Special Use Permit
Application Packet – South Haven Affordable Solar

May 6, 2024

09761 Blue Star Hwy
South Haven, MI 49090

Dear Members of the South Haven Township Board,

This Special Use Permit is to construct a Solar Farm within South Haven Township, Michigan. The request is being made by South Haven Affordable Solar, LLC (dba SolAmerica Energy, LLC), "Applicant," on behalf for the project known as "South Haven Affordable Solar."

The Applicant plans to develop and construct an up to 4.5 MW-AC Solar Farm on approximately 32 acres of land of a +/-55-acre parcel. The parcel of land is owned by Rivers Edge Holdings LLC. The power generated by this solar farm will interconnect to the existing grid. According to the Van Buren County GIS, the participating PIN number is 80-17-014-021-00. The site has been designed to meet the South Haven Township Special Use requirements, as well as the South Haven Township Zoning Ordinance.

Exhibits included in Application Packet:

- Exhibit A – Project Narrative
- Exhibit B – Findings of Fact
- Exhibit C – Zoning Site Plan
- Exhibit D – Decommissioning Plan
- Exhibit E – Emergency Response, Fire Prevention, and Safety Plan
- Exhibit F – FEMA FIRMette
- Exhibit G – Hydrologic Response of Solar Farms
- Exhibit H – Environmental Constraints Memo
- Exhibit I – Solar Panel Cut Sheet
- Exhibit J – South Haven Interconnection Resolution
- Exhibit K – Memorandum of Option and Lease Agreement
- Exhibit L – Single Axis Tracker Detail
- Exhibit M – Review Letters from South Haven Area Emergency Services, County Road Commission, County Drain Commission, and EGLE
- Exhibit N – Preliminary Hydrology Analysis

This correspondence explains our application and addresses the requirements of South Haven Township. If you have any questions regarding the application for a Special Use Permit, please contact Lauren Beduhn at 404.351.8175 ext. 106/lbeduhn@solamericaenergy.com or Theresa McGreevy at 312.924.7430.

SolAmerica and our team appreciate the generous assistance that we have received from you and your staff, and we look forward to working with you to serve the public in South Haven Township. Thank you for your consideration of this application.

Warm Regards,

Theresa McGreevy
Kimley-Horn and Associates, Inc.
theresa.mcgreevy@kimley-horn.com

South Haven Charter Township
09761 Blue Star Hwy South Haven MI 49090
269-637-3305 shtwp.zoninga@gmail.com
Zoning Department 111 Grand St Allegan MI 49010 1-800-626-5964 mtsallegan@frontier.com

APPLICATION SITE PLAN REVIEW, SPECIAL USE PUD, SITE CONDO, OTHER

Property Owner

Name River Edge Holdings LLC

Address 4807 Green Meadow Ct. City Hamilton, MI Zip 49419

Telephone 616-836-1474 Email jim@hogquestfarms.com

Representative (if applicable) James DeWitt

Telephone _____ Email _____

Applicant (if different from Owner)

Name South Haven Affordable Solar, LLC

Address 190 Ottley Dr NE, Studio H City Atlanta Zip 30324

Telephone 404.351.8175 ext. 106 Email lbeduhn@solamericaenergy.com

Property Address: 73rd St South Haven Michigan

Property Number 80-17- 014-021-00

Current Zoning Classification and Use The property is zoned Medium Density Residential. There is a small portion of the property in the SW corner that is zoned high density residential. The existing use of the property is agricultural land with row crops.

Nature of Activity for which Review is Requested: (check which apply)
Commercial Use____; Industrial Use___; Multi-family Use ___; Temporary Use___ ;
Grading/Paving____; Special Use __X___;Site Condo ___; PUD _____;
(Other)_____

Describe proposed activity/use: community-scale solar facility

Signature of Property Owner DocuSigned by: James DeWitt A30484C18A2A4BB... Date 3.29.24

Signature of Applicant Docu Anthony M Yourcone C86066D1887D493... Date 3.29.24

(owner and applicant must sign)

OFFICE USE ONLY

Paid ck#_____

Planning Commission Action Date of meeting: _____

_____Approval Granted; ____Approval Granted with Conditions
Conditions:_____
_____

_____Approval Recommended to Township Board
Conditions:_____
_____

_____Disapproval Recommended to Township Board

Comments_____
_____
_____
_____
_____
_____
_____
*see meeting minutes for full details

Township Board Action (if applicable):

_____Approved
_____Disapproved

Comments/Conditions:_____
_____
_____
_____
*see meeting minutes for full detail

Applicants applying for Site plan review – refer to Section 22 Site Plan Review
Please review the whole Section
22.05 Preliminary site plan (if applicable)
22.06 Final site plan

Applicants applying for Special Use – refer to Section 15 Special Uses
Please review 15.01-15.07
See specific land use for regulations
Also refer to Section 22 Site Plan review (22.02B)

Applicants applying for PUD – refer Section 16 Planned Unit Development
Pleased review the whole section
16.05 Site plan review requirements

Applicants applying for Site Condo – refer to Section 16A Site Condominium
Pleased review the whole section
16A.05-06 Site plan review requirements

Other contact Zoning Administrator for submittal requirements

Site plan review fee (not requiring a public hearing) $500.00
Special use, other review fee (requiring a public hearing) $750.00
Make payable to: South Haven Township

SITE PLAN REVIEW APPLICATION CHECKLIST

Every site plan submitted for final review shall contain the following information except as otherwise provided for: Section 22 Site Plan Review Procedures

1. Small-scale sketch of properties, streets and land uses within ¼ mile of the subject property.
2. Ten (10) copies of a site plan at a scale of not more than one (1) inch equals one hundred (100) feet, showing all existing and any proposed arrangements of:
   a. Existing adjacent streets and proposed streets and existing curb cuts within one hundred (100) feet of the property.
   b. All lot lines and dimensions.
   c. Parking lots and access points
   d. All exterior lighting with sample drawings of the fixtures and where necessary engineering calculations showing the effects of such lighting on adjacent properties.
   e. Proposed buffer strips and screening
   f. Existing natural features, including but not limited to: stands of trees, streams, ponds, wetlands, floodplains, steep slopes, critical dunes and high risk erosion areas.
   g. Existing and proposed buildings, including existing buildings within one hundred (100) feet of the boundaries of the property.
   h. Number of square feet allocated to each proposed use and gross floor area in buildings, structures, drives and open space.
   i. For commercial or industrial buildings, the usable floor area for each proposed use.

j. For residential use, the dwelling unit, floor area and density by type.
k. Proposed methods of providing sanitary sewer and water supply services.
l. Proposed methods of providing storm water management with engineering calculations.
m. Written computation for the required parking in compliance with Art. XX
n. Review letter from the South Haven Area Emergency Services.
o. Review letter from the road authority having jurisdiction
p. Review letter from the County Drain Commissioner
q. Review letter(s) from any other public agency having jurisdiction.
r. For plats, condominiums and private roads the professional license seal of the person preparing the plan is required.

NOTE: If any one of the items listed above is absent, unless specifically exempted either in this ordinance or in writing from an appropriate official, the application is incomplete and can only be given conditional approval by the Planning Commission, if a majority of the Planning Commissioners agree.

3. WAIVERS:

The requirements listed above for site plans may be waived except for sub-part 2. b., c., d., and if relevant, n., o., p., and/or r. which shall be required. A site plan eligible for waivers is defined as a project disturbing less than 10% of the lot area or 5,000 square feet, and/or increases gross floor area by less than 10% or 1,000 square feet, as calculated by the Zoning Administrator. If there is a doubt, or if the Planning Commission determines that more information is required, then the project shall automatically be considered to be subject to full site plan requirements.

The applicant is responsible for submitting copies of the site plan as required to the appropriate outside agencies having jurisdiction over physical elements of the plan. These agencies include but are not limited to:

1. Van Buren County Drain Commissioner
2. Van Buren County Road Commission, Driveway Permits Officer and/or Michigan Department of Transportation, Coloma Field Office (or as redesignated by the Department).
3. South Haven Area Emergency Services, Fire Inspector
4. If the development includes a wetland, floodplain, high risk erosion area or critical dune, then the applicant shall indicate compliance with the Michigan Department of Environmental Quality or successor agency (Plainwell/Kalamazoo district office or as re-assigned) requirements.
5. If the development includes a structure over 35 feet in height or is to be located within an airport Accident Safety Zone, then the applicant shall obtain approvals from the Michigan Department of Transportation, Bureau of Aeronautics (Lansing) or successor agency.

APPLICANTS TAKE NOTE: Some of these agencies require lengthy review times. If an applicant fails to contact an agency in a timely manner, then the application may be considered to be incomplete and the Township accepts no responsibility for any delays.

Submit completed application, 10 copies of site plan(s) and fee to:

Zoning Administrator, Tasha Smalley
South Haven Township Hall
09761 Blue Star Hwy, South Haven MI 49090
Twp Hall is open M-F 9-12:30; 1:30-4pm
ZA office hours Tues's 9:00-12:00pm and Thurs's 1:30-4:00pm
269-637-3305

Also available:
Michigan Township Services – Allegan, Inc.
111 Grand Street, Allegan MI 49010
1-800-626-5964

Site plan deadline – 15 days prior to meeting
Public hearing site plan deadline – 28 days prior to meeting

Site plan review fee (not requiring a public hearing) $500.00
Special use, other review fee (requiring a public hearing) $750.00
Make payable to: South Haven Township

Any questions feel free to call or email mtsallegan@frontier.com

Exhibit A: Project Narrative

SPECIAL USE PERMIT
APPLICATION NARRATIVE

SOUTH HAVEN AFFORDABLE SOLAR
VAN BUREN COUNTY, MICHIGAN

PROPERTY OWNER:
RIVERS EDGE HOLDINGS LLC

APPLICANT:
SOUTH HAVEN AFFORDABLE SOLAR, LLC (dba SOLAMERICA ENERGY, LLC)
190 OTTLEY DRIVE NE, STUDIO H
ATLANTA, GA 30324

PREPARED BY:
KIMLEY-HORN OF MICHIGAN, INC.
1000 TOWN CENTER, SUITE 1900
SOUTHFIELD, MI 48075

MAY 2024

KHA #268196015

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I. EXECUTIVE SUMMARY

South Haven Affordable Solar, LLC ("Applicant") seeks the issuance of a Special Use Permit for a 4.5 megawatt (MW-ac) solar energy facility (South Haven Affordable Solar Project or "Project"). The Applicant is an Atlanta, GA based solar development and construction company founded in 2009 and has developed or constructed hundreds of megawatts of solar projects in 15 states and over 125 counties. Our clients include some of nation's largest utilities and independent power producers.

The Project site is located in South Haven Township within Van Buren County, MI at the intersection of 73rd St. and Highway M43, and is approximately 750 feet east of Interstate 196. The Project is to be located on an approximate 55-acre tract of land comprised of 1 parcel, zoned medium and high density residential. The site is currently used for agriculture. The surrounding area is rural with primarily agricultural uses along with single family residential to the south.

The total development area will be approximately 32 acres located centrally on the portion of the approximate 55-acre parent parcel. The remaining parcel area consists of farmland, setbacks and a vegetative screening buffer around the project area. The Project will interconnect to the grid via a pad mounted point-of-interconnection located on the project parcel. Ancillary project facilities will include electrical equipment pads and utility infrastructure. Native, pollinator-friendly vegetation will be maintained across the site to minimize erosion and promote a diverse ecological habitat. Electrical equipment will be encircled with chain link security fencing with barb wire or other anti-climbing device (or approved equal).

Solar energy is clean and efficient, and a properly sited solar facility such as this Project can be a safe, quiet, and unobtrusive neighbor. Solar development can bring significant benefits to South Haven Township and Van Buren County. The Project can complement the Township's agriculture industry, diversify incomes for landowners and revenues for the Township, and become an overall positive force in the community.

II. PROJECT DESCRIPTION

A. Proposed Use

Solar Power Farm, to consist of solar modules over roughly 28 acres of the parcel. Solar modules will be approximately 12 feet high after construction and each module is roughly 7.5 feet long by 4 feet wide. Modules are non-reflective. The project is considered a "passive" power plant.

B. The Applicant

The Project is being developed by South Haven Affordable Solar, LLC (dba SolAmerica Energy, LLC) who is leasing the property from the current property owner for the life of the proposed project. The Applicant is an Atlanta, GA based solar development and construction company, with more than 500-MW of solar energy projects in development on the East Coast and Mid-West. More information on the Applicant can be found at www.solamericaenergy.com.

C. Public Outreach

The Applicant participated in a preliminary application meeting with the Township's Zoning Administrator to discuss the special use permit application process and requirements. In this meeting, the applicant was informed that public notification is coordinated by the Township. The Applicant is willing to support this process if requested by the Township.

D. Project Location and Site Description

The Project site is located in Van Buren County, MI at the intersection of 73rd St. and Highway M43.

The site is comprised of an approximately 55-acre parcel that is utilized as agricultural land. The solar array project area consists of approximately 32 acres. According to the South Haven Township 2021 Zoning Map, a majority of the land area of the parcel is zoned Medium Density Residential as shown in Figure 1. The southwestern corner of the parcel is zoned High Density Residential.

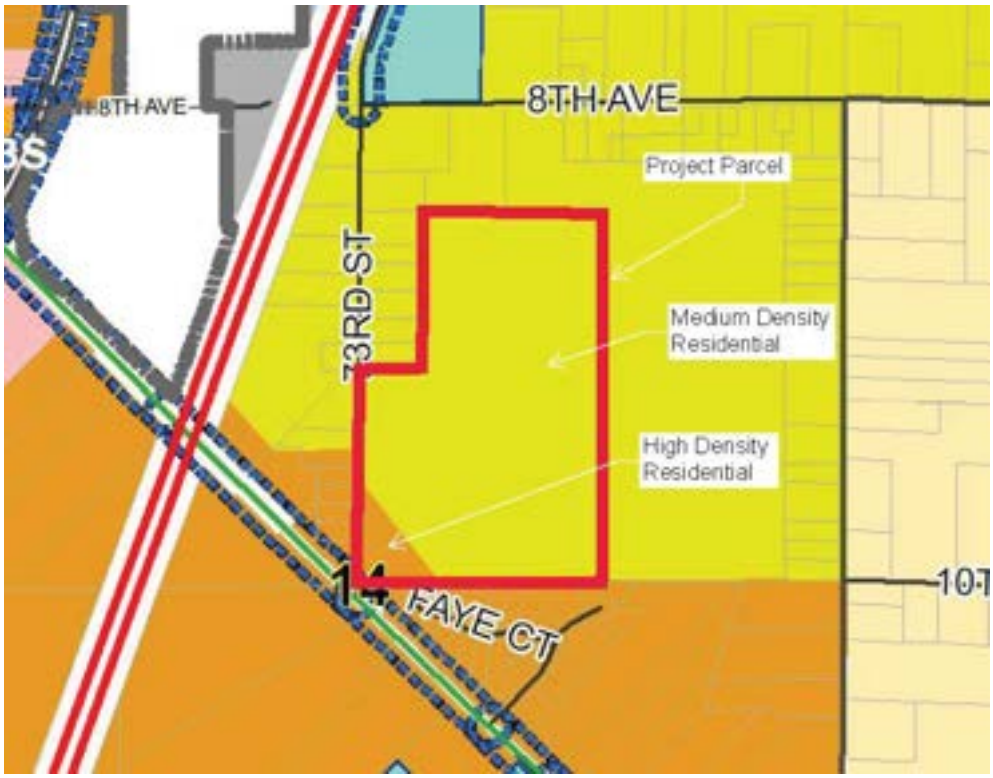


Figure 1. Project Parcel Zoning Map

The site will be developed and constructed by the Applicant and then operated by the Applicant or another long-term project owner. There will be a power purchase agreement (PPA) with the utility to sell the power to local businesses and/or residents to offset power costs from the utility grid.

E. Project Components

The Project will include the following key components:

- Rows of photovoltaic (PV) panels mounted on steel posts principally driven into the ground. Panels will be approximately 12 feet in height after construction is complete. Rows of panels are typically spaced 15-25 feet apart.
- The steel posts are placed individually in an effort to minimize the amount of on-site grading and are engineered to be driven to a depth in the ground that does not require concrete reinforcement.
- Solar PV panels will be mounted on racks running north to south that track the movement of the sun (trackers).
- Like most technology, equipment improves continuously, and markets fluctuate, so the specific manufacturer and models of equipment will not be known until the end of the engineering design process.

- Figure 2 shows a typical single-axis tracker system similar to what will be installed on this site.

Figure 2. Typical Single-Axis Tracker System

- Inverters and transformers will be located within pad-mounted modular metal cabinets. This equipment converts electricity from direct current (DC) to alternating current (AC) and increases its voltage to deliver the energy to the existing utility's distribution grid.

- Electrical collection and communications lines either mounted on the racking, buried in conduits, or located on overhead utility poles.

- Gravel onsite access roads, grassy driving aisles, and gravel entrances from public roads.

- Chain-link security fencing with barbed wire (or approved equal) located around the perimeter of the solar array and developed site areas.

- Stormwater, erosion, and sedimentation control features designed to meet county and

state requirements.

- A storage container placed on a gravel pad for spare parts and maintenance materials, if necessary.

The developed Project footprint is approximately 32 acres of the total 55-acre site, as shown on the Preliminary Site Plan. All disturbed and developed areas will be planted and maintained with native, pollinator-friendly vegetation to stabilize the site and prevent erosion. The remaining site area includes stormwater control features, erosion buffer areas, and property setbacks.

F. Setbacks and Screening

1. Setbacks

The proposed Preliminary Site Plan incorporates proposed setbacks from the Project's property line or road right-of-way line. Per the South Haven Township Zoning Ordinance, Section 15.28 and Article VI, solar equipment will be set back 100' from all property lines and 100' from the right-of way. Given the agricultural and low-density residential developments on neighboring properties, the proposed setbacks are considered more than adequate for the project.

Some stormwater, erosion, and sediment control facilities may be located within certain setback areas to connect them hydrologically to existing downstream systems, per state requirements.

2. Buffering

The solar development area is in the center of the project parcel, which is surrounded by farmland and residential buildings. The solar area is set back from the public rights of way and residential houses. The nearest residence is approximately 177 feet from the Project's solar arrays, the nearest state highway is approximately 375 feet from the Project's solar arrays, and the nearest interstate is over 1000 feet from the Project's solar arrays. Landscape buffers have been provided in areas of the project that lack adequate existing vegetative cover, per the South Haven Township Code. Existing buffers exist on the west side of the site and a portion of the south side of the site. These existing buffers will be kept to maintain existing screening.

III. POTENTIAL IMPACTS AND MITIGATION

A. Construction

The solar arrays are essentially constructed in three phases; 1) site work, 2) structure installation, and 3) electrical installation. The first phase consists of installing initial erosion control features (i.e., perimeter silt fence, sediment ponds, etc.), the site access road, and the perimeter security fence. The second phase consists of driving the support piles into the ground, connecting the racking system to the piles, attaching the solar panels to the racking system, and installing the concrete pad for the transformer and electrical pad. The third phase consists of trenching for the underground electrical conduits, installing the electrical components, and directional boring or trenching the Medium Voltage Line ("MVL") to the Point of Interconnection (POI), and connecting the system to the existing grid. Complete construction of the solar array will take approximately 20 weeks from breaking ground to commercial operation. Approximately 10-20 workers will be onsite during the peak of the construction phase.

1. Stormwater and Erosion and Sedimentation Control

The proposed project will comply with all requirements of the County and State stormwater management regulations and erosion & sediment control provisions, as well as NPDES permit requirements, as applicable. This site may require grading the existing topography to allow for the solar farm infrastructure to properly function on the site. Full stormwater management design will be a part of civil design plans and will include all necessary stormwater control structures to ensure no excess stormwater leaves the site during construction or post-development.

Land disturbing activities will be minimized as much as practical to reduce the potential for environmental and off-site impacts. Currently, the site consists of agricultural land. With the proposed site design, the entire site will be stabilized and maintained with vegetative cover; areas beneath the solar arrays will be planted with grass to stabilize the site. Disturbances within the site area will be seeded with native grasses and pollinator-friendly seed mixes appropriate for the region. Seeded vegetation will establish a deep root system that will stabilize the soil and promote stormwater ground infiltration similar to the existing vegetation on site. By increasing infiltration, the addition of the solar arrays will decrease storm water run-off and drainage.

The proposed site design will protect against soil erosion and sedimentation, as all such facilities must develop erosion and sediment control and stormwater management plans that satisfy applicable state and county requirements during the site plan process.

2. Traffic

Due to the passive nature of the proposed facility, traffic impacts will be minimal. Trip generation is one of the first steps in a traffic impact analysis for a proposed land use. For this project site, there are no on-site personnel required for day-to-day operations and the site will not be open to the public. Consequently, trip generations and impacts to the transportation network are negligible. Traffic impacts will be most noticeable during construction of the facility, which will last approximately 20 weeks. The types of vehicles expected to be accessing the site during construction include equipment hauling trucks, passenger vehicles, fuel delivery vehicles, and material delivery trucks. No oversize or overweight loads are anticipated.

3. Noise

Community-scale solar projects generally do not create noise outside the project area. The inverter is the loudest component of the system. Inverters used for this scale of project have noise levels of approximately 70 decibels within 3 meters of the inverter. Inverters are placed in the center of the solar array to maximize the distance between the inverter and property boundary lines. For this project, the closest inverter is approximately 113 meters to the property line. Utilizing the inverse Square Law for sound attenuation, a principle that describes how sound pressure levels decrease with increasing distance from a point sources, at the property line boundary sound emissions from the inverter are approximately 38 decibels which is similar to the sound levels of a quiet library. This analysis does not account for potential obstructions or barriers, such as vegetation, which will further reduce sound levels.

B. Operations

1. Health and Safety

Solar farms do not endanger public health or safety. The facility will be designed and built to all applicable electrical, construction, and environmental codes and regulations. Security fencing will be provided around all equipment to prevent unauthorized entry.

The photovoltaic (PV) solar panels that will be installed with this project are coated with non-reflective materials designed to maximize light absorption and significantly minimize glare. PV solar panels are designed to absorb as much light as possible since any reflected light is energy lost from the system; therefore, glare or reflected sun light is not an issue with PV solar projects. In fact, the amount of glare that is reflected from a PV solar panel is equivalent to the amount of glare from a newly paved asphalt road. The panels must be designed and installed to eliminate glint and glare effects, or available mitigation techniques must be used on site to

reduce the glint and glare to the lowest achievable levels.

The solar farm will be remotely monitored and will not have on-site personnel for normal day to day operations. Standard operation and maintenance of the facility requires personnel to be on-site approximately 7-10 days during a calendar year. Potable water and wastewater facilities are not necessary on site due to the lack of active on-site personnel.

2. Visual Impact

The Project will not have a negative visual impact on surrounding parcels. The solar development area is strategically placed away from public rights of way and residential houses. The nearest residence is approximately 177 feet from the Project's solar arrays, the nearest state highway is approximately 375 feet from the Project's solar arrays, and the nearest county road is over 1000 feet from the Project's solar arrays. Existing landscaping and proposed buffers provide additional screening around the boundaries of the site that are visually sensitive to receptors. The specific landscape species will be determined at the time of construction drawing submittal, but will be consisting mainly of shrubs and evergreen tree's with a planting height of 6 ft, and a mature height of 12 ft.

C. Decommissioning of the Project

Solar facilities generally have a lifespan of 25 to 30 years prior to decommissioning. The purpose of site decommissioning is to return the original property back to pre-development conditions to the greatest extent possible after the project lifespan has elapsed. Decommissioning of the solar facility will include the disconnection of the solar facility from the electrical grid and the removal of all solar facility components, including solar collectors, cabling, electrical components, fencing and any other associated equipment, facilities, and structures to a depth of at least 36 inches and stabilization of the site. Permits for decommissioning will be obtained as required and notification will be given to stakeholders prior to decommissioning the project. The owner and operator of the solar facility shall completely decommission the facility within 6 months if the facility stops generating electricity for a period of 12 months. In the case of abandonment of the project during construction or before its maturity, the same decommissioning procedures will be undertaken.

A finalized decommissioning plan will be submitted with the Special Use Permit (SUP) application. The plan will include the anticipated life of the project, the estimated decommissioning cost, how the estimate was determined, and the manner in which the project will be decommissioned. The full estimate of decommissioning will be guaranteed by escrow at a federally insured financial institution, irrevocable letter of credit, or surety bond prior to a building permit being issued.

IV. Conclusion

The Applicant respectfully requests approval of a Special Use Permit for the proposed Project. This narrative addresses the Special Use application and Zoning Ordinance requirements of South Haven Township. The Project plan as described herein, and the Special Use Permit Site Plan demonstrate a well-conceived Project that conforms to the latest Zoning Ordinance and provides substantial benefits to South Haven Township and Van Buren County.

Exhibit B: Findings of Fact

Required Standards and Findings for Making Determinations

Per the South Haven Township Zoning Ordinance, Section 15.06, see the following responses for convenience of review.

A. **Will be harmonious with and in accordance with the general objectives, intent and purposes of this Ordinance.**
   The Project has been designed to comply with the South Haven Township Zoning Ordinance and will conform to applicable local and federal regulations.

B. **Will be designed, constructed, operated, maintained and managed so as to be harmonious and appropriate in appearance with the existing or intended character of the general vicinity.**
   The Project will not impede the surrounding properties or the future development of the community. The Project does not generate any odor, or emit any air pollution. In converting the property from a farm field to a solar facility, pesticides will not be utilized unless mandated by state or local laws for the control of noxious weeds. Upon construction completion, the site will be remotely monitored 24/7 for performance and this data is used to inform ad hoc maintenance. Light pick-up truck traffic can be expected once a week as the Operations & Maintenance team preform regular preventative maintenance checks. A landscape buffer will be installed around the project area in locations that lack adequate vegetative cover.

C. **Will be served adequately by essential public facilities and services; such as, highways, roads, police and fire protection, drainage structures, refuse disposal, or that the persons or agencies responsible for the establishment of the proposed special use shall be able to provide adequately any such service.**
   Conversations with the Van Buren County Road Commission, Van Buren County Drain Commission, and the South Haven Area Emergency Services have taken place to ensure that the agencies can provide services which are deemed necessary to the Project. Preliminary approval letters from the aforementioned agencies have been, or will be, received prior to the issuance of a Special Use Permit.

D. **Will not be hazardous or disturbing to existing or future neighboring uses.**
   The Project will fully comply with all setbacks as specified in the South Haven Township Zoning Ordinance, Section 15.28 and Article VI. Solar energy projects operate in primarily a passive manner, with few moving parts. Solar projects also have few impacts on neighboring uses as they do not generate an odor, emit any air pollution, and overall, provide a net environmental benefit. Solar projects also operate with little noise as described in the attached Project Narrative. The existing and proposed buffer on the project will further screen the project from any nearby neighbors.

