September 2019

Minnesota Public Utilities Commission

Application for a Site Permit

Appendix C - Elk Creek Agricultural Impact Mitigation Plan (AIMP)

PUC Docket No. IP7009/GS-19-495

Elk Creek Solar Project

Rock County, Minnesota

Submitted by:
Elk Creek Solar, LLC
7650 Edinborough Way
Suite 725
Edina, MN 55435

GERONIMO® ENERGY
a nationalgrid company

ELK CREEK SOLAR

Appendix C – Agricultural Impact Mitigation Plan (AIMP) and Vegetation Management Plan

Agricultural Impact Mitigation Plan for the Elk Creek Solar Project

Elk Creek Solar, LLC

Rock County, MN

September 2019

7650 Edinborough Way
Suite 725
Edina, MN 55435

Prepared by:

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS & DEFINITIONS

AC	alternating current
AIMP or Plan	Agricultural Mitigation Plan
BMPs	best management practices
Contractor	construction contractor
CSAH	County State Aid Highway
DC	direct current
decompaction	Treatment which relieves soil compaction by introducing air space into the soil.
drain tile	System that removes excess water from the soil; typically, below-ground.
GPS	global positioning system
kV	kilovolt
Elk Creek Solar or Elk Creek	Elk Creek Solar, LLC
Land Control Area	Approximate 976-acre area of privately-owned land for which Elk Creek Solar, LLC has a purchase option
LCC	Land Capability Class
Monitor	environmental monitor
MDA	Minnesota Department of Agriculture
MNDNR	Minnesota Department of Natural Resources
MW	megawatts
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
O&M building	operations and maintenance building
Preliminary Development Area	Approximate 680-acre area where Elk Creek Solar, LLC proposes to build the Elk Creek Solar Project facilities
Project, Project Site, or Project Area	Elk Creek Solar Project
PV	photovoltaic
SCADA	Supervisory Control and Data Acquisition
SSURGO	Soil Survey Geographic Database
SWPPP	Stormwater Pollution Prevention Plan
Tile Contractor	agricultural drain tile contractor

1.0 PURPOSE AND APPLICABILITY OF PLAN

The objective of this Agricultural Impact Mitigation (the Plan or AIMP) and the accompanying Vegetation Management Plan (available in Appendix C) is to identify measures that Elk Creek Solar, LLC (Elk Creek Solar/Elk Creek) and its contractors will take to avoid, and/or repair potential negative agricultural impacts that may result from the construction, operation, and eventual decommissioning of the Elk Creek Solar Generating System Project (Project, Project Site, Project Area). Although Elk Creek Solar will own or lease the property on which the Project is constructed, and would cease agricultural production on the land during the life of the Project, this Plan outlines measures to ensure the land may be returned to future agricultural usages following the closure and decommissioning of the Project, including descriptions of best management practices (BMPs) that will be used during construction to minimize long-term impacts to soil. It is important to note that while Elk Creek Solar and the construction contractor (the Contractor) hired to build the facility fully intend to adhere to the specifics of this plan, certain practices may vary as the Contractor identifies methods that work more efficiently in this specific location and provide the highest degree of safety while constructing the facility.

Elk Creek Solar consulted with the Minnesota Department of Agriculture (MDA) in April 2019 to discuss the AIMP's contents and site-specific characteristics. MDA also reviewed and commented on draft versions of the AIMP. The Plan presented here incorporates agency feedback on the draft version of the Plan.

The strategy outlined in this Plan consists of creating a native prairie habitat within the footprint of the solar project while the Project is in operation. Typically, a solar site has a shorter prairie mix within the panel footprint, taller prairie plantings in the open space between the fence and array, and a wet seed mix for any wetlands or areas anticipated to hold water. The mixes are designed to be native and are developed with prairie specialists in coordination with the Minnesota Department of Natural Resources (MNDNR) to design a mix that will achieve Elk Creek's goals for operating the solar facility, promote pollinator habitat, establish stable ground cover successfully, reduce erosion, reduce runoff, and improve infiltration. MNDNR has reviewed the proposed seed mixes and approves of their use. Additionally, the contracted restoration company will work with Elk Creek to develop implementation plans for maintenance of the prairie throughout the life of the Project. More information on maintenance of the prairie is outlined in the Vegetation Management Plan.

This Plan is separated into several distinct sections: Section 2 provides an overview of the proposed Project and its components. Section 3 addresses limitations and suitability of the soils at the Project, Section 4 discusses the BMPs that will be used during construction and operation of the Project, and Section 5 outlines decommissioning.

2.0 PROJECT OVERVIEW

2.1 Background

Elk Creek Solar, a wholly owned subsidiary of Geronimo Energy, LLC, proposes to construct the Elk Creek Solar Project on approximately 976 acres (Land Control Area) of land in Magnolia Township, Sections 27 and 35, Township 103 North, Range 44 West, Rock County, Minnesota (Figure 1 – Project Location). Elk Creek Solar anticipates that approximately 680 acres (Preliminary Development Area) will be affected by Project facilities (Figure 2 – Land Control and Preliminary Development Areas). The Project lies north of Interstate 90 between County State Aid Highway (CSAH 8 and 9) approximately three miles north of the Town of Magnolia and 6 miles northeast of the City of Luverne Minnesota. The Project will generate up to 80 megawatts (MW), enough energy to provide electricity for approximately 18,000 homes annually and avoid the emission of approximately 113,000 metric tons of carbon annually. The Project is to be placed in service by the end of 2021.

The Project will interconnect to the adjacent Magnolia Substation, which is owned and operated by ITC Midwest. Elk Creek Solar selected this site due to its close proximity to existing and planned transmission facilities, existing road infrastructure, and the relatively flat, unobstructed terrain on the Project site. Importantly, in selecting the Project site, Elk Creek Solar also concluded that its development will not result in significant environmental impacts.

The Project Site is on a nearly level to gently rolling loess-mantled glacial till plain consisting of gray, calcareous pre-Wisconsin-aged till covered by a thin to thick mantle of Wisconsin-aged Loess. The nearly-level topography combined with highly fertile soils, favorable moisture holding characteristics, and usually adequate supplies of moisture from precipitation are well suited to agriculture, which is currently the dominant land use for the Project Area. Swales and depressions that were historically wet have been converted by subsurface drainage to highly productive farmland.

Elk Creek Solar has entered into lease or purchase option agreements with landowners for all of the parcels on which the Project would be constructed. Elk Creek would exercise its purchase options and hold title to the purchased property after the Site Permit is issued and prior to the start of construction. Concurrently, leased property will move into the operation term under the lease agreement. All Project facilities shown in the preliminary site layout (Figures 3 and 4 – Below-Ground Preliminary Project Layout and Above-Ground Preliminary Project Layout) were sited on land for which Elk Creek Solar currently has either a purchase option or lease. The current land interests under purchase option and lease are sufficient to accommodate the Project's facilities and setback requirements.

2.2 Project Components

The Project will include the following major components, systems and associated facilities:

- Solar panels, racking system, and inverters
- Electrical collection system
- Project substation

- Operations and maintenance building (O&M building)
- Access roads
- Up to two weather stations (up to 20 feet tall)
- Perimeter fencing

Each of these components is described in more detail below.

2.2.1 Configuration of Solar Panels, Arrays, and Racking

The Project will convert sunlight into direct current (DC) electrical energy within photovoltaic (PV) panels. For purposes of describing construction, the Project can be considered an aggregate of individual PV panel components interconnected by cabling and infrastructure at increasing scales to ultimately deliver up to 80 MW of nameplate alternating current (AC) of electricity to the existing Magnolia substation currently on the electrical grid and immediately adjacent to the Project. From smallest to largest scales Project components are described below and presented on Figure 5 (Configuration of Project Components):

1. **Individual PV panels** are approximately 4 to 6.5 feet long by 2 to 3.5 feet wide by 1 to 2 inches thick and are installed on metal foundations that are driven or screwed into the ground.
2. **Lines** of interconnected PV panels consist of a line of short-edge butted panels approximately 290-feet long, with each line oriented to and rotating along a north-south axis to track the east-west movement of the sun and maximize the interception of solar energy. These lines represent the racking upon which the individual panels are mounted upon.
3. **Arrays** PV of north/south lines of PV panels organized in racks associated with an east/west oriented access road.
4. **Blocks** of PV panels typically consist of one or two arrays north, and one or two arrays south of a permanent access and maintenance road. Depending on site constraints, there may be fewer arrays associated with a specific block. Perimeter access roads are typically present on the east and west sides of individual blocks.
5. **Construction Units** consist of Blocks of PV panels delineated by their connectivity and relationship to main roads. The Project consists of:
    a. a 320-acre (approximate) **North Unit** bounded by 141st Street to the south, 151st Street to the North, 180th avenue to the west, and 190th Avenue to the east.
    b. a 130-acre (approximate) **Central Unit** bounded by an existing 161 kV transmission line to the south, 141st Street to the north, 190th Avenue to the west, and CSAH 3 to the east.
    c. a 220-acre (approximate) **South Unit** bounded by 131st Street to the south, an existing 161 kV transmission line to the north, 190th avenue to the west, and CSAH 3 to the east.
6. Approximately 3,200 feet of electrical collection system along the west side of 190th Avenue to connect the North and South construction units at the Project substation.

Elk Creek Solar will use a single axis tracking system where the panels within a line are rotated by small motors to track with the sun throughout the day. The panels aligned in rows north and south face east in the morning, parallel to the ground during mid-day, and then west in the

afternoon. Panels can be manually oriented to the east or west at maximum tilt angle to facilitate maintenance access and vegetation management, if necessary, although spacing between the panel edges when at a horizontal position is typically 13.3 feet and sufficient for maintenance vehicles. Separation of PV Panel lines will typically be 20-feet from turning axis to turning axis.

2.2.2 Inverters, Transformers, and Electrical Collection System

Electrical wiring will connect the panels to inverters, which will convert the power from DC to AC. The AC will be stepped up through a transformer from the inverter output voltage to 34.5 kilovolt (kV) and brought via the collection cables to the Project substation. The electrical collection system will be installed below-ground, above-ground, or a combination of both. The type of electrical system will be determined prior to construction based on technology, availability of materials, and costs. It should be noted that both the below-ground and above-ground collection systems are currently used at utility-scale solar projects. The inverters and electrical cables that would be used for each type of electrical collection system are described below.

2.2.2.1 Below-ground Electrical Collection System

Inverters convert approximately 1,500 volts of DC output of the PV panels to between 650-950 volts of AC. Then a step-up transformer converts the inverter AC voltage to an intermediate voltage of 34.5kV. The panels deliver DC power to the inverters through cabling that will be located in a below-ground trench (approximately four feet deep and one to two feet wide). Below-ground AC collection systems from the inverter skids to the substation will be installed in trenches or ploughed into place at a depth of at least four feet below grade. During all trench excavations the topsoil and subsoil will be removed and stockpiled separately in accordance with the Section 4.7 of this Plan. Once the cables are laid in the trench, the area will be backfilled with subsoil followed by topsoil. Electrical collection technology is rapidly evolving and will be site-specific depending on geotechnical analysis, constructability, and availability of materials. Final engineering and procurement will help determine the construction method for the electrical collection system.

For below-ground cabling, inverter skids will be utilized at locations throughout the Preliminary Development Area and include a transformer to which the inverters will feed electricity. The final number of inverters for the Project will depend on the inverter size, as well as inverter and panel availability. The Project's preliminary design assumes below-ground cabling to represent the maximum potential impacts and has proposed 34 central inverter skids (one inverter is required for every 2-3 MW). These skids provide the foundation for the inverter, transformer, and SCADA system. The skids will be placed atop a concrete slab or pier foundations and typically measure 10 feet wide by 25 feet long, with a structure height of approximately 12 feet above grade. Concrete foundations will be poured onsite or precast and assembled off-site. The inverters are within the interior of the Project along access roads.

2.2.2.2 Above-ground Electrical Collection System

An above-ground electrical system is being considered for the Project for several reasons including ease of access for operations and maintenance, reduced ground disturbance, and cost considerations. If above-ground cabling is utilized, the DC collection cables will be strung under

each row of panels on steel arms and a steel cable attached to the piles. At the end of each row, hanging brackets would connect several racks/rows of cables to their assigned inverter/transformer skid where the current is converted to AC and voltage is stepped up to 34.5 kV. The electrical cables will then be routed to a distribution-type pole. These poles would be made of wood and be approximately 30 feet in height. Above-ground medium voltage collection technology is rapidly evolving and, if utilized, the number of poles will be determined based on final engineering. Cables connecting each unit of solar arrays will be directionally bored under or spanned over township roads. If a combined above-ground/below-ground system is utilized, DC collection cables will be strung under each row of panels and as described above and AC collection will be buried below-ground from the inverter/transformer skid to the substation.

2.2.3 Project Substation and Operations and Maintenance Building

The Project will have an on-site substation that combines all the AC power from the collection circuits. This substation will be located within the Project Area South Unit and in proximity to the existing Magnolia Substation as depicted in Figures 3 and 4. The Project substation will occupy approximately 2.5 acres and the ground coverage will be washed rock. The Project substation will be a 34.5/161 kV step-up substation with metering and switching gear required to connect to the transmission grid. It will be designed according to regional utility practices, Midcontinent Independent Transmission System Operator Standards, Midwest Reliability Organization Standards, National Electrical Safety Code, and the Rural Utility Service Code. The area within the substation will be graveled to minimize vegetation growth in the area and reduce fire risk. The substation will be fenced with a 6-foot chain-link fence, topped with one foot of barbed wire for security and safety purposes. The substation's area will be approximately 150 feet by 150 feet once construction is complete.

An O&M building will provide access and storage for Project maintenance and operations and will be located adjacent to the Project substation (adjacent to the 2.5-acre footprint described above). The Project will obtain a building permit for the O&M building from Rock County prior to construction. The buildings typically used for this purpose are approximately 2,000 to 4,000 square feet and will be made of metal. It will contain an office for the onsite Plant Manager, a technician room, restroom, and storage area for equipment to operate and maintain the Project. Equipment includes a Supervisory Control and Data Acquisition (SCADA) cabinet, spare panels, spare parts for the substation and equipment to operate the substation, as well as safety equipment for working with live electricity.

A parking lot will be located adjacent to the O&M building and will be approximately 500 square feet with the final size being determined in accordance with the Rock County Planning and Zoning Ordinance. The parking lot will be gravel or paved depending on the size to comply with the parking and loading regulations detailed in Section 29 of the Rock County Planning and Zoning Ordinance (Rock County, 2000).

