Appendix D
Decommissioning Plan

Red Rock Solar, LLC
Docket No. 19-620
November 2020

Red Rock Solar Project

Cottonwood County, Minnesota

Decommissioning Plan

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1.0 Decommissioning Plan

1.1 General

The following provisions are intended to ensure that facilities are properly removed after their useful life. The plan includes provisions for removal of all structures and foundations, restoration of soil and vegetation, and a plan ensuring financial resources will be available to fully decommission the site. The Contractors will comply with requirements of all permits during the decommissioning process.

The Red Rock Solar Project is a proposed 60 Megawatt alternating current (60 MW-ac) solar electric generating facility using ground mounted photo voltaic panels, located on 1276 acres of land in Cottonwood County, Minnesota, south of the town of Dafur. The facilities will be located in a fenced area of roughly 500 acres. See Figure 1.

The project has a 79.8 MW direct current capacity and uses 181,364 bifacial 440 Watt modules. The modules are mounted on single axis trackers, which are supported by pile foundations. The individual arrays are enclosed by chain link security fences, and access is provided by at multiple access points through gates in the fences. Thirty thousand feet (5.7 miles) of 16 foot wide access roads provides access to the arrays and equipment skids. A below-ground electrical collection system brings the power from the arrays to 15 equipment skids contain inverters, transformers, and other electrical equipment. The voltage is increased to 34.5 kV by the transformers on the equipment skids, and electricity routed to a step-up substation adjacent to the Big Bend Wind Project substation located approximately three miles away. The Red Rock Solar substation decommissioning is included in this decommissioning plan, while the Big Bend Wind substation is included in the Big Bend Wind Project Decommissioning Plan.

The fenced area occupied by the arrays, and the connection to the Big Bend Wind Project substation is exclusively cropland prior to construction of the project. The project is still in the early stages of development and this plan assumes a December 31, 2022 Commercial Operations Date (COD). At this time there is no Power Purchase Agreement (PPA) in place.

The purpose of this Decommissioning Plan (and its succeeding and revised Decommissioning Plans, the “Plans”) is to describe the means and methods that can be used to remove project facilities, and reclaim, restore, and return the land altered during the construction and operation of the project to its predevelopment condition to the extent feasible, in accordance with the requirements of Section 25, Subdivision 2B. 7 of the Cottonwood County Zoning Ordinance, titled Renewable Energy Ordinance, and Minnesota Statutes Chapter 216C.25, 500.30 and Minnesota Rules Chapter 1325.1100. For this project, predevelopment condition is agricultural use, and the goal will be to return the land to an agricultural ready (tilled to farmable) condition. This plan is intended solely for the decommissioning of the Red Rock Solar Project. A separate decommissioning plan has been prepared for the Big Bend Wind Project which includes the operations and maintenance facility

1.2 Decommissioning and Reclamation

The project has a lifespan of 30-50 years. For the decommissioning estimate, we assume the original solar panels that are installed are expected to have a useful commercial lifespan of approximately 35 years. At the end of commercial operations, or when the facility has not produced electricity for a continuous period of twelve months, the Owner will be responsible for removal of all structures and foundations. The owner will restore and reclaim the site to pre-construction topography and topsoil quality to the extent practical.

Decommissioning includes removing the solar panels, solar panel racking, steel foundation posts and beams, inverters, transformers, above-ground cable, below-ground cables and lines less than 48” deep, equipment pads and foundations, equipment cabinets, and ancillary equipment. The civil facilities, access road, security fence, and any drainage structures are included in the scope. Standard decommissioning

practices would be utilized, including dismantling and repurposing, salvaging/recycling, or disposing of the solar energy improvements.

After all equipment is removed, any holes or voids created by poles, concrete pads and other equipment will be filled in with soil to the surrounding grade and seeded with a previously approved seed mix. All access roads and other areas compacted by equipment will be de-compacted to a depth of 18 inches from finished grade prior to fine grading and tilling to an agriculture ready condition. This may include seeding as farmland or re-development of the land for other beneficial uses, based on consultation with the landowner.

1.3 List of Decommissioning Activities

1.3.1 Timeline

Decommissioning is estimated to take approximately 20 weeks to complete once decommissioning activities commence. The decommissioning crew(s) will ensure that all equipment and materials are recycled or disposed of properly. Due to the large land area used by the solar facility, the number of crews can easily be increased, or decreased, to adjust the time required for decommissioning. There are only a few tasks that must be performed in sequence to decommission a solar facility and each individual task is short in duration.