E. **Will not create excessive additional requirements at public cost for public facilities, utilities and services.**

Excessive public cost for facilities, utilities, and services are not anticipated as the Project does not require potable water or wastewater facilities, generates minimal traffic, and is easily-maintained. At the end of the Project's life cycle, decommissioning will occur in accordance to the attached Decommissioning Plan. Prior to the issuance of a building permit, the full cost estimate of decommissioning will be guaranteed by escrow, letter of credit, or surety bond.

Per the South Haven Township Zoning Ordinance, Section 15.28, see the following responses for convenience of review.

A. **Verification that adequate infrastructure exists to transport the electricity generate into the larger grid system.**

Refer to Exhibit J – South Haven Interconnection Resolution.

B. **Applicant shall provide verification that there exists an adequate water supply for the site.**

Solar use does not require water supply, per conversation with Tasha Smalley on 03/12/2024 this is not required for solar developments. Refer to Exhibit A - Project Narrative Section III.B.1.

C. **The installation of the panels and associated structures shall not disturb the existing topography and soil.**

Existing drainage patterns will remain in the proposed condition.

D. **The mounting height of the panels as well as the total heigh of the panels (in an elevated or tilted position) shall be provided. The Planning Commission may regulate the overall height of the panels based on surrounding land uses.**

Refer to Exhibit L - Single Axis Tracker Detail. The max height of the arrays will be 12'.

E. **The plans submitted shall include a site restoration plan showing the use of the site should the panels be removed, as well as described method and mechanisms to implement the site restoration plan.**

Refer to Exhibit D- Decommissioning Plan.

F. **A copy of the site plan and specification for solar panels, solar shingles and arrays of panels shall be transmitted to the South Haven Area Emergency Services (SHAES).**

The project has received preliminary approval from South Haven Area Emergency Services. Their approval letter has been attached in Exhibit M.

G. **The panel array shall be fitted with an automatic shut off or breaker switch as approved by the Fire Department to isolate the panels in case of fire.**

Refer to Exhibit E – Emergency Response, Fire Prevention, and Safety Plan, for information related to Fire and Safety.

H. **The Fire Department shall keep on file the type of system that the solar panel array is a part of, either photovoltaic or thermal.**

The project is photovoltaic. The solar panel cut sheet has been sent to the Fire Department.

I. **All panels shall have tempered non-reflective services.**

Refer to Exhibit A - Project Narrative, the modules are non-reflective.

J. **It shall be shown that all panels are adequately secured to the surface upon which they are mounted and that the mounting structure has the capability of supporting the panels.**
Refer to Exhibit L – Single Axis Tracker Detail for a detail of a typical array.

K. **The installation of the panels shall not require or be reliant on the clear cutting of trees or other vegetation.**
Trees are not anticipated to be removed on this project.

L. **The installation of any solar panel shall not negatively impact adjacent properties with additional or excessive storm water runoff and/or drainage.**
Refer to Exhibit A - Project Narrative, Section III.A.1. By adjusting the land from crop to a native grass meadow, runoff will be reduced in the proposed condition.

M. **Solar Energy Systems under this section shall be located on parcels of land no less than five (5) acres in size.**
Refer to Site Data Table included in Exhibit C – Zoning Site Plan for associated project areas.

N. **Solar Energy Systems under this section shall meet the minimum front, side, and rear yard setbacks of the zoning district.**
Refer to Exhibit C – Zoning Site Plan, 100' setbacks are met.

O. **Landscaping shall be provided to screen the system from the view on all sides to the greatest extent possible.**
Refer to Exhibit C – Zoning Site Plan for locations of existing and proposed landscape buffers.

P. **If the owner of the facility or the property owner fails to remove or repair the defective or abandoned Commercial Solar Energy System, the Township, in addition to any other remedy under this Ordinance, may pursue legal action to abate the violation by seeking to remove the solar Energy System and recover any and all costs, including attorney fees.**
This is understood.

Per the South Haven Township Special Use Site Plan Review Application Checklist, see the following locations to find the checklist requirements:

A. **Existing adjacent streets and proposed streets… within one hundred (100) feet of the property.**
Refer to Exhibit C- Zoning Site Plan.

B. **All lot lines and dimensions.**
Refer to Exhibit C – Zoning Site Plan.

C. **Parking lots and access points.**
Refer to Exhibit C – Zoning Site Plan, Note 21. Parking areas not anticipated.

D. **All exterior lighting.**
Lighting is not anticipated on this project.

E. **Proposed buffer strips and screening.**
Refer to Exhibit C – Zoning Site Plan, for existing and proposed screening locations.

F. **Existing natural features (trees, streams, ponds, wetlands, floodplains, steep slopes, critical dunes, and high-risk erosion areas).**
Refer to Exhibit C – Zoning Site Plan.

G. Existing and proposed buildings, including existing buildings within one hundred (100) feet of the boundaries of the property.

Refer to Exhibit C – Zoning Site Plan for neighboring existing buildings within 100 feet. There are no existing or proposed buildings on the project parcel.

H. Number of square feet allocated to each proposed use and gross floor area in buildings, structures, drives and open space.

Refer to Site Data Table included in Exhibit C – Zoning Site Plan for parcel area, solar area, and project area. This project is not proposing a building.

I. For commercial or industrial buildings, the usable floor area for each proposed use.

NA – solar is not a commercial or industrial building.

J. For residential use, the dwelling unit, floor area, and density by type.

NA – solar is not for residential use.

K. Proposed methods of providing sanitary sewer and water supply services.

NA – Solar use does not require water supply, per conversation with Tasha Smalley on 03/12/2024 this is not required for solar developments. Refer to Exhibit A - Project Narrative Section III.B.1.

L. Proposed methods of providing storm water management with engineering calculations.

The project is concurrently seeking approval from the Van Buren County Drain Commission. Their approval letter is forthcoming. Trees are not being cleared and disturbance is low impact.

M. Written computation for the requires parking in compliance with Art. XX

NA - Refer to Exhibit C – Zoning Site Plan, Note 21. Parking areas are not anticipated.

N. Review letter from South Haven Area Emergency Services

The project has received preliminary approval from South Haven Area Emergency Services. Their approval letter has been attached in Exhibit M.

O. Review letter from the road authority having jurisdiction.

The project has received preliminary approval from the Van Buren County Road Commission. Their approval letter has been attached in Exhibit M.

P. Review letter from the County Drain Commissioner.

The project is concurrently seeking approval from the Van Buren County Drain Commission. Their approval letter is forthcoming.

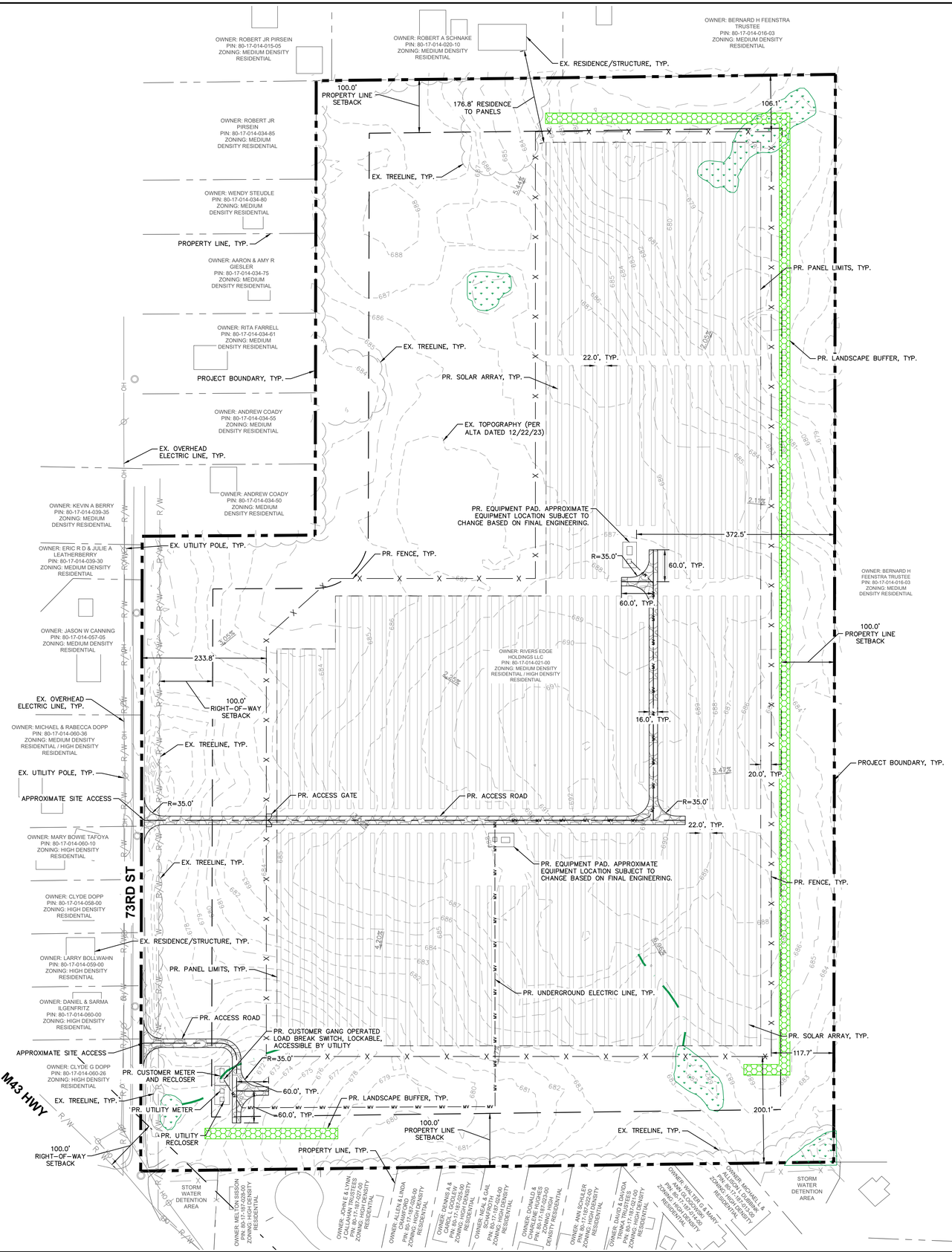
Q. Review letter(s) from any other public agency having jurisdiction.

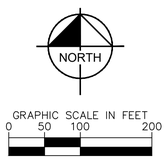
Additional review letters are forthcoming.

R. For Plats, condominiums, and private roads the professional license seal of the person preparing the plan is required.

NA – solar is not seeking a plat, and is not a condominium or private road.

Exhibit C: Zoning Site Plan

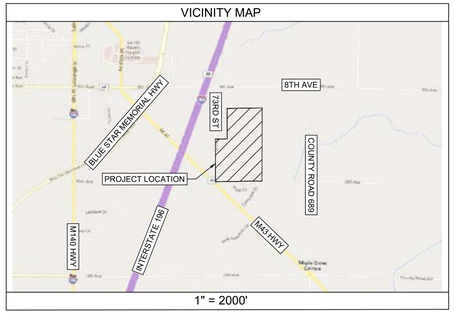




LEGEND

ROAD LABEL	N 2200TH ST
RIGHT OF WAY	R/W
PROJECT BOUNDARY	
PROPERTY LINE/RIGHT OF WAY SETBACK	
PROPERTY LINE	
EX. RESIDENCE/STRUCTURE (TRACED PER AERIAL)	
EX. OVERHEAD ELECTRIC	OH
EX. GRAVEL/PAVEMENT	
EX. UTILITY POLE	
EX. SANITARY MANHOLE	
EX. TREELINE (TRACED PER AERIAL)	
EX. LINEAR FEATURES (PER KIMLEY-HORN)	
EX. WETLANDS (PER KIMLEY-HORN)	
EX. ELEVATION CONTOURS	XXX
EX. FLOW (DIRECTION AND SLOPE)	XX%
PR. FENCE	X
PR. ACCESS GATE	
PR. PANEL LIMITS	
PR. SOLAR ARRAY	
PR. OVERHEAD ELECTRIC	OH
PR. UNDERGROUND ELECTRIC	MV
PR. PAD MOUNTED UTILITY CONNECTION	
PR. ACCESS ROAD	
PR. LANDSCAPE BUFFER	
PR. EQUIPMENT PAD	

VICINITY MAP



1" = 2000'

SITE DATA TABLE

APPLICANT	SOUTH HAVEN AFFORDABLE SOLAR, LLC
PIN #	80-17-014-021-00
ZONING JURISDICTION	SOUTH HAVEN TOWNSHIP
EXISTING USE	AGRICULTURAL LAND WITH ROW CROPS
PROPOSED USE	COMMERCIAL SOLAR ENERGY SYSTEM
TOTAL PARCEL AREA	54.8 ± AC
PRELIMINARY PROJECT AREA	32.0 ± AC
PRELIMINARY SOLAR AREA	28.0 ± AC
RIGHT OF WAY SETBACK	100'
PROPERTY LINE SETBACK	100'

*ZONING SITE PLAN IS BEING SUBMITTED FOR SPECIAL USE PERMIT TO CONSTRUCT/OPERATE A SOLAR FARM

NOTES

1. THE PURPOSE OF THIS PLAN IS FOR SPECIAL USE PERMIT REVIEW AND APPROVAL BY SOUTH HAVEN TOWNSHIP TO CONSTRUCT A SOLAR FARM.
2. THIS PLAN WAS PRODUCED UTILIZING GIS RESOURCES AND INFORMATION FROM MULTIPLE SOURCES, INCLUDING VAN BUREN COUNTY GIS AND GOOGLE EARTH. ALL INFORMATION LISTED AS EX. IN THE LEGEND ARE FROM THE ALTA SURVEY PREPARED BY FARNSWORTH GROUP DATED 12/22/2023 UNLESS OTHERWISE SPECIFIED.
3. SUBJECT PROPERTY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AS SHOWN ON THE FLOOD INSURANCE RATE MAP (COMMUNITY PANEL 26159C0019D AND 26159C0038C) PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA).
4. PHOTOVOLTAIC PANELS, INVERTERS, AND INTERCONNECTION EQUIPMENT LOCATIONS SHOWN FOR REFERENCE ONLY. DESIGN AND FINAL LAYOUT TO BE COMPLETED PER DRAWINGS BY ELECTRICAL AND STRUCTURAL ENGINEER
5. ALL EXISTING ROADWAY SHOULDER AND DITCH SECTIONS SHALL REMAIN AS-IS AS A MINIMUM, OR BE UPGRADED AS DETERMINED NECESSARY BY HERRIN AT THE ENTRANCE INSTALLATION LOCATION.
6. CONTRACTOR SHALL ENSURE EQUIPMENT PAD IS ELEVATED AT LEAST ONE FOOT ABOVE EXISTING GRADE AND CONFIRM ELEVATION WITH ENGINEER PRIOR TO POURING SLAB.
7. PROJECT AREA, INCLUDING CONSTRUCTION STAGING AREAS, WILL BE CLEARED AND GRUBBED AS NECESSARY, RETAINING PRE-DEVELOPMENT DRAINAGE PATTERNS TO THE BEST EXTENT POSSIBLE. CONSTRUCTION STAGING AND AREAS SUBJECT TO RUTTING DURING CONSTRUCTION WILL BE TEMPORARILY STABILIZED WITH GRAVEL. SOIL CONDITIONS AND EQUIPMENT LOADS WILL DETERMINE FINAL DESIGN.
8. ALL DIMENSIONS SHOWN ARE AT 90 DEGREES UNLESS OTHERWISE NOTED.
9. CONTRACTOR SHALL CALL AT LEAST 72 HOURS PRIOR TO BEGINNING CONSTRUCTION OR EXCAVATION TO HAVE EXISTING UTILITIES LOCATED. ADDITIONALLY, CONTRACTOR SHALL CONTACT ANY LOCAL UTILITIES THAT PROVIDE THEIR OWN LOCATOR SERVICES.
10. CONTRACTOR SHALL MAINTAIN ACCESS AND UTILITY SERVICES TO ANY REMAINING BUILDING(S) OR ADJACENT BUILDING(S) THROUGHOUT THE DEMOLITION AND CONSTRUCTION PHASES. EXISTING IMPROVEMENTS DAMAGED DURING CONSTRUCTION SHALL BE REPLACED/RESTORED TO THE SATISFACTION OF THE OWNER BY THE CONTRACTOR RESPONSIBLE FOR THE DAMAGE.
11. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE TO PROVIDE SIGNS, BARRICADES, WARNING LIGHTS, GUARD RAILS, AND EMPLOY FLAGGERS AS NECESSARY WHEN CONSTRUCTION ENDANGERS EITHER VEHICULAR OR PEDESTRIAN TRAFFIC. THESE DEVICES SHALL REMAIN IN PLACE UNTIL THE TRAFFIC MAY PROCEED NORMALLY AGAIN.
12. SITE WILL NOT INCLUDE WATER SOURCE OR SEWAGE DISPOSAL. NO EXISTING WATER WELLS ARE WITHIN THE PROJECT AREA PER THE EGLE WATER WELL VIEWER ONLINE.
13. STORMWATER MANAGEMENT FACILITIES TO BE PROVIDED AS REQUIRED BY COUNTY AND/OR NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTING. FINAL DESIGN WILL BE DETERMINED DURING FINAL ENGINEERING.
14. THE MAXIMUM HEIGHTS OF ANY SOLAR PANEL SHALL NOT EXCEED 12 FEET.
15. THERE SHALL BE NO EXTERIOR LIGHTING.
16. SETBACKS SHOWN ON THIS PLAN ARE BASED ON SOUTH HAVEN TOWNSHIP CODE OF ORDINANCES, ARTICLE VI, MEDIUM DENSITY RESIDENTIAL DISTRICT.
17. ALL NECESSARY PERMITS FOR SOIL EROSION CONTROL AND DRIVEWAY CONSTRUCTION WILL BE OBTAINED AS PART OF FINAL ENGINEERING AND PRIOR TO CONSTRUCTION.
18. FINAL SPECIES FOR LANDSCAPE BUFFER TO BE DETERMINED AT TIME OF CONSTRUCTION DRAWINGS SUBMITTAL. IT IS ANTICIPATED THAT THE HEIGHT OF THE VEGETATIVE BUFFER WILL BE INSTALLED AT 6 FEET, AND REACH A FULL GROWTH HEIGHT OF 12 FEET. THE BUFFER, AT FULL GROWTH, WILL COVER THE HEIGHT OF THE SOLAR ARRAYS AT FULL TILT. LANDSCAPE BUFFERS TYPICALLY CONSIST OF EVERGREEN TREES AND SHRUBS.
19. WETLANDS AND LINEAR FEATURES SHOWN ARE FROM LEVEL 1 WETLAND DELINEATION REPORT BY KIMLEY-HORN, DATED 02/16/2024.
20. ZONING DISTRICTS MENTIONED ON NEIGHBORING PROPERTIES AND THE PROJECT PROPERTY ARE FROM SOUTH HAVEN TWP. ZONING MAP LAST AMENDED 05/01/2023.
21. PARKING AREAS ARE NOT ANTICIPATED AS ON-SITE PERSONNEL FOR TYPICAL OPERATIONS IS NOT REQUIRED.

No.	REVISIONS	DATE
1	PROJECT AREA REVISION	04/17/2024
2	LAYOUT REVISION	04/08/2024

SolAmerica ENERGY

Kimley»Horn
© 2024 KIMLEY-HORN OF MICHIGAN, INC.
1000 TOWN CENTER, SUITE 1900
SOUTHFIELD, MI 48075 (313) 572-1560
WWW.KIMLEY-HORN.COM

KHA PROJECT 268196015
DATE 03/28/2024
SCALE AS SHOWN
DESIGNED BY AVT
DRAWN BY AVT
CHECKED BY TM

ZONING SITE PLAN

SOUTH HAVEN AFFORDABLE SOLAR, LLC

VAN BUREN COUNTY, MI

SHEET NUMBER
EX-1

Exhibit D: Decommissioning Plan

Solar Facility Decommissioning Plan

May 2024

Table of Contents

1. Introduction

South Haven Affordable Solar, LLC proposes to build a photovoltaic (PV) solar facility in South Haven, MI (the "**Solar Facility**"). The Solar Facility is planned to have a nameplate capacity of approximately 4.5 megawatts (MW) alternating current (AC) and be built on approximately 32 acres of private land (the "**Facility Site**").

This Decommissioning Plan ("**Plan**") provides an overview of activities that will occur during the decommissioning phase of the Solar Facility, including activities related to removal of the Solar Facility, the restoration of land, and the management of materials and waste.

This Decommissioning Plan assumes a solar facility lifespan of thirty (*30*) years. At the end of the solar facilities' lifespan, the facility will be dismantled and the Facility Site restored to a state similar to its pre- construction condition at its maturity date. The Plan also covers the case of the abandonment of a Solar Facility, for any reason, prior to the maturity date.

Decommissioning of the Solar Facility will include the disconnection of the Solar Facility from the electrical grid and the removal of all Solar Facility components, including photovoltaic (PV) modules, racking, inverters, transformers, electrical equipment, wiring cables, and perimeter fence.

This Decommissioning Plan is based on current best management practices and procedures. This Plan may be subject to revision based on new standards and emergent best management practices at the time of decommissioning. Permits will be obtained as required and notification will be given to stakeholders prior to decommissioning. This Decommissioning Plan will follow the Michigan Department of Environment, Great Lakes, and Energy (EGLE) requirements.

2. Contact Information

Contact information for this Plan is as follows:

Full Name of Project Owner Developer	South Haven Affordable Solar, LLC (SolAmerica Energy, LLC)
Contact Name	Lauren Beduhn
Address	190 Ottley Drive NE Studio H Atlanta, GA 30324
Telephone	O: 404.351.8175 M: 404.351.8175 ext 106
Email	lbeduhn@solamericaenergy.com

3. Project Information

Address / Parcel IDs	73rd Street, South Haven, MI 49090 / 80-17-014-021-00
Project Size (Estimated)	~32 Acres
Landowner	Rivers Edge Holdings LLC
Own / Lease	Lease

4. Decommissioning of the Solar Facility

At the time of decommissioning, the components of the Solar Facility will be removed, reused, recycled, sold for scrap, or otherwise disposed of. The Facility Site will be restored to a state similar to its pre-construction condition. All removal of equipment will be done in accordance with any applicable regulations and manufacturer recommendations. All applicable permits will be acquired.

4.1. Equipment Dismantling and Removal

Generally, the decommissioning of a Solar Facility proceeds in the reverse order of the installation along the following steps.

1. The Solar Facility shall be disconnected from the utility power grid.
2. PV modules shall be disconnected, collected, and sold for scrap, recycled at an approved solar module recycler, reused / resold on the market, or otherwise disposed of in accordance with best practices. Although the PV modules will not be cutting edge technology at the time of decommissioning, they will still produce power for many years.
3. All aboveground and underground electrical interconnection and distribution cables shall be removed and sold for scrap or disposed or recycled at an approved recycler.
4. Galvanized steel PV module support and racking system support posts shall be removed and sold for scrap or disposed / recycled at an approved recycler.
5. Electrical and electronic devices, including transformers and inverters shall be removed and sold for scrap or disposed /recycled at an approved recycler. Remaining components will be disposed of in accordance with the standards of the day. The small amount of oil from the transformers will be removed on-site to reduce the potential for spills and will be transported to an approved facility for disposal.
6. Fencing shall be removed and shall be sold for scrap or disposed /recycled at an approved recycler.
7. Concrete foundations will be broken down and taken to a recycling or approved disposal facility.

4.2. Site Restoration

Through the decommissioning phase, the Facility Site will be restored to a state similar to its preconstruction condition. Rehabilitated lands may be seeded to help stabilize soil conditions, enhance soil structure, and increase soil fertility. Erosion control best management practices shall be applied throughout the decommissioning process.

4.3. Decommissioning During Construction or Abandonment Before Maturity

In case of abandonment of the Solar Facility during construction or before its maturity, the same decommissioning procedures as for decommissioning after ceasing operation will be undertaken and the same decommissioning and restoration program will be honored, in as far as construction proceeded before abandonment. The Solar Facility will be dismantled, materials removed and

disposed, the soil that was removed will be graded and the site restored to a state similar to its pre-construction condition.

4.4. Decommissioning Notification

Decommissioning activities may require the notification of stakeholders given the nature of the works at the Facility Site. The local municipality, in particular, will be notified prior to commencement of any decommissioning activities.

4.5. Approvals

Well-planned and well-managed renewable energy facilities are not expected to pose environmental risks at the time of decommissioning. Decommissioning of a Solar Facility will follow standards of the day, and required permits will be obtained prior to decommissioning from local, state, and federal entities, as applicable. The Project will follow all EGLE standards, and applicable permits shall be obtained.

4.6 Financial Assurance

The financial resources for the decommissioning plan shall be in the form of a surety bond or other commercially available financial assurance that is acceptable to the AHJ. This project intends to submit a surety bond. The attached cost estimate shall be the basis of the bond.

* * * * * * * * * * * *

This Decommissioning Plan will be updated every five years thereafter, by a third-party Professional Engineer licensed in the State of Michigan to ensure that changes in technology and site restoration methods are taken into consideration.

South Haven Affordable Solar, LLC
Van Buren County, MI
Decommissioning and Site Reclamation Estimate Pro Forma with Salvage

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs. LS = Lump Sum, HR = Hours, EA = Each, LF = Linear Feet.