2.2.4 Access Roads

The Project will include approximately 11.8 miles of graveled access roads that lead to the inverters and Project substation for operation and maintenance. The final length of the access roads will depend on the equipment selected and final engineering. These roads are up to 16 feet wide

along straight portions of the roads and wider along curves at internal road intersections (approximately 45 feet). There are four access points to the Project from existing county roads: one to each construction unit and one to the Project substation. These entrances will have locked gates.

Elk Creek has included an access road around the perimeter of the Project for effective and efficient access for operations and maintenance and for safe ingress and egress of employees, visitors and emergency responders. Elk Creek has minimized the amount of access roads within the Preliminary Development Area. Prior versions of the site plan had access roads between every block of racking, which resulted in approximately 14.2 miles of access roads. The site plan included here has removed ancillary access roads that don't provide direct access to inverters resulting in a nearly 17 percent decrease in the miles of access roads included in the Project design.

Some upgrades or other changes to the public roads may be required for construction or operation of the Project. Elk Creek will work with Rock County to facilitate and pay for required upgrades that meet the required public standards. Upgrades or changes could include, but are not limited to, road improvements, additional aggregate, and driveway changes. Road improvements may require a road use and repair agreement with Rock County and/or Vienna Township; Elk Creek will continue to coordinate with both agencies as the Project develops. Driveway changes will require a county entrance permit from Rock County, which will be obtained prior to construction.

2.2.5 Permanent Fencing

Permanent security fencing will be installed along the perimeter of the solar arrays and North and South Unit's Preliminary Development Area. Fencing will be secured to posts which will be directly embedded in the soil or set in concrete foundations as required for structural integrity. The fencing will consist of an agricultural woven wire fence and will extend approximately 6 feet above grade. At the request of MNDNR, barbed wire will not be used around the perimeter of the Project, and instead one foot of 3-4 strands of smooth wire will be used. However, the fencing around the substation will be a 6-feet above grade chain-link fence and include one foot of barbed wire to comply with the National Electric Code. This fencing will be designed to prevent the public from gaining access to electrical equipment which could cause injury. Additionally, the fencing will prevent larger wildlife from entering the facility.

2.2.6 Stormwater Drainage Basins

Elk Creek has preliminarily designed 13 drainage basins throughout the Preliminary Development Area that range in size from 0.7 to 1.8-acre. These basins are located in existing low areas that also contain hydric soils and for which the preliminary design for solar facilities has avoided. These areas will be vegetated with a wet seed mix that will help stabilize soils after rain events.

2.2.7 Transmission System

The Project will interconnect into the existing Magnolia Substation via a 161-kV overhead gen-tie transmission line of less than 1,500 feet. There will be a single dead-end structure within the Project substation and likely 2-3 additional structures to enter the Magnolia Substation with an overall length currently estimated to be approximately 300 feet, pending final engineering. The structures will likely be made of wood and will be less than 150 feet tall. The type of conductor

will be determined following the completion of detailed electrical design. Per Minn. Stat. 216E.01 subd. 4, the transmission line does not meet the high voltage transmission line definition because it's less than 1,500 feet. As such, a separate route permit from the Commission will not be required for the gen-tie line.

2.2.8 Temporary Facilities

Elk Creek will utilize five temporary laydown areas within the Preliminary Development Area, totaling between 17.6 acres (below-ground configuration) and 20.4 acres (above-ground configuration). These areas will serve both as a parking area for construction personnel and staging areas for Project components during construction. These laydown areas have been sited to avoid any tree clearing. After construction, the five laydown areas within the Preliminary Development Area will be reseeded as described in the Vegetation Management Plan.

2.3 Construction

2.3.1 Site Clearing & Vegetation Removal

Depending on timing of the start of construction, the Project may require the clearing of residual row-crop debris from the 2020 harvest season. Alternatively, and depending on construction timing, Elk Creek may plant a cover crop in Spring 2020 that is compatible with the Project's Vegetation Management Plan (Appendix C). This cover crop would stabilize soils if row crops are not planted that year.

2.3.2 Earthwork

The majority of soil disturbances will occur during the first phase of Project construction when the grading activities take place. The Contractor may need to move some soils to "flatten" certain parts of the local terrain or, at the very least, to complete minor grading of topsoils. The earthwork activities will be completed using typical civil construction equipment – scrapers, bulldozers, front-end loaders, back-hoes or skid-steers. BMPs that will be used during these earthmoving activities are described in detail in Section 2.3.3 - Access Road Construction.

2.3.3 Access Road Construction

As a component of earthwork, permanent access roads and permanent turnouts will be developed as indicated in Figures 3 and 4, within the Project perimeter fence. This work would start with the stripping and segregating of topsoil materials from the anticipated 16-foot-wide road width. The Contractor will then compact the subgrade materials 16-feet wide to the specified compaction requirements as laid out by the civil and geotechnical engineer. After suitable compaction levels are reached and verified, the Contractor will then install the road as designed, typically done with or without geo-fabric depending on the soil type and then a surface of 4 to 12 inches of gravel. The gravel will be placed level with the existing grade to facilitate drainage and minimize ponding.

After gravel is installed and compacted to engineers' requirements, the Contractor will shape Project drainage ditches as identified on the final grading plan. Finally, the previously stripped and windrowed topsoil material will be re-spread throughout the Project Area.

Elk Creek has chosen low-relief areas within the Project Area to support Project infrastructure thus minimizing the amount of topsoil that will need to be removed due to grading. Topsoil removed from permanent access roads will be removed to suitable locations near the site of removal and graded for storage. Storage locations will be identified (global positioning system [GPS] boundary and depth) and recorded on site maps to facilitate final reclamation after decommissioning.

2.3.4 Solar Array Construction

Once grading activities are complete, the racking system supports will be constructed using steel piles driven into the ground. In some situations where soils are low strength or consist of loose, non-cohesive sand, helical screw or auger-type foundation posts may be used. Foundations are typically galvanized steel and used where high load bearing capacities are required. The pile is driven using a hydraulic ram or screw installer that moves along tracks, which requires two workers. Soil disturbance would be restricted to the hydraulic ram/ screw machinery, about the size of a small tractor, temporarily disturbing soil at each pile insertion location and while driving between drilling locations.

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

During array and racking assembly, multiple crews and various types of vehicles will be working within the Project Area. To the extent practicable, vehicular traffic will be limited to permanent and temporary access roads to minimize soil disturbance, mixing and compaction. 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. Panels will be staged in advance throughout the Project Area and be brought to specific work areas for installation by wagon-type trailers pulled by small tractors or by all-terrain tracked equipment. The solar panels will be installed by multiple crews using hand tools. Installation crews will proceed in serpentine fashion along staked temporary access roads in a pre-established route to minimize off-road traffic.

2.3.5 Electrical Collection System

As noted in Section 2.2.2, the collection system will either be buried in a trench or aboveground in cable trays or conduit. This technology is rapidly evolving and may be site-specific depending on geotechnical analysis, constructability, and availability of materials. Final engineering and procurement will help determine the construction method for the electrical collection system. For the purposes of this Plan, Elk Creek provides construction methods and BMPs for trenching; aboveground collection lines would not require a trench.

Collection system cabling will be installed along access roads using trenching machine or excavator. The trencher will cut an exposed trench approximately 1 foot wide by 4 feet deep. Within the security fence, cables will be installed to a depth of 4 feet; outside of the security fence, cables would be at least 5 feet below ground. Topsoil will be stripped from the trenched area up to a maximum depth of 12 inches using a small backhoe and would be temporarily stored adjacent to the trench. Similar to the pile drivers used to install the racking, the soil disturbance from the

trenching machines would be restricted to the trenching machine tracks only. This machine is the size of a small tractor. Once cables are installed, the trenches would be backfilled using a small, rubber tire or tracked backhoe and compaction equipment. Topsoil would be replaced to the restored trench line, and the pre-construction contour would be re-established using a small front-end loader.

BMPs that will be used during these earthmoving activities are described in detail in Section 3.

2.3.6 Inverter Installation

The inverters units will be placed on frost-footing supported concrete pads or driven/helical screw pier foundations that will be designed to specifications necessary to meet the local geotechnical conditions. Topsoil will be removed and will be stored at suitable pre-established locations and graded to facilitate revegetation. Underground conduit and junction boxes will be installed throughout the Project to facilitate required cabling connecting equipment. Premanufactured skids with inverter, transformer and SCADA equipment may be used. These arrive by typical flat-bed trailer and truck and are set in place by a Rough-terrain hydraulic crane.

2.3.7 Project Substation Construction

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

One of two methods will be used to install substation foundations. Option 1 would be to use a small rubber tire backhoe to dig out major foundations prior to pouring the concrete slabs. Option 2 would use an auger/drill type machine for minor foundations.

In both scenarios, the limit of disturbance will be within the footprint of the substation for both the foundation equipment and the concrete delivery trucks. BMPs that will be used during these earthmoving activities are described in detail in Section 3. All topsoil from the Substation footprint will be removed up to a maximum depth of 12 inches to a pre-established suitable location for storage. The storage area would be near the site where the soil was removed, accurately located (GPS boundary, soil depth) and graded to facilitate revegetation. Subsoil would be removed to an acceptable preestablished and approved area for storage. After decommissioning, subsoil would be returned to the area from which it was excavated (as needed), topsoil would be replaced, and the area would be brought back to pre-construction contours.

2.3.8 Stormwater Drainage Bains

Similar to Project substation construction described above, drainage basins would have topsoil removed and temporarily stored in a pre-established suitable location. Subsoil would then be

excavated to a depth of four to seven feet and the sides of the drainage basin sloped to design, including inlet/outlet. Excavated subsoil would be distributed throughout the site as fill material in areas where grading is required. Topsoil would be replaced and the basins vegetated with a wet seed mix.

2.3.9 Generator-Tie Line Construction

Given the close proximity of the Magnolia Substation and the proposed Project substation, a 161-kV gen-tie line of less than 1,500 feet will be required. This includes 2-3 structures outside of either substation.

2.3.10 Project Fencing Installation

A fencing company will be contracted to construct the perimeter fencing around the Project. The fencing will consist of an agricultural woven fence and will extend approximately 6 feet above grade. At the request of MNDNR, barbed wire will not be used around the perimeter of the Project, and instead 1 foot of 3-4 strands of smooth wire will be used. However, the fencing around the substation will be a 6-feet above grade chain-link fence and include 1 foot of barbed wire to comply with the National Electric Code. The wooden posts for the agricultural fence will be augured or directly embedded, set in place, and backfilled with the soil that was displaced by the auger, if necessary. Chain link posts around the Project substation will be spaced at 10 feet on center. Corner posts will be augured 3.5 feet and embedded in concrete for structural support. All tangent posts will be direct buried 3.5 feet similar to corner posts. The Site will have man doors and gates installed, as needed.

3.0 LIMITATIONS AND SUITABILITY OF SITE SOILS

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
- Drainage and wetness
- Presence of stones, rocks, and shallow bedrock
- Fertility and topsoil characteristics
- Soil slope

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
- Susceptibility to wind and water erosion
- Susceptibility to compaction
- Fertility and Plant Nutrition
- Drought susceptibility and revegetation potential

3.1 Land Use Considerations

Based on an air photo history, virtually all of the Land Control Area has been in agriculture starting prior to 1938, with several hundred acres of wet areas converted to agriculture by subsurface tile drainage. Most of the agricultural land is prime farmland or prime farmland if drained. Typically, high value crops such as corn and soybean rotations are grown in the area. Elk Creek assumes that all subsurface and surface drainage systems will be maintained during Project operation, and that upon decommissioning, all surface infrastructure will be removed and the land will be restored to agriculture.

3.2 Important Soil Characteristics

The Soil Survey Geographic Database (SSURGO) is the digitized county soil survey and provides a GIS relating soil map unit polygons to component soil characteristics and interpretations. Soil map unit polygons in the SSURGO database were clipped to the Project and internal infrastructure boundaries, including the major pieces of infrastructure:

- Fenced area hosting solar panels, racks, and arrays
- Inverter locations
- Access roads
- Laydown areas
- Project substation and O&M building

The acreage of major Project features sharing physical properties, classifications, and limitation interpretations important for construction, use, revegetation, and reclamation were determined by

spatial query of the GIS. Soils within the 976-acre Land Control Area but not anticipated to be affected by construction or operations are indicated in tables but not included in the following analysis, which only includes the 680 acres that will be affected by construction (Preliminary Development Area).

A soil map of the Land Control Area is provided along with a table of selected characteristics of site soils including physical properties, classifications, and construction-related limitations in Appendices A and B.

3.2.1 Selected Physical Characteristics: Texture, Slope, Drainage and Wetness, Topsoil Depth, Bedrock and Presence of Stones and Rocks

There are approximately 976 acres within the Land Control Area. Selected physical characteristics of site soils are broken down by acreage within the 680-acre Preliminary Development Area and the 296-acre undisturbed area in Table 1.

Table 1: Acreage of Soils with Selected Physical Characteristics by Project Feature within the Preliminary Development Area (Total 976 acres)

Project Feature	Total Acres[1]	Textural Family[2]				Slope Range[3]		Drainage Class[4]					Topsoil Thickness[5]			Shallow Bedrock/ Stony[6]
		Fine Loamy	Fine Silty	Fine-Silty over Sandy	Sandy	0-5	>5-8	SWE	W	MW	SWP	P	>6 - 12	>12 - 18	>18	
	Acres															
Preliminary Development Area (Potential Disturbance)																
Fence Area	630.2	18.5	611.7	-	-	630.2	-	-	19.8	280.0	186.0	144.3	1.3	313.9	315.0	-
Access Roads	23.2	1.5	21.7	-	-	23.2	-	-	1.7	8.9	7.8	4.8	0.2	10.6	12.3	-
Inverters	0.4	tr	0.3	-	-	0.4	-	-	tr	0.2	0.1	0.1	-	0.2	0.1	-
Laydown Yards	16.9	-	16.9	-	-	16.9	-	-	0.7	8.4	4.6	3.2	0.7	8.9	7.3	-
O&M building/Sub-station	2.5	-	2.5	-	-	2.5	-	-	-	0.6	0.9	1.0	-	0.6	1.9	-
Collection	7.0	-	7.0	-	-	7.0	-	-	-	3.4	3.1	0.5	-	3.4	3.6	-
Subtotal	**680.1**	**20.0**	**660.1**	**-**	**-**	**680.1**	**-**	**-**	**22.2**	**301.5**	**202.5**	**153.9**	**2.3**	**337.6**	**340.2**	**-**
Land Under Control but Not Currently Planned for Development																
Undisturbed	296.2	104.7	172.5	9.8	9.2	296.2	-	9.2	99.6	32.3	69.4	85.7	41.4	107.2	147.6	-
Grand Total																
Grand Total	**976.4**	**124.6**	**832.7**	**9.8**	**9.2**	**976.4**	**-**	**9.2**	**121.8**	**333.8**	**271.9**	**239.6**	**43.6**	**444.9**	**487.9**	**0.0**

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. Summations were performed in Microsoft™ Access.