1.3.2 Removal and Disposal of Site Components

The removal and disposal details of the site components are found below. For details on the assumptions of time required for each task, crew productivity, and logistics for transport for recycling, reselling, and disposal, see Section 1.6.

Modules: Modules will be inspected for physical damage, tested for functionality, and disconnected and removed from racking. Functioning modules will be packed and shipped to an offsite facility for reuse or resale. Non-functioning modules will be packed, palletized and shipped to the manufacturer or a third party for recycling or disposal.

Racking: Racking and racking components will be disassembled and removed from the steel foundation posts, processed to appropriate size, and sent to a metal recycling facility.

Steel Foundation Posts: All structural foundation steel posts will be pulled out to full depth, removed, processed to appropriate size, and shipped to a recycling facility. During decommissioning, the area around the foundation posts may be compacted by equipment and, if compacted, the area will be de-compacted in a manner to adequately restore the topsoil and sub-grade material to a density consistent for vegetation.

Above-ground and Below-ground Cables and Lines: Above-ground cables are used in the DC collection system and are suspended from the tracker arrays. The medium voltage alternating current collection system (MV-ac), including the cables running from the equipment skids to the step-up substation are below-ground. Below-ground cables and conduits contain no materials known to be harmful to the environment. Decommissioning will include removing below-ground cables buried above 48 inches. Topsoil will be segregated and stockpiled for later use prior to any excavation and the subsurface soils will be staged next to the excavation. The subgrade will be compacted to a density of approximately 90 percent of standard Proctor density. Topsoil will be redistributed across the disturbed area. Above-ground lines will be removed from the project and taken to a recycling facility.

Inverters, Transformers, and Ancillary Equipment: All electrical equipment will be disconnected and disassembled. All parts will removed from the site and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at the Owner’s sole discretion, consistent with applicable regulations and industry standards.

Equipment Foundation and Ancillary Foundations: The ancillary foundation for Red Rock Solar are pile foundations for both equipment skids and met towers. As with the solar array steel foundation posts, the

foundation piles will be pulled out completely. Duct banks will be excavated to a depth sufficient to remove all conduits, cables, etc. to a depth of 48 inches below grade. The remaining excavation will be filled with clean subgrade materials of quality comparable to the immediate surrounding area. All unexcavated areas compacted by equipment used in decommissioning will be de-compacted in a manner to adequately restore the topsoil and sub-grade material to a density of approximately 90 percent of standard Proctor density. All materials will be removed from the site and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at the owner's sole discretion, consistent with applicable regulations and industry standards.

Fence: All fence parts and foundations will be removed from the site and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at the owner's sole discretion, consistent with applicable regulations and industry standards. The surrounding areas will be restored to pre-construction conditions to extent feasible.

Access Roads: Facility access roads will be used for decommissioning purposes, after which removal of roads will be discussed with the Landowner, using the following process:

1) After final clean-up, roads may be left intact through mutual agreement of the landowner and the owner unless otherwise restricted by federal, state, or local regulations.

2) If a road is to be removed, aggregate will be removed and shipped from the site to be reused, sold, or disposed of appropriately, at the Owner's sole discretion, consistent with applicable regulations and industry standards. Clean aggregate can often be used as "daily cover" at landfills for no disposal cost. All internal service roads are constructed with geotextile fabric and eight inches of aggregate over compacted subgrade. Any ditch crossing connecting access road to 330th St, 590th Ave or CSAH 8 will be removed unless the landowner requests it remain. The subgrade will be de-compacted to a depth of approximately 18 inches using a chisel plow or other appropriate subsoiling equipment. All rocks larger than four inches will be removed. Topsoil that was stockpiled during the original construction will be distributed across the open area. The access roads and adjacent areas that are compacted by equipment will be de-compacted.

Substation: All steel framing, conductors, switch gear, transformers, security fence, and other components of the step-up facility will be disassembled and recycled, or reused off-site. The rock base will be removed using bulldozers and wheeled loaders or backhoes. The material will be hauled from the site using dump trucks to be recycled or disposed at an off-site facility. Permanent storm water treatment facilities, such as retention basins, will be removed. Topsoil will be reapplied to blend with the surrounding grade to promote pre-construction drainage patterns. Soil and topsoil will be decompacted and the site will be restored to the pre-construction conditions using conventions farm tractors, plows, and discs.

The cost of the point on interconnection substation removal is not included in the decommissioning plan. We understand that the ownership of that substation is different than solar facility.