Item	Quantity	Unit	Unit Price	Total Salvage	Total Price (incl. markups)	Total Price
Mobilization	1	LS		$ -	$ 14,470.00	$ (14,470.00)
Contractor's G&A	1	LS		$ -	$ 2,460.00	$ (2,460.00)
SWPPP, Erosion Control Measures	30	AC	$670.00	$ -	$ 20,100.00	$ (20,100.00)
Seeding	30.0	AC	$1,942.87	$ -	$ 58,286.10	$ (58,286.10)
Tilling 6" topsoil/scarifying access road and rough grading existing soil	1	AC	$28,997.55	$ -	$ 28,997.55	$ (28,997.55)
Remove and Recycle Chain Link Fence, 6' High	5,311	LF	$5.70	$ 2,442.00	$ 30,272.70	$ (27,830.70)
Remove Pad Mounted POI	1	EA	$ 2,498.01	$ 1,000.00	$ 2,498.01	$ (1,498.01)
Remove and Recycle Underground Cables	112,126	LF	$0.31	$ 17,659.85	$ 34,759.06	$ (17,099.22)
Remove and Recycle Inverters	2	EA	$2,498.01	$ 10,800.00	$ 4,996.02	$ 5,803.98
Remove and Recycle Photovoltaic Modules	11,256	EA	$6.14	$ 85,138.69	$ 69,111.84	$ 16,026.85
Remove and Recycle Piles	1,649	EA	$11.75	$ 26,120.16	$ 19,375.75	$ 6,744.41
Remove and Recycle Support Assemblies	347,228	LB	$0.06	$ 38,195.09	$ 20,833.69	$ 17,361.41
			Subtotal:	**$ 181,355.78**	**$ 306,160.72**	**$ (124,804.94)**
					30-Year Inflation (3%/year):	**$ (178,129.40)**
					Total:	**$ (302,934.34)**

Notes:

1. Quantities are from KH plan dated 04/17/24.
2. Equipment rental rates and labor productivity and unit rates were derived from RSMeans Online (Heavy Construction, 2024 data).
3. Labor, material, and equipment rates are based on the RSMeans City Cost Index (CCI) for Kalamazoo, MI.
4. PV Module Removal/Recycle labor and equipment costs are computed at present values.
5. The age at decommissioning of this estimate is 30 years.
6. This estimate assumes 72 modules/tracker for three-fourths length, and 96 modules/tracker for full length trackers.
7. This estimate assumes 11 piles/tracker for 72 module length trackers, and 14 piles/tracker for 96 module length trackers.
8. This estimate assumes 77,162 LB of support assemblies per 1 MW output.
9. Material salvage values were based off of current US salvage exchange rates.
10. Photovoltaic Module material salvage rate is based on straight-line depreciation of modules (-0.5% per year).
11. Material salvage values were determined using the most prevalent salvageable metal in each component. Copper Wire @$0.16/LF (AC and DC Cables) and Steel @0.46/LF of fence, and @$0.99/pile.
12. This estimate assumes string inverters centralized in two (2) locations with transformer and pad.
13. Inverter resale value is dependent on the assumption that all inverters will be decommissioned and resold half way through their useful life (every 5 years).

South Haven Affordable Solar, LLC
Van Buren County, MI
Decommissioning Estimate Pro Forma without Salvage

The Engineer has no control over the cost of labor, materials, equipment, or over the Contractor's methods of determining prices or over competitive bidding or market conditions. Opinions of probable costs provided herein are based on the information known to Engineer at this time and represent only the Engineer's judgment as a design professional familiar with the construction industry. The Engineer cannot and does not guarantee that proposals, bids, or actual construction costs will not vary from its opinions of probable costs. LS = Lump Sum, HR = Hours, EA = Each, LF = Linear Feet.

Item	Quantity	Unit	Unit Price	Total Price
Mobilization	1	LS		$14,470.00
Contractor's G&A	1	LS		$2,460.00
SWPPP, Erosion Control Measures	30	AC	$670.00	$20,100.00
Seeding	30.0	AC	$1,942.87	$58,286.10
Tilling 6" topsoil/scarifying access road and rough grading existing soil	1	AC	$28,997.55	$28,997.55
Remove Chain Link Fence, 6' High	5,311	LF	$5.70	$30,272.70
Pad Mounted POI	1	EA	$ 2,498.01	$2,498.01
Remove and Recyle Underground Cables	112,126	LF	$0.31	$34,759.06
Remove Inverters	2	EA	$2,498.01	$4,996.02
Remove Photovoltaic Modules	11,256	EA	$6.14	$69,111.84
Remove Piles	1,649	EA	$11.75	$19,375.75
Remove Support Assemblies	347,228	LB	$0.06	$20,833.69
			Subtotal:	$306,160.72
			30-Year Inflation (3%/year):	$436,971.70
			Total:	$743,132.42

Notes:

1. Quantities are from KH plan dated 04/17/24.
2. Equipment rental rates and labor productivity and unit rates were derived from RSMeans Online (Heavy Construction, 2024 data).
3. Labor, material, and equipment rates are based on the RSMeans City Cost Index (CCI) for Kalamazoo, MI.
4. PV Module Removal/Recycle labor and equipment costs are computed at present values.
5. The age at decommissioning of this estimate is 30 years.
6. This estimate assumes 72 modules/tracker for three-fourths length, and 96 modules/tracker for full length trackers.
7. This estimate assumes 11 piles/tracker for 72 module length trackers, and 14 piles/tracker for 96 module length trackers.
8. This estimate assumes 77,162 LB of support assemblies per 1 MW output.

Exhibit E: Emergency Response, Fire Prevention, and Safety Plan

South Haven Affordable Solar, LLC
DRAFT Emergency Response, Fire Prevention, & Safety Plan

March 2024

TABLE OF CONTENTS

SECTION 1. PURPOSE

The South Haven Affordable Solar Energy Generation Facility (Project) Emergency Response, Fire Prevention, and Safety Plan (Plan) describes actions to ensure the safety of Project employees, emergency service members serving the Project, and the surrounding community in the event of an emergency. This Plan provides emergency personnel contact information and outlines procedures to prevent, mitigate, and effectively respond to an incident should one arise at the Project.

SECTION 2. GENERAL FACILITY INFORMATION

The Project is a 4.5 megawatt (MW-ac), ground-mounted solar energy generation facility located along 73rd Street in South Haven Township and Van Buren County. The Project is owned and operated by South Haven Affordable Solar, LLC (Operator).

The Project entrance is located along 73rd Street. The Project consists of photovoltaic solar panels oriented in linear rows spaced approximately 15 feet apart. Panels are connected by electrical cables hung on the underside of the panels and buried underground at various points. “Blocks” of panels are connected to an inverter. The Project inverters convert direct current (DC) electricity to alternating current (AC). The AC power is then routed via underground lines to the onsite transformer, where the voltage steps up to medium voltage. From the transformer, underground lines run to the Point of Interconnection (POI). The Point of Interconnection is located on the southwestern corner of the site off the intersection of 73rd St and Highway M43. the north of the array along County Road. A Project overview is provided on Figure 1.

The Project access road off 73rd Street is approximately 230 feet long to the security gate. Following initial entrance into the project area, it is enclosed by chain-link fencing with locking gates to ensure public safety. The entrance gate will be locked with a Knox box, which access information will be provided to the local fire department. The electrical pads are located approximately 700 and 1200 feet from the security fence entrance gate, with adequate access roads and turnaround pads around the equipment. In addition, the site includes 20 feet of clearance (at a minimum) between the fence and panels to allow for additional vehicle access (e.g. pickup truck, ATV, etc.) along the perimeter of the site. Project components including; solar panels, fencing, inverters, access roads, transformer, combiner boxes, and gates are depicted on Figure 2.

2.A Fire Detection

In the event of a fire, the Operator will detect equipment faults using a remote operations sensor which will then lead to dispatch of the Operator’s site-personnel to investigate accordingly. There is no fire suppression system for the inverters located on-site, but due to the relatively inert materials that are on site, there is no significant concern of a large fire spreading.

2.B Shutoff Procedures and Locations

Entry of the Project should only be attempted at the direction of the Operator. Contact information for the Operator will be proved in Section 2.C below.

In the event of an emergency requiring shutdown, the solar system may be de-energized/isolated remotely, but local disconnects require manual operation by a qualified representative of the Operator to confirm breaker open. ***Emergency responders shall not assume the system is de-energized nor attempt to de- energize equipment due to arc flash risk. Operator Representatives should execute any Lock out tag out.***

In an emergency, **only representatives of the Operator may disconnect power blocks within the solar arrays at each inverter** according to the following procedures:

- The ON/OFF switch on each inverter shall be manually turned to the OFF position, shutting off both the AC and DC switches inside the inverter.
- After the system has been turned off, the DC Disconnect Switch shall be turned off, and a lock placed on it to keep it from being re-energized.

The Operator will coordinate with the local Fire Department Office regarding locking procedures for the inverters, shutdown and locking procedures will be updated as needed. The Plan will be completed prior to commencing Project operations and will be provided to the local Fire Department.

2.C Contacts

The following people are responsible for the operation, maintenance, and safety of the Project. The Operator conducts local monitoring of the site on a regular basis. In addition, the Operator has monitoring and operating capabilities from their main office. Should issues arise, they will dispatch local operations personnel to the site, as necessary.

Table 2.1 – Project Contacts

Responsibility	Contact Name	Contact Phone #	Contact Email
Owner/Operator	TBD	TBD	TBD
Installer	TBD	TBD	TBD
Public Inquiries	TBD	TBD	TBD

Table 2.2 – Project Manufacturer Contacts

Manufacturer (Equipment)	Contact Name	Contact Phone #	Contact Email
TBD (Racking)	TBD	TBD	TBD
TBD (Modules)	TBD	TBD	TBD
TBD (Inverters)	TBD	TBD	TBD
TBD (Transformer)	TBD	TBD	TBD
TBD (DAS)	TBD	TBD	TBD
TBD (Circuit Breaker)	TBD	TBD	TBD
TBD (Combiner Box)	TBD	TBD	TBD

No direct contact with a manufacturer should occur unless the Owner/Operator has been contacted first due to equipment warranty specifics.

2.D Emergency Contacts

In the event of an emergency dial 911

Contact the Project Owner/Operator after contacting 911. Please refer to Table 2.1 for a list of qualified emergency contacts.

SECTION 3. GENERAL SAFETY AND OPERATIONAL INFORMATION

Solar panels, located throughout the Project, convert sunlight to electricity. The process involves solid-state technology that consumes no materials and is completely self-contained. As such, the primary concern for first responders is exposure to electrical components that present a hazard to electric shock. During a response, it should be assumed that:

- **All solar equipment on site contains lethal AC and DC voltages**;
- All inverters contain energy storage devices that require 15 minutes to safely discharge **lethal voltages**;
- Electricity is supplied from multiple sources; and
- The site should only be accessed by personnel or emergency responders under the direction of the Owner or Operator.

The following are the most hazardous locations within the Project:

- Inverters and disconnects;
- Field wiring, collection lines, and all electrical boxes associated with the system; and
- Transformer.

3.A Precautions While in the Vicinity of the Solar Electric System

- Only trained personnel should work near the solar arrays, modules, electrical boxes, or wiring.
- It is recommended to always have at least two persons present when working on the array or handling modules. Do not attempt to service or respond to an emergency unless another person capable of rendering first aid and cardiopulmonary resuscitation (CPR) is also present.
- Any accidents should be immediately reported to the Operator as soon as it is safe to do so.
- Photovoltaic panels are made of glass and may break. If any cracks occur in the modules, touching a crack may expose a person to the full voltage and current of the array. **Do not touch the modules without wearing electrical insulating gloves.**

3.B. Fire Prevention and Suppression Protocols

Pursuant to the Code of Federal Regulations, Title 29, Part 1926.24 (29 CFR 1926.24), the Operator shall be responsible for the development and maintenance of an effective fire protection and prevention program at the jobsite through all phases of construction, repair, alteration, or demolition work. The Project operator shall ensure the availability of the fire protection and suppression equipment required by this regulation.

In addition to compliance with 29 CFR 1926.24, the Operator shall present basic fire-prevention training to all personnel working at the Project and shall implement the following:

- All employees, contractors and employees of contractors to do everything reasonable within their power, expertise, and assessment of human safety to prevent and suppress fires resulting from Project construction or maintenance activities on the lands to be occupied under this permit. The Operator is responsible for all suppression costs and resource damage rehabilitation costs resulting from the suppression of any fire resulting from its operations and practices.
- The Operator is responsible to ensure that each employee, subcontractor, or any other individual

or company working on the Project site is aware of the provisions of this fire plan, is familiar with the location and proper use of firefighting equipment and conducts themselves in a fire-safe manner.

- Exhaust systems of vehicles will have an acceptable muffler and will be in proper working condition. All motorized equipment and machinery will be equipped with spark arresters.
- Vehicles will be parked only in cleared areas.
- No smoking will be allowed on the Project site.
- Fuels and flammable materials, if required, will be stored in accordance with all applicable state and federal laws.
- The Project site shall be equipped with fire extinguishers and other equipment sufficient to extinguish small fires while construction work is ongoing.
- During construction, welding operations are subject to the following additional provisions:
    - There will be no welding when winds are over 15 miles per hour; and
    - Welding will occur only in areas cleared of all flammable vegetation and materials at a minimum radius of 30 feet from the welding operation.
    - Fire rules shall be posted on the project bulletin board at the contractor's field office and areas visible to employees. All construction workers, plant personnel, and maintenance workers visiting the plant and/or transmission lines to perform maintenance activities shall receive training on the procedures to be followed in the event of a fire. Training records shall be maintained and be available for review by the BLM and RCFD.
- Local fire agencies shall have access to the solar farm site. Access gates shall be a minimum of 12 feet to allow fire bulldozer access. The main access road shall be an all-weather surface.
- Minimize fire risk by maintaining vegetation. Measures to minimize fire risk shall include removal of dry vegetation and/or other combustible materials within 30 feet of any hazardous material storage, compressed gas storage, or equipment/vehicle that has the potential to spark a fire.

SECTION 4. EMERGENCY SITUATIONS

Emergency situation critical points:

- In the event of an emergency, dial 911.
- Entry and shutdown of the Project should only be attempted at the direction of the Operator.
- Solar and substation components are always hot and should always be considered electrically energized. DC voltage is always present (even at night).
- All inverters contain energy storage devices that require 15 minutes to safely discharge lethal voltages.
- Do not touch the modules without wearing electrical insulating gloves.

4.A Fire Response

In the event of a fire, the individual discovering the emergency shall:

1. Assess the situation to determine potential safety concerns to life and the environment, with life safety as the priority.
2. Notify the appropriate local authorities by dialing 911 and direct them to the entry point identified on Figures 1 and 2.
3. Local authorities should contact the Operator to determine the appropriate response.

Upon arrival to the Project, responders shall:

1. Evacuate and secure the area and keep people a minimum of 300 feet away, provided there are no immediate threats to people or non-solar property.
2. Let the facility burn. Burning electrical equipment is already damaged and must be replaced.
3. Protect adjacent exposures, such as homes, schools and grassed areas, as needed, to limit the potential of the fire spreading.
4. If fire must be suppressed within the array fence line, the Operator will direct local authorities on how to proceed.

The following are the most important considerations when responding to a fire or other emergency at the Project:

- Solar and other electrical components are always hot and should always be considered electrically energized. DC voltage is always present, even at night.
- Identify and validate the hazard in order to minimize injury.
- Electrical components produce gas during combustion. All responders should use a self-contained breathing apparatus (SCBA).
- Before committing apparatus to the access roads within any of the fenced panel array enclosures, understand that turn arounds will often be well over 1,000 feet away.
- Under the direction of the Operator, isolate or shutdown the electrical power at the site of the fire, if possible.
- Do not assume the system is de-energized and do not attempt to de-energize any equipment.

- Do not open any inverter doors until at least 48 hours have passed since the initiation of the event or conditions are verified safe and entry is approved by the Operator.
- Leave the scene in a safe condition after mitigating hazards.

4.B Natural Disasters

Severe weather events such as snowstorms, hurricanes, and tornadoes are possible at the Project. Although much less common, there is also the potential for minor earthquakes, flooding or high wind events (e.g., microbursts). These events should have limited impact on the Project site. The Project is designed and constructed to withstand the extreme weather likely to occur at the Project site (e.g. high winds, hail, lightning, snowstorms, etc.). After an extreme weather event, the Operator will evaluate all equipment for damages and repair, as necessary, to restore full Project operations.

4.C Public Safety

Access to the Project is limited to trained staff and maintenance personnel only.

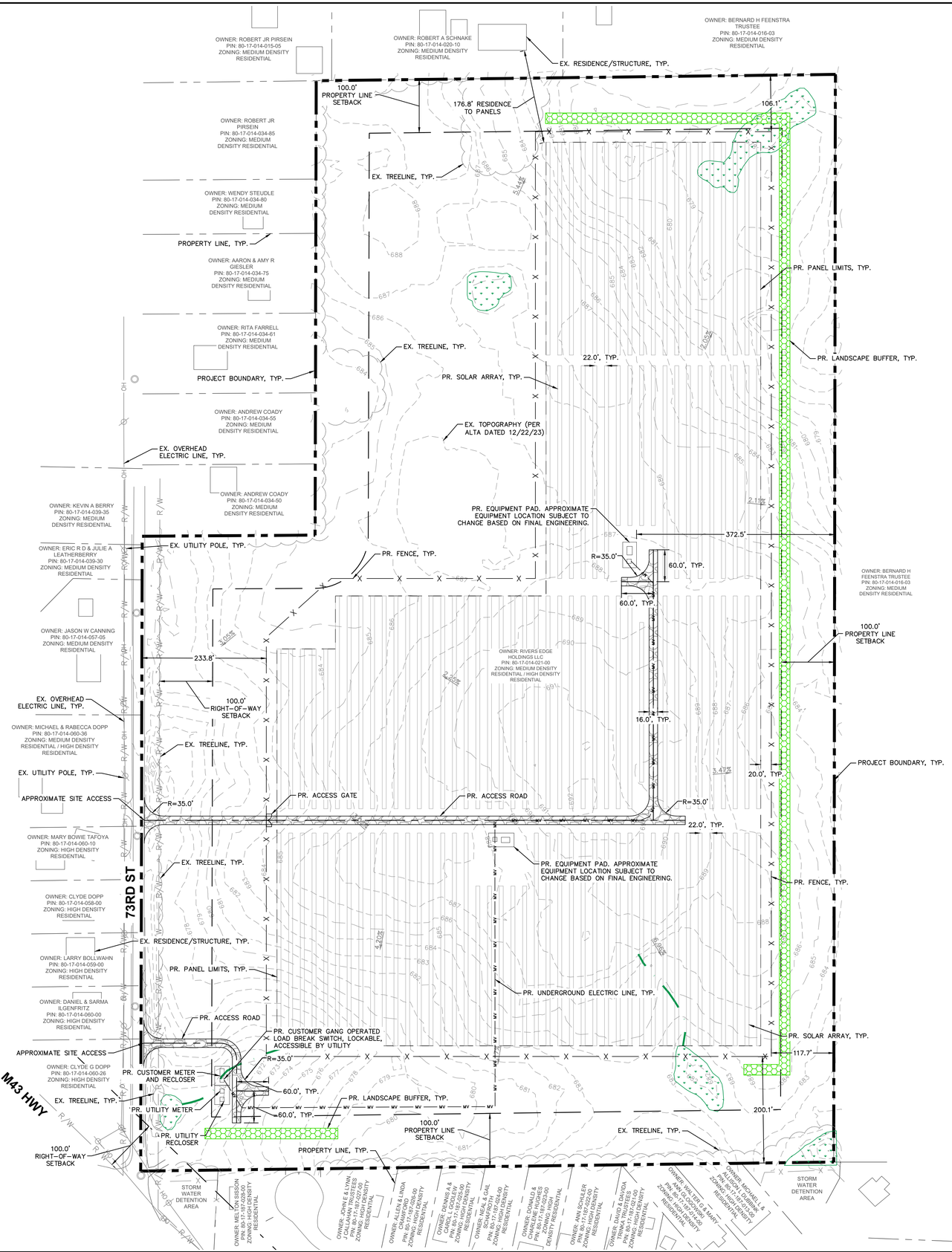
The solar facility is surrounded by a six-foot-tall chain link fence, per requirements of the National Electric Safety Code (NESC). Access to the Project site occurs through gates in the chain-link fence that are secured with a padlock, and only Operator personnel have access to the Project.

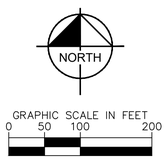
In the event of personnel injury from electric shock or if personnel should become incapacitated while within the Project site, the following procedures should be followed:

1. Assess the area for hazards and secure the area to protect additional life from injury.
2. Notify the appropriate local authorities by dialing 911 and direct them to the Project access point identified on Figures 1 and 2.
3. Local authorities should contact the Operator, as found in Section 2.C, to determine the appropriate response procedures and methods for shutting down the nearest components to ensure safe access.

FIGURE 1 – LOCATION MAP

FIGURE 2 – SITE PLAN

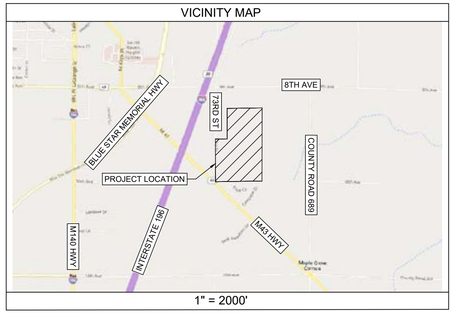




LEGEND

ROAD LABEL	N 2200TH ST
RIGHT OF WAY	R/W
PROJECT BOUNDARY	
PROPERTY LINE/RIGHT OF WAY SETBACK	
PROPERTY LINE	
EX. RESIDENCE/STRUCTURE (TRACED PER AERIAL)	
EX. OVERHEAD ELECTRIC	OH
EX. GRAVEL/PAVEMENT	
EX. UTILITY POLE	
EX. SANITARY MANHOLE	
EX. TREELINE (TRACED PER AERIAL)	
EX. LINEAR FEATURES (PER KIMLEY-HORN)	
EX. WETLANDS (PER KIMLEY-HORN)	
EX. ELEVATION CONTOURS	XXX
EX. FLOW (DIRECTION AND SLOPE)	XX%
PR. FENCE	X
PR. ACCESS GATE	
PR. PANEL LIMITS	
PR. SOLAR ARRAY	
PR. OVERHEAD ELECTRIC	OH
PR. UNDERGROUND ELECTRIC	MV
PR. PAD MOUNTED UTILITY CONNECTION	
PR. ACCESS ROAD	
PR. LANDSCAPE BUFFER	
PR. EQUIPMENT PAD	

VICINITY MAP



1" = 2000'

SITE DATA TABLE

APPLICANT	SOUTH HAVEN AFFORDABLE SOLAR, LLC
PIN #	80-17-014-021-00
ZONING JURISDICTION	SOUTH HAVEN TOWNSHIP
EXISTING USE	AGRICULTURAL LAND WITH ROW CROPS
PROPOSED USE	COMMERCIAL SOLAR ENERGY SYSTEM
TOTAL PARCEL AREA	54.8 ± AC
PRELIMINARY PROJECT AREA	32.0 ± AC
PRELIMINARY SOLAR AREA	28.0 ± AC
RIGHT OF WAY SETBACK	100'
PROPERTY LINE SETBACK	100'

*ZONING SITE PLAN IS BEING SUBMITTED FOR SPECIAL USE PERMIT TO CONSTRUCT/OPERATE A SOLAR FARM

NOTES

1. THE PURPOSE OF THIS PLAN IS FOR SPECIAL USE PERMIT REVIEW AND APPROVAL BY SOUTH HAVEN TOWNSHIP TO CONSTRUCT A SOLAR FARM.
2. THIS PLAN WAS PRODUCED UTILIZING GIS RESOURCES AND INFORMATION FROM MULTIPLE SOURCES, INCLUDING VAN BUREN COUNTY GIS AND GOOGLE EARTH. ALL INFORMATION LISTED AS EX. IN THE LEGEND ARE FROM THE ALTA SURVEY PREPARED BY FARNSWORTH GROUP DATED 12/22/2023 UNLESS OTHERWISE SPECIFIED.
3. SUBJECT PROPERTY DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD AS SHOWN ON THE FLOOD INSURANCE RATE MAP (COMMUNITY PANEL 26159C0019D AND 26159C0038C) PUBLISHED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA).
4. PHOTOVOLTAIC PANELS, INVERTERS, AND INTERCONNECTION EQUIPMENT LOCATIONS SHOWN FOR REFERENCE ONLY. DESIGN AND FINAL LAYOUT TO BE COMPLETED PER DRAWINGS BY ELECTRICAL AND STRUCTURAL ENGINEER
5. ALL EXISTING ROADWAY SHOULDER AND DITCH SECTIONS SHALL REMAIN AS-IS AS A MINIMUM, OR BE UPGRADED AS DETERMINED NECESSARY BY HERRIN AT THE ENTRANCE INSTALLATION LOCATION.
6. CONTRACTOR SHALL ENSURE EQUIPMENT PAD IS ELEVATED AT LEAST ONE FOOT ABOVE EXISTING GRADE AND CONFIRM ELEVATION WITH ENGINEER PRIOR TO POURING SLAB.
7. PROJECT AREA, INCLUDING CONSTRUCTION STAGING AREAS, WILL BE CLEARED AND GRUBBED AS NECESSARY, RETAINING PRE-DEVELOPMENT DRAINAGE PATTERNS TO THE BEST EXTENT POSSIBLE. CONSTRUCTION STAGING AND AREAS SUBJECT TO RUTTING DURING CONSTRUCTION WILL BE TEMPORARILY STABILIZED WITH GRAVEL. SOIL CONDITIONS AND EQUIPMENT LOADS WILL DETERMINE FINAL DESIGN.
8. ALL DIMENSIONS SHOWN ARE AT 90 DEGREES UNLESS OTHERWISE NOTED.
9. CONTRACTOR SHALL CALL AT LEAST 72 HOURS PRIOR TO BEGINNING CONSTRUCTION OR EXCAVATION TO HAVE EXISTING UTILITIES LOCATED. ADDITIONALLY, CONTRACTOR SHALL CONTACT ANY LOCAL UTILITIES THAT PROVIDE THEIR OWN LOCATOR SERVICES.
10. CONTRACTOR SHALL MAINTAIN ACCESS AND UTILITY SERVICES TO ANY REMAINING BUILDING(S) OR ADJACENT BUILDING(S) THROUGHOUT THE DEMOLITION AND CONSTRUCTION PHASES. EXISTING IMPROVEMENTS DAMAGED DURING CONSTRUCTION SHALL BE REPLACED/RESTORED TO THE SATISFACTION OF THE OWNER BY THE CONTRACTOR RESPONSIBLE FOR THE DAMAGE.
11. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE TO PROVIDE SIGNS, BARRICADES, WARNING LIGHTS, GUARD RAILS, AND EMPLOY FLAGGERS AS NECESSARY WHEN CONSTRUCTION ENDANGERS EITHER VEHICULAR OR PEDESTRIAN TRAFFIC. THESE DEVICES SHALL REMAIN IN PLACE UNTIL THE TRAFFIC MAY PROCEED NORMALLY AGAIN.
12. SITE WILL NOT INCLUDE WATER SOURCE OR SEWAGE DISPOSAL. NO EXISTING WATER WELLS ARE WITHIN THE PROJECT AREA PER THE EGLE WATER WELL VIEWER ONLINE.
13. STORMWATER MANAGEMENT FACILITIES TO BE PROVIDED AS REQUIRED BY COUNTY AND/OR NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMITTING. FINAL DESIGN WILL BE DETERMINED DURING FINAL ENGINEERING.
14. THE MAXIMUM HEIGHTS OF ANY SOLAR PANEL SHALL NOT EXCEED 12 FEET.
15. THERE SHALL BE NO EXTERIOR LIGHTING.
16. SETBACKS SHOWN ON THIS PLAN ARE BASED ON SOUTH HAVEN TOWNSHIP CODE OF ORDINANCES, ARTICLE VI, MEDIUM DENSITY RESIDENTIAL DISTRICT.
17. ALL NECESSARY PERMITS FOR SOIL EROSION CONTROL AND DRIVEWAY CONSTRUCTION WILL BE OBTAINED AS PART OF FINAL ENGINEERING AND PRIOR TO CONSTRUCTION.
18. FINAL SPECIES FOR LANDSCAPE BUFFER TO BE DETERMINED AT TIME OF CONSTRUCTION DRAWINGS SUBMITTAL. IT IS ANTICIPATED THAT THE HEIGHT OF THE VEGETATIVE BUFFER WILL BE INSTALLED AT 6 FEET, AND REACH A FULL GROWTH HEIGHT OF 12 FEET. THE BUFFER, AT FULL GROWTH, WILL COVER THE HEIGHT OF THE SOLAR ARRAYS AT FULL TILT. LANDSCAPE BUFFERS TYPICALLY CONSIST OF EVERGREEN TREES AND SHRUBS.
19. WETLANDS AND LINEAR FEATURES SHOWN ARE FROM LEVEL 1 WETLAND DELINEATION REPORT BY KIMLEY-HORN, DATED 02/16/2024.
20. ZONING DISTRICTS MENTIONED ON NEIGHBORING PROPERTIES AND THE PROJECT PROPERTY ARE FROM SOUTH HAVEN TWP. ZONING MAP LAST AMENDED 05/01/2023.
21. PARKING AREAS ARE NOT ANTICIPATED AS ON-SITE PERSONNEL FOR TYPICAL OPERATIONS IS NOT REQUIRED.