2 Data available directly from the Natural Resources Conservation Service (NRCS) SSURGO 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 SSURGO 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.

5 Topsoil thickness is the aggregate thickness of the A horizons described in the SSURGO database.

6 Depth to bedrock taken directly from the SSURGO database. Stony/Rocky soils are those soils that have either a cobbley, stony, boulder, shaly, very gravelly or extremely gravelly modifier to the textural class of the surface layer or that have a surface layer with > 5% stones or rocks > 3 inches in any dimension.

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. All of the soils within the Preliminary Development Area (680 acres) are in the Fine Silty (660 acres, 97 percent) and Fine Loamy (20 acres, 3 percent) textural families, indicating medium-textured soils dominated by soil particles in the loam and silt fractions (between 0.002 and 3 mm) with fewer particles in the clay (<0.002 mm) and sand (>2 mm) fractions. Medium-textured soils typically have good physical and available-water characteristics to support plant growth if not in excessively steep or wet conditions. They have high water-holding capacity, with most of the water being readily available for plant growth.

Slope affects constructability, water erosion, revegetation, compaction and rutting, among other properties. All of the soils (680 acres, 100 percent) within the Preliminary Development Area are nearly level soils with representative slopes falling within the 0-5 percent slope range.

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. Most of the soils within the Preliminary Development Area are in the moderately well and somewhat poor drainage classes (302 and 203 acres, respectively, cumulatively 74 percent of the Preliminary Development Area acreage), with smaller areas mapped into Well (22 acres, 4 percent) and Poor (154 acres, 23 percent) drainage classes. None of the soils are excessively drained that would be subject to drought. Soils in Somewhat Poor and Poor drainage classes are highly productive when drained and are frequently converted to agriculture by the installation of subsurface drain tile. Virtually all of the soils in Somewhat Poor and Poor drainage classes in the Preliminary Development Area have been drained. Moderately well and somewhat poorly drained soils typically are not droughty or wet and are typically well suited to intensive agriculture.

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. Most of the soils within the Preliminary Development Area are Mollisols and are characterized by the presence of relatively thick topsoil greater than 12 inches in depth (678 acres, 99 percent).

The presence of bedrock near the soil surface and rocks and stones in the soil profile affects constructability and revegetation. No soils in the Preliminary Development Area are shallow to bedrock or have stones at the soil surface or within the soil profile.

3.2.2 Selected Classification Data: Prime Farmland, Land Capability Classification, Hydric Soils.

Selected classification information for site soils are broken down by acreage within the 680-acre Preliminary Development Area and the 296-acre undisturbed area in Table 2.

Table 2: Acreage of Soils with Selected Classification Data by Project Feature Within the Preliminary Development Area (Total 976 acres)

Project Feature	Total Acres[1]	Prime Farmland[2]		Land Capability Class[2]					Hydric Soil[2]
		All Soils	If Drained	1	2e	2s	2w	3e	
	Acres								
Preliminary Development Area (Potential Disturbance)									
Fence Area	630.2	485.9	144.3	186.0	299.8	-	144.3	-	144.3
Access Roads	23.2	18.4	4.8	7.8	10.7	-	4.8	-	4.8
Inverters	0.4	0.3	0.1	0.1	0.2	-	0.1	-	0.1
Laydown Yards	16.9	13.7	3.2	4.6	9.1	-	3.2	-	3.2
O&M/Substation	2.5	1.5	1.0	1.0	0.6	-	1.0	-	1.5
Collection	7.0	6.4	0.5	3.1	3.4	-	0.5	-	0.5
Sub-Total	**680.1**	**526.2**	**153.9**	**202.5**	**323.7**	**-**	**153.9**	**-**	**153.9**
Land Under Control but Not Currently Planned for Development									
Undisturbed	296.2	201.3	85.6	69.4	131.7	0.2	85.7	9.2	85.7
Grand Total									
Grand Total	**976.4**	**727.5**	**239.6**	**271.9**	**455.4**	**0.2**	**239.6**	**9.2**	**239.6**

[1] Total acres of Project features that are anticipated to be disturbed by supporting construction equipment traffic, excavation, and grading. Data obtained by merging facility polygons with the SSURGO spatial data in ArcGIS. Summations were performed in Microsoft[tm] Access.

[2] Data available directly from the NRCS SSURGO spatial or attribute database via geospatial query of the spatial or attribute data.

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 and are also available for these uses[1]. All of the soils in the Preliminary Development Area are classified into prime farmland or prime farmland if drained (526 and 154 acres respectively; cumulatively 100 percent).

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. Soils within the Preliminary Development Area are in LCC 1, 2e, and 2w. A numerical value of 1 and 2 indicates soils with no or few limitations that restrict the choice of plants or require very careful management. Soils in LCC classes 1 and 2e are typically considered prime farmland and soils in LCC class 2W are considered prime farmland if drained. All of the soils in the Project site (680 acres, 100 percent) are in LCC 1, 2e, and 2w. Those soils with wetness limitations have been converted to prime farmland status by drainage.

Hydric soils are generally described as soils in poorly drained to very poorly drained drainage classes. Hydric soils are formally a component of regulated wetlands and can be used to indicate

[1] [prime farmland] has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. In general, prime farmland has an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, an acceptable level of acidity or alkalinity, an acceptable content of salt or sodium, and few or no rocks. Its soils are permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods of time, and it either does not flood frequently during the growing season or is protected from flooding.

areas with potential jurisdictional wetlands. Most of the soils are non-hydric (526 acres, 77 percent), with 154 acres (23 percent) being considered hydric soils. Virtually all of the hydric soils that were historic wetlands have been legally converted to non-wetland by subsurface tile drainage.

3.2.3 Construction-Related Interpretations: Highly Erodible Land (Wind and Water), Compaction Prone, Rutting Prone, and Drought Susceptible with Poor Revegetation Potential.

Selected construction-related interpretative data for site soils are broken down by acreage within the 680-acre Preliminary Development Area and the 296-acre undisturbed area in Table 3.

Table 3: Acreage of Soils in Selected Construction-related Interpretations by Project Feature Within the Preliminary Development Area (Total 976 acres)

Project Feature	Total Acres[1]	Highly Erodible[2]		Compact. Prone[3]	Rutting Hazard[4]			Drought Susceptible[5]
		Water	Wind		Probable	Possible	Unlikely	
	Acres							
Preliminary Development Area (Potential Disturbance)								
Fence Area	630.2	-	-	330.3	610.4	19.8	-	-
Access Roads	23.2	-	-	12.6	21.5	1.7	-	-
Inverters	0.4	-	-	0.2	0.3	tr	-	-
Laydown Yards	16.9	-	-	7.8	16.2	0.7	-	-
O&M/Sub-station	2.5	-	-	1.9	2.5	-	-	-
Collection	7.0	-	-	3.6	7.0	-	-	-
Subtotal	**680.1**	-	-	356.4	657.9	22.2	-	-
Land Under Control but Not Currently Planned for Development								
Undisturbed	296.2	-	-	155.1	187.4	99.6	9.2	9.2
Grand Total								
Total	**976.4**	**-**	**-**	**511.5**	**845.3**	**121.8**	**9.2**	**9.2**

1 Total acres of Project features that are anticipated to be disturbed by supporting construction equipment traffic, excavation, and grading. Data obtained by merging facility polygons with the SSURGO spatial data in ArcGIS. Summations were performed in Microsoft[tm] Access.

2 Highly Erodible Water Includes soils in Land Capability Class 4e through 8e or that have a representative slope value greater than or equal to 9%. Highly Erodible Wind Includes soils in wind erodibility groups 1 and 2.

3 Includes soils that are somewhat poorly drained to very poorly drained soils in loamy sands and finer textural classes.

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 Includes soils with a surface texture of sandy loam or coarser that are moderately well to excessively drained.

Highly erodible land is identified as being susceptible to water and wind erosion. The majority of soils in the Preliminary Development Area are low relief, medium-textured soils with intermediate water infiltration characteristics that limit soil erosion by the agent of water. None of the Preliminary Development Area has soils that are highly water erodible.

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. None of the soils within the Preliminary Development Area are considered highly wind erodible.

Soils prone to compaction and rutting are subject to dramatic and adverse changes in soil porosity and structure as a result of mechanical deformation caused loading by equipment during construction. Compaction and rutting are related to moisture content and texture and are worse when medium- and fine-textured soils are subject to heavy equipment traffic when wet. Compaction and rutting are anticipated on 356 acres (52 percent) and 658 acres (97 percent), respectively, if they are trafficked when wet. Elk Creek will develop prescriptions that avoid trafficking soils when wet to avoid and minimize potential compaction and rutting.

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. None of the soils within the Preliminary Development Area are susceptible to drought.

3.2.4 Summary of Major Soil Limitations at the Elk Creek Solar Project

3.2.4.1 Prime Farmland

Soils within the Elk Creek Land Control Area are nearly level, deep, moderately drained, medium-textured Mollisols. Nearly all of the soils within the Land Control Area are prime farmland. The primary limitations for the soils during construction, operations and maintenance, and decommissioning include compaction and rutting that may occur when the soils are trafficked when wet, and the need to reserve and store large volumes of topsoil.

While soils classified as prime farmland will be impacted by the solar facility, Elk Creek will implement BMPs during construction detailed in Section 4.0 including soil segregation and decompaction, wet weather conditions, erosion and sediment control. After construction, and for the life of the Project, soils will be stabilized and soils given an opportunity to rest, as the site is revegetated with a permanent cover of prairie grasses according to seeding and management specifications agreed to between Elk Creek and the MNDNR to the benefit of wildlife and the soil. Upon decommissioning, the land could be returned to its pre-construction agricultural use or to another use if the economic conditions at that time indicated another use is an appropriate use for the site. Elk Creek anticipates that the property will be restored to agricultural use on decommissioning of the Project.

Initial post-construction revegetation efforts and maintenance of vegetation during operations and maintenance will consider selecting suited plants, managing seeding times for late spring early summer when soil moisture is optimum for germination, use of mulch and other BMPs. Existing tile drainage systems will be maintained during Project operations. The only impact to prime farmland is that the land will not be farmed for the life of the Project, approximately 30 years.

3.2.4.2 Topsoil Storage

Topsoils are thick ranging from 12 to greater than 18 inches, relatively high in organic matter, and fertile. Storing topsoil in relatively sterile, large piles that are not active plant growth media is not recommended as the storage conditions may adversely influence soil flora and fauna affecting soil quality when topsoils are restored to areas from which the topsoil was taken. To the extent practicable, topsoil should be conserved by preselecting areas to receive excess topsoil from nearby areas, grading and seed bed preparation as appropriate, and revegetation to maintain a rhizosphere suitable for plant growth.

3.2.4.3 Compaction and Rutting

Compaction and rutting are potential limitations in the Preliminary Development Area. Elk Creek 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.

4.0 BMPs DURING CONSTRUCTION AND OPERATION

The Project will be constructed and operated on property owned or leased by Elk Creek. As stated above, the Project is located on highly productive farmland occupying a flat to gently rolling loess-covered till plain in southwestern Minnesota.

Because all construction activities will be limited to land owned or leased by Elk Creek, no direct impacts to adjacent land are expected. Additionally, the technology to be deployed at this facility does not require that the entire Project Site be completely flat or a uniform grade. Because most of the Project site is currently nearly level or has slightly rolling terrain (Table 1), the amount of grading anticipated within the Preliminary Development Area is expected to be minimal. The PV arrays can be designed to follow the existing grade of the Project Site within certain tolerances, which allows the designer of the facility to minimize the amount of earthmoving activities that are required (see Figures 3 and 4).

While some grading activities may be required to raise or lower certain areas within the Project Site, the majority of the Project Site's topography would be left unchanged. The remainder of earthmoving activities would consist of work on the interior access roads, trenches for the DC and AC collection system, and foundational work for the Project substation and inverter skids, as necessary. The sections below describe the measures that the Contractor will implement to minimize the physical impacts to the integrity of the topsoils and topography of the Project Site.

4.1 Environmental Monitor

Elk Creek will contract with a third-party to monitor earthmoving activities during the initial phase of Project construction to ensure appropriate measures are taken to properly segregate and handle the topsoils. Elk Creek will coordinate with MDA to identify a suitable environmental monitor (Monitor). The Monitor will have a variety of duties, including but not limited to:

- Perform weekly inspections during the major earthmoving phase of Project construction;
- 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 Elk Creek'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 a report of Elk Creek's adherence to soil BMPs to MDA on a weekly basis during the major earthmoving phase of Project construction and upon completion of earthmoving activities.

Potential issues with BMPs will be reported to Elk Creek's construction manager and to MDA. The construction manager will use discretion to either correct the activity or stop work.

4.2 Soil Segregation and Decompaction

During construction, one of the primary means to protect and preserve the topsoil at the Project Site will be to separate the topsoil from the other subgrade/subsoil materials when earthmoving activities or excavation are taking place during grading, road construction, cable installation, foundation installation, etc. There may be limited situations where excavated subsoil must be stored on adjacent undisturbed topsoil. In these situations, subsoil will be returned to the excavation with as little disturbance of the underlying topsoil as practicable. Laying down a thin straw mulch layer as a buffer between the subsoil and topsoil may be used as practicable to facilitate more effective separation of the subsoil and underlying topsoil during the excavation backfill process.

Based on SSURGO data, topsoil thickness is typically over 12 inches. This will be confirmed with tests by a Minnesota Licensed Professional Soil Scientist prior to earthwork activities on the site. Elk Creek will work with the soil scientist to identify the appropriate depth of topsoil that should be stripped and segregated from other subsoil materials during earthwork activities. Elk Creek will provide this information and a recommendation on specific segregation methods/techniques to the Monitor for review and input. As an interim recommendation Elk Creek suggests that the full depth of topsoil be stripped up to 12 inches in thickness. Topsoil greater than 12 inches from the soil surface would be treated similarly to the underlying subsoil. 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[2]. Elk Creek will strive to avoid compaction in other areas where it is not required by the design.

Following earthwork 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 on the Project Site at pre-established locations on the site. The location and amount of topsoil will be documented to facilitate re-spreading of topsoil after decommissioning. This practice is described in more detail below for each of the earthmoving activities that are anticipated for this Project.