1.3.3 Restoration/Reclamation of Site

The Owner will restore and reclaim the site to approximately the pre-construction condition consistent with the site lease agreement. The Owner assumes that most of the site will be returned to farmland and/or pasture after decommissioning, and will implement appropriate measures to facilitate such uses. If no specific use is identified, the Owner will till the soil to an agricultural ready condition. If the site is not returned to farming, it will be revegetated with a seed mix approved by the local soil and water conservation district or similar agency. The goal of restoration will be to restore natural hydrology and plant communities to the greatest extent practicable while minimizing new disturbance and removal of native vegetation. The decommissioning effort will implement best management practices (BMP's) to minimize erosion and to contain sediment on the Project to the extent practicable with the intent of meeting this goal include:

1. Minimize new disturbance and removal of native vegetation to the greatest extent practicable.

2. Removal of solar equipment and access roads up to four (4) feet below surrounding grade, backfill with subgrade material and cover with suitable topsoil to allow adequate root penetration for plants, and so that subsurface structures do not substantially disrupt ground water movements.

3. Any topsoil that is removed from the surface for decommissioning will be stockpiled on the landowners' property, and will not be removed or used on another landowners' property. Once decommissioning activity is complete, topsoil will be re-spread to assist in establishing and maintaining plant communities.

4. Stabilize soils and returning them to agricultural use according to the landowner direction.

5. During and after decommissioning activities, install erosion and sediment control measures, such as silt fences, bio-rolls, and ditch checks in all disturbance areas where potential for erosion and sediment transport exists, consistent with storm water management objectives and requirements.

6. Remediate any petroleum product leaks and chemical releases prior to completion of decommissioning.

Decommissioning and restoration activities at each site will be completed within 12 months after the end of commercial operations

1.3.4 Advance Notice to Private Property Owner

The Facility owner will provide the Landowner or Tenant with a minimum of 48 hours prior notice before accessing his/her property for the purpose of Construction or Deconstruction of a Commercial Solar Energy Facility.

Prior notice shall consist of either: (i) a personal contact, telephone contact, or email contact, whereby the Landowner or tenant is informed of the Facility owner's intent to access the land; or (ii) the Facility Owner mails or hand delivers to the Landowner or tenant's home a dated, written notice of the Facility Owner's intent. Such written or hand or hand delivered notice shall include a toll-free number at which agents of the Facility Owner can be reached. The Landowner or tenant need not acknowledge receipt of the written notice before the Facility Owner can enter the Landowner's property.

1.3.5 Advance Notice to Counties and Minnesota Public Utilities Commission

The Facility owner will provide written notice to Cottonwood County Commissioner, the Minnesota Pollution Control Agency (MnPCA), the Minnesota Public Utilities Commission, and any other local, state, or federal permitting agencies at least 30 days prior to commencement of decommissioning. Upon completion of decommissioning, the Facility owner will provide written notice to Cottonwood County Commissioner, and the Minnesota Public Utilities Commission within 30 days.

1.4 Post-Restoration Monitoring

Decommissioning of the site will comply with permits for NPDES/SDS CSW Permit, Spill Containment and Countermeasure (SPCC) Plan, and SWPPP, if grading activities are necessary and exceed applicable permit thresholds. Decommissioning may include post-restoration monitoring as required by the NPDES/SDS CSW Permit and SWPPP and other applicable requirements. In addition, the landowner will be notified about the activities planned for their property. Estimated Net Decommissioning Costs and Financial Assurance

1.5 Estimated Decommissioning Costs

The decommissioning costs are calculated using current pricing. In keeping with the requirements of many jurisdictions the estimate of net costs should be updated periodically to recognize price trends for both decommissioning costs and the salvage and resale values of the components. This estimate is based on the first five years of operation. Subsequent revisions to the decommissioning plan and cost estimate may

be required based on changes in construction techniques and technology, and changing material scrap or resale values.

There are currently active markets for scrap steel, aluminum, and copper, used transformers and electrical equipment, and used solar panels. Scrap metal prices have been discounted from posted spot prices found on www.scrapmonster.com. Pricing for used panels has been discounted from prices received from We Recycle Solar for a similar project. The pricing of the used panels has incorporated the degradation from five years of use as warrantied the manufacturer (not more than 0.5 percent per year).

The estimated cost for decommissioning is approximately $7,354,000. Salvage and resale value is estimated as approximately $6,335,000, resulting in a net cost of $1,019,000. The form and the amount of the financial security will be determined and the information provided in a Compliance Filling.

For additional detail on the assumptions made see Section 1.6.