No.	REVISIONS	DATE
1	PROJECT AREA REVISION	04/17/2024
2	LAYOUT REVISION	04/08/2024

SolAmerica ENERGY

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WWW.KIMLEY-HORN.COM

KHA PROJECT 268196015
DATE 03/28/2024
SCALE AS SHOWN
DESIGNED BY AVT
DRAWN BY AVT
CHECKED BY TM

ZONING SITE PLAN

SOUTH HAVEN AFFORDABLE SOLAR, LLC

VAN BUREN COUNTY, MI

SHEET NUMBER
EX-1

Exhibit F: FEMA FIRMette

National Flood Hazard Layer FIRMette

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/15/2024 at 11:04 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Exhibit G: Hydrologic Response of Solar Farms

Hydrologic Response of Solar Farms

Lauren M. Cook, S.M.ASCE[1]; and Richard H. McCuen, M.ASCE[2]

Abstract: Because of the benefits of solar energy, the number of solar farms is increasing; however, their hydrologic impacts have not been studied. The goal of this study was to determine the hydrologic effects of solar farms and examine whether or not storm-water management is needed to control runoff volumes and rates. A model of a solar farm was used to simulate runoff for two conditions: the pre- and postpaneled conditions. Using sensitivity analyses, modeling showed that the solar panels themselves did not have a significant effect on the runoff volumes, peaks, or times to peak. However, if the ground cover under the panels is gravel or bare ground, owing to design decisions or lack of maintenance, the peak discharge may increase significantly with storm-water management needed. In addition, the kinetic energy of the flow that drains from the panels was found to be greater than that of the rainfall, which could cause erosion at the base of the panels. Thus, it is recommended that the grass beneath the panels be well maintained or that a buffer strip be placed after the most downgradient row of panels. This study, along with design recommendations, can be used as a guide for the future design of solar farms. **DOI: 10.1061/(ASCE)HE.1943-5584.0000530.**

CE Database subject headings: Hydrology; Land use; Solar power; Floods; Surface water; Runoff; Stormwater management.

Author keywords: Hydrology; Land use change; Solar energy; Flooding; Surface water runoff; Storm-water management.

Introduction

Storm-water management practices are generally implemented to reverse the effects of land-cover changes that cause increases in volumes and rates of runoff. This is a concern posed for new types of land-cover change such as the solar farm. Solar energy is a renewable energy source that is expected to increase in importance in the near future. Because solar farms require considerable land, it is necessary to understand the design of solar farms and their potential effect on erosion rates and storm runoff, especially the impact on offsite properties and receiving streams. These farms can vary in size from 8 ha (20 acres) in residential areas to 250 ha (600 acres) in areas where land is abundant.

The solar panels are impervious to rain water; however, they are mounted on metal rods and placed over pervious land. In some cases, the area below the panel is paved or covered with gravel. Service roads are generally located between rows of panels. Although some panels are stationary, others are designed to move so that the angle of the panel varies with the angle of the sun. The angle can range, depending on the latitude, from 22° during the summer months to 74° during the winter months. In addition, the angle and direction can also change throughout the day. The issue posed is whether or not these rows of impervious panels will change the runoff characteristics of the site, specifically increase runoff volumes or peak discharge rates. If the increases are hydrologically significant, storm-water management facilities may be needed. Additionally, it is possible that the velocity of water draining from the edge of the panels is sufficient to cause erosion of the soil below the panels, especially where the maintenance roadways are bare ground.

The outcome of this study provides guidance for assessing the hydrologic effects of solar farms, which is important to those who plan, design, and install arrays of solar panels. Those who design solar farms may need to provide for storm-water management. This study investigated the hydrologic effects of solar farms, assessed whether or not storm-water management might be needed, and if the velocity of the runoff from the panels could be sufficient to cause erosion of the soil below the panels.

Model Development

Solar farms are generally designed to maximize the amount of energy produced per unit of land area, while still allowing space for maintenance. The hydrologic response of solar farms is not usually considered in design. Typically, the panels will be arrayed in long rows with separations between the rows to allow for maintenance vehicles. To model a typical layout, a unit width of one panel was assumed, with the length of the downgradient strip depending on the size of the farm. For example, a solar farm with 30 rows of 200 panels each could be modeled as a strip of 30 panels with space between the panels for maintenance vehicles. Rainwater that drains from the upper panel onto the ground will flow over the land under the 29 panels on the downgradient strip. Depending on the land cover, infiltration losses would be expected as the runoff flows to the bottom of the slope.

To determine the effects that the solar panels have on runoff characteristics, a model of a solar farm was developed. Runoff in the form of sheet flow without the addition of the solar panels served as the prepaneled condition. The paneled condition assumed a downgradient series of cells with one solar panel per ground cell. Each cell was separated into three sections: wet, dry, and spacer.

The dry section is that portion directly underneath the solar panel, unexposed directly to the rainfall. As the angle of the panel from the horizontal increases, more of the rain will fall directly onto

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Note. This manuscript was submitted on August 12, 2010; approved on October 20, 2011; published online on October 24, 2011. Discussion period open until October 1, 2013; separate discussions must be submitted for individual papers. This paper is part of the ***Journal of Hydrologic Engineering***, Vol. 18, No. 5, May 1, 2013. © ASCE, ISSN 1084-0699/2013/5-536-541/$25.00.

the ground; this section of the cell is referred to as the wet section. The spacer section is the area between the rows of panels used by maintenance vehicles. Fig. 1 is an image of two solar panels and the spacer section allotted for maintenance vehicles. Fig. 2 is a schematic of the wet, dry, and spacer sections with their respective dimensions. In Fig. 1, tracks from the vehicles are visible on what is modeled within as the spacer section. When the solar panel is horizontal, then the length longitudinal to the direction that runoff will occur is the length of the dry and wet sections combined. Runoff from a dry section drains onto the downgradient spacer section. Runoff from the spacer section flows to the wet section of the next downgradient cell. Water that drains from a solar panel falls directly onto the spacer section of that cell.

The length of the spacer section is constant. During a storm event, the loss rate was assumed constant for the 24-h storm because a wet antecedent condition was assumed. The lengths of the wet and dry sections changed depending on the angle of the solar panel. The total length of the wet and dry sections was set equal to the length of one horizontal solar panel, which was assumed to be 3.5 m. When a solar panel is horizontal, the dry section length would equal 3.5 m and the wet section length would be zero. In the paneled condition, the dry section does not receive direct rainfall because the rain first falls onto the solar panel then drains onto the spacer section. However, the dry section does infiltrate some of the runoff that comes from the upgradient wet section. The wet section was modeled similar to the spacer section with rain falling directly onto the section and assuming a constant loss rate.

For the presolar panel condition, the spacer and wet sections are modeled the same as in the paneled condition; however, the cell does not include a dry section. In the prepaneled condition, rain falls directly onto the entire cell. When modeling the prepaneled condition, all cells receive rainfall at the same rate and are subject to losses. All other conditions were assumed to remain the same such that the prepaneled and paneled conditions can be compared.

Rainfall was modeled after an natural resources conservation service (NRCS) Type II Storm (McCuen 2005) because it is an accurate representation of actual storms of varying characteristics that are imbedded in intensity-duration-frequency (IDF) curves. For each duration of interest, a dimensionless hyetograph was developed using a time increment of 12 s over the duration of the storm (see Fig. 3). The depth of rainfall that corresponds to each storm magnitude was then multiplied by the dimensionless hyetograph. For a 2-h storm duration, depths of 40.6, 76.2, and 101.6 mm were used for the 2-, 25-, and 100-year events. The 2- and 6-h duration hyetographs were developed using the center portion of the 24-h storm, with the rainfall depths established with the Baltimore IDF curve. The corresponding depths for a 6-h duration were 53.3, 106.7, and 132.1 mm, respectively. These magnitudes were chosen to give a range of storm conditions.

During each time increment, the depth of rain is multiplied by the cell area to determine the volume of rain added to each section of each cell. This volume becomes the storage in each cell. Depending on the soil group, a constant volume of losses was subtracted from the storage. The runoff velocity from a solar panel was calculated using Manning's equation, with the hydraulic radius for sheet flow assumed to equal the depth of the storage on the panel (Bedient and Huber 2002). Similar assumptions were made to compute the velocities in each section of the surface sections.

Fig. 1. Maintenance or "spacer" section between two rows of solar panels (photo by John E. Showler, reprinted with permission)

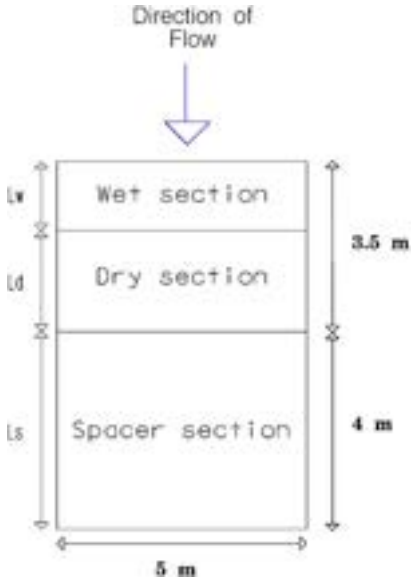

Fig. 2. Wet, dry, and spacer sections of a single cell with lengths *Lw*, *Ls*, and *Ld* with the solar panel covering the dry section

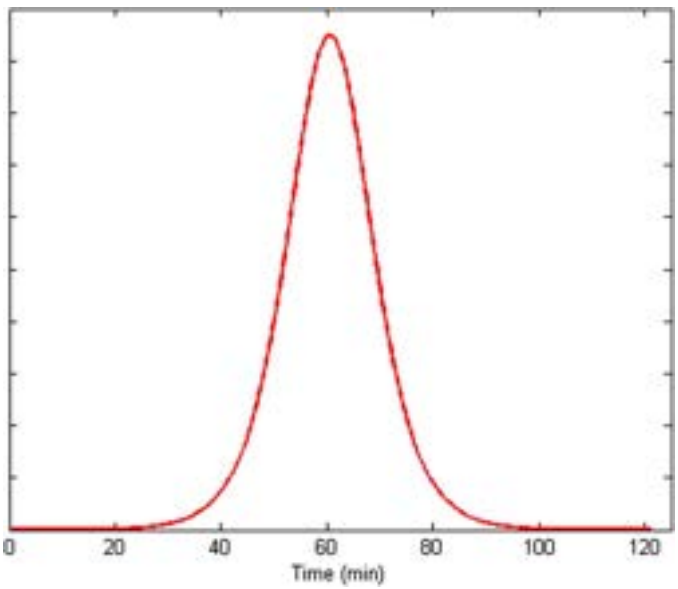

Fig. 3. Dimensionless hyetograph of 2-h Type II storm

J. Hydrol. Eng. 2013.18:536-541.

Runoff from one section to the next and then to the next downgradient cell was routed using the continuity of mass. The routing coefficient depended on the depth of flow in storage and the velocity of runoff. Flow was routed from the wet section to the dry section to the spacer section, with flow from the spacer section draining to the wet section of the next cell. Flow from the most downgradient cell was assumed to be the outflow. Discharge rates and volumes from the most downgradient cell were used for comparisons between the prepaneled and paneled conditions.

Alternative Model Scenarios

To assess the effects of the different variables, a section of 30 cells, each with a solar panel, was assumed for the base model. Each cell was separated individually into wet, dry, and spacer sections. The area had a total ground length of 225 m with a ground slope of 1% and width of 5 m, which was the width of an average solar panel. The roughness coefficient (Engman 1986) for the silicon solar panel was assumed to be that of glass, 0.01. Roughness coefficients of 0.15 for grass and 0.02 for bare ground were also assumed. Loss rates of 0.5715 cm/h (0.225 in./h) and 0.254 cm/h (0.1 in./h) for B and C soils, respectively, were assumed.

The prepaneled condition using the 2-h, 25-year rainfall was assumed for the base condition, with each cell assumed to have a good grass cover condition. All other analyses were made assuming a paneled condition. For most scenarios, the runoff volumes and peak discharge rates from the paneled model were not significantly greater than those for the prepaneled condition. Over a total length of 225 m with 30 solar panels, the runoff increased by 0.26 m^3, which was a difference of only 0.35%. The slight increase in runoff volume reflects the slightly higher velocities for the paneled condition. The peak discharge increased by 0.0013 m^3, a change of only 0.31%. The time to peak was delayed by one time increment, i.e., 12 s. Inclusion of the panels did not have a significant hydrologic impact.

Storm Magnitude

The effect of storm magnitude was investigated by changing the magnitude from a 25-year storm to a 2-year storm. For the 2-year storm, the rainfall and runoff volumes decreased by approximately 50%. However, the runoff from the paneled watershed condition increased compared to the prepaneled condition by approximately the same volume as for the 25-year analysis, 0.26 m^3. This increase represents only a 0.78% increase in volume. The peak discharge and the time to peak did not change significantly. These results reflect runoff from a good grass cover condition and indicated that the general conclusion of very minimal impacts was the same for different storm magnitudes.

Ground Slope

The effect of the downgradient ground slope of the solar farm was also examined. The angle of the solar panels would influence the velocity of flows from the panels. As the ground slope was increased, the velocity of flow over the ground surface would be closer to that on the panels. This could cause an overall increase in discharge rates. The ground slope was changed from 1 to 5%, with all other conditions remaining the same as the base conditions.

With the steeper incline, the volume of losses decreased from that for the 1% slope, which is to be expected because the faster velocity of the runoff would provide less opportunity for infiltration. However, between the prepaneled and paneled conditions, the increase in runoff volume was less than 1%. The peak discharge and the time to peak did not change. Therefore, the greater ground slope did not significantly influence the response of the solar farm.

Soil Type

The effect of soil type on the runoff was also examined. The soil group was changed from B soil to C soil by varying the loss rate. As expected, owing to the higher loss rate for the C soil, the depths of runoff increased by approximately 7.5% with the C soil when compared with the volume for B soils. However, the runoff volume for the C soil condition only increased by 0.17% from the prepaneled condition to the paneled condition. In comparison with the B soil, a difference of 0.35% in volume resulted between the two conditions. Therefore, the soil group influenced the actual volumes and rates, but not the relative effect of the paneled condition when compared to the prepaneled condition.

Panel Angle

Because runoff velocities increase with slope, the effect of the angle of the solar panel on the hydrologic response was examined. Analyses were made for angles of 30° and 70° to test an average range from winter to summer. The hydrologic response for these angles was compared to that of the base condition angle of 45°. The other site conditions remained the same. The analyses showed that the angle of the panel had only a slight effect on runoff volumes and discharge rates. The lower angle of 30° was associated with an increased runoff volume, whereas the runoff volume decreased for the steeper angle of 70° when compared with the base condition of 45°. However, the differences (~0.5%) were very slight. Nevertheless, these results indicate that, when the solar panel was closer to horizontal, i.e., at a lower angle, a larger difference in runoff volume occurred between the prepaneled and paneled conditions. These differences in the response result are from differences in loss rates.

The peak discharge was also lower at the lower angle. At an angle of 30°, the peak discharge was slightly lower than at the higher angle of 70°. For the 2-h storm duration, the time to peak of the 30° angle was 2 min delayed from the time to peak of when the panel was positioned at a 70° angle, which reflects the longer travel times across the solar panels.

Storm Duration

To assess the effect of storm duration, analyses were made for 6-h storms, testing magnitudes for 2-, 25-, and 100-year return periods, with the results compared with those for the 2-h rainfall events. The longer storm duration was tested to determine whether a longer duration storm would produce a different ratio of increase in runoff between the prepaneled and paneled conditions. When compared to runoff volumes from the 2-h storm, those for the 6-h storm were 34% greater in both the paneled and prepaneled cases. However, when comparing the prepaneled to the paneled condition, the increase in the runoff volume with the 6-h storm was less than 1% regardless of the return period. The peak discharge and the time-to-peak did not differ significantly between the two conditions. The trends in the hydrologic response of the solar farm did not vary with storm duration.

Ground Cover

The ground cover under the panels was assumed to be a native grass that received little maintenance. For some solar farms, the area beneath the panel is covered in gravel or partially paved because the panels prevent the grass from receiving sunlight. Depending on the

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volume of traffic, the spacer cell could be grass, patches of grass, or bare ground. Thus, it was necessary to determine whether or not these alternative ground-cover conditions would affect the runoff characteristics. This was accomplished by changing the Manning's n for the ground beneath the panels. The value of n under the panels, i.e., the dry section, was set to 0.015 for gravel, with the value for the spacer or maintenance section set to 0.02, i.e., bare ground. These can be compared to the base condition of a native grass ($n = 0.15$). A good cover should promote losses and delay the runoff.

For the smoother surfaces, the velocity of the runoff increased and the losses decreased, which resulted in increasing runoff volumes. This occurred both when the ground cover under the panels was changed to gravel and when the cover in the spacer section was changed to bare ground. Owing to the higher velocities of the flow, runoff rates from the cells increased significantly such that it was necessary to reduce the computational time increment. Fig. 4(a) shows the hydrograph from a 30-panel area with a time increment of 12 s. With a time increment of 12 s, the water in each cell is discharged at the end of every time increment, which results in no attenuation of the flow; thus, the undulations shown in Fig. 4(a) result. The time increment was reduced to 3 s for the 2-h storm, which resulted in watershed smoothing and a rational hydrograph shape [Fig. 4(b)]. The results showed that the storm runoff

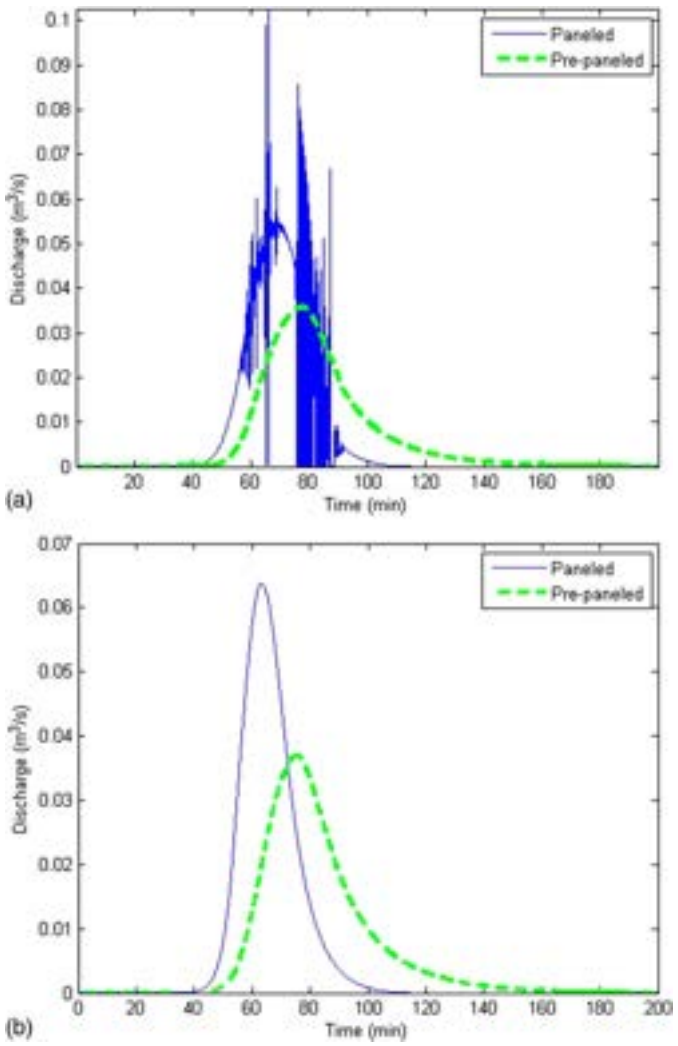

Fig. 4. Hydrograph with time increment of (a) 12 s; (b) 3 s with Manning's n for bare ground

increased by 7% from the grass-covered scenario to the scenario with gravel under the panel. The peak discharge increased by 73% for the gravel ground cover when compared with the grass cover without the panels. The time to peak was 10 min less with the gravel than with the grass, which reflects the effect of differences in surface roughness and the resulting velocities.

If maintenance vehicles used the spacer section regularly and the grass cover was not adequately maintained, the soil in the spacer section would be compacted and potentially the runoff volumes and rates would increase. Grass that is not maintained has the potential to become patchy and turn to bare ground. The grass under the panel may not get enough sunlight and die. Fig. 1 shows the result of the maintenance trucks frequently driving in the spacer section, which diminished the grass cover.

The effect of the lack of solar farm maintenance on runoff characteristics was modeled by changing the Manning's n to a value of 0.02 for bare ground. In this scenario, the roughness coefficient for the ground under the panels, i.e., the dry section, as well as in the spacer cell was changed from grass covered to bare ground ($n = 0.02$).The effects were nearly identical to that of the gravel. The runoff volume increased by 7% from the grass-covered to the bare-ground condition. The peak discharge increased by 72% when compared with the grass-covered condition. The runoff for the bare-ground condition also resulted in an earlier time to peak by approximately 10 min. Two other conditions were also modeled, showing similar results. In the first scenario, gravel was placed directly under the panel, and healthy grass was placed in the spacer section, which mimics a possible design decision. Under these conditions, the peak discharge increased by 42%, and the volume of runoff increased by 4%, which suggests that storm-water management would be necessary if gravel is placed anywhere.

Fig. 5 shows two solar panels from a solar farm in New Jersey. The bare ground between the panels can cause increased runoff rates and reductions in time of concentration, both of which could necessitate storm-water management. The final condition modeled involved the assumption of healthy grass beneath the panels and bare ground in the spacer section, which would simulate the condition of unmaintained grass resulting from vehicles that drive over the spacer section. Because the spacer section is 53% of the cell, the change in land cover to bare ground would reduce losses and decrease runoff travel times, which would cause runoff to amass as it

Fig. 5. Site showing the initiation of bare ground below the panels, which increases the potential for erosion (photo by John Showler, reprinted with permission)

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moves downgradient. With the spacer section as bare ground, the peak discharge increased by 100%, which reflected the increases in volume and decrease in timing. These results illustrate the need for maintenance of the grass below and between the panels.

Design Suggestions

With well-maintained grass underneath the panels, the solar panels themselves do not have much effect on total volumes of the runoff or peak discharge rates. Although the panels are impervious, the rainwater that drains from the panels appears as runoff over the downgradient cells. Some of the runoff infiltrates. If the grass cover of a solar farm is not maintained, it can deteriorate either because of a lack of sunlight or maintenance vehicle traffic. In this case, the runoff characteristics can change significantly with both runoff rates and volumes increasing by significant amounts. In addition, if gravel or pavement is placed underneath the panels, this can also contribute to a significant increase in the hydrologic response.

If bare ground is foreseen to be a problem or gravel is to be placed under the panels to prevent erosion, it is necessary to counteract the excess runoff using some form of storm-water management. A simple practice that can be implemented is a buffer strip (Dabney et al. 2006) at the downgradient end of the solar farm. The buffer strip length must be sufficient to return the runoff characteristics with the panels to those of runoff experienced before the gravel and panels were installed. Alternatively, a detention basin can be installed.

A buffer strip was modeled along with the panels. For approximately every 200 m of panels, or 29 cells, the buffer must be 5 cells long (or 35 m) to reduce the runoff volume to that which occurred before the panels were added. Even if a gravel base is not placed under the panels, the inclusion of a buffer strip may be a good practice when grass maintenance is not a top funding priority. Fig. 6 shows the peak discharge from the graveled surface versus the length of the buffer needed to keep the discharge to prepaneled peak rate.

Water draining from a solar panel can increase the potential for erosion of the spacer section. If the spacer section is bare ground, the high kinetic energy of water draining from the panel can cause soil detachment and transport (Garde and Raju 1977; Beuselinck et al. 2002). The amount and risk of erosion was modeled using the velocity of water coming off a solar panel compared with the velocity and intensity of the rainwater. The velocity of panel

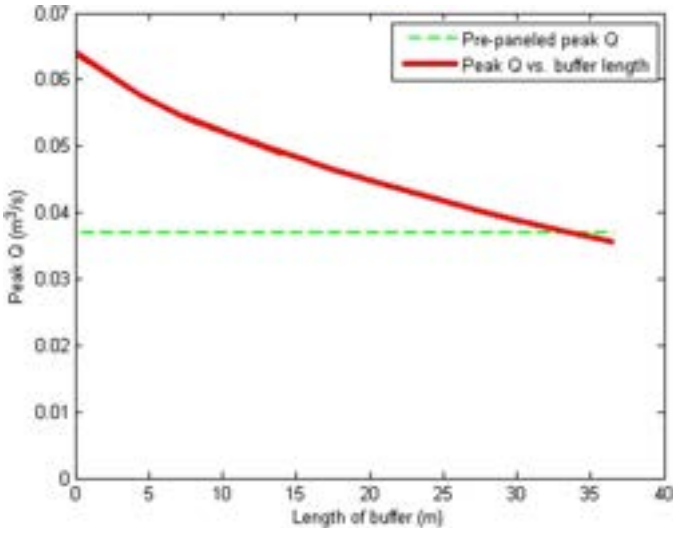

Fig. 6. Peak discharge over gravel compared with buffer length

runoff was calculated using Manning's equation, and the velocity of falling rainwater was calculated using the following:

$$V_t = 120\, d_r^{0.35} \tag{1}$$

where d_r = diameter of a raindrop, assumed to be 1 mm. The relationship between kinetic energy and rainfall intensity is

$$K_e = 916 + 330 \log_{10} i \tag{2}$$

where i = rainfall intensity (in./h) and K_e = kinetic energy (ft-tons per ac-in. of rain) of rain falling onto the wet section and the panel, as well as the water flowing off of the end of the panel (Wischmeier and Smith 1978). The kinetic energy (Salles et al. 2002) of the rainfall was greater than that coming off the panel, but the area under the panel (i.e., the product of the length, width, and cosine of the panel angle) is greater than the area under the edge of the panel where the water drains from the panel onto the ground. Thus, dividing the kinetic energy by the respective areas gives a more accurate representation of the kinetic energy experienced by the soil. The energy of the water draining from the panel onto the ground can be nearly 10 times greater than the rain itself falling onto the ground area. If the solar panel runoff falls onto an unsealed soil, considerable detachment can result (Motha et al. 2004). Thus, because of the increased kinetic energy, it is possible that the soil is much more prone to erosion with the panels than without. Where panels are installed, methods of erosion control should be included in the design.