4.3 Wet Weather Conditions

During the construction of the Project, it is likely that there will be periods of wet weather that may necessitate a temporary halt of construction activities. The Elk Creek Construction Manager will have responsibility for halting activities if weather conditions pose a risk to worker safety or if conditions are such that heavy equipment would cause severe rutting of the Project Site. Following initial grading at the Site, many activities could still proceed in wet weather given the lack of heavy equipment required for those tasks. However, Elk Creek's Construction Manager would be responsible for ensuring that topsoil erosion, rutting, compaction, or damage to drain tiles (as present) is avoided or minimized to the extent possible. Because compaction of soils can

[2] Elk Creek recognizes that topsoil mixing is both an aesthetic and crop-productivity issue and will strive to minimize to the extent practicable topsoil and subsoil mixing during initial construction, operations, and decommissioning/reclamation. For the purpose of identifying areas where topsoil mixing is a problem, the Environmental Monitor will consider topsoil storage piles, restored trench excavations, and post-closure restored areas with > 5% area of the soil surface as obvious subsoil inclusions to be out of compliance. Remediation may consist of removal of subsoil and replacement with acceptable topsoil.

become problematic during wet weather conditions, as stated above, the Construction Manager will work with the soil scientist and the Monitor to ensure that techniques/practices are employed to decompact soils appropriately following wet weather conditions. Decompaction with chisel plows prior to disking and planting will typically be a standard method of soil preparation in areas proposed for seeding to native grasses, forbs, and pollinator species. Agricultural equipment capable of operating within the approximate 20-foot wide space between panel lines when panels are oriented vertically would be used to decompact, prepare a seedbed, and plant suited seed mixes.

4.4 Adaptive Management During Construction

Should weather or site conditions during construction require different BMPs than those that are described in this section, Elk Creek will work with the Monitor, MDA and other appropriate agencies to discuss potential new approaches to the specific conditions that are encountered.

Elk Creek will remain flexible and implement new practices/procedures that will help ensure the quality of the land while maintaining the safety of the workers.

4.5 Initial Grading/Road Construction/Array Construction

The first phase of Project construction will be the general civil works at the Project Site where all major cut and fill activities will be performed by the Contractor. As stated above, Elk Creek Solar will consult with a qualified soil scientist to identify the appropriate depth of topsoil up to 12 inches that should be stripped and segregated from other materials during initial grading activities. Based on discussions with MDA, topsoils in this region of Minnesota may reach depths of 3-feet. This will be confirmed with tests by the soil scientist prior to grading activities. Elk Creek Solar will provide this information and a recommendation on specific segregation methods/techniques to the MDA for review and input.

The Contractor will first strip topsoil around the few selected hills/valleys on site. This will ensure that the topography falls within the tolerances allowed for by the solar array design. Based on preliminary design, engineering expects approximately 40.6 acres to require grading. During this civil work, topsoil will be pushed outside of the cut/fill areas and collected into designated spots for later use. Once topsoil is removed from the cut/fill areas, the sub-grade materials will be removed as required from on-site hills and relocated to on-site low spots. Prior to relocating sub-grade materials to the low spots, top soil in the low areas will be stripped and set aside before the fill is added, then respreads over the new fill. The sub-grade materials would be compacted in place. When compaction is complete, the topsoil spoil piles will be re-spread over the reconditioned sub-grade areas. See footnote 2 for information on identifying topsoil/subsoil mixing when and where it occurs.

This newly spread topsoil will be loosely compacted and/or “tracked” and employ the wind and stormwater erosion prevention BMPs described below in Section 4.8.

After the majority of the major earthwork activities have been completed, the Contractor will start construction of the internal road network. This work would start with the stripping of topsoil materials from the 16-foot-wide roadbeds to a depth of at least 12 inches. Topsoil will be windrowed to the edges of each 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 Contractor will then compact the sub-grade materials. As discussed in Section 2.3.3, after gravel is installed and compacted to engineers' requirements, the Contractor will shape Project drainage ditches as identified on the final grading plan. Finally, the previously stripped and windrowed topsoil material will be re-spread throughout the Preliminary Development Area.

Once grading and road construction is complete, the Contractor can begin the installation of foundation piles for the PV array racking system. This work will consist of directly driving the pile into the soil with pile hammers. 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.

4.6 Foundations

The Contractor will also perform foundation work for the Project substation and inverters. For the substation, the Contractor will strip topsoil off the substation area, install the pier-type foundations, compact sub-grade materials, re-grade spoils around the substation yard, and then install clean washed rock on the surface. All topsoil stripped from the substation area will be pushed outside of the substation 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 substation construction is advanced, the topsoil piles would be distributed in a thin layer adjacent to the substation area.

For the inverters, topsoil will again be stripped and placed adjacent to the inverter. Afterwards, 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 inverters. After the inverter is set, the adjacent topsoil will be re-spread around the inverter.

4.7 Trenching

Construction of the Project may require trenching for the installation of both DC and AC collection lines across the Project Area. If the collection lines are buried, the Contractor will be installing AC and DC collection cables in trenches of 4 feet deep using the "open trench" method. Topsoil and subgrade materials would be excavated from the trench using typical excavating equipment or backhoes and segregated as described above. The bottom of each trench may be lined with clean fill to surround the cables. Elk Creek anticipates that native subsoil will be rock free (Table 1), 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. See footnote 2 for information on identifying topsoil/subsoil mixing when and where it occurs.

4.8 Temporary Erosion and Sediment Control

Elk Creek Solar will prevent excessive soil erosion on lands disturbed by construction by adhering to a Stormwater Pollution Prevention Plan (SWPPP) required under the National Pollutant Discharge Elimination System (NPDES) permitting requirement that will be administered by the Minnesota Pollution Control Agency.

Prior to construction, Elk Creek will work with engineers or the Contractor to outline the reasonable methods for erosion control and prepare the SWPPP.

These measures would primarily include silt fencing on the downside of all hills, near waterways, and near drain tile inlets. 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 identify designated 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.

4.9 Drain Tile Identification, Avoidance and Repair

Elk Creek Solar is aware of the presence of drain tile within the Land Control Area which appears to be adequately draining the Project Area and discharging primarily into the County managed ditches on the north and south ends of the proposed Project. To minimize unforeseen repairs or damages to existing drain tile and/or drain tile systems, Elk Creek Solar has developed a comprehensive plan to address the presence and treatment of this tile before, during, and after construction. The plan consists of the following components and each component is discussed in detail below:

- Pre-Construction Tile Mapping and Repair
- Project Design Considerations
- Construction Mitigation Measures
- Repair/Remediation of Damaged Tile

4.9.1 Pre-Construction Tile Mapping and Repair

Elk Creek Solar has contacted landowners and has secured drain tile maps for all but 80 acres of the Preliminary Development Area. Elk Creek will continue to coordinate for mapping on the final 80-acre parcel. In the event the remaining drain tile mapping cannot be identified, Elk Creek will utilize other sources, including infrared aerial photographs, LiDAR data, and, if necessary, a site-specific tile locate survey with a local agricultural drain tile contractor (Tile Contractor).

If necessary, physical location of drain tile will be performed by using a small excavator to dig a shallow trench perpendicular to and at varying intervals across areas where research indicated tile could be found.

Visible surface inlets will be identified and a tile probe inserted to locate the tile line and determine its direction from the inlet. Using an excavator, a shallow trench will be dug to confirm the presence of the tile. Once confirmed, a tile probe will locate the tile line to determine the direction of the tile. As necessary, appropriate tile lines will be exposed to determine size, type, flow direction, and condition. Any damaged tile encountered in the tile location process will be repaired or replaced to its original size and capacity.

Clogged tiles found during the location process will be assessed. Clogged tile is often an indication of a failing line tile. However, cleaning clogged tile is not usually cost effective and may lead to future problems, so a remediation plan is being developed to address clogged tile locations during the construction process. Remediation may involve replacing the clogged portion of tile or replacing the line completely.

In some locations within the Preliminary Development Area, existing tile lines may need to be relocated to avoid damage from Project facilities. In the event a tile line requires replacement, the new tile will have the capacity, depth, and appropriate slope to ensure the new tile line performs adequately for the line it is replacing. All replacement or rerouting of tile will take place proactively during construction or as it is identified in order to maintain the integrity of the drainage lines during construction. This practice should minimize interruption of any drainage on site or on any neighboring farms that may drain through the property.

Repairs or rerouting will be performing using a small to mid-sized excavator. Laser equipment will be used to ensure proper grading of the pipe. 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 pipe 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.
- Tile 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.
- Elk Creek Solar will make efforts to complete permanent tile repairs within a reasonable timeframe, taking into account weather and soil conditions.

4.9.2 Project Design Considerations

By establishing an accurate assessment of the drain tile in the Project Site prior to construction, Elk Creek can overlay the location of the tile lines on their construction plans and identify any conflicts with the drainage lines. Following the location process, GIS layers and CAD files of tile

locations will be generated and provided to the solar array design engineer. The engineers will design around the tiles to ensure placement of the solar racking systems do not damage the 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.

4.9.3 Construction Measures

In areas where it will be impossible to design solar arrays around tile locations, steps will be taken to ensure the integrity of the drainage system will remain intact both during and after construction. Tile lines that are in direct conflict with solar array installation or trenches (i.e., collection lines) will be rerouted around the conflict area. Tile lines that have the potential to be damaged by construction traffic will be bridged or reinforced to maintain integrity.

4.9.4 Operational Measures

Following completion of construction, Elk Creek 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 any damaged tile that may have been missed during construction. Tile would be repaired following the process outlines above.

4.10 Construction Debris

Construction-related debris and unused material will be removed by Elk Creek Solar and the Contractor. Any below-grade, unusable materials will be removed and loaded immediately onto trucks for subsequent disposal at a designated off-site location. The Contractor will use locally sourced dumpsters and removal services to regularly check and schedule pick-ups for full dumpsters which will be switched out for empty ones. To the extent practicable, recyclable materials (i.e., cardboard) will be sorted and recycled at a local facility.

Debris/trash collection points and dumpsters will be located both in the laydown yards as well as at strategically designated locations close to where actual work is being performed. If loose debris fails to be deposited into dumpsters or if it becomes wind-blown, the Contractor will inspect and clear fence lines of debris on a daily basis to ensure that debris and trash does not leave the Project Area. Contaminated materials are not expected; however, if any such materials are encountered during construction, specialized dumpsters and handling instructions will be employed to suit the types of contaminated materials that are discovered. Contaminated materials will be disposed of at the nearest appropriate facility in accordance with applicable laws, ordinances, regulations, and standards.

5.0 DECOMMISSIONING

At the end of the Project's useful life, Elk Creek will either take necessary steps to continue operation of the Project (such as re-permitting and retrofitting) or will decommission the Project and remove facilities. Decommissioning activities will include:

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

5.1.1 Timeline

Decommissioning is estimated to take six to twelve months to complete and the decommissioning crew will ensure that all equipment is recycled or disposed of properly.

5.1.2 Removal and Disposal of Project Components

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

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

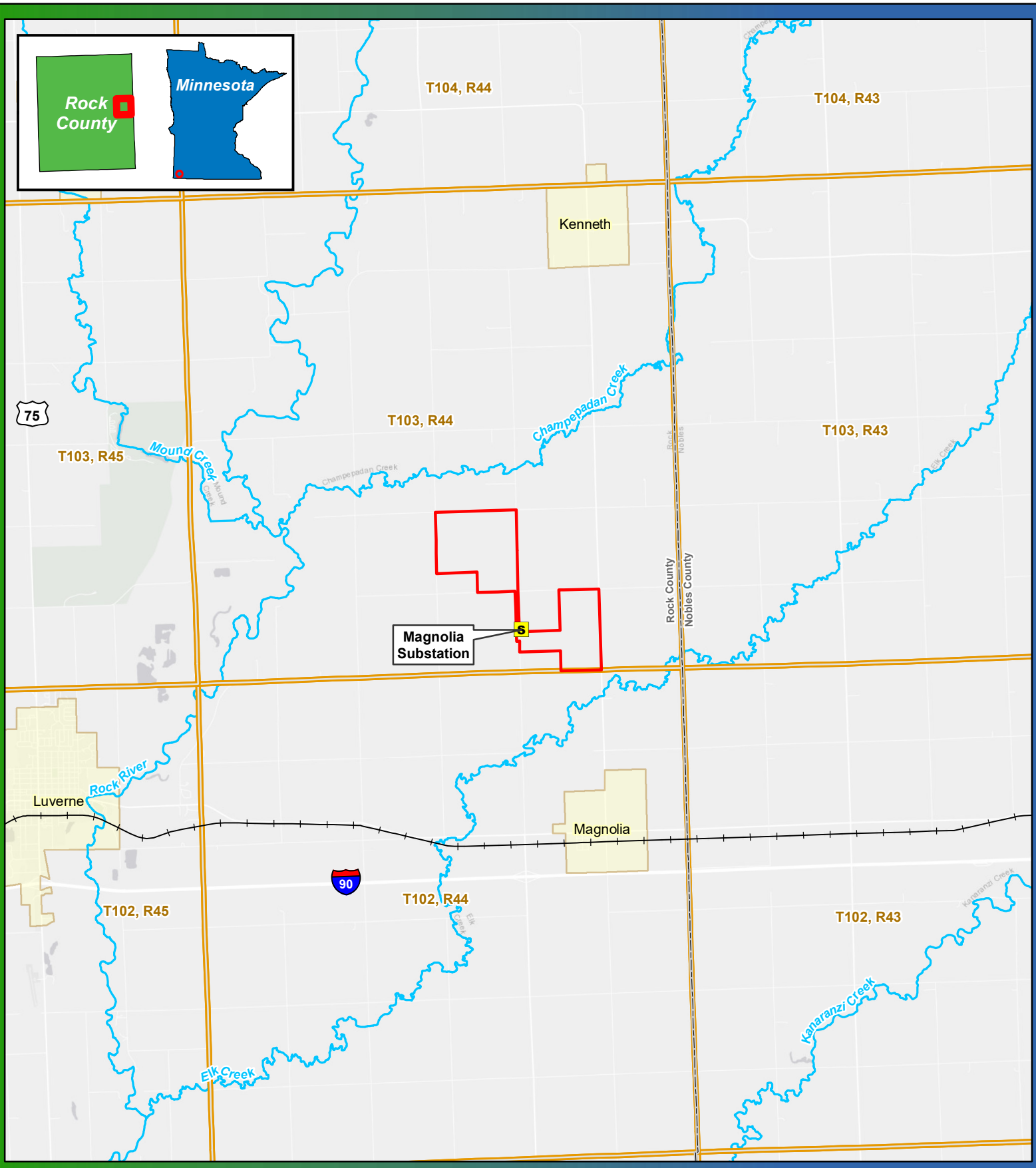
- **Inverter/Transformer**: Evaluate remaining operation life and resell or send to manufacturer and/or electronics recycler.
- **Concrete pad(s)**: Sent to concrete recycler.
- **Fence**: Fence will be sent to metal recycling facility and wooden posts for the agricultural fence will be properly disposed.
- **Computers, monitors, hard drives, and other components**: Sent to electronics recycler. Functioning parts can be reused.

