likely have none at the time of decommissioning. Removed materials that cannot be sold on the resale market will be salvaged or recycled to the extent possible. Other waste materials will be disposed of in accordance with state and federal law in an approved licensed solid waste facility.

Solar panels may have value in a resale market, depending on their condition at the end of the Project life. If the Project is decommissioned prior to the anticipated 30-year timeframe, the component's resale value will be substantially higher than at the end of the projected Project. Table 1 presents a summary of the primary components of the Project included in this decommissioning plan.

Table 1 Primary Components of Project to be Decommissioned

Component	Quantity	Unit of Measure
Solar Modules (approximate)	570,622	Each
Tracking System (equivalent full trackers)	7,316	Tracker
Steel Piles	88,776	Each
Inverter Stations with Piers or Foundations	82	Each
Perimeter Fencing	83,805	Linear Foot
Access Roads (approximate)	86,197	Linear Foot
Overhead Tie-in Transmission Line	1.0	Linear Mile
O&M Building (prefabricated)	1	Each
Project Substation	1	Each

2.2 SOLAR MODULES

Statistics and estimates provided in this Plan are based on a Canadian Solar 690-watt bifacial module. The module assembly (with frame) will have a total weight of approximately 83.33 pounds and will be approximately 93.90 inches by 51.30 inches in size. The modules are mainly comprised of non-metallic materials such as silicon, glass, plastic, and epoxies, with an anodized aluminum frame.

At the time of decommissioning, module components in working condition may be refurbished and sold in a secondary market yielding greater revenue than selling as salvage material. The estimates in this report have been calculated using a conservative approach, considering revenue from salvage only, rather than resale of Project components.

2.3 TRACKING SYSTEM AND SUPPORT

The solar modules are planned to be mounted on a single-axis, one-in-portrait tracking system. Each full, three-string tracker will be approximately 318 feet in length and will support 78 modules. Smaller trackers will be employed at the edges of the layout to efficiently utilize available space. The tracking system is mainly comprised of high-strength, galvanized steel and anodized aluminum; steel piles that support the system are assumed to be comprised of galvanized steel.

The solar arrays will be deactivated from the surrounding electrical system and made safe for disassembly. Liquid wastes, including oils and hydraulic fluids will be removed and properly disposed of or recycled according to regulations current at the time of decommissioning. Electronic components, and internal electrical wiring will be removed and salvaged. The steel piles will be completely removed from the ground.

The supports, tracking system, and posts contain salvageable materials which can be sold to provide revenue to offset the decommissioning costs.

2.4 INVERTER/TRANSFORMER STATIONS

The inverter and transformer stations are located within the arrays and will sit on platforms supported by small concrete footings. The inverters and transformers will be deactivated, disassembled, and removed. Depending on the condition of the unit at decommissioning, the equipment may be sold for refurbishment and re-use. If not re-used, they will be salvaged or disposed of at an approved solid waste management facility.

2.5 ELECTRICAL CABLING AND CONDUITS

The Project’s underground electrical collection system will be placed at a depth of three feet (36 inches) or greater below the ground surface. This Plan assumes that all underground cabling will be abandoned in place.

2.6 PROJECT SUBSTATION

A Project substation will be constructed as part of the Project development. The substation will contain within its perimeter, a gravel pad, power transformer and footings, an electrical control house, and concrete pads, as needed. The substation transformer may be sold for re-use or salvage. Components of the substation that cannot be salvaged will be transported off-site for disposal at an approved waste management facility. Although the Project substation may remain at the end of the Project life, an estimated decommissioning cost has been included in this Plan.

2.7 OVERHEAD GENERATION TIE-IN TRANSMISSION LINE

An overhead electrical generation tie-in transmission line, approximately one mile in length, will be constructed between the Project substation and a proposed utility switchyard (the POI). Removal of the overhead generation tie-in transmission lines is included in this Plan.

2.8 OPERATIONS AND MAINTENANCE BUILDING

Iron Pine Solar will include one operations and maintenance (O&M) building as part of the Project. The structure will be a prefabricated building with connections to electrical or other services, as needed. The placement of the structure on the site will be in conformance with local and state building codes and will be removed during the decommissioning process.

2.9 PERIMETER FENCING AND ACCESS ROADS

The Project will include a 10-foot-high wildlife-permeable security fence around the perimeter of each solar array site. The total length of fence will be approximately 83,805 feet (15.87 miles).

Access drives from local roads and within the arrays will provide direct access to the solar facility and substation equipment. The access drives will be approximately 12 feet in width and total approximately 86,197 feet (16.3 miles) in length. The access drive lengths may change with final Project design. Landowners may choose to retain the access drives at completion of the Project; however, to be conservative, the decommissioning estimate assumes that all access drives will be removed. Access drives are planned to be gravel.

During installation of the Project, site access drives will be excavated to remove topsoil, the subgrade will be compacted, and aggregate fill will be placed as necessary. This plan is based on a design of twelve inches of gravel with geotextile fabric placed beneath the gravel for the length of each access drive. The estimated quantity of these materials is provided in Table 2.

Table 2 Typical Access Drive Construction Materials

Item	Quantity	Unit
Aggregate fill, 12-inch thick – to be removed	38,310	Cubic Yards
Geotextile	114,929	Square Yards

Decommissioning activities include the removal and stockpiling of aggregate materials onsite for salvage preparation. It is conservatively assumed that all aggregate materials will be removed from the Project site and hauled up to five miles from the Project area. Underlying geotextile fabric will also be removed during the decommissioning process. Fabric that is easily separated from the aggregate during excavation will be disposed of in an approved solid waste disposal facility. Fabric that remains with the aggregate will be sorted out at the processing site and properly disposed. Following removal of aggregate and geotextile fabric, the gravel and compacted soil access road areas will be de-compacted with deep ripper or chisel plow (ripped to 18 inches), backfilled with native subsoil and topsoil, as needed, and graded as necessary.

3.0 LAND USE AND ENVIRONMENT

3.1 SOILS AND LAND USE

The proposed Project is predominantly located on agricultural land. Areas of Project disturbance will be restored to substantially similar conditions that existed immediately prior to Project construction. Soils compacted during de-construction activities will be de-compacted, as necessary.

3.2 RESTORATION AND REVEGETATION

Areas of the Project that have been excavated and backfilled will be graded as previously described. If present, drain tiles that have been damaged will be restored to pre-construction condition. Restored areas will be revegetated in consultation with the current landowner and in compliance with regulations in place at the time of decommissioning. Work will be completed to comply with the conditions agreed upon by Iron Pine Solar, Project leaseholders, and the MPUC or other federal, state, and local regulations in affect at the time of decommissioning.

If permitted by the landowner who retains control of the land following decommissioning of the Project, Iron Pine Solar will monitor the site for successful revegetation.

3.3 SURFACE WATER DRAINAGE AND CONTROL

Project facilities are being sited to avoid impacts to wetlands and waterways. The existing Project site conditions and proposed BMPs to protect surface water features will be detailed in a Project Stormwater Pollution Prevention Plan (SWPPP) prior to the commencement of decommissioning construction activities.

Surface water conditions at the Project site will be reassessed prior to the decommissioning phase. Iron Pine Solar will obtain the required water quality permits from the Minnesota Department of Natural Resources (MNDNR) and the U.S. Army Corp of Engineers (USACE), as needed, before decommissioning of the Project. Decommissioning construction stormwater permits will also be obtained and a SWPPP prepared describing the protection needed to reflect conditions present at the time of decommissioning. BMPs may include enhancement of construction entrances, temporary seeding, permanent seeding, mulching (in non-agricultural areas), erosion control matting, silt fence, filter berms, and filter socks.

3.4 MAJOR EQUIPMENT REQUIRED FOR DECOMMISSIONING

The activities involved in decommissioning the Project include removal of the above- and below-ground ground components of the Project and restoration as described in Sections 2, 3.1 and 3.2.

Equipment required for the decommissioning activities is similar to what is needed to construct the solar facility and may include, but is not limited to: small cranes, low ground pressure (LGP) tracked excavators, backhoes, LGP tracked bulldozers and dump trucks, front-end loaders, deep rippers, water trucks, disc plows and tractors to restore subgrade conditions, along with ancillary equipment. Standard dump trucks may be used to transport material removed from the site to disposal facilities.

4.0 DECOMMISSIONING COST ESTIMATE SUMMARY

Expenses associated with decommissioning the Project will be dependent on labor costs at the time of decommissioning. For the purposes of this report, approximate late-2023 market values were used to estimate labor expenses. Fluctuation and inflation of the labor costs or equipment were not factored into the estimates.