If the Company fails to decommission the arrays in material compliance with the decommissioning and restoration requirements of this Plan, the County may choose to decommission the arrays located therein and make a claim or claims upon the Security (defined below), for the decommissioning costs. If the County does not choose to decommission the arrays, a landowner may undertake decommissioning of the arrays located on his or her property and make a claim for decommissioning costs incurred by the landowner, subject to the terms of the land agreement between such landowner and the Company.

The Company shall provide to the County security in the form of a (or combination of) performance bond, surety bond, letter of credit, corporate guarantee, or other form reasonably satisfactory to the County (the "Security") that is accessible by the county or landowner. The Company will provide the Security to the County no later than the 10th anniversary of the operation date of the Project (the "Initial Security").

The Security will be in an amount equal to the Net Removal Cost (definition to follow). As set forth above, Westwood calculates the current Net Removal Cost as $16,983 per MW-ac. The Net Removal Cost will be reevaluated prior to provision of the Initial Security, and the amount of the Initial Security will be equal to the Net Removal Cost at the time that the Initial Security is due. To determine the Net Removal Cost for the Initial Security, the Company shall choose a licensed professional engineer, who may be an employee of the Company or an employee of an affiliate of the Company, with knowledge of the operation and decommissioning of solar farms (a "Professional Engineer"), which Professional Engineer will be reasonably satisfactory to the Commission and retained by the Company. The Professional Engineer will determine the removal cost per MW of the operating arrays located in the County minus the estimated resales or salvage value of any Project equipment located in the County included in the decommissioning (the "Net Removal Cost"). In the event Company does not suggest any Professional Engineer that is reasonably satisfactory to the Commission, the Commission and the Company shall each select a Professional Engineer licensed in Minnesota and the Professional Engineers thus selected shall select a third Professional Engineer, which shall each provide an estimate of the Net Removal Cost; the Security will be in an amount equal to the average of the three estimates of the Net Removal Cost. The Company shall pay all fees in obtaining the estimates of the Net Removal Cost.

The Security shall be reevaluated by a Professional Engineer following the process set forth in the preceding paragraph on the fifth anniversary of the Commercial Operation Date and every five years thereafter. The amount of Security may be modified to reflect any adjustments to the Net Removal Cost. The Security will stay in place until the Decommissioning of all of the arrays in the Project is complete; provided that in the event of Decommissioning of an array is completed prior to the remaining arrays in the Project, the Security will be reduced by the amount applicable to such array.

Cost estimate: On Next Page

Red Rock Solar Project				
Project Size	79.80	MW-DC	60	MW-AC
	Quantity	Unit	Unit Cost	Total Cost
Mobilization/Demobilization	1	Lump Sum	$469,400.00	$469,400
Mobilization was estimated to be approximately 7% of total cost of other items.				
Permitting				
State Permits	1	Lump Sum	$10,000.00	$10,000
Subtotal Permitting				**$10,000**
Decommissioning will require a SWPPP and SPCC plan, cost is an estimate of the permit preparation cost				
Civil Infrastructure				
Removal Gravel Surfacing from Road	8,889	Cubic Yards (BV)	$3.88	$34,449
Haul Gravel Removed from Road (Windom, MN)	11,111	Cubic Yards (LV)	$6.41	$71,222
Disposal of Gravel Removal from Road	14,400	Tons	$0.00	$0
Remove and Load Culvert from Beneath Access Roads	5	Each	$448.00	$2,240
Haul Culvert Removed from Access Roads	3	Tons	$4.48	$12
Disposal of Culverts (Windom, MN)	3	Tons	$74.00	$201
Grade Road Corridor (Re-spread Topsoil)	30,000	Linear Feet	$1.56	$46,944
Erosion and Sediment Control for Road Restoration	9,000	Linear Feet	$1.71	$15,390
Decompaction of Road Areas	16.53	Acres	$418.71	$6,921
Till to Farmable Condition at Road Areas	16.53	Acres	$236.80	$3,914
Removal of Security Fence	53,000	Linear Feet	$6.00	$318,000
Subtotal Civil Infrastructure				**$499,293**
Structural Infrastructure				
Removal Array Steel Foundation Posts	22,670	Each	$12.90	$292,543
Haul Array Steel Post (New Ulm, MN)	1,530	Tons	$13.16	$20,138
Removal Array Racking	3,752	Each	$248.40	$932,107
Haul Array Racking (New Ulm, MN)	2,348	Ton	$13.16	$30,893
Subtotal Structural Infrastructure				**$1,275,682**
Steel removal costs were calculated by using information from array manufacturers for installation rates and using the sam				
rates to calculate total days to remove equipment. Hauling calculations are based on the locations of metals recyclers.				
Electrical Collection/Transmission System				
Removal of PV Panels	181,364	Each	$12.07	$2,188,606
Haul PV Panels to Reseller	4,498	Tons	$382.80	$1,721,765
Removal of Combiner Boxes	180	Each	$60.00	$10,800
Removal of PCU Stations (Colman, SD)	15	Each	$4,000.00	$60,000
Removal of Scada Equipment	1	Each	$5,000.00	$5,000
Removal of DC Collector System Cables (copper)	79.8	Per MW	$3,000.00	$239,400
Removal of Underground (AC) Collector System Cables	79.8	Per MW	$5,000.00	$399,000
Load and Haul Cables for Recycling	172.4	Ton	$29.44	$5,075
Removal of Fiber Optic Cable	79.8	Per MW	$1,000.00	$79,800
Subtotal Electrical Collection/Transmission System				**$4,709,445**