5.1.3 Restoration/Reclamation of Facility Site

After all equipment is removed, the facility could be restored to an agricultural use, in accordance with the AIMP or to another use if the economic conditions at that time indicate another use is an appropriate use for the site. Holes created by steel pier foundations and fence poles, concrete pads, re-claimed access road corridors and other equipment will be filled in with soil to existing conditions and seeded. Grading and other soil disturbance activities during decommissioning will be kept to the minimum necessary to effectively decommission the site to maintain the soil benefits realized during the long-term operation of the Project, such benefits include: building topsoil through plant matter decay, carbon capture, and beneficial, soil bacteria that are often absent from soil subject to rowcrop agriculture. This will include the revegetation.

Elk Creek Solar reserves the right to extend operations instead of decommissioning at the end of the site permit term. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the facilities with upgrades based on newer technologies. If the decision is made to continue operations, the Project will be re-permitted.

Figures



ELK CREEK SOLAR

0 1 2 Miles

1:100,000

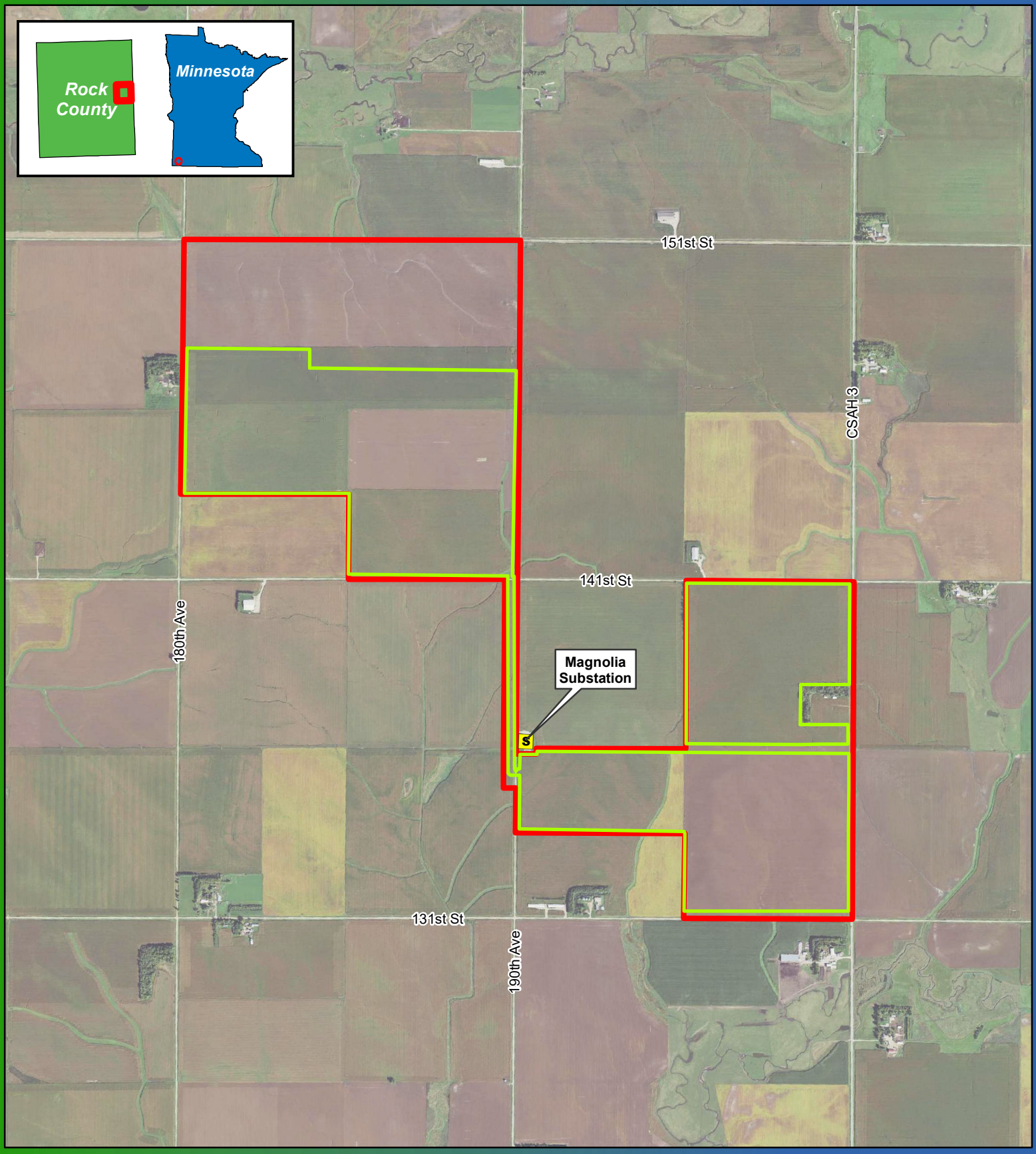
Figure 1
Project Location
Elk Creek Solar Project
Rock County, MN

43.68038, -96.10199

- S Existing Substation
- Land Control Area
- City/Town
- Township
- County Boundary
- NHD Named Stream
- railroad

Document Path: Z:\Clients\E_H\Geronimo\Elk_Creek\Facility_Permit\Mapping\Fig1_Elk_Creek_Project_Location.mxd

brian.schreurs Date: 9/10/2019



ELK CREEK SOLAR

N

0 0.25 0.5 Miles

1:24,000

Figure 2
Land Control and Developmnet Areas
Elk Creek Solar Project
Rock County, MN

43.68038, -96.10199

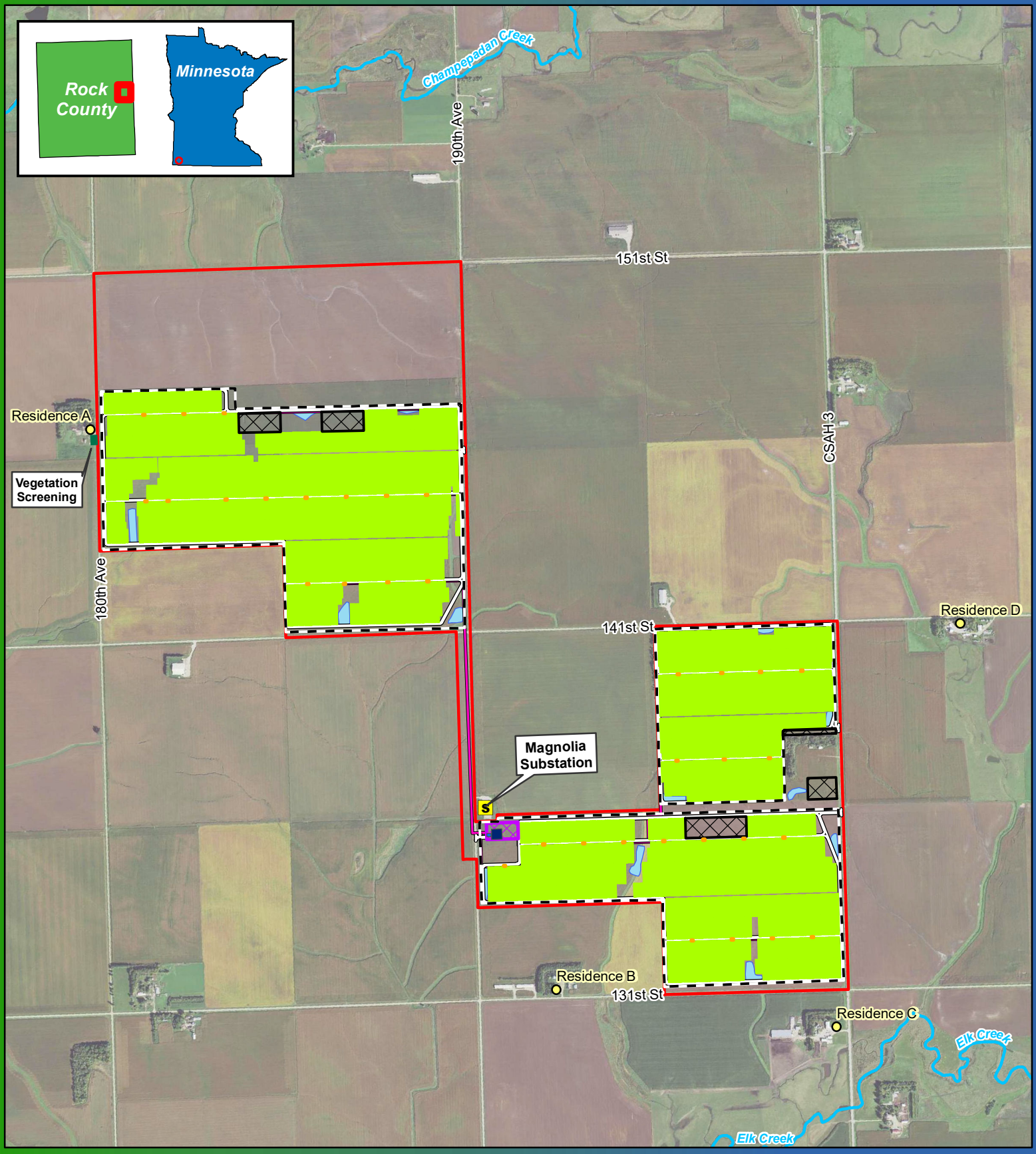
S Existing Substation

Land Control Area

Preliminary Development Area

Document Path: Z:\Clients\E_H\Geronimo\Elk_Creek\Facility_Permit\Mapping\Fig2_Elk_Creek_Land_Control_Development_Area_COE.mxd

brian.schreurs Date: 9/10/2019



ELK CREEK SOLAR

0 0.25 0.5 Miles

1:22,000

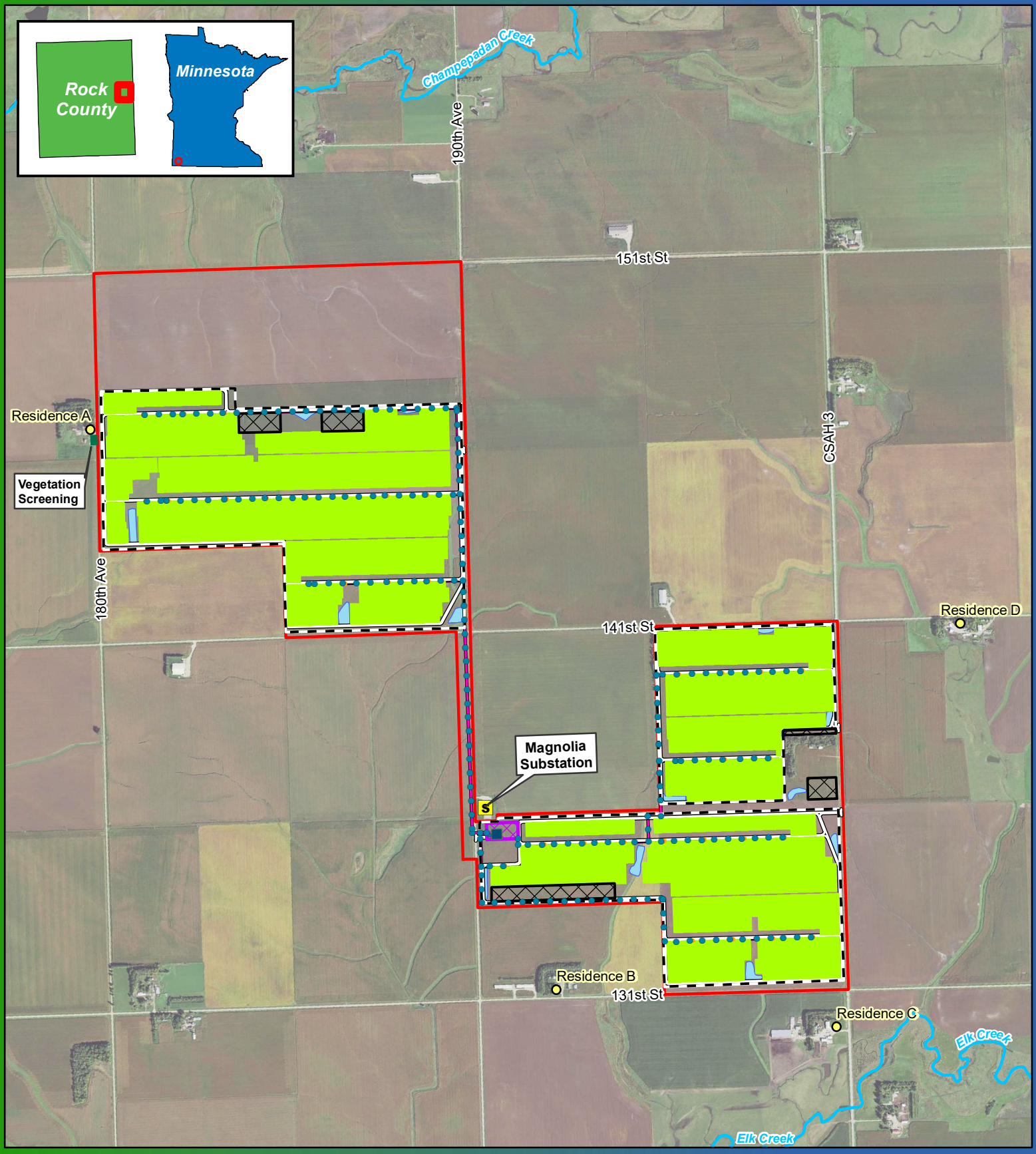
Figure 3
Below-Ground Preliminary Project Layout
Elk Creek Solar Project
Rock County, MN

43.68038, -96.10199

- Adjacent Residence
- Existing Substation
- Collection Line
- Vegetation Screening
- Land Control
- Security Fence
- Access Road
- Solar Array
- Inverter
- Project Substation
- O&M Facility
- Associated Facilities
- Laydown
- NHD Stream
- Drainage Basin