Conclusions

Solar farms are the energy generators of the future; thus, it is important to determine the environmental and hydrologic effects of these farms, both existing and proposed. A model was created to simulate storm-water runoff over a land surface without panels and then with solar panels added. Various sensitivity analyses were conducted including changing the storm duration and volume, soil type, ground slope, panel angle, and ground cover to determine the effect that each of these factors would have on the volumes and peak discharge rates of the runoff.

The addition of solar panels over a grassy field does not have much of an effect on the volume of runoff, the peak discharge, nor the time to peak. With each analysis, the runoff volume increased slightly but not enough to require storm-water management facilities. However, when the land-cover type was changed under the panels, the hydrologic response changed significantly. When gravel or pavement was placed under the panels, with the spacer section left as patchy grass or bare ground, the volume of the runoff increased significantly and the peak discharge increased by approximately 100%. This was also the result when the entire cell was assumed to be bare ground.

The potential for erosion of the soil at the base of the solar panels was also studied. It was determined that the kinetic energy of the water draining from the solar panel could be as much as 10 times greater than that of rainfall. Thus, because the energy of the water draining from the panels is much higher, it is very possible that soil below the base of the solar panel could erode owing to the concentrated flow of water off the panel, especially if there is bare ground in the spacer section of the cell. If necessary, erosion control methods should be used.

Bare ground beneath the panels and in the spacer section is a realistic possibility (see Figs. 1 and 5). Thus, a good, well-maintained grass cover beneath the panels and in the spacer section is highly recommended. If gravel, pavement, or bare ground is

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deemed unavoidable below the panels or in the spacer section, it may necessary to add a buffer section to control the excess runoff volume and ensure adequate losses. If these simple measures are taken, solar farms will not have an adverse hydrologic impact from excess runoff or contribute eroded soil particles to receiving streams and waterways.

Acknowledgments

The authors appreciate the photographs (Figs. 1 and 5) of Ortho Clinical Diagnostics, 1001 Route 202, North Raritan, New Jersey, 08869, provided by John E. Showler, Environmental Scientist, New Jersey Department of Agriculture. The extensive comments of reviewers resulted in an improved paper.

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Exhibit H: Environmental Constraints Memo

MEMORANDUM

To:	Lauren Beduhn *South Haven Affordable Solar, LLC*
From:	Ashley Payne *Kimley-Horn and Associates, Inc.*
Date:	November 10, 2023
Subject:	*South Haven Charter Township, Van Buren County, Michigan – Van Buren Rivers Edge Environmental Constraints Memorandum*

INTRODUCTION

Kimley-Horn was contracted by South Haven Affordable Solar, LLC to review the Van Buren Rivers Edge Solar project study area for potential environmental constraints. See Figure 1 for project location and Figure 2 for the study area boundary. The study area is located in South Haven Charter Township, Van Buren County, Michigan. The study area is approximately 55 acres in size and is located in Section 14 of Township 1S, Range 17W. Kimley-Horn reviewed available background data to assist in determining if there are any potential environmental constraints for the study area.

ENVIRONMENTAL CONSTRAINTS:

Aquatic Resources (Wetlands and Waterways)

Kimley-Horn reviewed available topographic maps, the National Wetlands Inventory (NWI), the Part 303 Final Wetlands Inventory, the National Hydrography Dataset (NHD), soil survey data, and floodplain data to identify potential wetlands or surface waters within the study area vicinity.

U.S. Geological Survey (USGS) Topographic Map

A review of the South Haven, Illinois 7.5-minute topographic quadrangle depicted no water features within the study area. The study area is depicted as orchard. The USGS topographic map is presented on Figure 3.

National Wetlands Inventory (NWI)

Based on a review of the U.S. Fish and Wildlife Service (USFWS) NWI,[1] portions of 2 wetland features are present within the study area. The NWI-mapped features include one freshwater forested/shrub wetland (PSS1C) and one freshwater emergent wetland (PEM1C). The NWI-mapped features are presented on Figure 4.

[1] USFWS. 2023. National Wetlands Inventory. Vector Digital Data. Published October 2023.

Part 303 Final Wetlands Inventory

Based on a review of the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Part 303 Final Wetlands Inventory, portions of one wetland feature are present within the study area.[2] The wetland feature is in approximate alignment with the NWI-mapped features. EGLE identified hydric soils within the southeastern portion of the study area. The Part 303-mapped features are presented on Figure 4.

USGS National Hydrography Dataset (NHD)

Based on a review of the USGS NHD,[3] there are no flowline segments or waterbodies located within the study area. NHD flowlines are present within the study area vicinity. The NHD-mapped resources are presented on Figure 4.

Van Buren County Soil Survey

A review of the Van Buren County soil survey identified 3 soil types within the study area. Approximately 4 percent of the study area is mapped with a predominantly hydric soils rating of 40 percent. This area is generally located in the vicinity of NWI-mapped features. The remainder of the study area is mapped with a predominantly non-hydric soils rating of 4 percent, or a non-hydric soils rating of 0 percent. Hydric soils rating data are presented on Figure 5.

FEMA Floodplain

The Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) Viewer[4] was reviewed to determine if FEMA 100-year floodplains are located within the study area. Based on Panels 26159C0019C and Panel 26159C0038C (effective December 3, 2009), the study area is not located within a FEMA 100-year floodplain. The FEMA floodplain data are presented on Figure 6.

Aquatic Resource Assessment

Based on the National Wetlands Inventory, Part 303 Final Wetlands Inventory, and the National Hydrography Dataset, Kimley-Horn identified potential wetlands and waterway features within the property (see Figure 4). A Level 2 (field) wetland delineation is recommended to confirm the extents of wetlands and waterways within the project study area.

USFWS Federally Listed Threatened and Endangered Species

Kimley-Horn conducted a preliminary review of the potential for federally listed threatened, endangered, and proposed species to occur within the study area or be affected by the proposed project for the purposes of due diligence in compliance with the Endangered Species Act (ESA). A list of the threatened, endangered, and proposed species, and designated critical habitat that could occur in Van Buren County was obtained and evaluated from the USFWS Information for Planning and Consultation (IPaC) online planning tool. The resource list is not considered official USFWS correspondence for ESA consultation. Habitat descriptions for the identified species were compared to the habitat within or near the study area. The resource list obtained via the USFWS IPaC for the project identified nine species that should be considered in an effects analysis. The resource list is included in Attachment A and the identified species are reviewed below in Table 1.

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[2] EGLE. Wetlands Map Viewer. Available online at https://www.mcgi.state.mi.us/wetlands/mcgiMap.html#
[3] USGS. National Hydrography Dataset. Vector Digital Data. Published August 2023.
[4] USGS. FEMA National Flood Hazard Layer Viewer. Available online at https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

Table 1. USFWS Listed Threatened and Endangered Species

Species	Status	Preferred Habitat	Findings
Myotis sodalis (Indiana Bat)	Endangered	During summer, Indiana bats roost under loose bark or in hallows and cavities of mature trees in the floodplain forest or savanna habitats adjacent to riparian corridors. In winter, Indiana bats hibernate in caves and mines.	There is no critical habitat for the Indiana bat within the vicinity of the study area. Minimal suitable habitat may be present within the study area due to the presence of wooded areas located in the northern portion of the study area. Any tree trimming or removal should be completed between October 1 and April 14.
Myotis septentrionalis (Northern Long-Eared Bat [NLEB])	Endangered	During summer, NLEB roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. This bat uses tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bats spend winter hibernating in caves and mines.	No critical habitat has been designated for this species. Minimal suitable habitat may be present within the study area due to the presence of forested areas located in the northern portion of the study area. Any tree trimming or removal should be completed between October 1 and April 14.
Perimyotis subflavus (Tricolored Bat)	Proposed Endangered	During the spring, summer and fall, tricolored bats roost among leaf clusters of live or recently dead deciduous hardwood trees. They are also found in Spanish moss, pine trees, and human structures. In winter, tricolored bats hibernate in caves and mines.	No critical habitat has been designated for this species. Minimal suitable habitat may be present within the study area due to the presence of forested areas located in the northern portion of the study area. Tree trimming or removal would not be restricted to a specific season; however, USFWS recommends tree clearing activities be conducted in the winter.

Species	Status	Preferred Habitat	Findings
Sistrurus catenatus (Eastern massasauga rattlesnake)	Threatened	The eastern massasauga is found in a variety of wetland habitats including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens.	Potential suitable habitat is located within the study area in the wetland areas. The Department of Natural Resources (DNR) recommends that any eastern massasauga sightings be documented and reported to the DNR.
Grus americana (Whooping crane)	Experimental population, Non-essential	The whooping crane breeds, migrates, winters and forages in a variety of habitats, including coastal marshes and estuaries, inland marshes, lakes, open ponds, shallow bays, salt marsh and sand or tidal flats, upland swales, wet meadows and rivers, pastures, and agricultural fields.	No critical habitat has been designated for this species. The study area contains agricultural fields which are listed as habitat for the whooping crane. Due to the non-essential, experimental nature of the population, no impacts are anticipated.
Rufa Red Knot	Threatened	Preferred wintering and migration habitats are muddy or sandy coastal areas, specifically, bays and estuaries, tidal flats, and unimproved tidal inlets. Red knots generally nest in dry, slightly elevated tundra locations, often on windswept slopes with little vegetation.	There is no critical habitat for the rufa red knot within the vicinity of the study area. No suitable habitat has been identified within the study area. No adverse impacts are anticipated.
Neonympha mitchellii mitchellii (Mitchell's Satyr Butterfly)	Endangered	The Mitchell's satyr butterfly is found in prairie fens. The species can also be associated with beaver-influenced wetlands that are sedge-dominated, and occasionally semi-open riparian or floodplain forest areas.	No critical habitat has been designated for this species. No suitable habitat within the study area has been identified. No adverse impacts are anticipated.
Danaus plexippus (Monarch butterfly)	Candidate	The monarch butterfly requires grassland habitats where milkweed and flowers are present. North American populations of the monarch	No critical habitat has been designated for this species. Minimal preferred habitat may appear within the study area. Because the area is primarily active

Species	Status	Preferred Habitat	Findings
		butterfly typically follow a seasonal migration pattern.	farmland and therefore disturbed, no adverse impacts are anticipated. To avoid potential impacts, reseeding with native seed mixes is recommended, although not required.
Bombus affinis (Rusty Patched Bumble Bee [RPBB])	Endangered	RPBB has been observed in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes and residential parks and gardens. RPBB requires areas that support sufficient food, including nectar and pollen from diverse and abundant flowers, as well as undisturbed nesting sites that are in proximity to those floral resources.	Suitable habitat may be present in unmanicured areas as well as forested portions of the study area. Impacts to forested areas should be minimized or avoided. The area is primarily active farmland. No adverse impacts are anticipated.
Cirsium pitcheri (Pitcher's Thistle)	Threatened	Pitcher's thistle grows on the open sand dunes and low open beach ridges along the shorelines of Lakes Michigan, Superior, and Huron. It is most often found in near-shore plant communities but can grow in all nonforested areas of a dune system.	No critical habitat has been designated for this species. No suitable habitat has been identified in the study area. No adverse impacts are anticipated.

Migratory Birds

According to the IPaC resource list, nine migratory species on the Birds of Conservation Concern (BCC) list have been identified within the study area. The BCC list was updated in 2021 by the USFWS and is an effort to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act."

The Migratory Bird Treaty Act (MBTA) makes it illegal for anyone to "take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations by the USFWS". Typically, if active nests of bird species protected by the MBTA are identified, the USFWS recommends avoiding tree clearing or nest removal until at least the peak of the nesting season (generally March through August) has passed or until the nest is abandoned.

The U.S. Department of the Interior, Office of the Solicitor, published a memorandum (M-37050) dated December 22, 2017 regarding the MBTA and how "incidental take" is viewed by the Department. The memorandum analyzes whether the MBTA prohibits the accidental or "incidental" taking or killing of migratory birds. "Incidental take" is take that results from an activity, but is not the purpose of that activity. In this memorandum, the Department of the Interior concluded that "the MBTA's prohibition on pursuing, hunting, taking, capturing, killing, or attempting to do the same applies only to direct and affirmative purposeful actions that reduce migratory birds, their eggs, or their nests, by killing or capturing, to human control." Therefore, according to the Department of the Interior, the MBTA does not prohibit "incidental take." Courts have different opinions and decisions with respect to including or excluding "incidental take" when considering the prohibitions under the MBTA. In 2015, the Fifth Circuit in United States v. Citgo Petroleum Corp. issued an opinion that agreed with the Eighth and Ninth circuits that a taking is limited to deliberate acts done directly and intentionally to migratory birds. Therefore, the Fifth Circuit decided that the MBTA only prohibits intentional take and does not prohibit incidental take. This decision by the Fifth Circuit set precedent within the Fifth Circuit's jurisdiction.

On January 7, 2021, the USFWS published a final rule ("MBTA rule") defining the scope of the MBTA which excluded incidental take of migratory birds from being unlawful. This interpretation of the MBTA was effective as of March 8, 2021. On May 7, 2021, the USFWS proposed to revoke the January 7, 2021 final regulation and opened a public comment period which closed on June 7, 2021. On September 29, 2021, the U.S. Department of Interior announced a series of actions to unwind the most recent rulemaking in an effort "to ensure that the MBTA conserves birds today and into the future." On October 4, 2021, the USFWS published a final rule revoking the most recent rule enacted by the Trump Administration that limited the scope of the MBTA. According to the Federal Register, the final MBTA revocation rule went into effect on December 3, 2021.

In addition, on October 4, 2021, the USFWS published an Advanced Notice of Proposed Rulemaking announcing the intent to solicit public comments and information to help develop proposed regulations that would establish a permitting system to authorize the incidental take of migratory birds in certain circumstances. The USFWS issued a Director's Order establishing criteria for the types of conduct that will be a priority for enforcement activities with respect to incidental take of migratory birds.

It should be noted that the regulatory climate with respect to the MBTA is changing; however, it is our understanding that as of December 3, 2021 incidental take of migratory birds would be liable under the MBTA. This should be considered until a rulemaking process is complete. Kimley-Horn recommends evaluating the MBTA regulation prior to ground disturbance activities commencing.

Kimley-Horn downloaded the Trust Resources Report Migratory Bird List from the IPaC online planning tool. The IPaC results are included in Attachment A. Kimley-Horn conducted a preliminary desktop review of the potential for migratory bird habitat (focusing primarily on trees and shrubs) to occur on the proposed study area or be affected by the proposed study area for the purposes of due diligence in complying with the MBTA. The desktop review revealed the presence of minimal potential migratory bird habitat within the study area. It is our understanding that as of December 3, 2021, incidental take would be enforceable under the MBTA.

Michigan State Listed Threatened, Endangered, and Species of Special Concern

Kimley-Horn reviewed the Michigan State University Natural Features Inventory (MNFI) county species list. Based on the county species list, there are 24 endangered species, 43 threatened species, and 53 species of special concern within the county. Based on the existing land use (predominantly agricultural land), no adverse impacts are anticipated. The county species list is included in Attachment A. Kimley-Horn will submit a MNFI Review Request for the study area.

Historic Resources Database Review

Kimley-Horn reviewed the National Register of Historic Places (NRHP) database for known historic resources within the project vicinity. According to the NRHP database, there are no known sites listed in the NRHP within the study area (see Attachment B). There is one known site listed within one mile of the study area. A desktop cultural resources assessment will be completed..

CONCLUSIONS AND RECOMMENDATIONS:

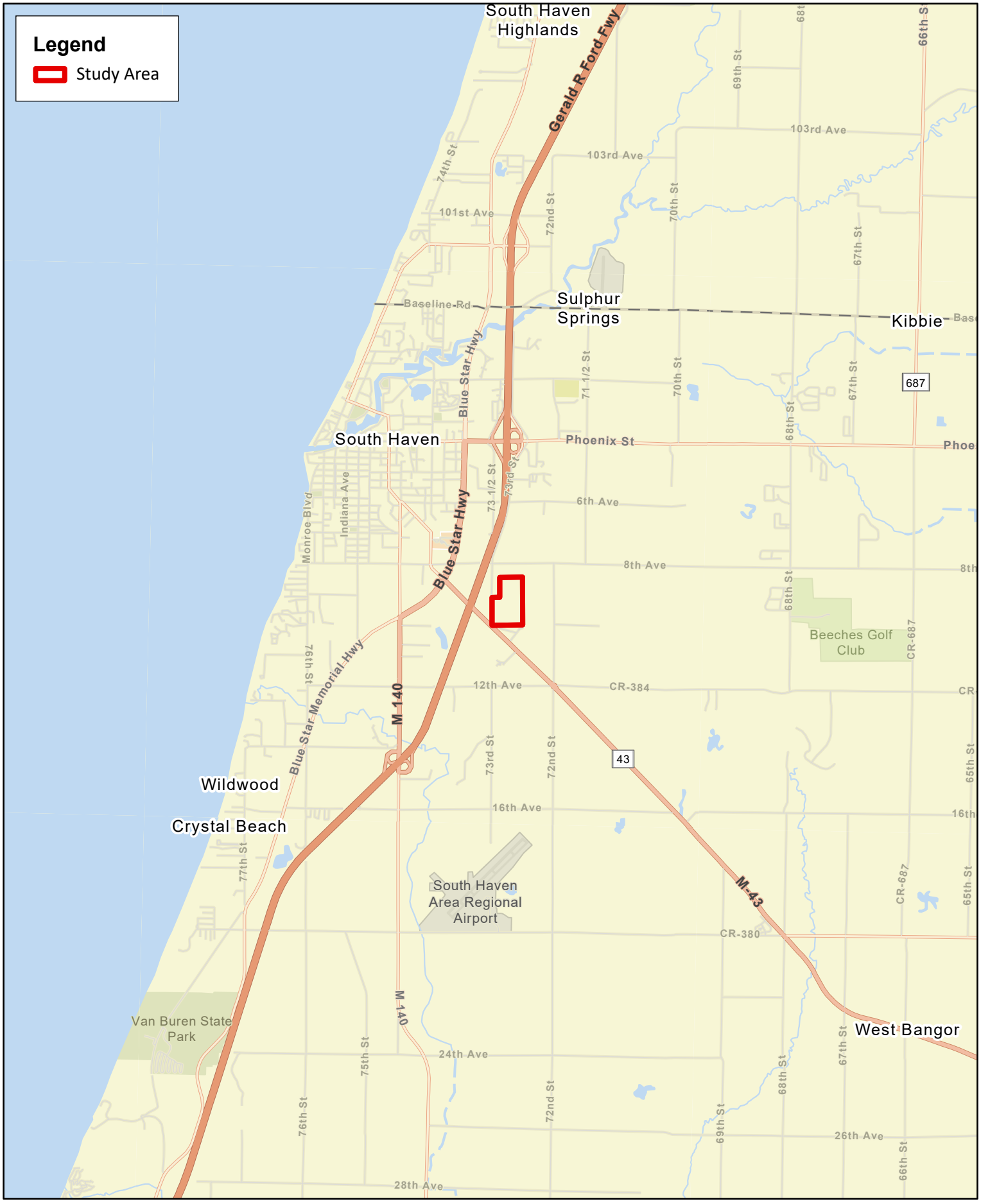
Based on the information reviewed, Kimley-Horn has identified potential environmental constraints that could require additional planning.

Based on the aquatic resource assessment, Kimley-Horn identified potential wetlands and waterways within the study area. A Level 2 (Field) wetland delineation is recommended to determine the extents of wetlands and waterways within the study area.

Potential suitable habitat for listed federal species may be present within the study area. If tree clearing or structure demolition is anticipated, it is recommended to be completed between October 1 and April 14, which is outside of the active bat season. Numerous state listed species are identified within the county. Based on the existing land use (predominantly agricultural land), no adverse impacts are anticipated. A MNFI review will be completed to evaluate potential effects to state listed species or protected resources.

No impacts to known NRHP-listed resources are anticipated. A desktop cultural resources assessment will be completed..

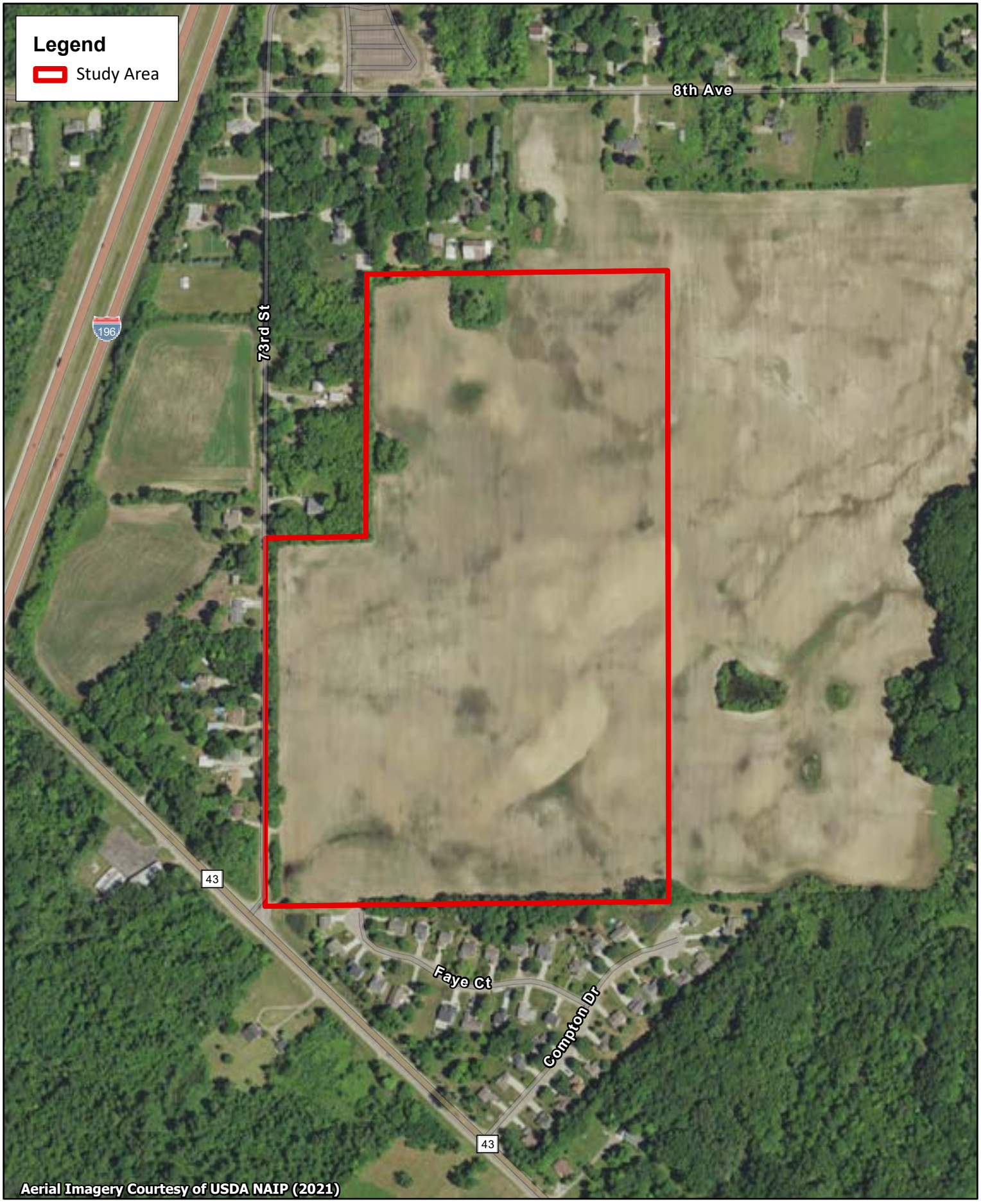
Figures



Kimley»Horn

0 0.5 1 Miles

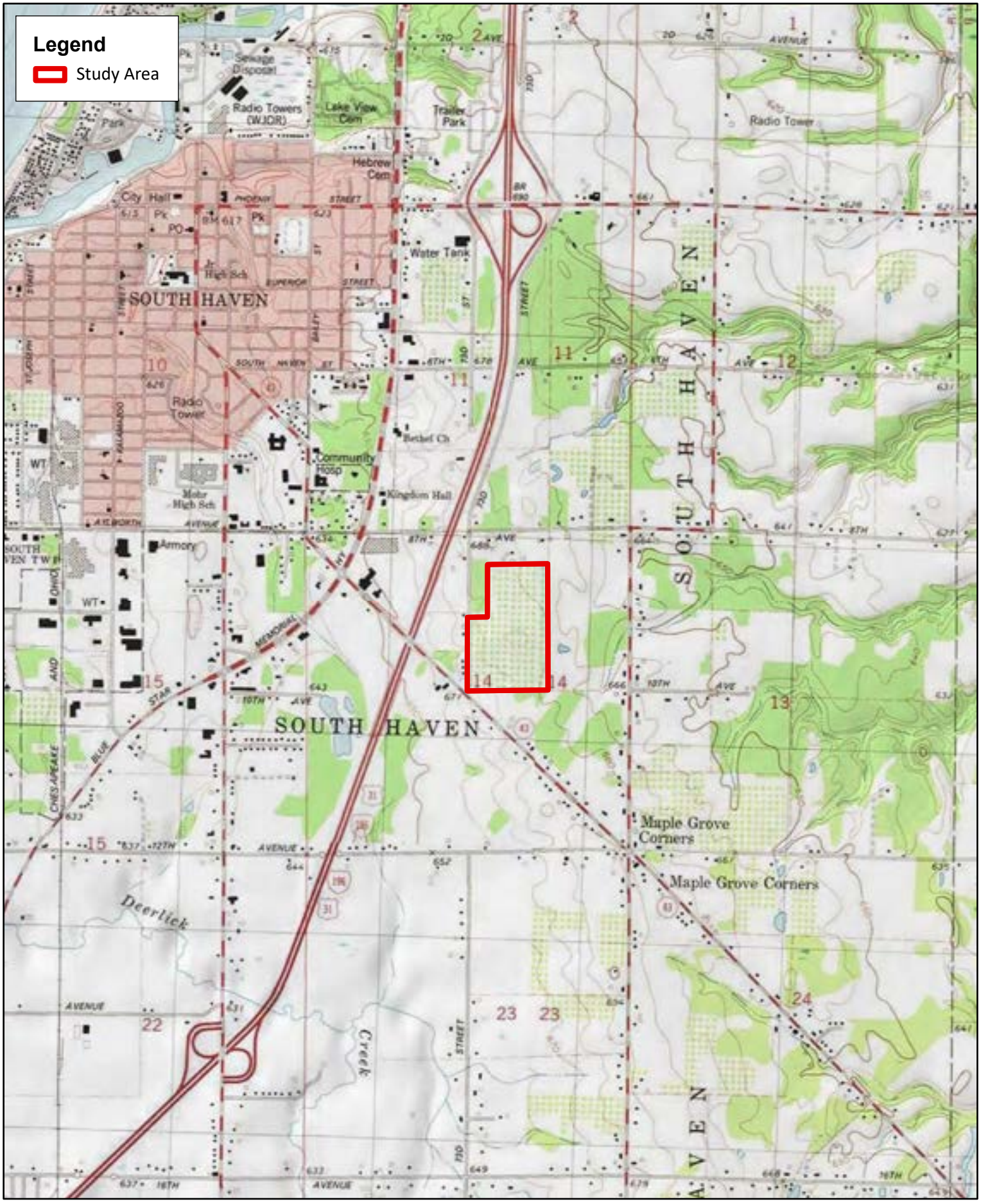
Figure 1. Project Location Map
South Haven Charter Township
Van Buren County
SolAmerica Energy, LLC