The value of the individual components of the Project will vary with time. In general, the highest component value would be expected at the time of construction with declining value over the life of the Project. During the early life of the Project, components such as the solar modules and batteries could be sold in the wholesale market for reuse or refurbishment. Secondary markets for used solar components include other utility scale solar facilities with similar designs that may require replacement equipment due to damage or normal wear over time; or other buyers (e.g., developers, consumers) that are willing to accept a slightly lower power output in return for a significantly lower price point when compared to new equipment. As efficiency and power production of the panels decrease due to aging and/or weathering, the resale value will decline accordingly.

4.1 DECOMMISSIONING RISK OVER THE LIFECYCLE OF A PROJECT

The probability of an event that would lead to abandonment or long-term interruption is extremely low during the first 15 to 20 years of the Project life. Accordingly, the risk of decommissioning the Project is extremely low during this time frame. The reasons why the risk to decommission the Project is extremely low in the early phases of the Project include, but are not limited to, the resale value of the facilities; power purchase agreements in place; manufacturer warranties on components; property damage and business interruption insurance coverage; and the value of renewable energy in general in the current market.

4.2 DECOMMISSIONING EXPENSES

Project decommissioning will incur costs associated with disposal of components not sold for salvage, including materials which will be disposed of at a licensed facility, as required. Decommissioning costs also include backfilling, grading, and restoration of the Project site as described in Sections 2 and 3. Table 3 summarizes the estimates for activities associated with removal of the major components of the Project and site restoration.

Table 3 Estimated Decommissioning Expenses

Activity	Unit	Quantity	Cost per Unit	Total
Overhead and management (includes estimated permitting required and public road repairs)	Lump Sum	1	$1,103,000	$1,103,000
Solar modules; disassembly and removal	Each	570,622	$4.95	$2,824,579
Tracking System disassembly and removal (equivalent full trackers)	Each	7,316	$685	$5,011,460
Steel pile/post removal	Each	88,776	$10.70	$949,903
Inverter and transformer removal with foundation	Each	82	$1,860	$152,520
Access road excavation and removal	Lump Sum	1	$352,700	$352,700
Restoration of access roads and rehabilitation of site	Lump Sum	1	$662,350	$662,350
Perimeter fence removal (wildlife fence)	Linear Feet	83,805	$4.60	$385,503
O&M building (prefabricated)	Lump Sum	1	$12,000	$12,000
Project substation	Lump Sum	1	$400,000	$400,000
Removed above ground transmission line and poles	Linear Mile	1.00	$275,000	$275,000
Total Estimated Decommissioning Cost				**$12,129,015**

4.3 DECOMMISSIONING REVENUES

Revenue from decommissioning the Project will be realized through the sale of the facility components and construction materials. As previously described, the value of the decommissioned components will be higher in the early stages of the Project and decline over time. Resale of components such as solar panels is expected to be greater than salvage (i.e., scrap) value for at least the first ten years of the Project.

Modules and other solar facility components may be sold within a secondary market or as salvage. A current sampling of used solar panels indicates a wide range of pricing depending on age and condition ($0.10 to $0.30 per watt). Future pricing of solar panels is difficult to predict, due to the relatively young age of the market, changes to solar panel technology, and the ever-increasing product demand. A conservative estimation of the value of solar panels at $0.10 per watt would yield approximately $39,588,000. To preserve the integrity of the modules, higher removal and handling costs would be expected for module resale versus salvage. However, although costs would be higher, the net revenue due to resale would still be substantially greater than the estimated salvage value.

The resale value of components such as trackers, may decline more quickly; however, the salvage value of the steel that makes up a large portion of the tracker is expected to stay at or above the value used in this report.

The market value of steel and other materials fluctuates daily and has varied widely over the past five years. Salvage value estimates were based on an approximate five-year-average price of steel derived from sources including on-line recycling companies and United States Geological Survey (USGS) commodity summaries. The price used to value the steel used in this report is $262 per metric ton; aluminum at $0.40 per pound; silicon at $0.40 per pound and glass at $0.05 per pound. The main component of the tracking system and piles is assumed to be salvageable steel. Solar panels are estimated to contain approximately 75 percent glass, 8 percent aluminum and 5 percent silicon. A 50 percent recovery rate was assumed for aluminum and all panel components, due to the processing required to separate the panel components. Alternative and more efficient methods of recycling solar panels are anticipated before this Project is decommissioned, given the large number of solar facilities that are currently being developed. Table 4 summarizes the potential salvage value for the solar array components and construction materials.

Table 4 Estimated Decommissioning Revenues – Solar Facilities

Item	Unit of Measurement	Quantity per Unit	Salvage Price per Unit	Total Salvage Price per Item	Number of Items	Total
Panels - Silicon	Pounds per Panel	2.1	$0.40	$0.840	570,622	$479,322
Panels - Aluminum	Pounds per Panel	3.3	$0.40	$1.320	570,622	$753,221
Panels - Glass	Pounds per Panel	31.3	$0.05	$1.565	570,622	$893,023
Tracking System and Posts	Metric tons per $MW_{[DC]}$	32.0	$262	$8,384	395.88	$3,319,058
Substation	Each	1	$50,000	$50,000	1	$50,000
Total Estimated Decommissioning Revenue – Solar Facilities						**$5,494,624***

* Revenue based on salvage value only. Revenue from used panels at $0.10 per watt could raise $39,588,000 as resale versus the estimated salvage revenue.

4.4 DECOMMISSIONING COST SUMMARY

Table 5 provides a summary of the estimated cost to decommission the Project, using the information detailed in Section 4.2. Estimates are based on late-2023 prices, with no market fluctuations or inflation considered.

Table 5 Net Decommissioning Cost Summary

Item	(Cost)/Revenue
Decommissioning Expenses (Solar Project)	**($12129,015)**
Potential Revenue – salvage value of panel components and recoverable materials	**$5,494,624**
Net Decommissioning Cost/Revenue	**($6,634,391)**

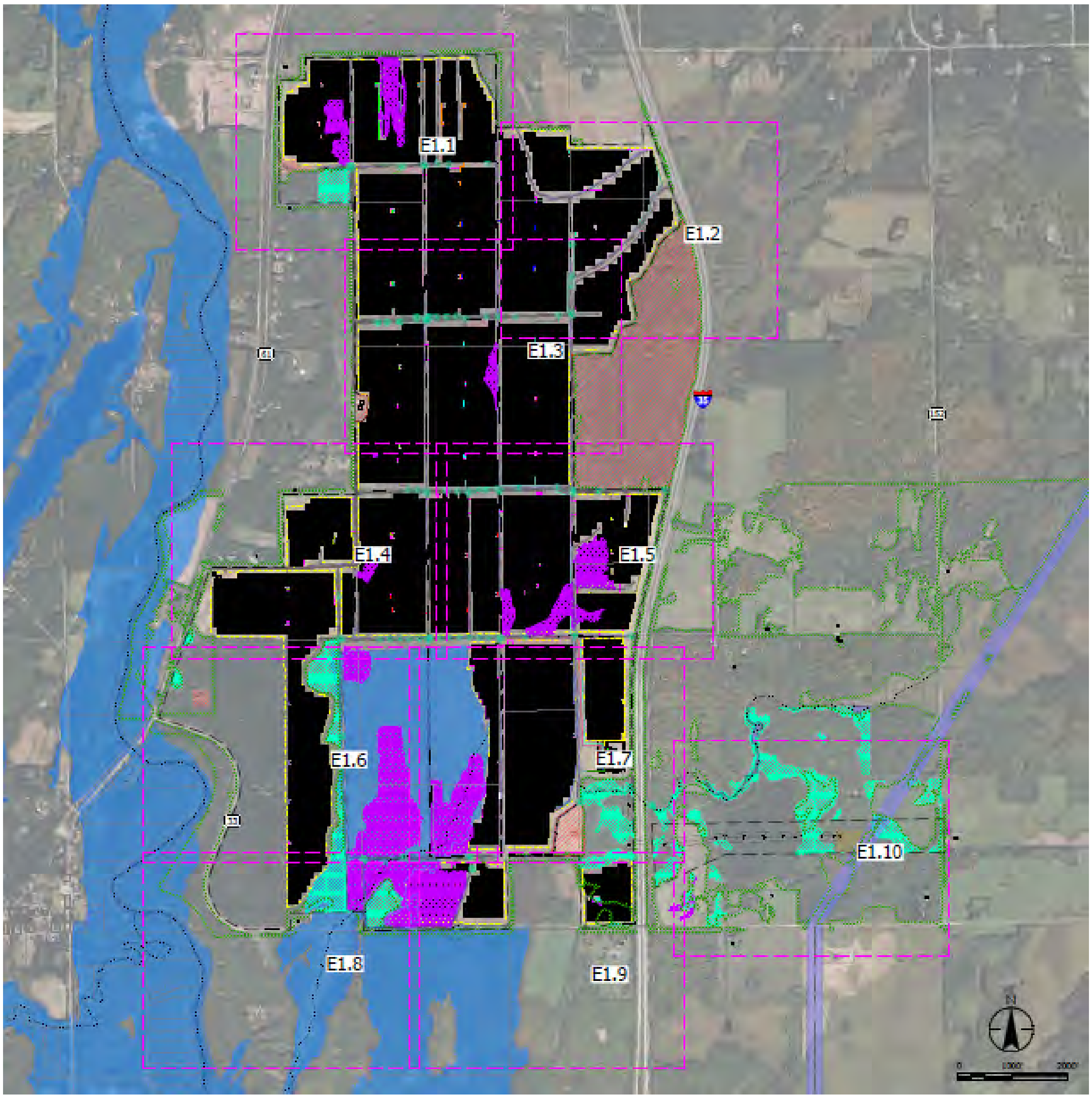
4.5 FINANCIAL ASSURANCE

Iron Pine Solar will be the financially responsible party for decommissioning the Project and restoring the site to a condition similar to that which existed prior to the Project construction. As recommended in the EERA Guidance, Iron Pine Solar proposes the following schedule of decommissioning cost re-assessment and financial assurance. The schedule is based on Year 0 being the Project date of commissioning.