Document Path: Z:\Clients\E_H\Geronimo\Elk_Creek\Facility_Permit\Mapping\Fig3_Elk_Creek_Below_Ground_Layout.mxd

brian.schreurs Date: 9/10/2019



ELK CREEK SOLAR

0 0.25 0.5 Miles

1:22,000

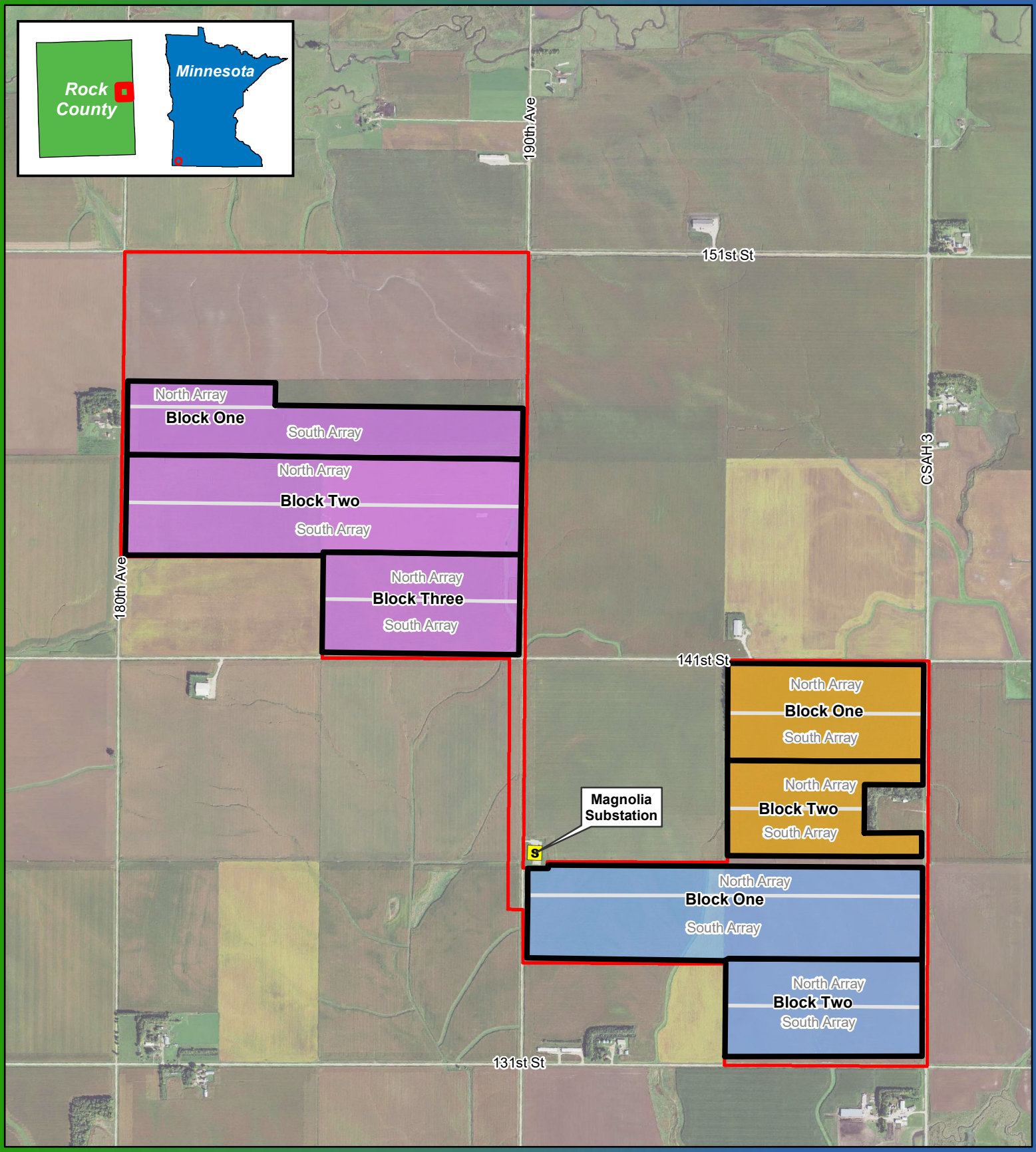
Figure 4
Above-Ground Preliminary Project Layout
Elk Creek Solar Project
Rock County, MN

43.68038, -96.10199

- Above-Ground Collection Pole
- Adjacent Residence
- Existing Substation
- Collection Line
- Vegetation Screening
- Land Control Area
- Security Fence
- Access Road
- Solar Array
- Inverter
- Project Substation
- O&M Facility
- Associated Facilities
- Laydown Area
- NHD Stream
- Drainage Basin

Document Path: Z:\Clients\E_H\Geronimo\Elk_Creek\Facility_Permit\Mapping\Fig4_Elk_Creek_Above_Ground_Layout_AIMP.mxd

brian.schreurs Date: 9/10/2019



ELK CREEK SOLAR

0 0.2 0.4 Miles

1:20,000

Figure 5
Configuration of Project Components
Elk Creek Solar Project
Rock County, MN

43.68038, -96.10199

- Project Area
- North Unit
- Central Unit
- South Unit
- Array Boundary

Document Path: Z:\Clients\E_H\Geronimo\Elk_Creek\Facility_Permit\Mapping\AIMP\Fig5_Elk_Creek_Project_Components_AIMP.mxd

brian.schreurs Date: 9/10/2019

Appendix A

Selected Soil Physical Features, Classifications, and Interpretations and Limitations

Appendix A: Selected Soil Physical Features, Classifications, and Interpretations and Limitations

Feature Type[1]	Acres[2]	Map Unit Symbol[3]	Map Unit Name[3]	Selected Soil Physical Features					Selected Soil Classifications			Construction/Reclamation Interpretations and Limitations				
				Particle Size Family[3]	Slope Range[4]	Drainage Class[5]	Topsoil Thickness[6]	Shallow Bedrock/ Stony and Rocky[7]	Prime Farmland[3]	Land Capability Classification[3]	Hydric Soil Rating[3]	Highly Erodible Water[8]	Highly Erodible Wind[9]	Compaction Prone[10]	Rutting Potential[11]	Droughty[12]
Project Area	58.01	P14B	Flandreau silt loam, 2 to 6 percent slopes	fine-loamy	0-5	WD	>18	No	All Areas	2e	No	No	No	No	Possible	No
	36.38	P29A	Rushmore silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	32.90	P42A	Whitewood silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	32.31	P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	fine-silty	0-5	MWD	>12-18	No	All Areas	2e	No	No	No	No	Probable	No
	31.21	P27A	Primghar silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	SWPD	>18	No	All Areas	1	No	No	No	Yes	Probable	No
	26.36	P12B	Everly silty clay loam, 2 to 6 percent slopes	fine-loamy	0-5	WD	>6-12	No	All Areas	2e	No	No	No	No	Possible	No
	20.29	P43A	Wilmonton silty clay loam, 1 to 3 percent slopes	fine-loamy	0-5	SWPD	>12-18	No	All Areas	1	No	No	No	Yes	Probable	No
	17.95	P28A	Ransom silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	SWPD	>12-18	No	All Areas	1	No	No	No	Yes	Probable	No
	15.00	P15B	Galva silty clay loam, 2 to 5 percent slopes	fine-silty	0-5	WD	>6-12	No	All Areas	2e	No	No	No	No	Possible	No
	9.63	P55A	Kato silty clay loam, 0 to 2 percent slopes	fine-silty over sandy or sandy-skeletal	0-5	PD	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	9.23	P38B	Thurman sandy loam, 2 to 6 percent slopes	sandy	0-5	SWED	>18	No	-	3e	No	No	No	No	Unlikely	Yes
	6.67	P21A	Marcus silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.20	P48A	Allendorf silty clay loam, 0 to 2 percent slopes	fine-silty over sandy or sandy-skeletal	0-5	WD	>12-18	No	All Areas	2s	No	No	No	No	Possible	No
	0.11	P31A	Spicer silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
Fence Area	280.04	P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	fine-silty	0-5	MWD	>12-18	No	All Areas	2e	No	No	No	No	Probable	No
	174.92	P27A	Primghar silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	SWPD	>18	No	All Areas	1	No	No	No	Yes	Probable	No
	79.80	P42A	Whitewood silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	41.78	P21A	Marcus silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	18.45	P14B	Flandreau silt loam, 2 to 6 percent slopes	fine-loamy	0-5	WD	>18	No	All Areas	2e	No	No	No	No	Possible	No
	16.97	P29A	Rushmore silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	11.12	P28A	Ransom silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	SWPD	>12-18	No	All Areas	1	No	No	No	Yes	Probable	No
	5.75	P31A	Spicer silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	PD	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	1.34	P15B	Galva silty clay loam, 2 to 5 percent slopes	fine-silty	0-5	WD	>6-12	No	All Areas	2e	No	No	No	No	Possible	No
Access Road	8.91	P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	fine-silty	0-5	Moderately well drained	>12-18	No	All Areas	2e	No	No	No	No	Probable	No
	7.00	P27A	Primghar silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	Somewhat poorly drained	>18	No	All Areas	1	No	No	No	Yes	Probable	No
	3.07	P42A	Whitewood silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	1.51	P14B	Flandreau silt loam, 2 to 6 percent slopes	fine-loamy	0-5	Well drained	>18	No	All Areas	2e	No	No	No	No	Possible	No
	0.85	P29A	Rushmore silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.76	P28A	Ransom silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	Somewhat poorly drained	>12-18	No	All Areas	1	No	No	No	Yes	Probable	No

Appendix A: Selected Soil Physical Features, Classifications, and Interpretations and Limitations

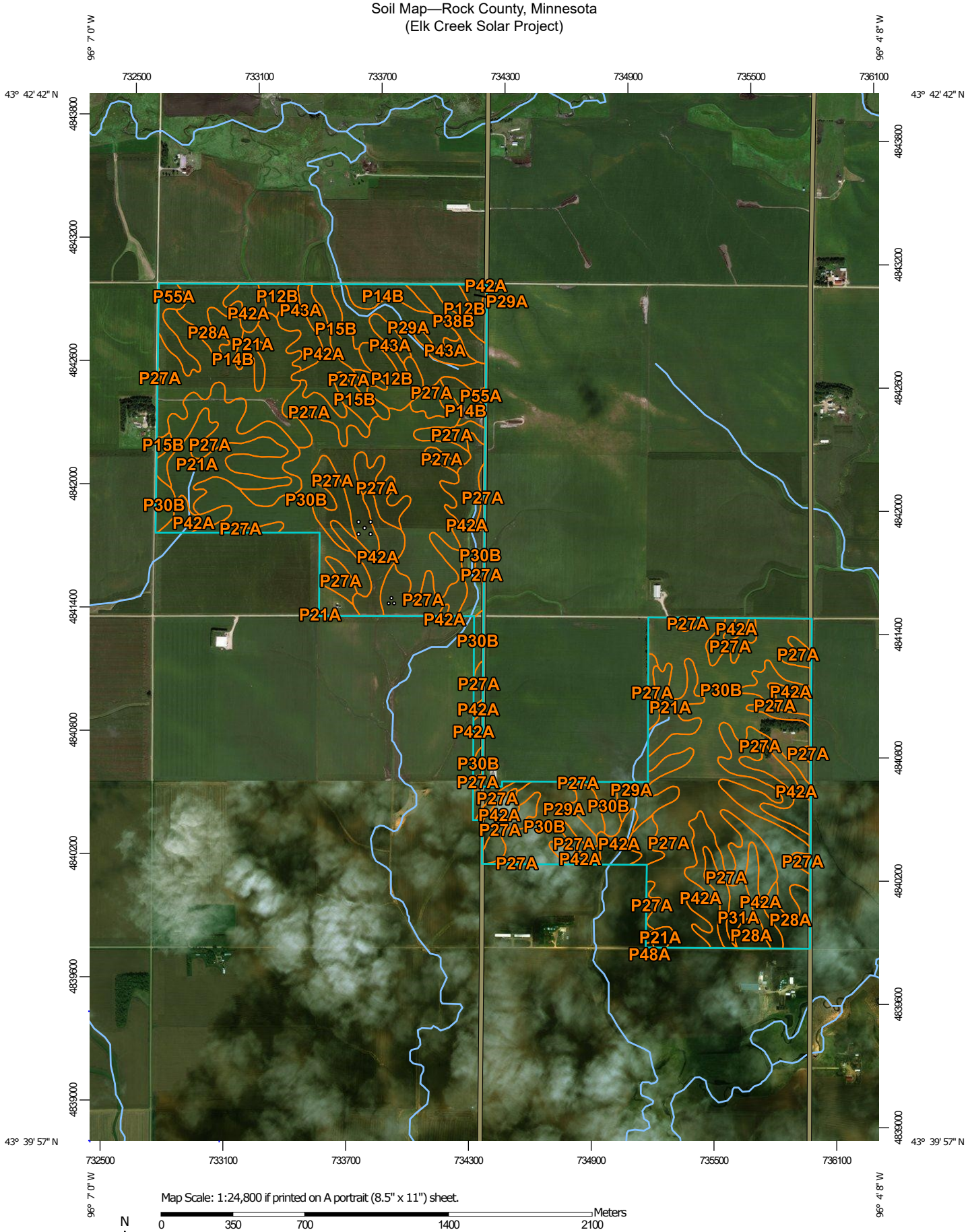
Feature Type[1]	Acres[2]	Map Unit Symbol[3]	Map Unit Name[3]	Selected Soil Physical Features					Selected Soil Classifications			Construction/Reclamation Interpretations and Limitations				
				Particle Size Family[3]	Slope Range[4]	Drainage Class[5]	Topsoil Thickness[6]	Shallow Bedrock/ Stony and Rocky[7]	Prime Farmland[3]	Land Capability Classification[3]	Hydric Soil Rating[3]	Highly Erodible Water[8]	Highly Erodible Wind[9]	Compaction Prone[10]	Rutting Potential[11]	Droughty[12]
	0.74	P21A	Marcus silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.24	P15B	Galva silty clay loam, 2 to 5 percent slopes	fine-silty	0-5	Well drained	>6-12	No	All Areas	2e	No	No	No	No	Possible	No
	0.15	P31A	Spicer silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
Laydown	8.40	P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	fine-silty	0-5	Moderately well drained	>12-18	No	All Areas	2e	No	No	No	No	Probable	No
	4.61	P27A	Primghar silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	Somewhat poorly drained	>18	No	All Areas	1	No	No	No	Yes	Probable	No
	2.70	P42A	Whitewood silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.68	P15B	Galva silty clay loam, 2 to 5 percent slopes	fine-silty	0-5	Well drained	>6-12	No	All Areas	2e	No	No	No	No	Possible	No
	0.52	P29A	Rushmore silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
Inverter	0.18	P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	fine-silty	0-5	Moderately well drained	>12-18	No	All Areas	2e	No	No	No	No	Probable	No
	0.10	P27A	Primghar silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	Somewhat poorly drained	>18	No	All Areas	1	No	No	No	Yes	Probable	No
	0.02	P42A	Whitewood silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.02	P29A	Rushmore silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.02	P21A	Marcus silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.01	P14B	Flandreau silt loam, 2 to 6 percent slopes	fine-loamy	0-5	Well drained	>18	No	All Areas	2e	No	No	No	No	Possible	No
	0.01	P31A	Spicer silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>12-18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
Collection	3.39	P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	fine-silty	0-5	Moderately well drained	>12-18	No	All Areas	2e	No	No	No	No	Probable	No
	3.05	P27A	Primghar silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	Somewhat poorly drained	>18	No	All Areas	1	No	No	No	Yes	Probable	No
	0.54	P42A	Whitewood silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
Project Substation	0.96	P42A	Whitewood silty clay loam, 0 to 2 percent slopes	fine-silty	0-5	Poorly drained	>18	No	If Drained	2w	Yes	No	No	Yes	Probable	No
	0.94	P27A	Primghar silty clay loam, 1 to 3 percent slopes	fine-silty	0-5	Somewhat poorly drained	>18	No	All Areas	1	No	No	No	Yes	Probable	No
	0.58	P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	fine-silty	0-5	Moderately well drained	>12-18	No	All Areas	2e	No	No	No	No	Probable	No