Kimley»Horn

0 200 400 Feet

Figure 2. Study Area Boundary
South Haven Charter Township
Van Buren County
SolAmerica Energy, LLC



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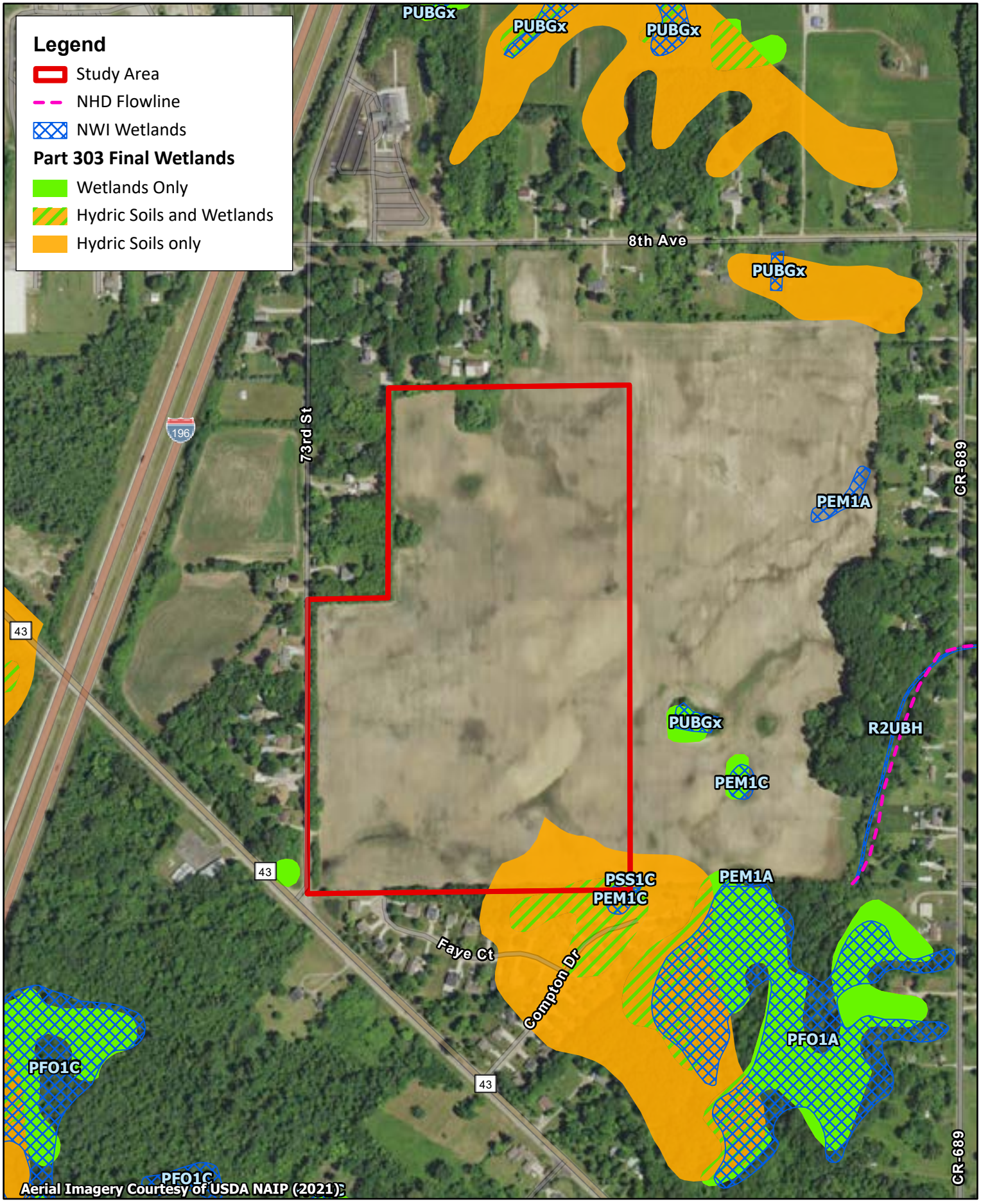
0 1,000 2,000 Feet

Figure 3. USGS Topographic Map
South Haven Charter Township
Van Buren County
SolAmerica Energy, LLC

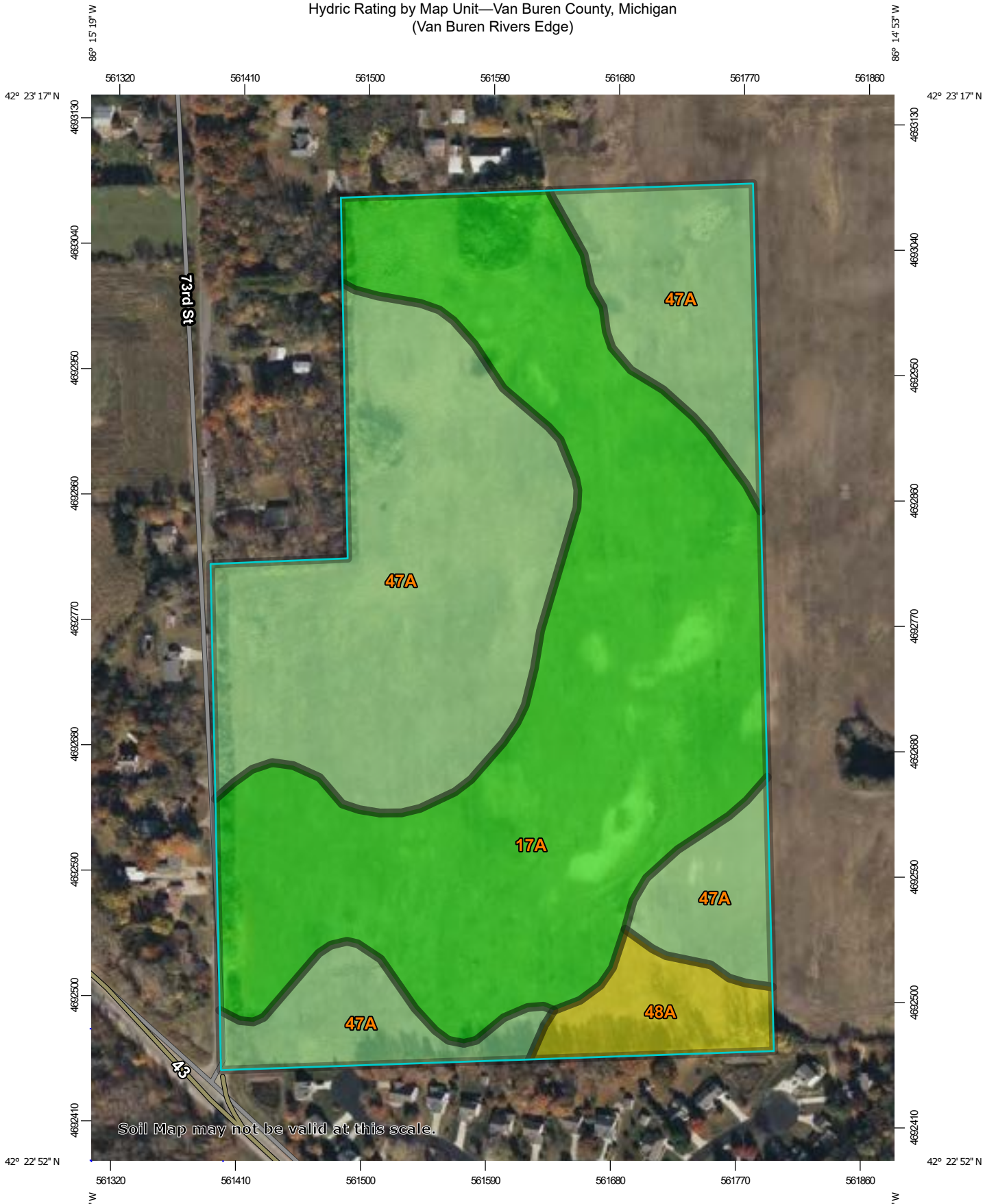


Kimley»Horn

0 250 500 Feet

Figure 4. NHD, NWI and Part 303 Wetlands Map
South Haven Charter Township
Van Buren County
SolAmerica Energy, LLC

Hydric Rating by Map Unit—Van Buren County, Michigan
(Van Buren Rivers Edge)



Map Scale: 1:3,730 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

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

Soils

Soil Rating Polygons
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Lines
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

Soil Rating Points
- Hydric (100%)
- Hydric (66 to 99%)
- Hydric (33 to 65%)
- Hydric (1 to 32%)
- Not Hydric (0%)
- Not rated or not available

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 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Van Buren County, Michigan
Survey Area Data: Version 19, Aug 25, 2023

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

Date(s) aerial images were photographed: Oct 4, 2022—Oct 28, 2022

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.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
17A	Brems sand, 0 to 2 percent slopes	0	27.3	49.7%
47A	Selfridge loamy sand, 0 to 3 percent slopes	4	25.3	45.9%
48A	Pipestone-Kingsville complex, 0 to 3 percent slopes	40	2.4	4.4%
Totals for Area of Interest			**55.0**	**100.0%**

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Kimley»Horn

0 400 800 Feet

Figure 6. FEMA Floodplain Map
South Haven Charter Township
Van Buren County
SolAmerica Energy

ATTACHMENT A

Species Resources

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
Phone: (517) 351-2555 Fax: (517) 351-1443

In Reply Refer To: November 06, 2023
Project Code: 2024-0012968
Project Name: SolAmerica Energy- Van Buren Rivers Edge

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

Official Species List
The attached species list identifies any Federally threatened, endangered, proposed and candidate species that may occur within the boundary of your proposed project or may be affected by your proposed project. The list also includes designated critical habitat if present within your proposed project area or affected by your project. This list is provided to you as the initial step of the consultation process required under section 7(c) of the Endangered Species Act, also referred to as Section 7 Consultation.

Under 50 CFR 402.12(e) (the regulations that implement section 7 of the Endangered Species Act), the accuracy of this species list should be verified after 90 days. You may verify the list by visiting the IPaC website (https://ipac.ecosphere.fws.gov/) at regular intervals during project planning and implementation. To update an Official Species List in IPaC: from the My Projects page, find the project, expand the row, and click Project Home. In the What's Next box on the Project Home page, there is a Request Updated List button to update your species list. Be sure to select an "official" species list for all projects.

Consultation requirements and next steps
Section 7 of the Endangered Species Act of 1973 requires that actions authorized, funded, or carried out by Federal agencies not jeopardize Federally threatened or endangered species or adversely modify designated critical habitat. To fulfill this mandate, Federal agencies (or their designated non-Federal representative) must consult with the Fish and Wildlife Service if they determine their project may affect listed species or critical habitat.

There are two approaches to evaluating the effects of a project on listed species.

Approach 1. Use the All-species Michigan determination key in IPaC. This tool can assist you in making determinations for listed species for some projects. In many cases, the determination key

will provide an automated concurrence that completes all or significant parts of the consultation process. Therefore, we strongly recommend screening your project with the **All-Species Michigan Determination Key (Dkey)**. For additional information on using IPaC and available Determination Keys, visit https://www.fws.gov/media/mifo-ipac-instructions (and click on the attachment). Please carefully review your Dkey output letter to determine whether additional steps are needed to complete the consultation process.

Approach 2. Evaluate the effects to listed species on your own without utilizing a determination key. Once you obtain your official species list, you are not required to continue in IPaC, although in most cases using a determination key should expedite your review. If the project is a Federal action, you should review our section 7 step-by-step instructions before making your determinations: https://www.fws.gov/office/midwest-region-headquarters/midwest-section-7-technical-assistance. If you evaluate the details of your project and conclude "no effect," document your findings, and your listed species review is complete; you do not need our concurrence on "no effect" determinations. If you cannot conclude "no effect," you should coordinate/consult with the Michigan Ecological Services Field Office. The preferred method for submitting your project description and effects determination (if concurrence is needed) is electronically to EastLansing@fws.gov. Please include a copy of this official species list with your request.

For all **wind energy projects** and **projects that include installing communications towers >450 feet that use guy wires**, please contact this field office directly for assistance, even if no Federally listed plants, animals or critical habitat are present within your proposed project area or may be affected by your proposed project.

Migratory Birds
Please see the "Migratory Birds" section below for important information regarding incorporating migratory birds into your project planning. Our Migratory Bird Program has developed recommendations, best practices, and other tools to help project proponents voluntarily reduce impacts to birds and their habitats. The Bald and Golden Eagle Protection Act prohibits the take and disturbance of eagles without a permit. If your project is near an eagle nest or winter roost area, see our Eagle Permits website at https://www.fws.gov/program/eagle-management/eagle-permits to help you avoid impacting eagles or determine if a permit may be necessary.

Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/partner/council-conservation-migratory-birds.

We appreciate your consideration of threatened and endangered species during your project

planning. Please include a copy of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- Migratory Birds
- Wetlands

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Michigan Ecological Services Field Office
2651 Coolidge Road Suite 101
East Lansing, MI 48823-6360
(517) 351-2555

PROJECT SUMMARY

Project Code: 2024-0012968
Project Name: SolAmerica Energy- Van Buren Rivers Edge
Project Type: Power Gen - Solar
Project Description: SolAmerica Energy is proposing to develop the study area into a solar farm.
Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@42.3847462,-86.25180979848696,14z

Counties: Van Buren County, Michigan

ENDANGERED SPECIES ACT SPECIES

There is a total of 9 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Note that 2 of these species should be considered only under certain conditions.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

MAMMALS

NAME	STATUS
Indiana Bat *Myotis sodalis* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/3OQUSHVPWRF7LCBI4IW2O3PBY4/documents/generated/6982.pdf	Endangered
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

BIRDS

NAME	STATUS
Rufa Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. This species only needs to be considered under the following conditions: ▪ Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

REPTILES

NAME	STATUS
Eastern Massasauga (=rattlesnake) *Sistrurus catenatus* No critical habitat has been designated for this species. This species only needs to be considered under the following conditions: ▪ For all Projects: Project is within EMR Range Species profile: https://ecos.fws.gov/ecp/species/2202 General project design guidelines: https://ipac.ecosphere.fws.gov/project/3OQUSHVPWRF7LCBI4IW2O3PBY4/documents/generated/5280.pdf	Threatened

INSECTS

NAME	STATUS
Mitchell's Satyr Butterfly *Neonympha mitchellii mitchellii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8062	Endangered
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

FLOWERING PLANTS

NAME	STATUS
Pitcher's Thistle *Cirsium pitcheri* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8153	Threatened

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

USFWS NATIONAL WILDLIFE REFUGE LANDS AND FISH HATCHERIES

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read the supplemental

information and specifically the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

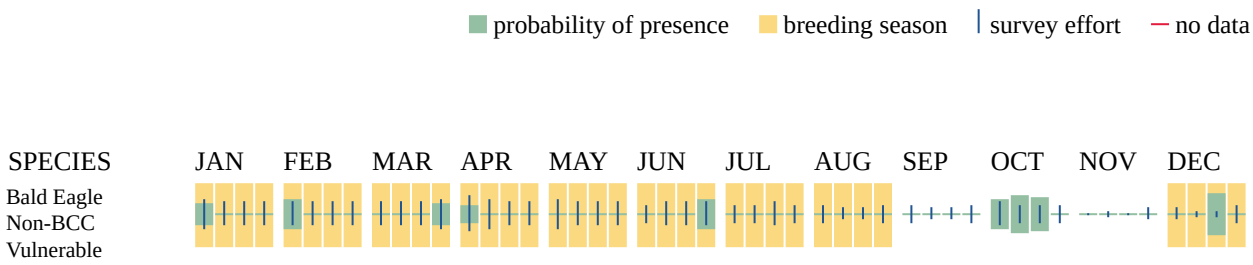
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Managment https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 22 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere

NAME	BREEDING SEASON
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read the supplemental information and specifically the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

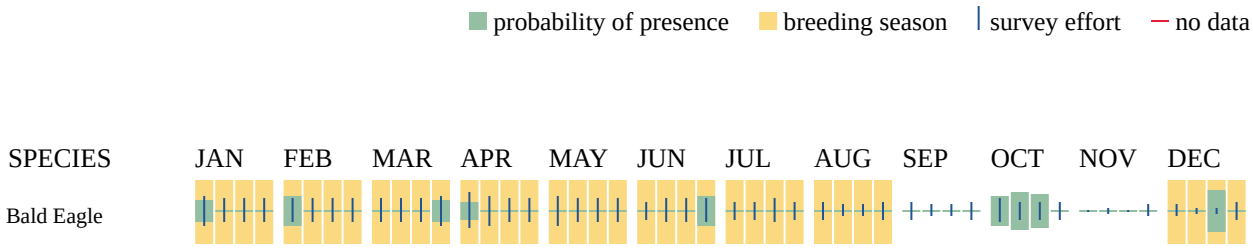
Probability of Presence (▪)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

WETLANDS

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- PEM1C

FRESHWATER FORESTED/SHRUB WETLAND

- PSS1C

IPAC USER CONTACT INFORMATION

Agency:	Private Entity
Name:	Madeline Roess
Address:	767 Eustis Street
Address Line 2:	#100
City:	St. Paul
State:	MN
Zip:	55114
Email	madeline.roess@kimley-horn.com
Phone:	6128456789

Michigan Natural Features Inventory

MSU Extension

County Element Data

The lists include all elements (species and natural communities) for which locations have been recorded in MNFI's database for each county. Information from the database cannot provide a definitive statement on the presence, absence, or condition of the natural features in any given locality, since much of the state has not been specifically or thoroughly surveyed for their occurrence and the conditions at previously surveyed sites are constantly changing. The County Elements Lists should be used as a reference of which natural features currently or historically were recorded in the county and should be considered when developing land use plans.

Choose a county Van Buren

Van Buren County

Code Definitions

Species

Scientific Name	Common Name	Federal Status	State Status	Global Rank	State Rank	Occurrences in County	Last Observed in County
Acris blanchardi	Blanchard's cricket frog		T	G5	S2S3	14	2021
Adlumia fungosa	Climbing fumitory		T	G4	S3	1	1880
Agrimonia rostellata	Beaked agrimony		SC	G5	S2	2	1921
Alasmidonta marginata	Elktoe		SC	G4	S3?	1	Historical
Alasmidonta viridis	Slippershell		T	G4G5	S2S3	10	2022
Ambystoma opacum	Marbled salamander		E	G5	S1	1	1966
Ammannia robusta	Sessile tooth-cup		SC	G5	SNR	1	2013
Ammodramus savannarum	Grasshopper sparrow		SC	G5	S4	3	2006
Amorpha canescens	Leadplant		SC	G5	S3	3	2017
Aristida tuberculosa	Beach three-awned grass		E	G4	S1	1	1908
Arnoglossum plantagineum	Prairie indian-plantain		SC	G4G5	S3	6	2005
Asclepias purpurascens	Purple milkweed		T	G4G5	S2	5	2008
Baptisia lactea	White or prairie false indigo		T	G4Q	S3	4	2017
Bartonia paniculata	Panicled screwstem		T	G5	S2	1	1996
Berula erecta	Cut-leaved water parsnip		SC	G4G5	S2	6	2015
Besseya bullii	Kitten-tails		E	G3	S1	1	1930
Betula populifolia	Gray birch		SC	G5	S3	1	2021

Scientific Name	Common Name	Federal Status	State Status	Global Rank	State Rank	Occurrences in County	Last Observed in County
Bombus auricomus	Black and gold bumble bee		SC	G5	S2	1	2014
Bombus borealis	Northern amber bumble bee		SC	G4G5	S3	1	2016
Bombus pensylvanicus	American bumble bee		E	G3G4	S1	1	1939
Bombus terricola	Yellow banded bumble bee		SC	G3G4	S2S3	1	1971
Brickellia eupatorioides	False boneset		SC	G5	S2	3	2008
Buteo lineatus	Red-shouldered hawk		SC	G5	S4	1	2015
Cambarunio iris	Rainbow		SC	GNR	S3	4	2009
Carex lupuliformis	False hop sedge		T	G4	S2	1	1915
Carex platyphylla	Broad-leaved sedge		E	G5	S1	1	1983
Carex seorsa	Sedge		T	G5	S2	3	2006
Centronyx henslowii	Henslow's sparrow		E	G4	S3	3	2007
Cirsium hillii	Hill's thistle		SC	G3	S3	3	1939
Cirsium pitcheri	Pitcher's thistle	LT	T	G3	S3	1	2013
Clemmys guttata	Spotted turtle		T	G5	S2	16	2020
Clonophis kirtlandii	Kirtland's snake		E	G2	S1	1	1965
Coregonus artedi	Lake herring or Cisco		T	GNR	S3	2	1995
Coregonus zenithicus	Shortjaw cisco		E	G3	S2	1	1994
Coreopsis palmata	Prairie coreopsis		E	G5	S2	1	1982
Corispermum pallasii	Pallas' bugseed		SC	G4?	SNR	1	2021
Cypripedium candidum	White lady slipper		T	G4	S2	3	2022
Dalea purpurea	Purple prairie clover		X	G5	SX	1	1986
Dichanthelium leibergii	Leiberg's panic grass		T	G4	S2	1	2013
Dorydiella kansana	Leafhopper		SC	GNR	S3	1	2008
Dryopteris celsa	Small log fern		T	G4	S2	2	1989
Eleocharis equisetoides	Horsetail spike rush		SC	G4	S3	2	1915
Emydoidea blandingii	Blanding's turtle		SC	G4	S2S3	13	2021
Endodeca serpentaria	Virginia snakeroot		T	G4	S2	1	1906
Eryngium yuccifolium	Rattlesnake-master or button snakeroot		E	G5	S2	5	2016
Faxonius immunis	Calico crayfish		SC	G5	S4	2	2015
Filipendula rubra	Queen-of-the-prairie		T	G4G5	S2	1	2004
Fontigens nickliniana	Watercress snail		SC	G5	S2S3	3	1947
Fuirena pumila	Umbrella-grass		T	G4	S2	3	1988

Scientific Name	Common Name	Federal Status	State Status	Global Rank	State Rank	Occurrences in County	Last Observed in County
Fundulus dispar	Starhead topminnow		SC	G4	S1	1	2016
Galearis spectabilis	Showy orchis		T	G5	S2	1	1906
Hieracium paniculatum	Panicled hawkweed		T	G5	S2	1	2021
Hydrastis canadensis	Goldenseal		T	G3G4	S2	3	2006
Hypericum gentianoides	Gentian-leaved St. John's-wort		SC	G5	S3	4	2021
Isotria verticillata	Whorled pogonia		T	G5	S2	1	2022
Juncus scirpoides	Scirpus-like rush		T	G5	S2	5	2021
Justicia americana	Water willow		T	G5	S2	1	2021
Lampsilis fasciola	Wavyrayed lampmussel		T	G5	S2	1	1878
Lasmigona compressa	Creek heelsplitter		SC	G5	S3	5	2009
Lasmigona costata	Flutedshell		SC	G5	SNR	6	2022
Lepisosteus oculatus	Spotted gar		SC	G5	S2S3	10	2013
Lepyronia angulifera	Angular spittlebug		SC	G3	S3	2	2009
Lepyronia gibbosa	Great Plains spittlebug		SC	G4	S3	2	2008
Linum virginianum	Virginia flax		T	G4G5	S2	1	1882
Lipocarpha micrantha	Dwarf-bulrush		SC	G5	S3	8	1988
Lithobates palustris	Pickerel frog		SC	G5	S3S4	4	2018
Ludwigia sphaerocarpa	Globe-fruited seedbox		E	G5	S1	1	1999
Lycopodiella subappressa	Northern appressed clubmoss		SC	G2	S2	8	1986
Lygodium palmatum	Climbing fern		E	G4	S1	1	2015
Lysimachia hybrida	Swamp candles		X	G5	SX	1	1904
Melanerpes erythrocephalus	Red-headed woodpecker		SC	G5	S3	1	2021
Microtus ochrogaster	Prairie vole		E	G5	S3	1	1960
Myotis sodalis	Indiana bat	LE	E	G2	S1	1	2005
Necturus maculosus	Mudpuppy		SC	G5	S3S4	3	2009
Neonympha mitchellii mitchellii	Mitchell's satyr	LE	E	G2T2	S1	3	2022
Notropis anogenus	Pugnose shiner		E	G3	S1S2	1	1952
Obliquaria reflexa	Threehorn wartyback		E	G5	S1	1	Historical
Oecanthus laricis	Tamarack tree cricket		SC	G3?	S3	1	2008
Opheodrys vernalis	Smooth green snake		SC	G5	S3	1	2001
Panax quinquefolius	Ginseng		T	G3G4	S2S3	7	2021
Pandion haliaetus	Osprey		SC	G5	S4	1	2019