Substation				
Disassembly and Removal of Main Power Transformer(s)	1	Each	$4,500.00	$4,500
Freight Transformer(s) Offsite	1	Each	$3,000.00	$3,000
Disposal of Transformer (Including Oil)	1	Each	$0.00	$0
Excavate Around Transformer Foundation(s)	1	Each	$1,870.00	$1,870
Remove Complete Transformer Foundation(s)	1	Each	$14,300.00	$14,300
Backfill Excavation Area from Transformer Foundation Removal	1	Each	$580.50	$581
Haul Concrete (Transformer, Switch Gear, etc. Foundations)	170	Tons	$7.20	$1,225
Disposal of Concrete from Transformer Foundation	170	Tons	$57.20	$9,730
Demolish Substation Site Improvements (fences, etc)	1	Lump Sum	$5,000.00	$5,000
Demolish Control Building and Foundation	1	Lump Sum	$12,000.00	$12,000
Remove Medium/High Voltage Equipment	1	Lump Sum	$3,500.00	$3,500
Remove Structural Steel Substation Frame	1	Lump Sum	$3,500.00	$3,500
Haul - Demolition Materials, Removed Equipment & Structural St	1	Lump Sum	$2,880.00	$2,880
Disposal of Demolition Materials, Removed Equipment and Struc	1	Lump Sum	$0.00	$0
Remove and Load Gravel Surfacing from Substation Site	1,076	Cubic Yards	$2.42	$2,604
Haul Gravel Removed from Substation Site	1,598	Tons	$7.20	$11,505
Disposal of Gravel from Substation Site	1,598	Tons	$1.56	$2,500
Decompact Substation Site	1.00	Acres	$418.71	$419
Grade Substation Site	1	Each	$0.00	$0
Erosion and Sediment Control at Substation Site	1	Lump Sum	$352.20	$352
Revegetate Sustation Site	1.00	Acres	$13,358.40	$13,358
Subtotal Substation				$92,823
Site Restoration				
Perimeter Controls	500	Linear Feet	$1.71	$855
Till to Farmable Condition at Array Areas	496.5	Acres	$236.80	$117,564
Subtotal Site Restoration				**$118,419**
Project Management				
PM (half-time), Superintendent, FE's, Clerk	20	Weeks	$8,950.00	$179,000
Subtotal Project Management				**$179,000**
Subtotal Demolition/Removals				**$7,354,062**
Salvage				
Fencing	265	Tons	$150.00	$39,750
Steel Posts	1,530	Tons	$142.50	$218,061
Module Racking	2,348	Tons	$150.00	$352,129
PV Modules	181,364	Each	$29.26	$5,306,700
PCU Stations	15	Each	$6,768.00	$101,520
Transformers (copper windings)	388,000	Pounds	$0.26	$100,880
DC Collection Lines	241,315	Pounds	$0.68	$164,698
AC Collection Lines	103,421	Pounds	$0.50	$51,193
Salvage values are a combination of the following factors; current market metal salvage prices, current secondary market for solar panel module recycling, discussions with national companies that specialize in recycling and reselling electrical transformers and inverters, and the assumption that care is taken to prevent any damage or breakage of equipment.				
Subtotal Salvage				**$6,334,931**
Total Demolition Minus Salvage				**$1,019,131**

Notes:				
1. Prices used in analysis are estimated based on research of current average costs and salvage values.				
2. Prices provided are estimates and may fluctuate over the life of the project.				
3. Contractor means and methods may vary and price will be affected by these.				