- Year 5 – Re-assessment of the net decommissioning cost; update to be provided to Pine County Zoning Administrator or applicable Pine County officer (Pine County).
- Year 10 – Re-assessment of the net decommissioning cost and issuance of surety bond or other agreed upon method of financial assurance.
- Years 15 through end of Project life – Re-assessment of net decommissioning cost and update of financial assurance.

FIGURE

Figure 1 Proposed Project Layout



Appendix G

Draft Route Permit

STATE OF MINNESOTA PUBLIC UTILITIES COMMISSION

ROUTE PERMIT FOR
~~[PROJECT NAME]~~IRON PINE SOLAR PROJECT GENERATION TIE

A HIGH-VOLTAGE TRANSMISSION LINE AND ASSOCIATED FACILITIES

IN
~~[COUNTY]~~PINE COUNTY

ISSUED TO
~~[PERMITTEE]~~IRON PINE SOLAR POWER, LLC

PUC DOCKET NO. ~~[Docket Number]~~ IP-7114/TL-23-415

In accordance with the requirements of Minnesota Statutes Chapter 216E and Minnesota Rules Chapter 7850 this route permit is hereby issued to:

~~[Permittee]~~IRON PINE SOLAR POWER, LLC

~~[Permittee]~~Iron Pine Solar Power, LLC is authorized by this route permit to construct and operate ~~[Provide a description of the project authorized by the Minnesota Public Utilities Commission]~~an approximately one mile long 230 kilovolt transmission line in Pine County, Minnesota .

The high-voltage transmission line shall be constructed within the route identified in this route permit and in compliance with the conditions specified in this route permit.

Approved and adopted this ____ day of [Month, Year]

BY ORDER OF THE COMMISSION

____

Will Seuffert,
Executive Secretary

To request this document in another format such as large print or audio, call 651-296-0406 or 800-657-3782 (voice). Persons with a hearing or speech impairment may call using their preferred Telecommunications Relay Service or email consumer.puc@state.mn.us for assistance.

CONTENTS

ATTACHMENTS

Attachment 1 – Complaint Handling Procedures for Permitted Energy Facilities
Attachment 2 – Compliance Filing Procedures for Permitted Energy Facilities
Attachment 3 – Route Permit Maps

1 ROUTE PERMIT

The Minnesota Public Utilities Commission (Commission) hereby issues this route permit to ~~[Permittee Name]~~Iron Pine Solar Power, LLC (Permittee) pursuant to Minnesota Statutes Chapter 216E and Minnesota Rules Chapter 7850. This route permit authorizes the Permittee to construct and operate an ~~[Provide a description of the project as authorized by the Commission]~~approximately one mile long 230 kilovolt transmission line and associated switchyard in Pine County, Minnesota (~~[Project Name, if applicable],~~ henceforth known as Transmission Facility). The high-voltage transmission line shall be constructed within the route identified in this route permit and in compliance with the conditions specified in this route permit.

1.1 Pre-emption

Pursuant to Minn. Stat. § 216E.10, this route permit shall be the sole route approval required for construction of the transmission facilities and this route permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose governments.

2 TRANSMISSION FACILITY DESCRIPTION

~~[Provide a description of the Transmission Facility as authorized by the Commission]~~Iron Pine Solar Power, LLC will construct, own, and operate approximately one mile of new 230 kilovolt (kV) high voltage transmission line (HVTL) beginning at the Iron Pine Solar project substation located in Kettle River Township and terminating at a switchyard connecting to Minnesota Power's existing Arrowhead-Bear Creek 230 kV transmission line.

The Transmission Facility is located in the following:

County	Township Name	Township	Range	Section
Pine	Kettle River	44	20	25

2.1 Structures

~~[Provide a detailed description of the structures authorized by the Commission]~~The 230 kV line will consist of self-weathering, steel monopoles with direct embedded or concrete pier foundations. Poles will range from 100 to 140 feet in height with spans of 100 to 900 feet.

2.2 Conductors

~~[Provide a detailed description of the conductors authorized by the Commission]~~The single-circuit structures will have three single conductor phase wires and one shield wire. The phase wires are anticipated to be a 1113 kcmil 45/7 ACSR “Bluejay” conductor or a conductor of similar capacity and size. The overhead shield wire is anticipated to be a dual-purpose optical ground wire with a minimum of 24 fibers.

The table below details specifics on the various structure and conductor types as presented in the route permit application.

Line Type	Structure		Foundation	Height (feet)	Span (feet)
	Type	Material			
230 kV	Tangent	Steel	Direct Embed or Concrete	100 – 140	100 - 900
230 kV	Angle	Steel	Direct Embed or Concrete	100 – 140	100 - 900
230 kV	Deadend	Steel	Direct Embed or Concrete	100 – 140	100 - 900

2.3 Substations and Associated Facilities

~~[Provide a detailed description of the associated facilities and substations as authorized by the Commission]~~The 230 kV line will connect to Minnesota Power’s existing Arrowhead-Bear Creek 230 kV transmission line via a switchyard.

3 DESIGNATED ROUTE

The route designated by the Commission is depicted on the route maps attached to this route permit (Designated Route). The Designated Route is generally described as follows:

~~[Provide detailed description of the authorized route including the route widths and any other specifics relevant to each segment. Also include a reference to the relevant route map to be attached to the route permit.]~~The 230 kV transmission line will begin at the Iron Pine Solar project substation in Kettle River Township in Pine County, Minnesota. The route will proceed south along Interstate 35 for approximately 1,500 feet. The route will turn eastward and cross Interstate 35. The route will then proceed eastward for approximately 3.780 feet to a new 230 kV switchyard.

The Designed Route includes an anticipated alignment and a right-of-way. The right-of-way is the physical land needed for the safe operation of the transmission line. The Permittee shall locate the alignment and associated right-of-way within the Designated Route unless otherwise authorized by this route permit or the Commission. The Designated Route provides the Permittee with flexibility for minor adjustments of the alignment and right-of-way to accommodate landowner requests and unforeseen conditions.

Any modifications to the Designated Route or modifications that would result in right-of-way placement outside the Designated Route shall be specifically reviewed by the Commission in accordance with Minn. R. 7850.4900 and Section 10 of this route permit.

4 RIGHT-OF-WAY

This route permit authorizes the Permittee to obtain a new permanent right-of-way for the transmission line up to ~~[number]~~160 feet in width. The permanent right-of-way is typically ~~[number]~~80 feet on both sides of the transmission line measured from its centerline or alignment.

The anticipated alignment is intended to minimize potential impacts relative to the criteria identified in Minn. R. 7850.4100. The final alignment must generally conform to the anticipated alignment identified on the route maps unless changes are requested by individual landowners and agreed to by the Permittee or for unforeseen conditions that are encountered or as otherwise provided for by this route permit.

Any right-of-way or alignment modifications within the Designated Route shall be located so as to have comparable overall impacts relative to the factors in Minn. R. 7850.4100, as does the right-of-way and alignment identified in this route permit, and shall be specifically identified and documented in and approved as part of the plan and profile submitted pursuant to Section 9.1 of this route permit.

Where the transmission line parallels existing highway and other road rights-of-way, the transmission line right-of-way shall occupy and utilize the existing right-of-way to the maximum extent possible; consistent with the criteria in Minn. R. 7850.4100, and the other requirements of this route permit; and for highways under the jurisdiction of the Minnesota Department of Transportation (MnDOT), the procedures for accommodating utilities in trunk highway rights-of-way.

5 GENERAL CONDITIONS

The Permittee shall comply with the following conditions during construction and operation of the Transmission Facility over the life of this route permit.