1 Project Area include soils under Elk Creek Solar lease but that are not anticipated to be disturbed during construction or operations.
2 Data obtained by merging facility polygons with the SSURGO spatial data in ArcGIS. Summations were performed in Microsoft[tm] Access.
3 Obtained directly by query of the SSURGO geospatial database.
4 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.
5 Drainage class as taken directly from the SSURGO database. ED, PD, and VPD indicate Excessively Drained, Poorly Drained, and Very Poorly Drained soils, respectively.
6 Topsoil thickness is the aggregate thickness of the A horizons described in the SSURGO database.
7 Shallow Bedrock taken directly from the SSURGO database. Stony/Rocky soils are those soils that have either a cobbley, stony, boulder, shaly, very gravelly or extremely gravelly modifier to the textural class of the surface layer or that have a surface layer with > 5% stones or rocks > 3 inches in any dimension.
8 Includes soils in land capability classes 4e through 8e or that have a representative slope value greater than or equal to 9%.
9 Includes soils in wind erodibility groups 1 and 2.
10 Includes soils that are somewhat poorly drained to very poorly drained soils in loamy sands and finer textural classes.
11 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.
12 Includes soils with a surface texture of sandy loam or coarser that are moderately well to excessively drained.

Appendix B

NRCS Soil Map for the Elk Creek Solar Project

Soil Map—Rock County, Minnesota
(Elk Creek Solar Project)



Map Scale: 1:24,800 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 350 700 1400 2100

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 14N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Rock County, Minnesota
Survey Area Data: Version 16, Oct 9, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 27, 2012—Mar 5, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
P12B	Everly silty clay loam, 2 to 6 percent slopes	26.4	2.7%
P14B	Flandreau silt loam, 2 to 6 percent slopes	78.0	8.0%
P15B	Galva silty clay loam, 2 to 5 percent slopes	17.3	1.8%
P21A	Marcus silty clay loam, 0 to 2 percent slopes	49.2	5.1%
P27A	Primghar silty clay loam, 1 to 3 percent slopes	220.4	22.7%
P28A	Ransom silty clay loam, 1 to 3 percent slopes	29.8	3.1%
P29A	Rushmore silty clay loam, 0 to 2 percent slopes	54.7	5.6%
P30B	Sac silty clay loam, loam substratum, 2 to 5 percent slopes	331.8	34.1%
P31A	Spicer silty clay loam, 0 to 2 percent slopes	6.0	0.6%
P38B	Thurman sandy loam, 2 to 6 percent slopes	9.2	0.9%
P42A	Whitewood silty clay loam, 0 to 2 percent slopes	119.5	12.3%
P43A	Wilmonton silty clay loam, 1 to 3 percent slopes	20.3	2.1%
P48A	Allendorf silty clay loam, 0 to 2 percent slopes	0.2	0.0%
P55A	Kato silty clay loam, 0 to 2 percent slopes	9.6	1.0%
Totals for Area of Interest		**972.5**	**100.0%**

Appendix C

Vegetation Management Plan

Vegetation Management Plan

Elk Creek Solar, LLC

Prepared for

Elk Creek Solar, LLC

August 13, 2019

Prepared by

Benjamin Staehlin, M.S. & Kim Chapman, Ph.D.

21938 Mushtown Road

Prior Lake, MN 55372

APPLIED ECOLOGICAL SERVICES

Table of Contents

Appendices

I. Goals and Objectives

Elk Creek Solar, LLC ("Elk Creek") is developing a solar energy facility (SEF) which is planned to cover approximately 970 acres in Rock County, MN, and generate up to 80 megawatts (MW) of energy. Elk Creek ("Owner") has developed this Vegetation Management Plan ("Plan") to guide site preparation, installation of prescribed seed mixes, management of invasive species and noxious weeds, and control of erosion/sedimentation. The goal of this Plan is to establish vegetative cover that complies with all permits and regulations. The required management is designed to continue for three years.

This document is intended to be a working document. Revisions will be made as new information is obtained with respect to vegetation management, site characteristics, and availability of management practices at the time of procurement of services.

II. Vegetation Installation Plan

After the solar panels and other infrastructure are installed, native seed mixes developed for the project in coordination with the Minnesota Department of Natural Resources (MNDNR) (Appendix 1) will be installed as described in the proposed planting plan for the site (in development). These seeds mixes are designed to be used with a vegetation management practice of traditional mowing. It is possible Elk Creek could implement a vegetation management practice that uses sheep as grazers. Should Elk Creek implement grazing as a long-term management technique, one or more separate seed mixes will need to be developed. All plant material must be installed as instructed, with regard for the time of installation, as described below. Any exceptions must be discussed with the Owner, and the Contractor shall receive written authorization for any changes prior to the start of work.

All seed mixes must adhere to the specifications described in the Plan. Genetic source origin of all native seed shall be local, preferably from within a 200-mile radius of the site, and the plant species should be native to the county where the site is located (considerations of range shifts due to climate change may modify this guidance). Species shall be true to their scientific name as specified. Seed tags or nursery confirmation of the order must be provided to Elk Creek prior to installation. Any species eliminations, substitutions, or source origin exceptions must be approved by Elk Creek prior to installation. If planted in the spring, seeds shall have been properly stratified and/or scarified to break seed dormancy. All legumes shall be inoculated with proper rhizobia at the appropriate time prior to planting.

The protocol for installing the native seed mixes is dependent on the time of the completion of construction. If construction is completed in spring, allowing for seeding between the time when the soil is free of frost and in a workable condition but no later than June 30, native seed mixes shall include 20 pounds per acre pure live seed (PLS) of oats (*Avena sativa*) as a cover crop. MNDNR recommends that a spring seeding occur after the soil temperature is 60 degrees Fahrenheit or higher. If construction is completed in summer, allowing for seeding between July 1 and August 15, the site shall be seeded immediately with 15 pounds per acre PLS of oats and 15 pounds per acre PLS of annual wheat (*Triticum aestivum*) to stabilize the soil and prevent erosion. In the same year, the native seed mixes shall be

installed as a fall dormant seeding (after November 1 but before the soil starts to freeze) with no additional cover crop added. If construction is completed in late summer or early fall, allowing for seeding between August 16 and October 31, the site shall be seeded immediately with 20 pounds per acre PLS of winter wheat to stabilize the soil and prevent erosion. In the same year, the native seed mixes shall be installed as a fall dormant seeding with no additional cover crop added. If construction is completed in late fall, allowing for seeding after November 1 but before the soil starts to freeze, native seed mixes shall include 30 pounds per acre PLS winter wheat to provide a cover crop for the following year. MNDNR recommends that a fall dormant seeding occur after soil temperatures fall below 50 degrees Fahrenheit for a consistent period of time. If agreed to by both the Owner and the Contractor, a spring seeding the following year can be substituted for a fall dormant seeding after a late fall completion of construction. If a cover crop has already been installed during the calendar year, native seed mixes must be installed the same year with a fall dormant seeding.

Seeding may be conducted with a seed drill (preferred) and/or by broadcast seeding; the Contractor shall evaluate the site and determine which technique will produce the best results. However, seed installed into a previous cover crop or other vegetation must be installed with a seed drill. Prior to installation, seed shall be divided into two equal parts. The first half shall be installed in one pass, and the second half installed in a second pass (perpendicular to the first pass, where possible). If broadcast seeding is used, gentle raking of seeded areas may be needed to ensure good seed-to-soil contact.

III. Vegetation Management Tasks

After the land is cleared and the panels are installed, a range of invasive plants will take advantage of the open soil and abundant light and germinate across the site. For the purpose of this Plan, “invasive plants” refers to both non-native species and native species that grow in an invasive manner or have the potential to negatively affect the success of the project (Appendices 2 and 3). This list also includes noxious weed designated in statute by the State of Minnesota. These invasive plants must be managed effectively during the first three years to ensure that the planted native species are given the opportunity to flourish. The care taken in the first three years after installation strongly determines the quality of the resulting plantings. The initial period of work onsite is referred to as the “establishment phase”, while management after that period is called the “perpetual maintenance phase”.

A. Establishment Phase

The first three years of vegetation management are a concerted effort to remove invasive vegetation from the site while also helping the planted native vegetation establish. General tasks described below will be applied as directed, while other management techniques will be used only if required by the unique conditions at the Elk Creek facility.

1. General Tasks for Managing Vegetation

Establishment Year 1. The first year of establishment is focused on consistent invasive plant control on a site-wide basis. Mowing during the first year should prevent invasive plants from adding new seeds to the soil and begin to exhaust the soil seed bank (a process that often requires several years to complete). From June 1 of the first establishment year, site-wide mowing to a height of 6-9 inches shall

occur whenever vegetation reaches a height of 18-24 inches. Care shall be taken during the nesting season (April 1 to August 1) to not destroy the nests of upland grassland birds.

Repeated mowings may produce a buildup of organic thatch, which discourages the development and persistence of diverse native vegetation. In order to help prevent thatch buildup onsite, either mowing shall be conducted with a flail-type mower to mulch the cut vegetation, or the site shall be hayed so that cut vegetation is removed. A swing arm specifically designed for mowing under solar panels is recommended for cutting beneath panels, but spot-mowing with brush saws, weed whips, and similar equipment is also permitted. It may be possible to coordinate with Elk Creek to adjust the orientation of the panels to increase the ease of mowing, but the Contractor should not depend on this coordination to complete its work. Any other techniques must be approved by Elk Creek prior to the start of work. Mowing equipment shall be cleaned prior to use on site to prevent the introduction and spread of invasive and non-native species. This mowing regime will prevent annual and perennial weeds from flowering and setting seed, prevent weeds from shading out the solar panels, and help control woody plant growth onsite. Additionally, noxious and perennial weeds shall be treated by spot-herbiciding, as described below, to prevent roots from resprouting.

Establishment Year 2. The second year of establishment continues invasive plant control but generally employs more targeted techniques. Site-wide mowing to a height of 6-9 inches shall occur when vegetation height reaches 18-24 inches. Care shall be taken during the nesting season (April 1 to August 1) to not destroy the nests of upland grassland birds.

Spot-mowing may be employed to treat specific problem areas as needed. Noxious and perennial weeds shall be treated with spot-herbiciding at least twice, with the focus on achieving the required performance standards (described below).

Establishment Year 3. In the third year of the establishment phase, invasive plant control should consist of spot-herbiciding to control the remaining small patches of persistent weeds. Efforts should be focused on achieving the required performance standards (described below). Additional onsite treatment with spot-mowing or hand weeding can be employed at the discretion of the Contractor.

2. Prescribed Treatment for Common Invasive Species

Every SEF will express a suite of invasive plant species determined by the makeup of the seed bank and the seed inputs from the surrounding environment, so management must be flexible and respond to the specific needs of the Elk Creek site. This Plan describes common techniques to manage a variety of invasive plants and common weeds growing in Minnesota, but not every technique will be required. In the establishment period, monthly evaluations of the plantings during the growing season (May to September) shall be conducted to determine the appropriate treatment techniques to use and the timing of those treatments. Management techniques for five categories of weeds are described below.

The Contractor is required to have the botanical expertise to correctly identify plant species and know the difference between species that must be removed and similar native species being established.

a. Annual Weeds

Annual weeds include all unwanted species that grow for a single year, set seed, and die. Common annual weeds include grasses like barnyard grass (*Echinochloa crus-galli*), witchgrass (*Panicum capillare*), fall panicum (*P. dichotomiflorum*), and foxtails (*Setaria* spp.), and broadleaf weeds like lambsquarters (*Chenopodium* spp.), velvetleaf (*Abutilon theophrasti*), Pennsylvania smartweed (*Polygonum pensylvanicum*), and black nightshade (*Solanum nigrum*) (University of Minnesota, 2018).

The most important purpose and result of treating annual weeds is preventing seed production. Beginning around June 1, the site shall be mowed as described above to prevent annual weeds from flowering and setting seed. Repeated mowings, however, may produce a buildup of organic thatch, which discourages the development and persistence of diverse native vegetation by changing soil nutrient composition and keeping the soil cool. Thatch favors cool-season forage and turf grasses and many species of agricultural weeds. Use of a flail mower or raking, baling, and removing cut vegetation can reduce thatch build-up.

b. Minnesota Department of Agriculture Noxious Weeds

The Minnesota Department of Agriculture maintains a list of noxious weeds in the state which must be controlled (Appendix 2). All species of noxious weeds present at Elk Creek shall be treated by mowing, herbiciding, or a combination of both methods, with the intention of preventing the weeds from setting seed or spreading by rhizomes, stolons, or other vegetative means.

c. Perennial Weeds

Perennial weeds include all unwanted species that persist for two or more years after germination, from biennials to those that live for many years. Many of these weeds greatly diminish during the establishment phase with proper maintenance, but several require special attention due to their highly competitive behavior. These include grasses like Kentucky bluegrass (*Poa pratensis*), reed canary grass (*Phalaris arundinacea*), common reed (*Phragmites australis*), and several species of bromes, especially smooth brome (*Bromus inermis*). Broadleaf weeds in this category include sweet clovers (*Melilotus alba, M. officinalis*), cow vetch (*Vicia cracca*), crown vetch (*Securigera varia*), birdsfoot trefoil (*Lotus corniculatus*), Canada thistle (*Cirsium arvense*), and spotted knapweed (*Centaurea stoebe*). A list of common Minnesota perennial weeds that colonize former cropland and compete with native vegetation (in addition to the listed noxious weeds) is provided in Appendix 3.