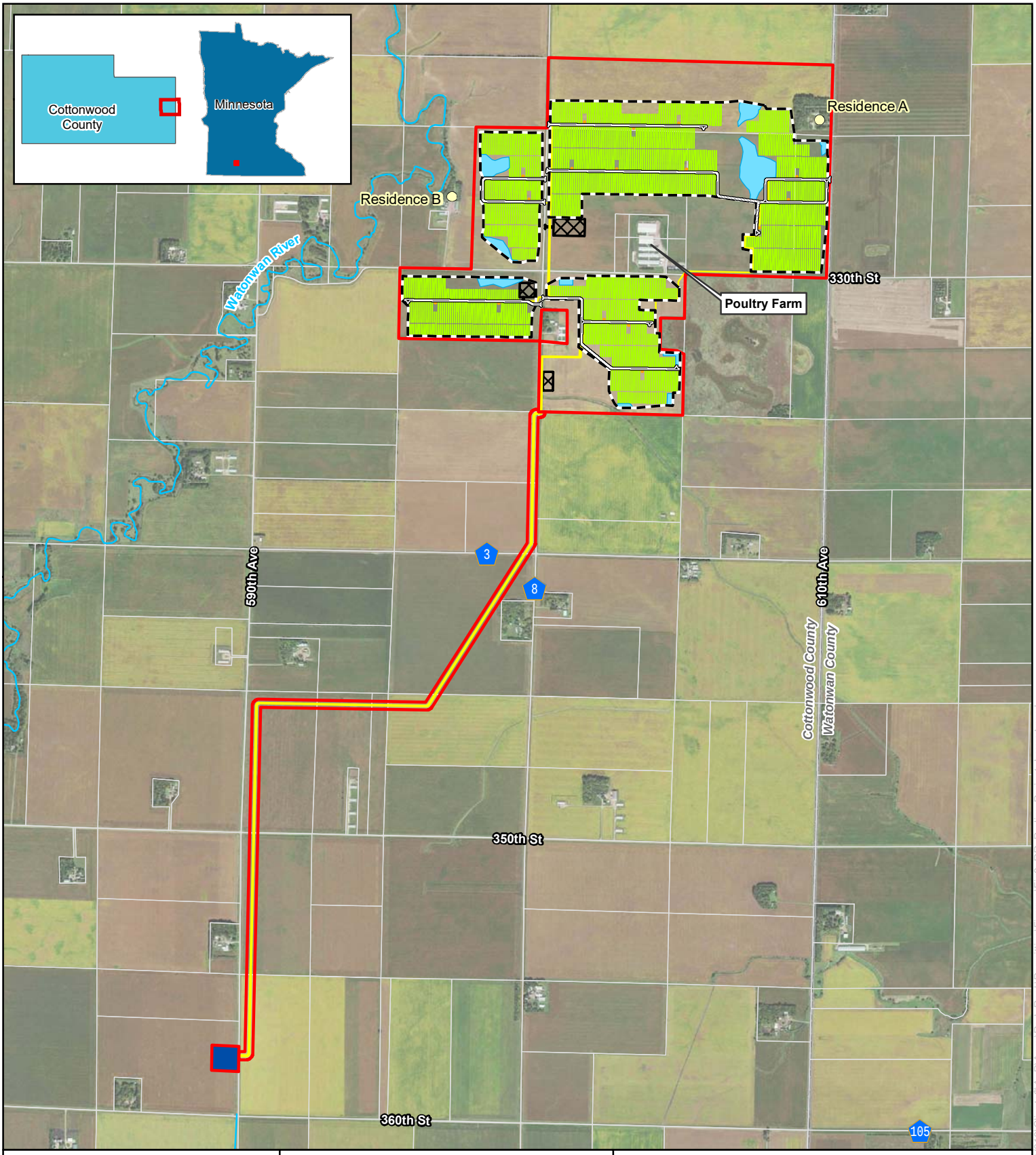
1.6 Decommissioning Assumptions

To develop a cost estimate for the decommissioning of the Red Rock Solar Project, Westwood engineers made the following assumptions and used the following pricing references: Costs were estimated based on current pricing, technology, and regulatory requirements. The assumptions are listed generally in order from top to bottom of the estimate spreadsheet. We developed time and material based estimates considering composition of work crews and equipment and material required using RS Means data. When materials have a salvage value at the end of the project life, the construction activity costs and the hauling/freight cost are separated from the disposal costs or salvage value to make revisions to salvage values more transparent.