5.1 Route Permit Distribution

Within 30 days of issuance of this route permit, the Permittee shall provide all affected landowners with a copy of this route permit and the complaint procedures. An affected landowner is any landowner or designee that is within or adjacent to the Designated Route. In no case shall a landowner receive this route permit and complaint procedures less than five days prior to the start of construction on their property. The Permittee shall also provide a copy of this route permit and the complaint procedures to the applicable regional development commissions, county environmental offices, and city and township clerks. The Permittee shall file with the Commission an affidavit of its route permit and complaint procedures distribution within 30 days of issuance of this route permit.

5.2 Access to Property

The Permittee shall notify landowners prior to entering or conducting maintenance within their property, unless otherwise negotiated with the landowner. The Permittee shall keep records of compliance with this section and provide them upon the request of the Minnesota Department of Commerce (Department of Commerce) staff or Commission staff.

5.3 Construction and Operation Practices

The Permittee shall comply with the construction practices, operation and maintenance practices, and material specifications described in the permitting record for this Transmission Facility unless this route permit establishes a different requirement in which case this route permit shall prevail.

5.3.1 Field Representative

The Permittee shall designate a field representative responsible for overseeing compliance with the conditions of this route permit during construction of the Transmission Facility. This person shall be accessible by telephone or other means during normal business hours throughout site preparation, construction, cleanup, and restoration.

The Permittee shall file with the Commission the name, address, email, phone number, and emergency phone number of the field representative at least 14 days prior to the pre-construction meeting. The Permittee shall provide the field representative's contact information to affected landowners, local government units and other interested persons at least 14 days prior to the pre-construction meeting. The Permittee may change the field representative at any time upon notice to the Commission, affected landowners, local government units and other interested persons. The Permittee shall file with the Commission an affidavit of distribution of its field representative's contact information at least 14 days prior to the pre-construction meeting and upon changes to the field representative.

5.3.2 Employee Training - Route Permit Terms and Conditions

The Permittee shall train all employees, contractors, and other persons involved in the Transmission Facility construction regarding the terms and conditions of this route permit. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

5.3.3 Independent Third-Party Monitoring

Prior to any construction, the Permittee shall propose a scope of work and identify an independent third-party monitor to conduct construction monitoring on behalf of the Department of Commerce. The scope of work shall be developed in consultation with and approved by the Department of Commerce. This third-party monitor will report directly to and will be under the control of the Department of Commerce with costs borne by the Permittee. Department of Commerce staff shall keep records of compliance with this section and will ensure that status reports detailing the construction monitoring are filed with the Commission in accordance with scope of work approved by the Department of Commerce.

5.3.4 Public Services, Public Utilities, and Existing Easements

During Transmission Facility construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur the Permittee shall work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this route permit.

The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

5.3.5 Temporary Workspace

The Permittee shall limit temporary easements to special construction access needs and additional staging or lay-down areas required outside of the authorized right-of-way. Temporary space shall be selected to limit the removal and impacts to vegetation. The Permittee shall obtain temporary easements outside of the authorized transmission line right-of-way from affected landowners through rental agreements. Temporary easements are not provided for in this route permit.

The Permittee may construct temporary driveways between the roadway and the structures to minimize impact using the shortest route feasible. The Permittee shall use construction mats to minimize impacts on access paths and construction areas. The Permittee shall submit the location of temporary workspaces and driveways with the plan and profile pursuant to Section 9.1.

5.3.6 Noise

The Permittee shall comply with noise standards established under Minn. R. 7030.0010 to 7030.0080. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable.

5.3.7 Aesthetics

The Permittee shall consider input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance. The Permittee shall use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Transmission Facility during construction and maintenance. The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads. The Permittee shall place structures at a distance, consistent with sound engineering principles and system reliability criteria, from intersecting roads, highways, or trail crossings.

5.3.8 Soil Erosion and Sediment Control

The Permittee shall implement those erosion prevention and sediment control practices recommended by the Minnesota Pollution Control Agency (MPCA) Construction Stormwater Program. If construction of the Transmission Facility disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.

The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Transmission Facility shall be returned to pre-construction conditions.

5.3.9 Wetlands and Water Resources

The Permittee shall develop wetland impact avoidance measures and implement them during construction of the Transmission Facility. Measures shall include spacing and placing the power poles at variable distances to span and avoid wetlands, watercourses, and floodplains. Unavoidable wetland impacts as a result of the placement of poles shall be limited to the immediate area around the poles. To minimize impacts, the Permittee shall construct in wetland areas during frozen ground conditions where practicable and according to permit requirements by the applicable permitting authority. When construction during winter is not possible, the Permittee shall use wooden or composite mats to protect wetland vegetation.

The Permittee shall contain soil excavated from the wetlands and riparian areas and not place it back into the wetland or riparian area. The Permittee shall access wetlands and riparian areas using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts. The Permittee shall not place staging or stringing set up areas within or adjacent to wetlands or water resources, as practicable. The Permittee shall assemble power pole structures on upland areas before they are brought to the site for installation.

The Permittee shall restore wetland and water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements. The Permittee shall meet the USACE, Minnesota Department of Natural Resources (DNR), Minnesota Board of Water and Soil Resources, and local units of government wetland and water resource requirements.

5.3.10 Vegetation Management

The Permittee shall minimize the number of trees to be removed in selecting the right-of-way specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation in areas such as trail and stream crossings where vegetative screening may minimize aesthetic impacts, to the extent that such actions do not violate sound engineering principles or system reliability criteria.

The Permittee shall remove tall growing species located within the transmission line right-of-way that endanger the safe and reliable operation of the transmission line. The Permittee shall leave undisturbed, to the extent possible, existing low growing species in the right-of-way or replant such species in the right-of-way to blend the difference between the right-of-way and adjacent areas, to the extent that the low growing vegetation that will not pose a threat to the transmission line or impede construction.

5.3.11 Application of Pesticides

The Permittee shall restrict pesticide use to those pesticides and methods of application approved by the Minnesota Department of Agriculture (MDA), DNR, and the U.S. Environmental Protection Agency (EPA). Selective foliage or basal application shall be used when practicable. All pesticides shall be applied in a safe and cautious manner so as not to damage adjacent properties including crops, orchards, tree farms, apiaries, or gardens. The Permittee shall contact the landowner at least 14 days prior to pesticide application on their property. The Permittee may not apply any pesticide if the landowner requests that there be no application of pesticides within the landowner's property. The Permittee shall provide notice of pesticide application to landowners and beekeepers operating known apiaries within three miles of the pesticide application area at least 14 days prior to such application. The Permittee shall keep pesticide communication and application records and provide them upon the request of Department of Commerce staff or Commission staff.

5.3.12 Invasive Species

The Permittee shall employ best management practices to avoid the potential introduction and spread of invasive species on lands disturbed by Transmission Facility construction activities. The Permittee shall develop an Invasive Species Prevention Plan and file it with the Commission at least 14 days prior to the pre-construction meeting. The Permittee shall comply with the most recently filed Invasive Species Prevention Plan.

5.3.13 Noxious Weeds

The Permittee shall take all reasonable precautions against the spread of noxious weeds during all phases of construction. When utilizing seed to establish temporary and permanent vegetative cover on exposed soil the Permittee shall select site appropriate seed certified to be free of noxious weeds. To the extent possible, the Permittee shall use native seed mixes. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

5.3.14 Roads

The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Transmission Facility. Where practical, existing roadways shall be used for all activities associated with construction of the Transmission Facility. Oversize or overweight loads associated with the Transmission Facility shall not be hauled across public roads without required permits and approvals.

The Permittee shall construct the fewest number of site access roads required. Access roads shall not be constructed across streams and drainage ways without the required permits and approvals. Access roads shall be constructed in accordance with all necessary township, county or state road requirements and permits.

The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner.

5.3.15 Archaeological and Historic Resources

The Permittee shall make every effort to avoid impacts to archaeological and historic resources when constructing the Transmission Facility. In the event that a resource is encountered, the Permittee shall consult with the State Historic Preservation Office and the State Archaeologist. Where feasible, avoidance of the resource is required. Where not feasible, mitigation must include an effort to minimize Transmission Facility impacts on the resource consistent with State Historic Preservation Office and State Archaeologist requirements.

Prior to construction, the Permittee shall 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 human remains are encountered during construction, the Permittee shall immediately halt construction and promptly notify local law enforcement and the State Archaeologist. The Permittee shall not resume construction at such location until authorized by local law enforcement or the State Archaeologist. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

5.3.16 Avian Protection

The Permittee in cooperation with the DNR shall identify areas of the transmission line where bird flight diverters will be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. Standard transmission design shall incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that may simultaneously come in contact with a conductor and grounding devices. The Permittee shall submit documentation of its avian protection coordination with the plan and profile pursuant to Section 9.1.