Scientific Name	Common Name	Federal Status	State Status	Global Rank	State Rank	Occurrences in County	Last Observed in County
Panicum verrucosum	Warty panic grass		T	G4	S1	4	2014
Pantherophis spiloides	Gray rat snake		SC	G4G5	S2S3	4	2019
Papaipema beeriana	Blazing star borer		SC	G3?	S2	1	2023
Parkesia motacilla	Louisiana waterthrush		T	G5	S2	1	2021
Persicaria careyi	Carey's smartweed		T	G4	S1S2	2	1982
Platanthera ciliaris	Orange- or yellow-fringed orchid		E	G5	S1S2	2	1983
Pleurobema sintoxia	Round pigtoe		SC	G4G5	S3	3	2009
Polemonium reptans	Jacob's ladder		T	G5	S2	1	2005
Polygala cruciata	Cross-leaved milkwort		SC	G5	S3	3	1988
Pomatiopsis cincinnatiensis	Brown walker		SC	G4	SH	2	1954
Populus heterophylla	Swamp or Black cottonwood		E	G4G5	S1	1	1917
Potamogeton bicupulatus	Waterthread pondweed		T	G4	S2	1	1986
Protonotaria citrea	Prothonotary warbler		SC	G5	S3	1	2001
Pycnanthemum verticillatum	Whorled mountain mint		SC	G5	S2	2	2021
Rallus elegans	King rail		E	G4	S2	1	1969
Rhexia mariana	Maryland meadow beauty		T	G5T5	S1S2	1	2021
Rhexia virginica	Meadow beauty		SC	G5	S3	6	2021
Rhynchospora macrostachya	Tall beakrush		SC	G4	S3S4	9	2015
Rhynchospora scirpoides	Bald-rush		SC	G4	S2	5	2015
Sabatia angularis	Rosepink		T	G5	S2	1	1915
Scleria pauciflora	Few-flowered nut rush		E	G5	S1	1	1904
Scleria reticularis	Netted nut rush		T	G4	S2	2	2015
Scutellaria ovata	Forest skullcap		T	G5	S1	1	1918
Setophaga cerulea	Cerulean warbler		T	G4	S3	1	1998
Setophaga citrina	Hooded warbler		SC	G5	S3	5	2021
Setophaga discolor	Prairie warbler		SC	G5	S3	1	1997
Silphium integrifolium	Rosinweed		T	G5	S2	3	2009
Siren intermedia nettingi	Western lesser siren		E	G5	S1	2	2021
Sistrurus catenatus	Eastern massasauga	LT	T	G3	S3	12	2021

Scientific Name	Common Name	Federal Status	State Status	Global Rank	State Rank	Occurrences in County	Last Observed in County
Spiza americana	Dickcissel		SC	G5	S3	5	2017
Sporobolus heterolepis	Prairie dropseed		SC	G5	S3	3	2005
Stellaria crassifolia	Fleshy stitchwort		E	G5	S1	1	1906
Strophostyles helvula	Trailing wild bean		SC	G5	S3	1	1880
Symphyotrichum sericeum	Western silvery aster		T	G5	S2	1	2009
Terrapene carolina carolina	Eastern box turtle		T	G5T5	S2S3	24	2021
Trichostema dichotomum	Bastard pennyroyal		T	G5	S2	8	2008
Trillium sessile	Toadshade		T	G5	S2S3	1	1981
Triphora trianthophora	Nodding pogonia or three birds orchid		T	G4?	S1	2	1907
Triplasis purpurea	Sand grass		SC	G4G5	S2	2	1983
Truncilla truncata	Deertoe		SC	G5	S2S3	1	Historical
Valeriana edulis var. *ciliata*	Edible valerian		T	G5T3	S2	3	2013
Valerianella chenopodiifolia	Goosefoot corn salad		E	G4	S1	1	1990
Venustaconcha ellipsiformis	Ellipse		SC	G4	S3	9	2022
Woodwardia areolata	Netted chain-fern		X	G5	SX	1	1880

Natural Communities

Community Name	Global Rank	State Rank	Occurrences in County	Last Observed in County
Coastal Plain Marsh	G2	S2	5	2010
Floodplain Forest	G3?	S3	1	2010
Mesic Northern Forest	G4	S3	2	2021
Mesic Sand Prairie	G2	S1	1	1981
Mesic Southern Forest	G2G3	S3	2	2017
Oak Barrens	G2?	S1	1	1982
Prairie Fen	G3	S3	5	2009
Wet-mesic Prairie	G2	S1	1	1984

ATTACHMENT B

Historic Resources

National Register of Historic Places

Public, non-restricted data depicting National Register spatial data processed by the Cultural Resources GIS facility. Last minor update, September 2020.

National Park Service
U.S. Department of the Interior

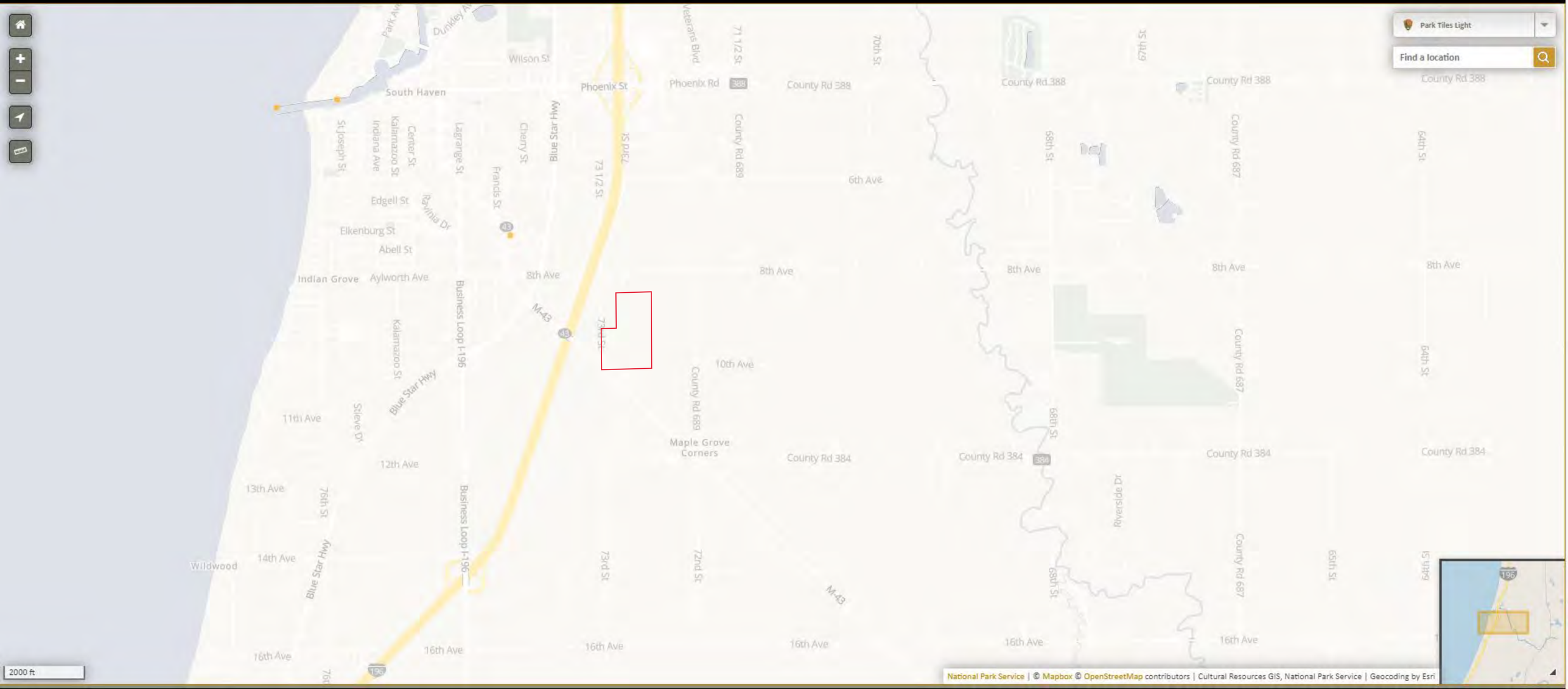


Exhibit I: Solar Panel Cut Sheet

First Solar

Series 7 *TR1*.

505-540 Watt Thin Film Solar Module

Series 7 *TR1* thin film solar modules combine First Solar's thin film technology with an optimized structural design to deliver improved efficiency, enhanced installation velocity, and unmatched lifetime energy performance for large/utility-scale PV projects.

More Lifetime Energy per Nameplate Watt

- Industry's best (0.3%/yr) warranted degradation rate (>89% power output after 30 years)
- Superior temperature coefficient, spectral and shading response

Unmatched Quality and Reliability

- End-to-end manufacturing process for globally consistent quality
- Tested and certified to IEC standards and beyond
- Durable glass/glass construction
- Immune to and warranted against power loss from cell cracking
- 30-year Linear Performance Warranty
- 12-year Limited Product Warranty

Optimized Module Design

- Optimized back rail mount design enhances installation velocity
- Frameless design improves soiling and snow shedding
- Dual junction box design reduces wire management complexity and cost

Industry's Most Eco-efficient PV Solution

- Industry leading carbon footprint, water footprint and energy payback time
- Globally available PV module recycling services

America's Solar Company

- Designed, responsibly sourced, and manufactured in the USA

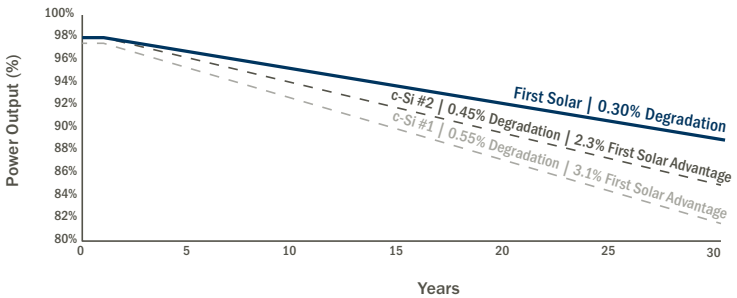
19.3%
HIGH BIN EFFICIENCY

30YR
LINEAR PERFORMANCE WARRANTY

98%
WARRANTY START POINT

0.3%
WARRANTED ANNUAL DEGRADATION RATE

First Solar Lifetime Energy Advantage
From 30 Year Warranted Annual Power Degradation



Learn more about First Solar and Series 7 *TR1* at firstsolar.com/S7

Series 7 TR1.

Electrical Specifications

MODEL TYPES: FS-7XXXA-TR1 (XXX = NOMINAL POWER) RATINGS AT STANDARD TEST CONDITIONS (1000W/m², AM 1.5, 25°C)[2]									
Nominal Power[3] (-0/+5%)	P_{MAX} (W)	505	510	515	520	525	530	535	540
Efficiency (%)	%	18.1	18.3	18.4	18.6	18.8	19.0	19.1	19.3
Cell Efficiency (%)	%	18.9	19.1	19.3	19.5	19.7	19.9	20.1	20.3
Voltage at P_{MAX}	V_{MAX} (V)	182.5	183.4	184.3	185.2	186.0	186.9	187.8	188.7
Current at P_{MAX}	I_{MAX} (A)	2.77	2.78	2.80	2.81	2.82	2.84	2.85	2.86
Open Circuit Voltage	V_{OC} (V)	223.9	224.5	225.0	225.6	226.1	226.7	227.2	227.7
Short Circuit Current	I_{SC} (A)	3.01	3.02	3.03	3.04	3.04	3.05	3.06	3.06
Maximum System Voltage	V_{SYS} (V)	1500[5]							
Limiting Reverse Current	I_R (A)	5.0							
Maximum Series Fuse	I_{CF} (A)	5.0							
RATINGS AT NOMINAL OPERATING CELL TEMPERATURE OF 45°C (800W/m², 20°C air temperature, AM 1.5, 1m/s wind speed)[2]									
Nominal Power	P_{MAX} (W)	378.1	381.8	385.6	389.4	393.2	396.8	400.6	404.4
Voltage at P_{MAX}	V_{MAX} (V)	168.8	169.7	170.6	170.8	171.7	172.5	173.4	174.3
Current at P_{MAX}	I_{MAX} (A)	2.24	2.25	2.26	2.28	2.29	2.30	2.31	2.32
Open Circuit Voltage	V_{OC} (V)	211.9	212.4	212.9	213.5	214.0	214.5	215.0	215.5
Short Circuit Current	I_{SC} (A)	2.44	2.44	2.45	2.45	2.46	2.47	2.47	2.48

TEMPERATURE CHARACTERISTICS		
Module Operating Temperature Range	(°C)	-40 to +85
Temperature Coefficient of P_{MAX}	$T_K(P_{MAX})$	-0.32%/°C [Temperature Range: 25°C to 75°C]
Temperature Coefficient of V_{OC}	$T_K(V_{OC})$	-0.28%/°C
Temperature Coefficient of I_{SC}	$T_K(I_{SC})$	+0.04%/°C

Certifications & Tests[4]

CERTIFICATIONS & LISTINGS

UL 61730 1500V Listed
IEC 61215:2021 & 61730-1:2016[5]
IEC 61701 Salt Mist Corrosion
IEC 60068-2-68 Dust and Sand Resistance
IEC 62716 Ammonia Corrosion

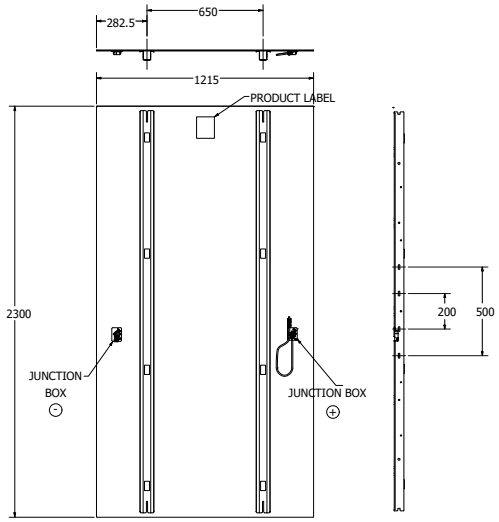
EXTENDED DURABILITY TESTS

IEC 63209-1 Extended Stress Test
Long-Term Sequential
Thresher Test
PID Resistant

QUALITY & EHS

ISO 9001:2015
ISO 14001:2015
ISO 45001:2018
ISO 14064-3:2006
EPEAT Silver Registered

Mechanical Specifications



MECHANICAL DESCRIPTION	
Length	2300mm
Width	1215mm
Area	2.79m²
Module Weight	39.7kg
Leadwire[6]	2.5mm², 650mm (+) & Bulkhead (-)
Connectors	TE Connectivity PV4-S or alternate
Junction Box	IP68 Rated
Bypass Diode	N/A
Cell Type	Thin film CdTe semiconductor, up to 268 cells
Back Rail Material	Galvanized steel
Front Glass	Heat strengthened
Back Glass	Heat strengthened
Encapsulation	Laminate material with edge seal
Frame to Glass Adhesive	Silicone
Load Rating	2400Pa

Install in portrait only

PACKAGING INFORMATION		
Model Type	Modules Per Pack	Packs per 53' Container
FS-7XXXA-TR1	46	10

1 Limited power output and product warranties subject to warranty terms and conditions
2 All ratings ±10%, unless specified otherwise. Specifications are subject to change
3 Measurement uncertainty applies
4 Testing Certifications/Listings pending
5 IEC 61730-1: 2016 Class II
6 Leadwire length from junction box exit to connector mating surface

First Solar

LEADING THE WORLD'S
SUSTAINABLE ENERGY FUTURE

Exhibit J: South Haven Interconnection Resolution

CITY OF SOUTH HAVEN
VAN BUREN AND ALLEGAN COUNTIES, MICHIGAN

RESOLUTION NO. 2023-35

A RESOLUTION AUTHORIZEING THE CITY MANAGER OR HER DESIGNEE AND THE CITY CLERK TO EXECUTE AGREEMENTS ASSOCIATED WITH THE SOLAR PROJECT ON THE SOUTH HAVEN TOWNSHIP SITE, SUBJECT TO NO MATERIAL CHANGES TO THE AGREEMENTS, SOLAMERICA OBTAINING THE USDA GRANT, AND UPON FINAL REVIEW OF MPPA, THE CITY OF SOUTH HAVEN AND LEGAL COUNSEL, AND THE USDA.

Minutes of a regular meeting of the City Council of the City of South Haven, Van Buren and Allegan Counties, Michigan, held in the City Hall, 539 Phoenix Street, South Haven, Michigan 49090 on December 4, 2023, at 7:00 p.m. local time.

PRESENT: Jeff Arnold, Joe Reeser, Steve Schlack, George Sleeper, Letitia Wilkins, Scott Smith

ABSENT: Wendi Onuki

The following preamble and resolution was offered by Member Arnold and supported by Member Sleeper.

WHEREAS, the City consulted with Michigan Public Power Agency (MPPA) and GRP Engineering, Inc. regarding the viability of placing a solar generating facility in South Haven Township located on the East side of 73rd Street north of M-43 with the interconnection located at the at the intersection of 73rd Street and M-43 (Solar Project); and

WHEREAS, MPPA and South Haven Affordable Solar LLC, a solar developer, recognized a potential opportunity to pursue a solar project through the United States Department of Agriculture (USDA) Powering Affordable Clean Energy (PACE) Program; and

WHEREAS, South Haven Affordable Solar LLC would own, operate, and maintain the Solar Project located in South Haven Township and sell and deliver the electricity produced to the City at a below market rate due to the impact of the PACE Program's forgivable loan; and

WHEREAS, the Solar Project would directly connect and inject generated energy to the City's distribution system for the use of the City's electric customers; and

WHEREAS, to move forward with the Solar Project, South Haven Affordable Solar LLC needs to have a Power Purchase Agreement (PPA) and Interconnection Agreement in place with the City of South Haven; and

WHEREAS, the City and its legal counsel, and MPPA staff in conjunction with their legal team who are advising other MPPA members regarding similar power purchases, were responsible for developing and negotiating the terms and conditions of the PPA; and

WHEREAS, the Interconnection Agreement, which addresses how the Solar Project will be safely connected to the City's electric distribution system was developed by the City's electric consultant, GRP Engineering, and South Haven and its legal counsel:

NOW, THEREFORE, BE IT RESOLVED, the South Haven City Council, does and hereby authorizes the City Manager or her designee and the City Clerk to execute the PPA and Interconnection Agreement associated with the Solar Project located in South Haven Township, subject to: (1) no material changes to the agreements; (2) South Haven Affordable Solar LLC obtaining the USDA forgivable loan; and (3) upon final review by MPPA, the City of South Haven and its legal counsel, and the USDA.

FURTHER, BE IT RESOLVED, that any resolutions and parts of resolutions are, to the extent of any conflict with this resolution, rescinded.

RECORD OF VOTE:

Yeas: Arnold, Reeser, Schlack, Sleeper, Wilkins, Smith

Nays: None

RESOLUTION DECLARED ADOPTED.

Scott Smith, Mayor

CERTIFICATION

I hereby certify that the foregoing is a true and complete copy of a resolution adopted by the City Council at a meeting held on the December 4, 2023, at which meeting a quorum was present, and that this resolution was ordered to take immediate effect. Public notice of said meeting was given pursuant to and in compliance with the Open Meetings Act, Act No. 167 of the Public Acts of Michigan 1976 (MCL 15.261 *et seq*).

Megan Kiker

Megan Kiker, City Clerk

Exhibit K: Memorandum of Option and Lease Agreement

Received for Record 02/26/2024 01:57 PM

LR-3443733 L: 1762 P: 392 MLEASE
02/26/2024 02:23:48 PM Total Pages: 8 Fees: $30.00
Paul W. DeYoung, Register of Deeds - Van Buren County, MI

PREPARED BY:
Todd Hoffman
SolAmerica Energy, LLC
190 Ottley Drive N.E. Studio H
Atlanta, GA 30324

WHEN RECORDED RETURN TO:
Lauren Beduhn
SolAmerica Energy, LLC
190 Ottley Drive N.E. Studio H
Atlanta, GA 30324
Attention: Lease Management

(Space Above for Recorder's Use)

MEMORANDUM OF OPTION AND LEASE AGREEMENT

THIS MEMORANDUM OF OPTION AND LEASE AGREEMENT (this "Memorandum") is made and entered into as of January 31, 2024 by and between **South Haven Affordable Solar, LLC**, a Delaware limited liability company, whose address is 190 Ottley Dr NE, Studio H, Atlanta, GA 30324 ("Tenant"), and **River's Edge Holdings, LLC,** a Michigan limited liability company, whose address is 4807 Green Meadow Ct., Hamilton, MI 49419 ("Landlord").

Recitals

A. Landlord is the fee title owner of that certain real property located in Van Buren County, Michigan, more particularly described on Schedule I attached hereto (the "Property").

B. Landlord and Tenant (as assignee under the Assignment) are parties to that certain Solar Lease Option Agreement, dated February 4, 2022 (the "Original Agreement"), as evidenced by that certain Memorandum of Option Agreement dated February 4, 2022 and recorded March 14, 2022 as Liber 1734 Page 399 by the Van Buren County, MI Register of Deeds (the "Original Memorandum").

C. Landlord and Tenant have entered into that certain Amended and Restated Solar Lease Option Agreement, dated January 31, 2024 ("Agreement"), replacing in its entirety the Original Agreement, pursuant to which Landlord affirms a grant to Tenant of an exclusive option to (i) lease all or a portion of that certain real property more particularly described

on Schedule 2 attached hereto (the "Option Area"), and (ii) take Easement interests in connection therewith, all for the development and operation of a solar energy generation system.

D. Landlord and Tenant now desire to provide for public notice of the existence of the Agreement and Tenant's rights thereunder, superseding in its entirety the Original Memorandum, as follows:

Memorandum of Agreement

1. Defined Terms. The definitions set forth in the introduction and recitals to this Memorandum are incorporated herein. Capitalized terms used herein, and not otherwise defined, shall have the same meanings assigned to them in the Agreement.

2. Grant of Option. Landlord has granted to Tenant the exclusive option (the "Option") to lease all or a portion of the Option Area, upon the terms and subject to the terms and conditions set forth in the Agreement.

3. Term of the Option. Subject to the terms and conditions set forth in the Agreement, the term of the Option commenced under the Original Agreement as the Prior Option on February 4, 2022 and shall continue as the Option under the Agreement for three (3) years from such date of commencement.

4. Lease of Premises/Grant of Easements. Pursuant to the terms and conditions of the Agreement, upon exercise of the Option, Landlord (a) leases to Tenant for its exclusive use of the applicable leased Option Area for various permitted uses described therein (the "Premises"), and (b) grants to Tenant the Easements and other rights for the benefit of Tenant under the Agreement during the term of the Agreement, as further described in Section 7 below.

5. Term of the Agreement. Subject to the terms and conditions set forth in the Agreement, (a) the Agreement expires, and this Memorandum will be of no further force or effect, as of the date that is twenty-five (25) years from the Commercial Operation Date of the Solar Project that is the subject of the Agreement, unless extended pursuant to the Agreement, and (b) Landlord grants to Tenant the right to extend the term of the Agreement for two (2) period(s) of five (5) year(s) each, such that the total term of the Agreement, together with all extended terms, shall last for a period of thirty-five (35) years plus the number of days between the Lease Commencement Date and the Commercial Operation Date of the Solar Project, unless sooner terminated, as provided in the Agreement.

6. Ownership of Solar Project Improvements. Landlord has no ownership, lien, security or other interest in any Solar Project Improvements installed on the Premises or wherever located, regardless of whether such Solar Project Improvements are deemed fixtures, or any profits or other Incentives derived therefrom, and Tenant may add to, relocate or remove any or all such Solar Project Improvements at any time.

7. Easements on Property. Upon exercise of the Option, Landlord hereby grants the following easements on the Property, which such easements will be in effect during the Lease

Term in favor of Tenant, its managers, members, officers, directors, investors, contractors, invitees and guests:

7.1. A non-exclusive easement for vehicular and pedestrian (including, without limitation, construction vehicles and equipment) ingress and egress over the Property in order to provide access to the Premises for the design, construction, installation, operation, maintenance and repair of the Solar Project Improvements, including for the installation of roadway improvements for use in providing such access;

7.2. A non-exclusive easement for the design, construction, installation, development, ownership, operation, use, maintenance, repair, relocations, replacement and removal of an integrated assembly of photovoltaic panels, mounting assemblies, inverters, converters, metering, lighting fixtures, transformers, ballasts, disconnects, combiners, switches, wiring, wiring devices, overhead and underground electrical energy collection fixtures, facilities and equipment, overhead and underground generation-tie power line fixtures, facilities and equipment, overhead and underground communications lines, energy storage facilities, fences and gates, overhead and underground electric, telecommunications, or other utility fixtures, facilities and equipment related to one or more solar electric generating facilities for the purpose of connecting the Solar Project Improvements on the Premises to offsite electrical transmission facilities or equipment or other utilities necessary or appropriate to service the Solar Project Improvements;

7.3. A non-exclusive easement to trim, cut down and remove all trees (whether natural or cultivated), brush, vegetation and fire and electrical hazards now or hereafter existing on the Property which might interfere with or endanger the Solar Project Improvements or Tenant's Construction and Operation Activities, as determined by Tenant;

7.4. A non-exclusive easement to place signs or advertising on or proximate to Tenant's Solar Project Improvements on the Property; and

7.5. Landlord may not permit the obstruction of or interference with the free flow of sunshine and solar radiation throughout the entire area of the Premises where any portion of the Solar Project is or may be located. In addition, for the remainder of the term of the Agreement, Landlord grants to Tenant an exclusive solar easement allowing for the free flow of sunshine and solar radiation to each point within the Premises where any portion of the Solar Project is or may be located, allowing for the free flow of sunshine and solar radiation to each such point within the Premises both horizontally three hundred and sixty degrees (360°) and also vertically through all space above each such point within the Premises.

8. Right of First Refusal. The Agreement contains a right of first refusal in favor of Tenant.

9. Zoning and Permits. Pursuant to the Agreement, Tenant is authorized, at any time and from time to time during the term of the Agreement, in the name of Landlord, Tenant or both, to file with the appropriate governmental authorities one or more (a) to zone and/or to rezone the Premises and/or the real property encumbered by the Easements (as applicable), or any portion

thereof, to such zoning classifications as Tenant may from time to time deem appropriate for such use, (b) to subdivide or change the land use plan applicable to the Premises and/or the Easements (as applicable), (c) to obtain use permits with respect to the Premises and/or the Easements (as applicable), or any portion of such areas, for the installation and operation of the Solar Project Improvements and other improvements authorized hereby, (d) to obtain variances from zoning and use restrictions otherwise applicable to the Premises and/or the Easements (as applicable), (e) to have conditions placed on the use of the Premises and/or the Easements (as applicable) in connection with any zoning or rezoning, (f) to obtain environmental permits, wetlands delineations, and/or jurisdictional determinations, or (g) to obtain any permit or study necessary for the development and construction of the Solar Project Improvements.