1. Decommissioning year is based on a 5 year initial period for the financial security. The projected life of the project is 30-50 years.
2. This Cost Estimate is based on a site boundary provided by Apex on 8/21/2020, additional project information provided by Apex on 5/15/2020, and Westwood's experienced on previous utility scale solar decommissioning plans.
3. A project of this size and complexity requires part-time project manager and support staff.
4. Prevailing wage will be used for the majority of the tasks except for heavy equipment operation. Since MNDOT unit prices are used, where possible, the labor rates will reflect the prevailing wage as determined by the Minnesota Department of Labor and Industry (DLI).
5. Mobilization was estimated at approximately 7% of total cost of other items.
6. Permit applications required include the preparation of a Storm Water Pollution Protection Plan (SWPPP) and a Spill Prevention Control and Countermeasure (SPCC) Plan.
7. Road gravel removal was estimated on a time and material basis using a 16 foot width and an six inch thickness for the access roads. Since the material will not remain on site, a hauling cost is added to the removal cost. Road aggregate can often be disposed of by giving to landowners for use on driveways and parking areas. Many landfills will accept clean aggregate for use as "daily cover" and do not charge for the disposal.
8. Grade Road Corridor reflects the cost of mobilizing and operating light equipment to spread and smooth the topsoil stockpiled on site to replace the aggregate removed from the road.
9. Erosion and sediment control along road reflects the cost of silt fence on the downhill side of the road and surrounding all on-site wetlands.
10. Topsoil will be stockpiled on landowners' property during construction, and will not be removed or used on other landowners' property. Therefore, this top soil will be available on site to replace the road aggregate, once removed. Subsoiling cost to decompact roadway areas is estimated as $418 per acre (based on state DOT bid prices for Subsoiling), and tilling to an agriculture ready condition is estimated as $236 per acre (based on state DOT bid prices for Soil Bed Preparation). The majority of the project area is tilled to agriculture ready condition since the decommissioning activities are not expected to eliminate the existing grasses and vegetation under the arrays or heavily compact the soils. Array areas left as pasture will require little restoration effort since the arrays will have been planted with prairie, pollinator seed mixes, and the soils will have been rejuvenated by being planted as prairie and removed from intense farming.

11. Fence removal includes loading, hauling, and recycling or disposal. Fence and posts weigh approximately 10 pounds per foot.
12. Array support posts are generally lightweight “I” beam sections installed with a piece of specialized tracked equipment. Crew productivity is approximately 240 posts per day, and the same crew and equipment should have a similar productivity removing the posts, resulting in a per post cost of approximately $13.00.
13. A metal recycling facility (New Ulm Steel & Recycling) is located in New Ulm, MN is 47 miles from the project site. Pricing was acquired from www.scrapmonster.com. The posts weigh approximately 150 pounds each, and we estimate the hauling costs at approximately $0.28 per ton mile. The pricing from Scrapmonster is adjusted to 75 percent of the published price to reflect the processing required for the posts to fit recycling requirements and New Ulm Steel & Recycling’s margin.
14. Based on the review of a manufacturer’s details of the array support structures the structures weigh approximately fifteen pounds per linear foot. The facility has 181,364 modules, for a total module weight of 4,498 tons. The tracker arrays are made of steel pipes, mounted on the foundation piles, which the panels are bolted to. We estimate a crew with hand tools and hydraulic shears can disassemble and cut the pieces to sizes for recycling at a rate of about 30 arrays per person four man crew per day based on RS Means cost data.
15. Hauling the steel to New Ulm, MN at $0.28 per ton mile costs about $13.16 per ton.
16. The solar panels rated at 440 watts measure approximately 3.45 feet by 6.99 feet and weigh 49.6 pounds so they can easily be disconnected, removed, and packed by a three person crew at a rate we estimate at 20 panels per hour.
17. Based on preliminary design information that 4000 kVA inverters will be used on this project. Pad mounted Inverters are modular medium sized enclosures (18’-4” long, 7’-3” tall, and 5’-3” deep (ABB PVS980-CS 4000 kVA US 1500 V) that are mounted on a concrete slab. They weigh 13,220 pounds, and can be disconnected by a crew of electricians. They must be lifted by a truck mounted crane for transport to the recycler. They contain copper or aluminum windings.
18. Transformers for this project will likely be mounted on the same concrete pads as the inverters. The transformers and associated cabinets weigh approximately 15,000 pounds and contain either copper, or more commonly, aluminum windings that have significant salvage value. They are typically oil filled, but most transformer recyclers will accept the transformers with oil. The estimated costs include removal of the concrete pads and conduits feeding the equipment.
19. Medium voltage (MV) equipment and SCADA equipment are mounted on the same concrete pad as the transformer and enclosed in weather proof cabinets. Their size requires light equipment to remove them. The costs shown include the removal of the concrete pads.
20. The below-ground collector system cables are placed in trenches, inside of PVC conduits, with a minimum of 3 feet of cover.
21. All access road entrances to public roads are located on gravel surfaced roads, so no rock construction entrances to reduce vehicle tracking will be required.
22. Perimeter control pricing is based on a sediment fence placed on the downgrade side of the work area perimeters, and protecting wetlands and drainage swales within the project area. Pricing is based on RS Means unit prices. Since the entire array area is currently planted in crops, and the land is very flat, very little erosion and sediment control will be required.
23. No topsoil will be removed from the landowner’s property or used on other landowners’ property during decommissioning. Most of the site will not have been compacted by heavy truck or equipment traffic so no top soil will need to be imported, and very few areas will need to be decompacted.