5.3.17 Drainage Tiles

The Permittee shall avoid, promptly repair, or replace all drainage tiles broken or damaged during all phases of the Transmission Facility's life unless otherwise negotiated with the affected landowner. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

5.3.18 Restoration

The Permittee shall restore the right-of-way, temporary workspaces, access roads, abandoned right-of-way, and other public or private lands affected by construction of the Transmission Facility. Restoration within the right-of-way must be compatible with the safe operation, maintenance, and inspection of the transmission line. Within 60 days after completion of all restoration activities, the Permittee shall file with the Commission a Notice of Restoration Completion.

5.3.19 Cleanup

The Permittee shall remove and properly dispose of all construction waste and scrap from the right-of-way and all premises on which construction activities were conducted upon completion of each task. The Permittee shall remove and properly dispose of all personal litter, including bottles, cans, and paper from construction activities daily.

5.3.20 Pollution and Hazardous Wastes

The Permittee shall take all appropriate precautions to protect against pollution of the environment. The Permittee shall be responsible for compliance with all laws applicable to the generation, storage, transportation, clean up and disposal of all waste generated during construction and restoration of the Transmission Facility.

5.3.21 Damages

The Permittee shall fairly restore or compensate landowners for damage to crops, fences, private roads and lanes, landscaping, drain tile, or other damages sustained during construction. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

5.4 Electrical Performance Standards

5.4.1 Grounding

The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the right-of-way, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the right-of-way, except electric fences that parallel or cross the right-of-way, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the National Electric Safety Code. The Permittee shall address and rectify any induced current problems that arise during transmission line operation.

5.4.2 Electric Field

The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms.

5.4.3 Interference with Communication Devices

If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Transmission Facility, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the Transmission Facility. The Permittee shall keep records of compliance with this section and provide them upon the request of Department of Commerce staff or Commission staff.

5.5 Other Requirements

5.5.1 Safety Codes and Design Requirements

The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and North American Electric Reliability Corporation requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, right-of-way widths, and permit requirements.

5.5.2 Other Permits and Regulations

The Permittee shall comply with all applicable state statutes and rules. The Permittee shall obtain all required permits for the Transmission Facility and comply with the conditions of those permits unless those permits conflict with or are preempted by federal or state permits and regulations.

At least 14 days prior to the pre-construction meeting, the Permittee shall file with the Commission an Other Permits and Regulations Submittal that contains a detailed status of all permits, authorizations, and approvals that have been applied for specific to the Transmission Facility. The Other Permits and Regulations Submittal shall also include the permitting agency name; the name of the permit, authorization, or approval being sought; contact person and contact information for the permitting agency or authority; brief description of why the permit, authorization, or approval is needed; application submittal date; and the date the permit, authorization, or approval was issued or is anticipated to be issued.

The Permittee shall demonstrate that it has obtained all necessary permits, authorizations, and approvals by filing an affidavit stating as such and an updated Other Permits and Regulations Submittal prior to commencing construction. The Permittee shall provide a copy of any such permits, authorizations, and approvals at the request of Department of Commerce staff or Commission staff.

6 SPECIAL CONDITIONS

The special conditions shall take precedence over other conditions of this permit should there be a conflict.

6.1 Interstate 35 Crossing

The Permittee shall coordinate with the Minnesota Department of Transportation (MnDOT) regarding the crossing of Interstate 35 by the project transmission line. The Permittee shall construct and operate the crossing consistent with MnDOT's 2557 Standard Specification Book and MnDOT's required height clearances for transmission line crossings of trunk highway/interstate rights-of-way.

7 DELAY IN CONSTRUCTION

If the Permittee has not commenced construction or improvement of the route within four years after the date of issuance of this route permit the Permittee shall file a Failure to Construct Report and the Commission shall consider suspension of this route permit in accordance with Minn. R. 7850.4700.

8 COMPLAINT PROCEDURES

At least 14 days prior to the pre-construction meeting, the Permittee shall file with the Commission the complaint procedures that will be used to receive and respond to complaints.

The complaint procedures shall be in accordance with the requirements of Minn. R. 7829.1500 or Minn. R. 7829.1700, and as set forth in the complaint procedures attached to this route permit.

Upon request, the Permittee shall assist Department of Commerce staff or Commission staff with the disposition of unresolved or longstanding complaints. This assistance shall include, but is not limited to, the submittal of complaint correspondence and complaint resolution efforts.

9 COMPLIANCE REQUIREMENTS

Failure to timely and properly make compliance filings required by this route permit is a failure to comply with the conditions of this route permit. Compliance filings must be electronically filed with the Commission.

9.1 Pre-Construction Meeting

Prior to the start of construction, the Permittee shall participate in a pre-construction meeting with Department of Commerce and Commission staff to review pre-construction filing requirements, scheduling, and to coordinate monitoring of construction and site restoration activities. Within 14 days following the pre-construction meeting, the Permittee shall file with the Commission a summary of the topics reviewed and discussed and a list of attendees. The Permittee shall indicate in the filing the anticipated construction start date.

9.2 Plan and Profile

At least 14 days prior to the pre-construction meeting, the Permittee shall file with the Commission, and provide the Department of Commerce, and the counties where the Transmission Facility, or portion of the Transmission Facility, will be constructed with a plan and profile of the right-of-way and the specifications and drawings for right-of-way preparation, construction, structure specifications and locations, cleanup, and restoration for the Transmission Facility. The documentation shall include maps depicting the plan and profile including the right-of-way, alignment, and structures in relation to the route and alignment approved per this route permit.

The Permittee may not commence construction until the earlier of (i) 30 days after the pre-construction meeting or (ii) or until the Commission staff has notified the Permittee in writing that it has completed its review of the documents and determined that the planned construction is consistent with this route permit.

If the Commission notifies the Permittee in writing within 30 days after the pre-construction meeting that it has completed its review of the documents and planned construction, and finds that the planned construction is not consistent with this route permit, the Permittee may submit additional and/or revised documentation and may not commence construction until the Commission has notified the Permittee in writing that it has determined that the planned construction is consistent with this route permit.

If the Permittee intends to make any significant changes in its plan and profile or the specifications and drawings after submission to the Commission, the Permittee shall notify the Commission, the Department of Commerce, and county staff at least five days before implementing the changes. No changes shall be made that would be in violation of any of the terms of this route permit.

9.3 Status Reports

The Permittee shall file with the Commission monthly Construction Status Reports beginning with the pre-construction meeting and until completion of restoration. Construction Status Reports shall describe construction activities and progress, activities undertaken in compliance with this route permit, and shall include text and photographs.

If the Permittee does not commence construction of the Transmission Facility within six months of this route permit issuance, the Permittee shall file with the Commission Pre-Construction Status Reports on the anticipated timing of construction every six months beginning with the issuance of this route permit until the pre-construction meeting.

9.4 In-Service Date

At least three days before the Transmission Facility is to be placed into service, the Permittee shall notify the Commission of the date on which the Transmission Facility will be placed into service and the date on which construction was completed.

9.5 As-Builts

Within 90 days after completion of construction, the Permittee shall submit to the Commission copies of all final as-built plans and specifications developed during the Transmission Facility construction.

9.6 GPS Data

Within 90 days after completion of construction, the Permittee shall submit to the Commission, in the format requested by the Commission, geo-spatial information (*e.g.*, ArcGIS compatible map files, GPS coordinates, associated database of characteristics) for all structures associated with the Transmission Facility and each substation connected.

9.7 Right of Entry

The Permittee shall allow Commission designated representatives to perform the following, upon reasonable notice, upon presentation of credentials and at all times in compliance with the Permittee's site safety standards:

(a) To enter upon the facilities easement of the property for the purpose of obtaining information, examining records, and conducting surveys or investigations.
(b) To bring such equipment upon the facilities easement of the property as is necessary to conduct such surveys and investigations.
(c) To sample and monitor upon the facilities easement of the property.
To examine and copy any documents pertaining to compliance with the conditions of this route permit.

10 ROUTE PERMIT AMENDMENT

This route permit may be amended at any time by the Commission. Any person may request an amendment of the conditions of this route permit by submitting a request to the Commission in writing describing the amendment sought and the reasons for the amendment. The Commission will mail notice of receipt of the request to the Permittee. The Commission may amend the conditions after affording the Permittee and interested persons such process as is required under Minn. R. 7850.4900.

11 TRANSFER OF ROUTE PERMIT

The Permittee may request at any time that the Commission transfer this route permit to another person or entity (transferee). In its request, the Permittee must provide the Commission with:

(a) the name and description of the transferee;
(b) the reasons for the transfer;
(c) a description of the facilities affected; and
(d) the proposed effective date of the transfer.