Mowing is important to prevent seed production (as described above), but herbicide is generally required to prevent the spread of perennial weeds. Perennial grasses shall be treated by spot-spraying or boom spraying, as warranted, with glyphosate or comparably effective herbicide, or the aquatic formulation of the same if near open water. Perennial broadleaf weeds shall be treated by spot-spraying or boom spraying, as warranted, with glyphosate, triclopyr, clopyralid, or comparably effective herbicides. All herbicides shall be applied by a licensed applicator, following instructions provided by the manufacturer.

d. Problematic Native Plants

Several native species that are present in the soil seed bank or enter the site by seed rain from neighboring properties have the potential to interfere with the functioning of the solar panels. Giant ragweed (*Ambrosia trifida*) grows tall enough to shade the panels. Several native vines have the potential to overgrow installations, including wild grape (*Vitis riparia*), wild cucumber (*Echinocystis lobata*), bur cucumber (*Sicyos angulatus*), and Woodbine/Virginia creeper (*Parthenocissus* spp.). Giant ragweed, or any other native species shading the arrays, should be controlled by mowing (see above). If growing under or near the solar panels, wild cucumber and bur cucumber can be pulled and removed manually, but woody vines such as wild grape and Woodbine/Virginia creeper shall be cut to within 1 inch of the ground and the stump treated with glyphosate, triclopyr, or a comparable herbicide by a licensed applicator, following instructions provided by the manufacturer.

e. Woody Species

Almost all woody species on site can shade or otherwise interfere with the operation of solar panels. During the establishment phase, all woody plants must be removed. This can be done by mowing, herbiciding, or a combination of both methods. All woody plants over 0.5 inches DBH (diameter at breast height, about 4.5 feet) shall be cut to within 1 inch of the ground and the stump treated with triclopyr or a comparable herbicide by a licensed applicator, following instructions provided by the manufacturer. Cut brush shall be removed from the site.

3. Re-seeding Bare Soil

Areas of bare soil are detrimental to successful establishment of native vegetation. Bare soil provides opportunities for the common invasive species described above to colonize and spread. Bare soil also contributes to soil loss by sheet erosion and may prevent Elk Creek from discharging its SWPPP permit in a timely fashion. If areas of bare soil greater than 75 ft^2 are found on site, the Contractor shall remedy the issue at its own expense by re-seeding the area, using the seed mix previously installed and following the timing instructions laid out in Section II (Vegetation Installation Plan).

B. Perpetual Maintenance Phase

1. Mowing for Perpetual Maintenance

Following the end of the Establishment Phase of vegetation management, yearly management is still required to control the re-establishment and spread of invasive species, combat the establishment of undesirable and invading trees and shrubs, and reduce biomass/fuel load on site. This management may take the form of mowing or haying, depending on Elk Creek preference and site feasibility. Some degree of hand weeding, spot-mowing, and/or spot-herbiciding may be warranted thereafter to maintain vegetation quality and achieve the project goals.

Annual site-wide haying (preferred) or mowing to a height of 6-9 inches shall occur each October, or when prairie plants have gone dormant. Where feasible, mowed vegetation shall be raked, baled, and removed to prevent the buildup of organic thatch, which will discourage the development and persistence of diverse native vegetation. If vegetation removal is not achievable, mowing shall be conducted with a flail-type mower to finely chop plant material and accelerate decomposition. Should

Elk Creek enter into a haying partnership for some or all of the site prior to construction, seed mixes will be reviewed and potentially revised to meet the local agricultural needs.

2. Grazing for Perpetual Maintenance

Elk Creek may decide to use grazing with sheep as a long-term vegetation management technique. Well-managed grazing can restrict woody vegetation and non-native species encroachment into grasslands, prevent excessive litter accumulation, improve forage production, and accelerate decomposition and nutrient cycling. Should grazing be selected as a management technique for some or all of the site, an additional section for this Plan will be developed that addresses methodology, stocking rate, water sources, grazing objectives, and seed mixes more appropriate for grazing. Grazing SEFs with livestock is a developing management approach; the instructions in this plan should be considered a guide, but the actual practices must adapt year-to-year to evolving vegetation conditions at the Elk Creek Solar project.

IV. Vegetation Quality Targets

Vegetation management should result in a diverse plant community dominated by native species, as envisioned in the planting plans. Permits and regulations impose additional requirements on the final quality and performance of native plantings.

A. Native Vegetation Targets

By the end of the first growing season of the vegetation establishment phase, at least 80 percent of the site shall be vegetated. In order to discharge the SWPPP permit for the site, at least 70 percent of the site must be covered with uniform perennial vegetation; the contractor shall endeavor to achieve this by the end of the first growing season and must achieve this in the second growing season. By the end of the vegetation establishment phase (approximately 36 months after vegetation installation), at least 95 percent of the site shall be vegetated, and at least 90 percent of the cover shall be comprised of native species. Six or more species of planted native graminoids and 12 or more species of planted native forbs shall be well-established across the site.

B. Noxious Weeds and Problem Plants

All Minnesota prohibited noxious weeds and other problem plants (Appendices 2 & 3) shall be treated repeatedly with herbicide and mowed where appropriate at a frequency sufficient to prevent seed set and remove target weeds over time. Each treatment shall show evidence of at least 90 percent of the target vegetation having been affected by herbicide or removed. Two weeks after treatment, at least 95 percent of all herbicided plants shall be dead or dying within any 100 square foot area.

By the end of the vegetation establishment phase (approximately 36 months after vegetation installation), all prohibited noxious and other problem plants shall not exceed 5 percent aerial cover within any 100 square foot area across the site.

V. References

Minnesota Department of Agriculture. 2018. Minnesota Noxious Weed List. Accessed September 2018 at https://www.mda.state.mn.us/plants-insects/minnesota-noxious-weed-list

University of Minnesota. 2018. Common annual weeds. Accessed September 2018 at https://extension.umn.edu/weed-management/weed-identification

Minnesota Department of Natural Resources. Revised June 2018. Prairie Establishment & Maintenance Technical Guidance for Solar Projects. Accessed April 2019 at https://files.dnr.state.mn.us/publications/ewr/prairie_solar_tech_guidance.pdf

Appendix 1. Seed Mixes for Elk Creek Solar

Array Mix

Scientific Name	Common Name	Oz/Acre	Lbs/Acre	% (w/w)	Seeds/Sq Ft
Bouteloua curtipendula	Side oats grama	40.00	2.50	26.7	5.51
Carex bicknellii	Bicknell's sedge	1.25	0.08	0.8	0.49
Carex brevior	Short beak sedge	1.75	0.11	1.2	1.17
Elymus trachycaulus	Slender wheatgrass	60.00	3.75	40.0	9.50
Koeleria macrantha	June grass	1.50	0.09	1.0	6.89
Schizachyrium scoparium	Little bluestem	20.00	1.25	13.3	6.89
Sporobolus compositus	Composite dropseed	2.00	0.13	1.3	1.38
Sporobolus heterolepis	Prairie dropseed	1.50	0.09	1.0	0.55
	Graminoids	**128.00**	**8.00**	**85.3**	**32.38**
Achillea millefolium	Yarrow	1.00	0.06	0.7	4.09
Amorpha canescens	Leadplant	1.00	0.06	0.7	0.37
Asclepias syriaca	Common milkweed	3.00	0.19	2.0	0.30
Dalea purpurea	Purple prairie clover	2.00	0.13	1.3	0.83
Lespedeza capitata	Round-headed bush clover	1.50	0.09	1.0	0.28
Monarda fistulosa	Wild bergamot	1.00	0.06	0.7	1.61
Oenothera biennis	Common evening primrose	2.00	0.13	1.3	4.13
Oligoneuron rigidum	Stiff goldenrod	1.50	0.09	1.0	1.41
Potentilla arguta	Prairie cinquefoil	0.25	0.02	0.2	1.32
Ratibida pinnata	Yellow coneflower	1.50	0.09	1.0	1.03
Rudbeckia hirta	Black-eyed Susan	4.00	0.25	2.7	8.45
Solidago missouriensis	Missouri goldenrod	0.50	0.03	0.3	1.43
Symphyotrichum laeve	Smooth blue aster	0.75	0.05	0.5	0.95
Symphyotrichum ericoides	Heath aster	0.25	0.02	0.2	1.15
Verbena stricta	Hoary vervain	0.75	0.05	0.5	0.48
Zizia aptera	Heart-leaved alexanders	1.00	0.06	0.7	0.28
	Forbs	**22.00**	**1.38**	**14.7**	**28.11**
	Total	**150.00**	**9.38**		**60.49**

Wet Mix

Scientific Name	Common Name	Oz/Acre	Lbs/Acre	% (w/w)	Seeds/Sq Ft
Beckmannia syzigachne	American slough grass	6.00	0.38	4.0	6.89
Carex tetanica	Mead's stiff sedge	1.50	0.09	1.0	0.59
Carex vulpinoidea	Fox sedge	1.25	0.08	0.8	2.87
Elymus virginicus	Virginia wild rye	64.00	4.00	43.0	6.17
Juncus torreyi	Torrey's rush	0.20	0.01	0.1	7.35
Panicum virgatum	Switch grass	20.00	1.25	13.4	6.43
Schizachyrium scoparium	Little bluestem	30.00	1.88	20.1	10.33
Scirpus atrovirens	Green bulrush	0.70	0.04	0.5	7.39
Spartina pectinata	Prairie cord grass	3.50	0.22	2.3	0.53
	Graminoids	**127.15**	**7.95**	**85.3**	**48.55**
Anemone canadensis	Canada anemone	1.00	0.06	0.7	0.18
Asclepias syriaca	Common milkweed	3.00	0.19	2.0	0.30
Bidens frondosa	Common beggar's ticks	2.00	0.13	1.3	0.23
Eupatorium perfoliatum	Common boneset	0.50	0.03	0.3	1.84
Helenium autumnale	Sneezeweed	0.50	0.03	0.3	1.49
Heliopsis helianthoides	False sunflower	4.00	0.25	2.7	0.58
Liatris pycnostachya	Prairie blazing star	1.50	0.09	1.0	0.38
Lycopus americanus	American water horehound	0.50	0.03	0.3	1.49
Rumex orbiculatus	Great water dock	1.00	0.06	0.7	0.27
Silphium perfoliatum	Cup plant	3.00	0.19	2.0	0.05
Solidago canadensis	Canada goldenrod	0.25	0.02	0.2	1.65
Solidago gigantea	Late goldenrod	0.25	0.02	0.2	1.43
Symphyotrichum novae-angliae	New England aster	0.75	0.05	0.5	1.14
Tradescantia ohiensis	Spiderwort	1.00	0.06	0.7	0.18
Verbena hastata	Blue vervain	1.00	0.06	0.7	2.13
Veronicastrum virginicum	Culver's root	0.10	0.01	0.1	1.84
Zizia aurea	Golden alexanders	1.50	0.09	1.0	0.38
	Forbs	**21.85**	**1.37**	**14.7**	**15.56**
	Total	**149.00**	**9.31**		**64.11**

Appendix 2. Minnesota Prohibited Noxious Weeds

Eradicate. *All above- and below-ground parts of the plant must be destroyed.*	
Common Name	**Scientific Name**
Palmer amaranth	*Amaranthus palmeri*
Oriental bittersweet	*Celastrus orbiculatus*
Diffuse knapweed	*Centaurea diffusa*
Brown knapweed	*Centaurea jacea*
Yellow star thistle	*Centaurea solstitialis*
Meadow knapweed	*Centaurea x moncktonii*
Poison hemlock	*Conium maculatum*
Black swallow-wort	*Cynanchum louiseae*
Grecian foxglove	*Digitalis lanata*
Common teasel	*Dipsacus fullonum*
Cut-leaved teasel	*Dipsacus laciniatus*
Giant hogweed	*Heracleum mantegazzianum*
Japanese hops	*Humulus japonicus*
Dalmatian toadflax	*Linaria dalmatica*
Control. *Effort must be made to prevent the spread, maturation, and dispersal of any propagating parts.*	
Common Name	**Scientific Name**
Common barberry	*Berberis vulgaris*
Narrowleaf bittercress	*Cardamine impatiens*
Plumeless thistle	*Carduus acanthoides*
Spotted knapweed	*Centaurea stoebe*
Canada thistle	*Cirsium arvense*
Leafy spurge	*Euphorbia esula*
Purple loosestrife	*Lythrum salicaria*
Wild parsnip	*Pastinaca sativa*
Common tansy	*Tanacetum vulgare*

Appendix 3. Additional Problem Weeds to Remove

Plant Group & Priority	Common Name	Scientific Name
Top Priority Grasses to Remove	Smooth brome grass	*Bromus inermis*
	Reed canary grass	*Phalaris arundinacea*
	Giant reed	*Phragmites australis*
	Kentucky bluegrass	*Poa pratensis*
Top Priority Forbs to Remove	Garlic mustard	*Alliaria petiolata*
	Musk thistle	*Carduus nutans*
	Bull thistle	*Cirsium vulgare*
	Crown vetch	*Securigera varia*
	Birds-foot trefoil	*Lotus corniculatus*
	White sweet clover	*Melilotus alba*
	Yellow sweet clover	*Melilotus officinalis*
Second Priority Grasses to Remove	Amur silver grass	*Miscanthus sacchariflorus*
Second Priority Forbs to Remove	Creeping Charlie	*Glechoma hederacea*
	Butter and eggs	*Linaria vulgaris*
	Japanese knotweed	*Polygonum cuspidatum*
	Perennial sow thistle	*Sonchus arvensis*
	Cow vetch	*Vicia cracca*
	Hairy vetch	*Vicia villosa*
Any Tree, Shrub, or Vine Outside the Screening Plantings		

Appendix 4. Revision Log

Date	Editor	Content
2019-08-05	Melissa Schmit, Geronimo	Revised mowing text, added possible review of seed mixes for haying
2019-08-06	Benjamin Staehlin, AES	Added revision log
2019-08-12	B. Staehlin & Kim Chapman, AES	Modified timing of mowing; added text for haying option