24. Metal salvage prices (steel, aluminum, copper) are based on quotes from www.scrapmonster .com for the U.S. Midwest in July 2020. These prices are based on delivery to the recycling facility with the material prepared to meet size, thickness, cleanliness and other specifications. A reduction of 25% has been taken from this price to reflect the difficulty of realizing the full spot prices posted. The prices are three months old at the time they are displayed on the website.
25. The steel posts and array racking are priced based on 75 percent of the HMS (high melt steel) 80/20 the price listed on www.scrapmonster.com on July 23, 2020. ($200 per ton)
26. Solar module degradation is approximately 0.50% per year, or 96% of capacity remaining after 5 years, and 82% capacity remaining after 35 years. The manufacturer guarantees that panels will have 98 percent the rated capacity when new, so combining the guaranteed capacity and the degradation, the estimate uses 95 percent capacity after five years. There is currently a robust market for used solar panels and pricing can be found on, Solar Biz, eBay and other sites. New entrants in the market include, We Recycle Solar, which markets used panels in Asia, Africa, and South America. We have assumed that as long as the modules are producing power they will have economic value. To avoid unconservative pricing for the used modules we used a pricing of 80 percent of the $0.0875 per watt price quoted by We Recycle Solar for a similar project within the last six months. The price is based on the buyer transporting panels placed on pallets from the project site.
27. There is an active market for reselling and recycling electrical transformers and inverters with several national companies specializing in recycling. We have assumed that the electrical equipment will be obsolete at the time of decommissioning so we have based the pricing on 75 percent of the quote for copper transformer scrape obtained from scrapmonster.com in July 2020. We have combined the weights of the transformers and inverters.
28. The collection lines are priced assuming copper conductor wire for the DC circuits, which is typical. The prices used reflect a reduced yield of the copper resulting from the insulation and other materials that must be stripped from the wire so that the copper can be recycled. The estimate uses the Midwest price of #2 copper wire with a 50 percent recovery rate as found on www.scrapmonster.com in July 2020, which is $0.91 per pound. For the salvage value we have assumed 75 percent of the published price.
29. The below-ground collection lines are assumed to be aluminum conductor. The majority of the length of the collection lines will be buried deep enough so that it does not have to be removed. Those sections coming up out of the ground at junction boxes, or otherwise, can be salvaged. The salvage value is based on the Midwest price of E.C. Aluminum Wire as found on www.scrapmonster.com in July 2020, which is $0.66 per pound. We have reduced the price to 75 percent of the quoted price to reflect the complications of stripping insulation and separating the materials.
30. Care to prevent damage and breakage of equipment, PV modules, inverters, capacitors, and SCADA must be exercised, but removal assumes unskilled common labor under supervision.
31. All salvage is based on the weights of bulk material or equipment.



RED ROCK SOLAR

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For Environmental Review Purposes Only

Figure 1
Preliminary Project Layout
Red Rock Solar Project
Cottonwood County, Minnesota

- Residence on Solar Development Parcel
- Collection Line
- Project Boundary
- Access Road
- Security Fence
- Inverter
- Solar Array
- Project Substation
- Laydown Area
- Basin
- Parcel Boundary
- NHD Stream (Perennial)

Source: \\MINTSRV01\Clients$\A_DApex\Red_Rock\Permitting\Figures\fig3_RR_Prelim_Project_Layout.mxd

Date: (11/2/2020)