The transferee must provide the Commission with a certification that it has read, understands and is able to comply with the plans and procedures filed for the Transmission Facility and all conditions of this route permit. The Commission may authorize transfer of the route permit after affording the Permittee, the transferee, and interested persons such process as is required under Minn. R. 7850.5000.

12 REVOCATION OR SUSPENSION OF ROUTE PERMIT

The Commission may initiate action to revoke or suspend this route permit at any time. The Commission shall act in accordance with the requirements of Minn. R. 7850.5100, to revoke or suspend this route permit.

Appendix H

Information for Planning and Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 11/27/2024 21:04:45 UTC
Project Code: 2025-0025392
Project Name: Iron Pine Solar

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

This response has been generated by the Information, Planning, and Conservation (IPaC) system to provide information on natural resources that could be affected by your project. The U.S. Fish and Wildlife Service (Service) provides this response under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq*.).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Please refer to refer to our Section 7 website for guidance and technical assistance, including step-by-step instructions for making effects determinations for each species that might be present and for specific guidance on the following types of projects: projects in developed areas, HUD, CDBG, EDA, USDA Rural Development projects, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

We recommend running the project (if it qualifies) through our **Minnesota-Wisconsin Federal Endangered Species Determination Key (Minnesota-Wisconsin ("D-key"))**. A demonstration video showing how-to access and use the determination key is available. Please note that the Minnesota-Wisconsin D-key is the third option of 3 available d-keys. D-keys are tools to help Federal agencies and other project proponents determine if their proposed action has the potential to adversely affect federally listed species and designated critical habitat. The Minnesota-Wisconsin D-key includes a structured set of questions that assists a project proponent in determining whether a proposed project qualifies for a certain predetermined consultation outcome for all federally listed species found in Minnesota and Wisconsin (except for the northern long-eared bat- see below), which includes determinations of “no effect” or “may affect, not likely to adversely affect." In each case, the Service has compiled and analyzed the best available information on the species’ biology and the impacts of certain activities to support these determinations.

If your completed d-key output letter shows a "No Effect" (NE) determination for all listed species, print your IPaC output letter for your files to document your compliance with the Endangered Species Act.

For Federal projects with a “Not Likely to Adversely Affect” (NLAA) determination, our concurrence becomes valid if you do not hear otherwise from us after a 30-day review period, as indicated in your letter.

If your d-key output letter indicates additional coordination with the Minnesota-Wisconsin Ecological Services Field Office is necessary (i.e., you get a “May Affect” determination), you will be provided additional guidance on contacting the Service to continue ESA coordination outside of the key; ESA compliance cannot be concluded using the key for “May Affect” determinations unless otherwise indicated in your output letter.

Note: Once you obtain your official species list, you are not required to continue in IPaC with d-keys, although in most cases these tools should expedite your review. If you choose to make an effects determination on your own, you may do so. If the project is a Federal Action, you may want to review our section 7 step-by-step instructions before making your determinations.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **no effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.
2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see below) – then project proponents must determine if proposed activities will have **no effect** on or **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain Life History Information for Listed and Candidate Species on our office website. If no impacts will occur to a species on the IPaC species list (e.g., there is no habitat present in the project area), the appropriate determination is **no effect**. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

3. Should you determine that project activities **may affect** any federally listed, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

Northern Long-Eared Bats
Northern long-eared bats occur throughout Minnesota and Wisconsin and the information below may help in determining if your project may affect these species.

Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches dbh for northern long-eared bat that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, northern long-eared bats could be affected. For bat activity dates, please review Appendix L in the Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines.

Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas,
- Trees found in highly developed urban areas (e.g., street trees, downtown areas),
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees, and
- A monoculture stand of shrubby vegetation with no potential roost trees.

If IPaC returns a result that northern long-eared bats are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** this species **IF** one or more of the following activities are proposed:

- Clearing or disturbing suitable roosting habitat, as defined above, at any time of year,
- Any activity in or near the entrance to a cave or mine,
- Mining, deep excavation, or underground work within 0.25 miles of a cave or mine,
- Construction of one or more wind turbines, or
- Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on the northern long-eared bat. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

If any of the above activities are proposed, and the northern long-eared bat appears on the user's species list, the federal project user will be directed to either the northern long-eared bat and tricolored bat range-wide D-key or the Federal Highways Administration, Federal Railways Administration, and Federal Transit Administration Indiana bat/Northern long-eared bat D-key, depending on the type of project and federal agency involvement. Similar to the Minnesota-Wisconsin D-key, these d-keys helps to determine if prohibited take might occur and, if not, will generate an automated verification letter. Additional information about available tools can be found on the Service's northern long-eared bat website.

Whooping Crane
Whooping crane is designated as a non-essential experimental population in Wisconsin and consultation under Section 7(a)(2) of the Endangered Species Act is only required if project activities will occur within a National Wildlife Refuge or National Park. If project activities are proposed on lands outside of a National Wildlife Refuge or National Park, then you are not required to consult. For additional information on this designation and consultation requirements, please review "Establishment of a Nonessential Experimental Population of Whooping Cranes in the Eastern United States."

Other Trust Resources and Activities
Bald and Golden Eagles **-** Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. It is the responsibility of the project proponent to survey the area for any migratory bird nests. If there is an eagle nest on-site while work is on-going, eagles may be disturbed. We recommend avoiding and minimizing disturbance to eagles whenever practicable. If you cannot avoid eagle disturbance, you may seek a permit. A nest take permit is always required for removal, relocation, or obstruction of an eagle nest. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds **-** The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers **-** Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts.

Transmission Lines **-** Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy **-** To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's Wind Energy Guidelines. In addition, please refer to the Service's Eagle Conservation Plan Guidance, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

State Department of Natural Resources Coordination
While it is not required for your Federal section 7 consultation, please note that additional state endangered or threatened species may also have the potential to be impacted. **Please contact the Minnesota or Wisconsin Department of Natural Resources for information on state listed species that may be present in your proposed project area.**

Minnesota
Minnesota Department of Natural Resources - Endangered Resources Review Homepage
Email: Review.NHIS@state.mn.us

Wisconsin
Wisconsin Department of Natural Resources - Endangered Resources Review Homepage
Email: DNRERReview@wi.gov

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

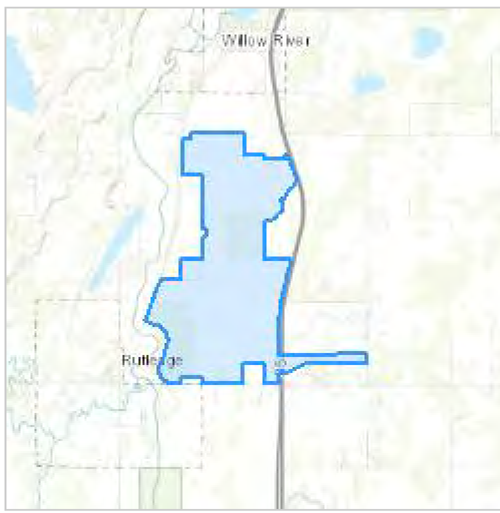
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
(952) 858-0793

PROJECT SUMMARY

Project Code: 2025-0025392
Project Name: Iron Pine Solar
Project Type: Power Gen - Solar
Project Description: The Project will consist of an approximately 2,207-acre solar facility located in Kettle River Township in Pine County. The high voltage transmission line will consist of approximately 5,275 feet of 230 kV line located in Kettle River Township in Pine County. As proposed, the transmission line will start at the solar energy generating system's collector substation and extend to Minnesota Power's Arrowhead-Bear Creek 230 kV transmission line. The transmission line has the sole purpose of delivering the output of the associated solar energy generating system to the transmission grid. The enclosed Project Area map depicts the proposed Project.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@46.2809052,-92.83665508776522,14z



Counties: Pine County, Minnesota

ENDANGERED SPECIES ACT SPECIES

There is a total of 4 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Canada Lynx *Lynx canadensis* Population: Wherever Found in Contiguous U.S. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf *Canis lupus* Population: MN There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4488	Threatened

BIRDS

NAME	STATUS
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

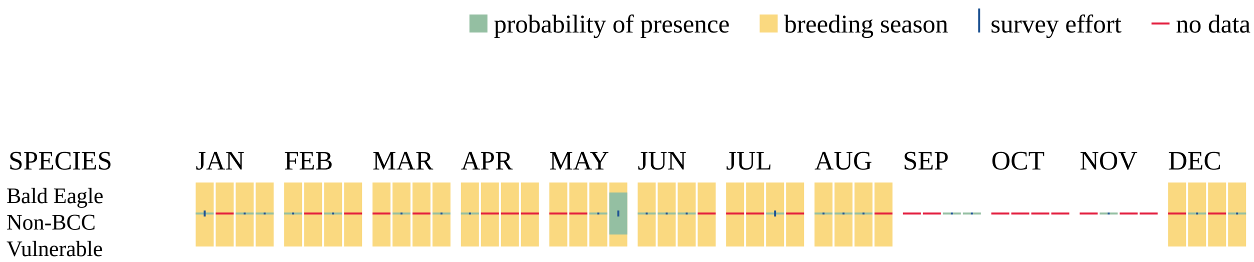
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)

Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Veery *Catharus fuscescens fuscescens* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/11987	Breeds May 15 to Jul 15

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

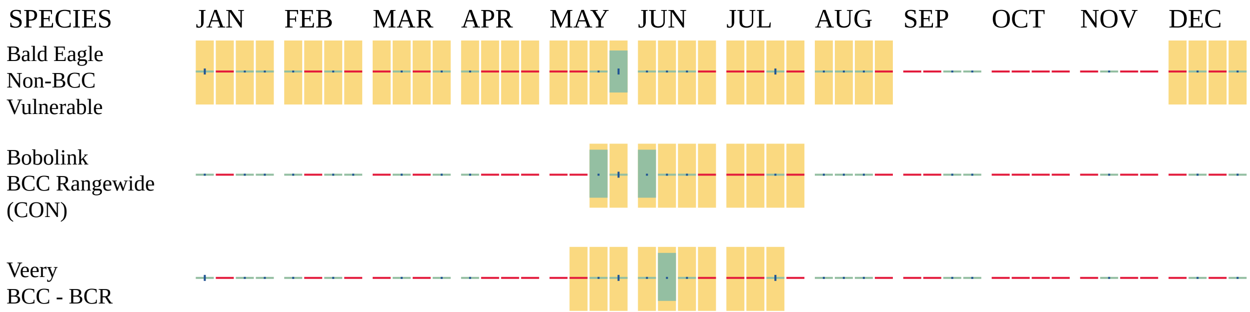
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

■ probability of presence ■ breeding season | survey effort – no data



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER FORESTED/SHRUB WETLAND

- PSS3/4Dg
- PSS1A
- PFO1A
- PSS1D
- PFO1Ad
- PSS1Dd
- PSS1C
- PFO1/4Dd
- PSS1Ad

RIVERINE

- R5UBFx
- R4SBC
- R2UBH
- R5UBH
- R2UBFx

FRESHWATER EMERGENT WETLAND

- PEM1Ad
- PEM1D
- PEM1Af
- PEM1C

FRESHWATER POND

- PUBHx

IPAC USER CONTACT INFORMATION

Agency: Barr Engineering Co.
Name: David Haar
Address: 4300 MarketPointe Dr Suite 200
City: Minneapolis
State: MN
Zip: 55345
Email dhaar@barr.com
Phone: 9528423625

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Army Corps of Engineers

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 11/27/2024 21:07:45 UTC
Project code: 2025-0025392
Project Name: Iron Pine Solar

Subject: Verification letter for 'Iron Pine Solar' for specified threatened and endangered species that may occur in your proposed project location consistent with the Minnesota-Wisconsin Endangered Species Determination Key (Minnesota-Wisconsin DKey).

Dear David Haar:

The U.S. Fish and Wildlife Service (Service) received on **November 27, 2024** your effect determination(s) for the 'Iron Pine Solar' (Action) using the Minnesota-Wisconsin DKey within the Information for Planning and Consultation (IPaC) system. You have submitted this key to satisfy requirements under Section 7(a)(2). The Service developed this system in accordance of with the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C 1531 et seq.).

Based on your answers and the assistance of the Service's Minnesota-Wisconsin DKey, you made the following effect determination(s) for the proposed Action:

Species	**Listing Status**	**Determination**
Canada Lynx (*Lynx canadensis*)	Threatened	NLAA
Gray Wolf (*Canis lupus*)	Threatened	NLAA
Monarch Butterfly (*Danaus plexippus*)	Candidate	No effect
Whooping Crane (*Grus americana*)	Experimental Population, Non-Essential	No effect

<u>Determination Information</u>

The Service will notify you within 30 calendar days if we determine that this proposed Action does not meet the criteria for a "may affect, not likely to adversely affect" (NLAA) determination for Federally listed species in Minnesota and Wisconsin. If we do not notify you within that timeframe, you may proceed with the Action under the terms of the NLAA concurrence provided here. This verification period allows the Minnesota-Wisconsin Ecological Services Field Office to apply local knowledge to evaluation of the Action, as we may identify a small subset of actions having impacts that were unanticipated. In such instances, the Minnesota-Wisconsin

Ecological Services Field Office may request additional information to verify the effects determination reached through the Minnesota-Wisconsin DKey.

Additional Information

Sufficient project details: Please provide sufficient project details on your project homepage in IPaC (Define Project, Project Description) to support your conclusions. Failure to disclose important aspects of your project that would influence the outcome of your effects determinations may negate your determinations and invalidate this letter. If you have site-specific information that leads you to believe a different determination is more appropriate for your project than what the Dkey concludes, you can and should proceed based on the best available information.

Future project changes: The Service recommends that you contact the Minnesota-Wisconsin Ecological Services Field Office or re-evaluate the project in IPaC if: 1) the scope or location of the proposed Action is changed; 2) new information reveals that the action may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the Action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occurs, additional consultation with the Service should take place before project changes are final or resources committed.

For non-Federal representatives: Please note that when a project requires consultation under section 7 of the Act, the Service must consult directly with the Federal action agency unless that agency formally designates a non-Federal representative (50 CFR 402.08). Non-Federal representatives may prepare analyses or conduct informal consultations; however, the ultimate responsibility for section 7 compliance under the Act remains with the Federal agency. Please include the Federal action agency in additional correspondence regarding this project.

Species-specific information

Gray Wolf: Please notify the Service if there is observed gray wolf activity during project implementation that could indicate a den or rendezvous site in close proximity (e.g., multiple wolves observed).

Bald and Golden Eagles: Bald eagles, golden eagles, and their nests are protected under the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d) (Eagle Act). The Eagle Act prohibits, except when authorized by an Eagle Act permit, the “taking” of bald and golden eagles and defines “take” as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” The Eagle Act’s implementing regulations define disturb as “… to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.”

Coordination with the Service is not complete if additional coordination is advised above for any species.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

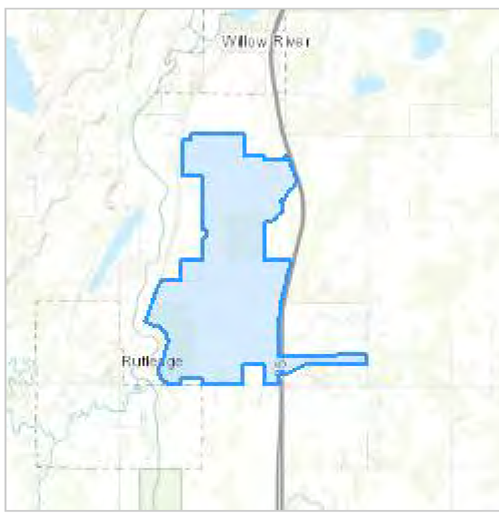
Iron Pine Solar

2. Description

The following description was provided for the project 'Iron Pine Solar':

> The Project will consist of an approximately 2,207-acre solar facility located in Kettle River Township in Pine County. The high voltage transmission line will consist of approximately 5,275 feet of 230 kV line located in Kettle River Township in Pine County. As proposed, the transmission line will start at the solar energy generating system's collector substation and extend to Minnesota Power's Arrowhead-Bear Creek 230 kV transmission line. The transmission line has the sole purpose of delivering the output of the associated solar energy generating system to the transmission grid. The enclosed Project Area map depicts the proposed Project.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@46.2809052,-92.83665508776522,14z



QUALIFICATION INTERVIEW

1. This determination key is intended to assist the user in evaluating the effects of their actions on Federally listed species in Minnesota and Wisconsin. It does not cover other prohibited activities under the Endangered Species Act (e.g., for wildlife: import/export, Interstate or foreign commerce, possession of illegally taken wildlife, etc.; for plants: import/export, reduce to possession, malicious destruction on Federal lands, commercial sale, etc.) or other statutes. Additionally, this key DOES NOT cover wind development, purposeful take (e.g., for research or surveys), communication towers that have guy wires or are over 450 feet in height, aerial or other large-scale application of any chemical (such as insecticide or herbicide), and approval of long-term permits or plans (e.g., FERC licenses, HCP's).

   Click **YES** to acknowledge that you must consider other prohibitions of the ESA or other statutes outside of this determination key.

   Yes
2. Is the action being funded, authorized, or carried out by a Federal agency?

   Yes
3. Are you the Federal agency or designated non-federal representative?

   No
4. Does the action involve the installation or operation of wind turbines?

   No
5. Does the action involve purposeful take of a listed animal?

   No
6. Does the action involve a new communications tower?

   No
7. Does the activity involve aerial or other large-scale application of ANY chemical, including pesticides (insecticide, herbicide, fungicide, rodenticide, etc)?

   No
8. Will your action permanently affect local hydrology?

   No
9. Will your action temporarily affect local hydrology?

   No
10. Will your project have any direct impacts to a stream or river (e.g., Horizontal Directional Drilling (HDD), hydrostatic testing, stream/road crossings, new stormwater outfall discharge, dams, other in-stream work, etc.)?

    No

11. Does your project have the potential to impact the riparian zone or indirectly impact a stream/river (e.g., cut and fill; horizontal directional drilling; construction; vegetation removal; pesticide or fertilizer application; discharge; runoff of sediment or pollutants; increase in erosion, etc.)?

    Note: Consider all potential effects of the action, including those that may happen later in time and outside and downstream of the immediate area involved in the action.

    Endangered Species Act regulation defines "effects of the action" to include all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. (50 CFR 402.02).

    No
12. Will your action disturb the ground or existing vegetation?

    Note: This includes any off-road vehicle access, soil compaction (enough to collapse a rodent burrow), digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application (herbicide, fungicide), vegetation management (including removal or maintenance using equipment or prescribed fire), cultivation, development, etc.

    Yes
13. Will your action include spraying insecticides?

    No
14. Does your action area occur entirely within an already developed area?

    Note: Already developed areas are already paved, covered by existing structures, manicured lawns, industrial sites, or cultivated cropland, AND do not contain trees that could be roosting habitat. Be aware that listed species may occur in areas with natural, or semi-natural, vegetation immediately adjacent to existing utilities (e.g. roadways, railways) or within utility rights-of-way such as overhead transmission line corridors, and can utilize suitable trees, bridges, or culverts for roosting even in urban dominated landscapes (so these are not considered "already developed areas" for the purposes of this question). If unsure, select NO..

    No
15. Have you determined that the action will have no effect on individuals within the whooping crane nonessential experimental population (NEP)?

    Yes
16. Is there any potential for this action to harm Canada lynx directly (e.g., mammal trapping, poison bait, broadcasting disease control agents for wild animals, capturing animals for research projects, or regular human activity that may exclude lynx from forested habitat including blasting or explosives)?

    No
17. Is your action associated with the U.S. Forest Service?

    No

18. Is there any potential for this action to harm Canada lynx indirectly (e.g., increased traffic volume and speed that may result in vehicle strikes, regular human activity that may disturb or exclude lynx from forested habitat, blasting or explosives)?

    No

19. Will the action result in changes to Canada lynx or snowshoe hare habitat quality, quantity, or availability that is greater than 10 acres?
    E.g., thinning and/or other timber management and logging practices; residential and commercial development; road, railroad and utility corridors development; mining activities; prescribed fire; trail development; winter activities that compact snow such as winter road use, snowmobiling, cross country skiing, and dog sledding.

    No

20. Is there any potential for the action to harm wolves directly (e.g., mammal trapping, poison bait), or indirectly (e.g., increasing vehicle use that may result in vehicle strikes, exposure to potential human persecution)?

    No

21. [Hidden Semantic] Does the action area intersect the Threatened gray wolf AOI?

    Automatically answered
    Yes

22. [Hidden Semantic] Does the action area intersect the monarch butterfly species list area?

    Automatically answered
    Yes

23. Under the ESA, monarchs remain warranted but precluded by listing actions of higher priority. The monarch is a candidate for listing at this time. The Endangered Species Act does not establish protections or consultation requirements for candidate species. Some Federal and State agencies may have policy requirements to consider candidate species in planning. We encourage implementing measures that will remove or reduce threats to these species and possibly make listing unnecessary.

    If your project will have no effect on monarch butterflies (for example, if your project won't affect their habitat or individuals), then you can make a "no effect" determination for this project.

    Are you making a "no effect" determination for monarch?

    Yes

IPAC USER CONTACT INFORMATION

Agency: Barr Engineering Co.
Name: David Haar
Address: 4300 MarketPointe Dr Suite 200
City: Minneapolis
State: MN
Zip: 55345
Email dhaar@barr.com
Phone: 9528423625

LEAD AGENCY CONTACT INFORMATION

Lead Agency: Army Corps of Engineers

Appendix I

Natural Heritage Review

Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

January 31, 2024
Correspondence # MCE 2023-00842

Jennifer Kamm
Stantec

RE: Natural Heritage Review of the proposed **Iron Pine Solar Project,**
Pine County

Dear Jennifer Kamm,

As requested, the Minnesota Natural Heritage Information System has been reviewed to determine if the proposed project has the potential to impact any rare species or other significant natural features. Based on the project details provided with the request, the following rare features may be impacted by the proposed project:

Ecologically Significant Areas

- The proposed project is directly adjacent to two areas preliminarily identified by the Minnesota Biological Survey (MBS) as Sites of ***Outstanding*** (**Lower Kettle River**) or ***Moderate*** (**Banning North**) Biodiversity Significance. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *Outstanding* contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes present in the state. Sites ranked as *Moderate* contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.

  The proposed project is directly adjacent to Dry Barrens Oak Savanna (Southern) Jack Pine Subtype (UPS14a1), a rare MN DNR Native Plant Community (NPC), which is considered **critically imperiled** (S1) in Minnesota.

  Development activities can negatively affect adjacent native plant communities, especially through the introduction of invasive plant species. As such, disturbance near these ecologically significant areas should be minimized. Actions to minimize disturbance may include, but are not limited to, the following recommendations:

- Retain a buffer between proposed activities and both the MBS Site and NPCs.
- Use effective erosion prevention and sediment control measures.
- If possible, conduct the work under frozen ground conditions.
- Inspect and clean all equipment prior to bringing it to the Site to prevent the introduction and spread of invasive species.
- As much as possible, operate within already-disturbed areas.
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern are birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas.
- For additional information regarding solar projects, please see Commercial Solar Siting Guidance.

MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be viewed using the Explore page in Minnesota Conservation Explorer or their GIS shapefiles can be downloaded from the MN Geospatial Commons. Please contact the NH Review Team if you need assistance accessing the data. Reference the MBS Site Biodiversity Significance and Native Plant Community websites for information on interpreting the data. To receive a list of MBS Sites of Biodiversity Significance and DNR Native Plant Communities in the vicinity of your project, create a Conservation Planning Report using the Explore Tab in Minnesota Conservation Explorer.

State-listed Species

- Several state-listed aquatic species have been documented in the Kettle River in the vicinity of the proposed project. These aquatic species are particularly vulnerable to deterioration in water quality, especially increased siltation. Given streams in the vicinity of the proposed project flow into the Kettle River, **it is important that effective erosion prevention and sediment control practices are implemented and maintained for the duration of the project and incorporated into any stormwater management plan.**

- The Natural Heritage Information System (NHIS) tracks bat roost trees and hibernacula plus some acoustic data, but this information is not exhaustive. Even if there are no bat records listed nearby, all seven of Minnesota's bats, including the federally endangered northern long-eared bat (*Myotis septentrionalis*), can be found throughout Minnesota. During the active season (approximately April-November) bats roost underneath bark, in cavities, or in crevices of both live and dead trees. Tree removal can negatively impact bats by destroying roosting habitat, especially during the pup rearing season when females are forming maternity roosting colonies and the pups cannot yet fly. To minimize these impacts, **the DNR recommends that tree removal be avoided from June 1 through August 15.**

- Please visit the DNR Rare Species Guide for more information on the habitat use of these species and recommended measures to avoid or minimize impacts.

Federally Protected Species

- To ensure compliance with federal law, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online Information for Planning and Consultation (IPaC) tool.

Environmental Review and Permitting

- Please include a copy of this letter and the MCE-generated Final Project Report in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, **the results of this Natural Heritage Review are valid for one year**; the results are only valid for the project location and project description provided with the request. If project details change or the project has not occurred within one year, please resubmit the project for review within one year of initiating project activities.

The Natural Heritage Review does not constitute project approval by the Department of Natural Resources. Instead, it identifies issues regarding known occurrences of rare features and potential impacts to these rare features. Visit the Natural Heritage Review website for additional information regarding this process, survey guidance, and other related information. For information on the environmental review process or other natural resource concerns, you may contact your DNR Regional Environmental Assessment Ecologist.

Thank you for consulting us on this matter and for your interest in preserving Minnesota's rare natural resources.

Sincerely,

Molly Barrett
Natural Heritage Review Specialist
Molly.Barrett@state.mn.us

Cc: Jessica Parson, Regional Environmental Assessment Ecologist, Region 2 (Northeast)
Cc: Cynthia Warzecha, Energy Projects Review