10. Binding Effect; Running Covenant. The Agreement is binding upon and inures to the benefit of Landlord and Tenant and their respective heirs, successors and assigns. It is intended to constitute a covenant that runs with the land, such that any purchaser of Landlord's interest in the property shall take such interest subject to the Agreement.

11. Recording. This Memorandum is executed for the purpose of recordation in the Office of the Van Buren County Register of Deeds, in order to subject the Property to the Agreement and to give notice of all of the terms, provisions and conditions of the Agreement.

12. Conflict of Provisions. This Memorandum is prepared for the purpose of recordation and shall not alter or affect in any way the rights and obligations of Tenant and Landlord under the Agreement. In the event of any inconsistency between this Memorandum and the Agreement, the terms of the Agreement shall control.

13. Counterparts. This Memorandum may be executed in one or more counterparts, each of which shall be deemed an original, and all of which when taken together, shall constitute one and the same instrument.

REMAINDER OF PAGE INTENTIONALLY LEFT BLANK. SIGNATURES BEGIN ON THE FOLLOWING PAGE.

LR-3443733 L: 1762 P: 392 MLEASE
02/26/2024 02:23:48 PM Total Pages: 8 Fees: $30.00
Paul W. DeYoung, Register of Deeds - Van Buren County, MI

IN WITNESS WHEREOF, the parties have executed this Memorandum as of the date first above written.

LANDLORD:

River's Edge Holdings, LLC,
a Michigan limited liability company

By: _____

Name: James R DeWitt

Title: Member

STATE OF Michigan

COUNTY OF Allegan

On this 31 day of January, 2024 before me, Pamela J Dreyer, a Notary Public, personally appeared James R DeWitt, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her authorized capacity.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

_____
Notary Public

Print Name: Pamela J Dreyer

My Commission Expires: July 18, 2027

Notary Public for Allegan County, MI
Acting in Allegan County, MI
[SEAL OR STAMP]

[SIGNATURES TO CONTINUE ON THE FOLLOWING PAGE]

LR-3443733 L: 1762 P: 392 MLEASE
02/26/2024 02:23:48 PM Total Pages: 8 Fees: $30.00
Paul W. DeYoung, Register of Deeds - Van Buren County, MI

TENANT:

South Haven Affordable Solar, LLC
a Delaware limited liability company

Anthony M. Yonnone
Senior Vice President

STATE OF Georgia

COUNTY OF Fulton

On this 31 day of January, 2024 before me, Jacqlyn Charles, a Notary Public, personally appeared Anthony M Yonnone, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity and that by his signature on the instrument the entity, upon behalf of which the person acted, executed the instrument.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Notary Public

Print Name: Jacqlyn Charles

My Commission Expires May 02 2026

[SEAL OR STAMP]

JACQLYN CHARLES
NOTARY PUBLIC
My Commission Expires
May 2, 2026
COBB COUNTY, GEORGIA

LR-3443733 L: 1762 P: 392 MLEASE
02/26/2024 02:23:48 PM Total Pages: 8 Fees: $30.00
Paul W. DeYoung, Register of Deeds - Van Buren County, MI

Schedule 1

Description of Property

Description of Property: 73rd St, South Haven, Michigan 49090

PIN(s): 80-17-014-021-00

Legal Description:

Commencing at a point on the North and South 1/4 line of Section 14, Town 1 South, Range 17 West, South Haven Township, Van Buren County, Michigan, which is 1,438.5 feet South of the North 1/4 post; thence North 89°30' East 325 feet; thence North 851.1 feet to a point 585.5 feet South of the North Section line; thence Easterly parallel with said North Section line 976.25 feet; thence Southerly 2,047.5 feet to the East and West 1/4 line; thence West 1,309.82 feet to the center of said Section 14; thence North to beginning.

LR-3443733 L: 1762 P: 392 MLEASE
02/26/2024 02:23:48 PM Total Pages: 8 Fees: $30.00
Paul W. DeYoung, Register of Deeds - Van Buren County, MI

Schedule 2

Description of Option Area

Common Address: 73rd St, South Haven, Michigan 49090

PIN(s): 80-17-014-021-00

The Option Area is described or depicted below. It is agreed and understood that the leased Premises location and area are subject to change pursuant to the Agreement.

Parcel #: 80-17-014-021-00 SolAmerica
Van Buren County, Michigan

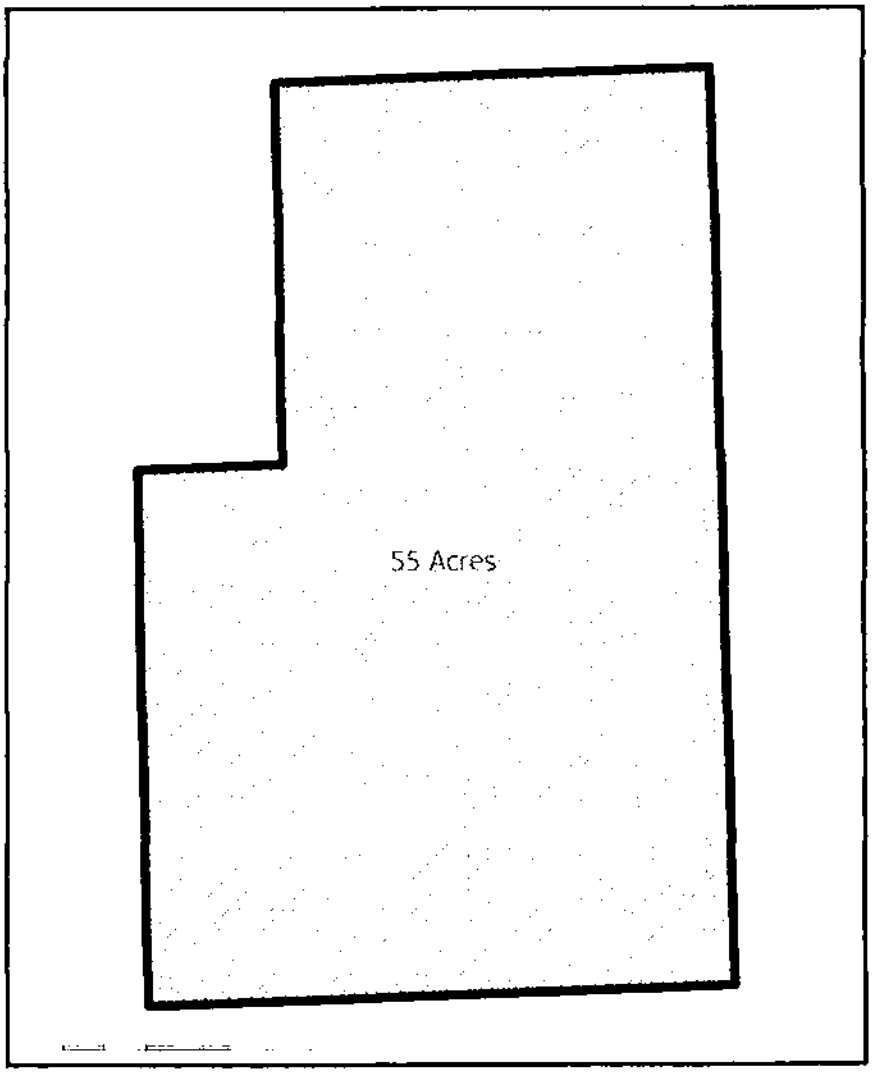
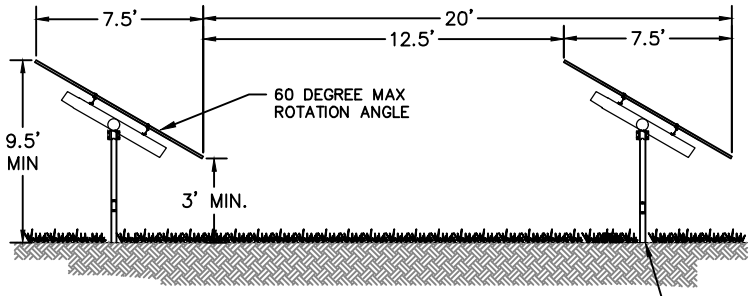


Exhibit L: Single Axis Tracker Detail



NOTES

1. THIS DETAIL IS APPROXIMATE. REFER TO THE RACKING DESIGN PLANS FOR SPECIFIC DETAILS.
2. FOUNDATION DEPTHS FOR THE RACKING SYSTEM ARE TO BE DETERMINED BY THE RACKING VENDOR.
3. POST LOCATIONS TO BE DETERMINED BY THE RACKING VENDOR.
4. ARRAY FIELD TO BE RESTORED TO MEADOW CONDITION. STABILIZE WITH LOAM, SEED, MULCH IN ACCORDANCE WITH EROSION & SEDIMENTATION CONTROL PLAN.
5. PANEL SPACING MAY VARY, SEE SITE PLAN FOR SPACING REQUIREMENTS.

SINGLE AXIS TRACKER SOLAR SYSTEM (TYP)

SCALE: NTS

Exhibit M: Review Letters from South Haven Area Emergency Services, County Road Commission, County Drain Commission, and EGLE

South Haven Area Emergency Services

90 Blue Star Highway • South Haven, Michigan 49090
Phone (269) 637-1813 • Fax (269) 637-0998
www.shaes.org

SITE PLAN REVIEW

☒ Preliminary Site Plan ☐ Final Site Plan

Name of Applicant: Alessandro Tartaglia/Kimley-Horn

Address of Applicant: 111 W Jackson BLVD, Suite 1320, Chicago, IL 60604
alessandro.tartaglia@kimley-horn.com

Applicant Telephone No: 708-683-9012

Project name, if any: South Haven Affordable Solar, LLC Project # 268196015, 4/8/24

Project location: 73rd ST & M-43, No address given

Brief project description: Building a 4.5 megawatt solar energy generation facility of photovoltaic solar panels, inverters, transformer & combiner boxes.

Are fire hydrants available at the site? ☐Yes ☒No
Comments: Available on 73rd ST

Is water pressure adequate for the project? ☒Yes ☐No
If no, explain: _____

Does project layout provide easy access for fire protection? ☒Yes ☐No
If no, explain: _____

Are the proposed plans acceptable to the Fire Department? ☒Yes ☐No
If no, explain: _____

Other comments / recommendations:
All builds to follow IFC 2015 edition. Knox Box required, address for the site to be visible at the main entrance on 73rd ST, all access roads to support a minimum of 75,000 LBS, signage with up to date contacts to be maintained at the main entrance gate

Review performed by Keith Bierhalter Deputy Chief/Fire Marshal Date 4/23/24

DC/FM

BOARD OF COUNTY ROAD COMMISSIONERS
BOARD OF COUNTY PARK TRUSTEES
BOARD OF PUBLIC WORKS

COMMISSIONERS:
W.C. Askew, Sr., Reginald D. Boze, Doug Burleson, Gregory H. Kinney
MANAGING DIRECTOR:
Daniel F. Bishop

April 1, 2024

Owner:
Rivers Edge Holdings LLC
4807 Green Meadow Ct.
Hamilton, MI 49419

Project Address:
South Haven Township
73rd Street
South Haven, MI 49090
80-17-014-021-00

RE: South Haven Affordable Solar_Commercial Driveway Application and Permit

Thank you for your communication regarding the South Haven Affordable Solar, located in South Haven Township, MI. The Road Commission has received the Site Plan for location and has discussed the proper commercial driveway application and permit as well as what is needed on the driveway details for permit approval. We are aware of the project and in communication with Alessandro Tartaglia with Kimley-Horm about the project.

I believe the landowner and engineer would like to gain approval for the Special Use Permit before they move forward with the driveway details and engineering plans needed for the driveway requirements. They understand that the driveway entrance construction should not begin until the permit is approved by the Road Commission but at this point in time, this is a preliminary approval letter.

If you have any questions, please feel free to contact the Road Commission at 269-674-8011.

Thank you,

AJ Brucks

AJ Brucks
Permit Officer

Tartaglia, Alessandro

From: Harrison, Zachary (EGLE) <HarrisonZ2@michigan.gov>
Sent: Monday, May 6, 2024 8:14 AM
To: Tartaglia, Alessandro
Cc: McGreevy, Theresa; Payne, Ashley; Lauren Beduhn; White, Savannah
Subject: RE: South Haven Affordable Solar - Special Use

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Alessandro,

I will be in the field this Friday for my inspection of this site. Is anyone from your team planning to join me during my inspection?

Thanks,

Zach Harrison
Environmental Quality Analyst
Water Resources Division, Kalamazoo District Office
Michigan Department of Environment, Great Lakes, and Energy
Phone: 269-569-6972

MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY

From: Tartaglia, Alessandro <Alessandro.Tartaglia@kimley-horn.com>
Sent: Tuesday, April 30, 2024 1:14 PM
To: Harrison, Zachary (EGLE) <HarrisonZ2@michigan.gov>
Cc: McGreevy, Theresa <Theresa.McGreevy@kimley-horn.com>; Payne, Ashley <Ashley.Payne@kimley-horn.com>; Lauren Beduhn <lbeduhn@solamericaenergy.com>; White, Savannah <Savannah.White@kimley-horn.com>
Subject: RE: South Haven Affordable Solar - Special Use

Hi Zach,

The Pre-Application documents for South Haven Affordable Solar have been submitted to the MiEnviro Portal (submission: **HQ3-3PJR-0JWV2**). The status has been updated to "In Process" as of 4/25, and was assigned to Sharon Espinosa. Please let us know if there are any next steps or if additional information is required prior to the issuance of a preliminary approval letter.

Good Morning Zach,

We are in the process of submitting for a Special Use Permit for a community scale solar farm (4.5 MWac) in South Haven Township, MI. Per the South Haven Township code, we need to show compliance and correspondence with you all prior to granting a Special Use Permit. What information is needed for you to review in order for EGLE to provide the requested approval?

Let me know if it is easier to discuss over the phone and we can setup a meeting time at your convenience.

I look forward to hearing from you.

Thanks!

Alessandro Tartaglia
Kimley-Horn | 111 West Jackson Blvd., Suite 1320, Chicago, IL 60604
Direct: 708 683 9012 | Main: 312 726 9445

Tartaglia, Alessandro

From: Tartaglia, Alessandro
Sent: Tuesday, April 30, 2024 12:26 PM
To: Joe Parman
Cc: McGreevy, Theresa; peter@paveng.com; Lauren Beduhn; White, Savannah
Subject: RE: South Haven Township Solar Special Use

Hi Joe,

Please let us know if additional information would be beneficial for review of the South Haven Affordable Solar development. We plan to submit the Special Use Permit application to South Haven Township next Monday, 5/6. Is it possible to get a preliminary review letter prior to this date?

Thank you,

Alessandro Tartaglia
Kimley-Horn | 111 West Jackson Blvd., Suite 1320, Chicago, IL 60604
Direct: 708 683 9012 | Main: 312 726 9445

From: Tartaglia, Alessandro
Sent: Tuesday, April 23, 2024 11:10 AM
To: Joe Parman <parmanj@vanburencountymi.gov>
Cc: McGreevy, Theresa <Theresa.McGreevy@kimley-horn.com>; peter@paveng.com; Lauren Beduhn <lbeduhn@solamericaenergy.com>; White, Savannah <Savannah.White@kimley-horn.com>
Subject: RE: South Haven Township Solar Special Use

Joe,

Hope you are doing well! Please see attached Site Plan Review Application, Preliminary Drainage Memorandum, and Site Plan for South Haven Affordable Solar. As Lauren mentioned in the below email, the check for this application was delivered on 4/5.

Let me know if you have any questions.

Thanks,

Alessandro Tartaglia
Kimley-Horn | 111 West Jackson Blvd., Suite 1320, Chicago, IL 60604
Direct: 708 683 9012 | Main: 312 726 9445

From: Lauren Beduhn <lbeduhn@solamericaenergy.com>
Sent: Friday, April 12, 2024 10:19 AM
To: Tartaglia, Alessandro <Alessandro.Tartaglia@kimley-horn.com>
Cc: Joe Parman <parmanj@vanburencountymi.gov>; McGreevy, Theresa <Theresa.McGreevy@kimley-horn.com>; peter@paveng.com
Subject: Re: South Haven Township Solar Special Use

Exhibit N: Preliminary Hydrology Analysis

MEMORANDUM

To:	Joe Parman Van Buren County Drain Office
From:	Theresa McGreevy, P.E. (IL) Kimley-Horn of Michigan, Inc.
Date:	April 23, 2024
Subject:	South Haven Affordable Solar, LLC – Preliminary Hydrology Analysis

This memorandum provides a general overview of the existing and proposed conditions for the South Haven Affordable Solar Facility in South Haven Charter Township, Van Buren County, Michigan. This preliminary analysis is intended to summarize existing and proposed site conditions within the project limits of disturbance regarding soil, topography, ground cover, and anticipated runoff per NRCS TR-55. These calculations are preliminary in nature and are not a full construction design. The project will obtain full construction design documents prior to construction.

Executive Summary

The South Haven Affordable Solar facility is projected to maintain or improve the existing stormwater runoff characteristics. By converting current agricultural land to a pasture, the overall runoff potential of the site will decrease. Solar panels will be mounted on piles to allow for vegetation to grow underneath, causing a negligible impact to on-site runoff volumes. A combination of utilizing established vegetation and best management practices (BMPs), if necessary, will reduce the runoff from the addition of gravel access roads. During the construction phase, temporary BMPs should be implemented until revegetation can be fully established.

Existing Conditions

The project area limits of disturbance consist of approximately 32 acres of farmland with two wetlands, one in the northeast corner of the site and one in the southeast corner of the site. The project area is located in Van Buren County, Michigan, at the northwest corner of State Highway 43 and 73rd Street. The existing topography for the site has a range of slopes from 2% to 8% with majority medium slopes between 2% and 6%. Drainage patterns vary on site but the middle of the project is a high point where half of the site drains to the south and the other half drains to the northeast. Per available National Resources Conservation Service (NRCS) soil mapping, the on-site soils generally consist of loamy sand, with smaller areas of Brems sand and one isolated area of Pipestone-Kingsville Complex. The soils present on the site range from hydrologic soil group A to D. For the purpose of this report, the site is considered to behave most like hydrologic soil group D, which typically provides a slow rate of water transmission into the soil. Refer to **Attachment 1 – NRCS Hydrologic Soil Group Map** for more information regarding onsite soils.

The United States Department of Agriculture (USDA) NRCS National Engineering Handbook has national standard Curve Numbers (CN) based on soil classification and land use for each subbasin

drainage area. Curve Numbers are generally used in hydrologic calculations to estimate the runoff of a given area. Curve Number (CN) values range from 30 to 100, where 30 represents permeable soils with high infiltration rates and 100 represents impervious surfaces with no infiltration rates. A higher curve number leads to a higher stormwater runoff rate and volume, and a lower curve number contributes to lower stormwater runoff rate and volume.

The existing cultivated farmland use can be considered straight row crop, which has a curve number (CN) of 89 per NRCS TR-55. There is additional existing area resembling woods in fair condition which has a CN of 79 per NRCS TR-55. The project area limits of disturbance also contain a small number of delineated wetlands. For this report, wetland areas are conservatively assumed to be in a submerged state and perform like an impervious surface with a curve number (CN) of 98 per NRCS TR-55. Refer to **Attachment 2 – Hydrologic Soil Cover Complexes** for the USDA NRCS National Engineering Handbook excerpts that relate to this memorandum.

Post-Development Runoff

The proposed development will include solar panels, gravel road access drives, electrical equipment pads, a point of interconnection (POI) pad, established vegetative ground cover and vegetative buffers. The project will be surrounded by a perimeter fence. The proposed area of disturbance is approximately 32 acres. Solar panels will be mounted on piles and elevated above the ground as to preserve existing underlying soil and allow for revegetation. Access roads are spaced out among several rows of solar arrays to maximize the amount of ground that will be ultimately revegetated. These access roads are proposed to consist of gravel aggregate base with compacted native soil shoulders. Per *Hydrology Response on Solar Farms*, published by the American Society of Civil Engineers (ASCE), with well-maintained vegetation underneath the panels, the solar panels themselves do not have much effect on total volumes of the runoff or peak discharge rates as the net increase in impervious ground surface is negligible. Rainfall that falls directly on a solar panel runs to the pervious areas around the surrounding panels. Therefore, the area between the arrays soaks up the rainfall, and the runoff in the solar farm condition is less than the existing agriculture condition. Drip edge is not a concern when utilizing tracker arrays, because water will fall off the array and infiltrate into the ground, illustrated in **Attachment 3 - Runoff Erosion Diagram.**

In the post-developed condition, the existing cultivated farmland will be converted to native meadow vegetation to stabilize and provide year-round ground cover. This post-condition emulates the meadow – good (for non-grazing) which has a CN of 78 per NRCS TR-55. The access roads will be gravel aggregate base with compacted native soil shoulders. For the purposes of this memo and to be conservative with our assumptions, the access roads are reflected in stormwater calculations as gravel, which has a CN of 91 per NRCS TR-55. The proposed landscape buffer is assumed to be woods-grass combination in fair condition with a CN of 82 per NRCS TR-55. For more information regarding CN values and soil cover, refer to **Attachments 1 & 2, NRCS Hydrologic Soil Group Map & Hydrologic Soil Cover Complexes**. The proposed project area will be primarily meadow in the post-development condition. This change, as shown in **Attachment 3 – Runoff Erosion Diagram**, will allow for increased infiltration rates and reduced runoff. This is accomplished by planting a native meadow with a deep-rooted system.

In the closest location where arrays drain to a neighboring property, the drainage path is approximately 140 LF. Per USDA NRCS National Engineering Handbook, after 100 LF drainage flow changes to sheet flow. Since the runoff rate is reduced in the proposed condition and all flow would be considered sheet flow, additional permanent BMPs are not needed.

Summary of Pre-Development vs. Post-Development Curve Numbers

A final hydrology and stormwater report will be prepared for this development as part of Final Engineering. The report will summarize pre and post development runoff flows from each of the sub-catchment areas of the site. The report will also analyze runoff velocities and scour potential to allow for further analysis to reduce sediment erosion and loss. In the absence of the final hydrology and stormwater report, the table below summarizes the pre-development condition versus the post-development as it relates to general imperviousness of the ground cover (and corresponding general stormwater runoff) for the entire project area. A higher curve number leads to a higher stormwater runoff rate and volume, and a lower curve number contributes to lower stormwater runoff rates and volumes.

Pre-Development (Existing Agriculture) Curve Number		
Area (AC)	**Land Condition**	**Curve Number (CN)**
31.62	Row Crops – Straight Row (SR) – Good Condition	89
0.10	Woods – Fair Condition	79
0.29	Wetlands	98
	Existing Composite Curve Number	**~89**

Post-Development (Solar Farm) Curve Number		
Area (AC)	**Land Condition**	**Curve Number (CN)**
1.18	Woods-Grass Combination – Fair Condition	82
29.67	Meadow – Good Condition (non-grazing)	78
0.77	Impervious Area – Gravel Access Roads	91
0.10	Impervious Area – Concrete for POI and Inverter Pads	98
0.29	Wetlands	98
	Proposed Composite Curve Number	**~79**

As reflected in the table above, the post-development condition results in a net decrease in the runoff potential from the site based on the proposed Composite Curve Number. **Attachment 3 – Runoff Erosion Diagram**, demonstrates what the site would look like in the existing and proposed conditions. A reduction of CN directly corresponds to a reduction of run-off. Therefore, the project will reduce the runoff compared to the existing condition.

Construction Management Best Practices

The above sections discuss the overall stormwater from an existing to proposed condition. However, construction management is equally as important. Prior to construction, a Soil Erosion and Sediment Control Plan and Permit will be prepared for the project and will conform with Van Buren County requirements and the Michigan Department of Environment, Great Lakes, and Energy (EGLE)

requirements. BMPs will be utilized during construction and final site design to control runoff and sediment on site. These BMPs may consist of, but not be limited to:

- construction entrances
- fiber rolls or earth dikes
- silt fence
- temporary diversion ditches
- temporary check dams
- vehicle tracking control
- dust control
- silt fence rock outlets

The above BMPs, conforming to Van Buren County and EGLE requirements, were chosen to limit sediment transport, slow runoff velocities, prevent erosion, and protect nearby wetlands and streams. BMPs will first be implemented prior to commencement of construction until vegetation is reestablished in the area. Some of these BMPs may remain in place to further mitigate the construction runoff conditions. General recommendation to establish vegetation throughout construction include:

- **Topsoil**: Any areas that are stripped and graded, it is recommended to replace with topsoil. The contractor shall follow site specific Geotech recommendations for topsoil. Generally, it is recommended that any exposed areas be respread with a minimum of 4" of topsoil to ensure vegetation will grow. If pollinator seed mixes are being utilized, a minimum respread of 6" of topsoil is recommended.
- **Seeding**: Immediately after grading and topsoil respread, it is recommended that seeding occurs.
    - **Temporary Seeding**: Per the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Seeding BMP, temporary vegetative cover should be provided to protect spoil piles and large disturbed areas. Seeding should be applied immediately after grading and preparation of the seed bed is finished on each small segment of a construction project. Mulch and/or soil erosion control blankets should be used to keep seed in place until vegetation is established. Contractor shall implement as needed to obtain stabilization. Table 2 within the EGLE Seeding BMP specifications document provides recommended seed types for temporary vegetation.
    - **Permanent Seeding** – Per Michigan Soil Erosion and Sediment Control Vegetative Stabilization document, during recommended seeding periods, seedbed preparation shall immediately follow construction activities. If seeding is delayed due to season or other factors, temporary erosion control measures such as anchored mulch or erosion control blankets shall be installed and maintained until seedbed preparation and seeding can commence. Contractor shall implement as needed to obtain stabilization. Timing of permanent seeding should conform to Table 3 in the EGLE Seeding BMP specification document. Table 1 within the EGLE Seeding BMP specifications document provides recommended seed types for permanent vegetation. Perennial grasses should be used for all permanent cover.

The above are general recommendations to ensure the project will be setup for success. South Haven Affordable Solar, LLC will obtain final design documents to meet all Authorities Having Jurisdiction (AHJ) requirements prior to constructing.

Permanent Stormwater Measures

As described above, the proposed solar site is not anticipated to increase runoff from the pre-development condition. A full hydrology report and study will be prepared to analyze this further during Final Engineering. Revegetation of disturbed and existing soils to suitable groundcover will reduce the post-development runoff. Permanent vegetation establishment will likely further reduce any dust and sediment loss inherent to the tilling operations utilized in the existing agricultural use. The permanent stormwater BMPs will be reassessed after final hydrology and stormwater reports are complete but will likely consist of a focus on revegetation.

Conclusion

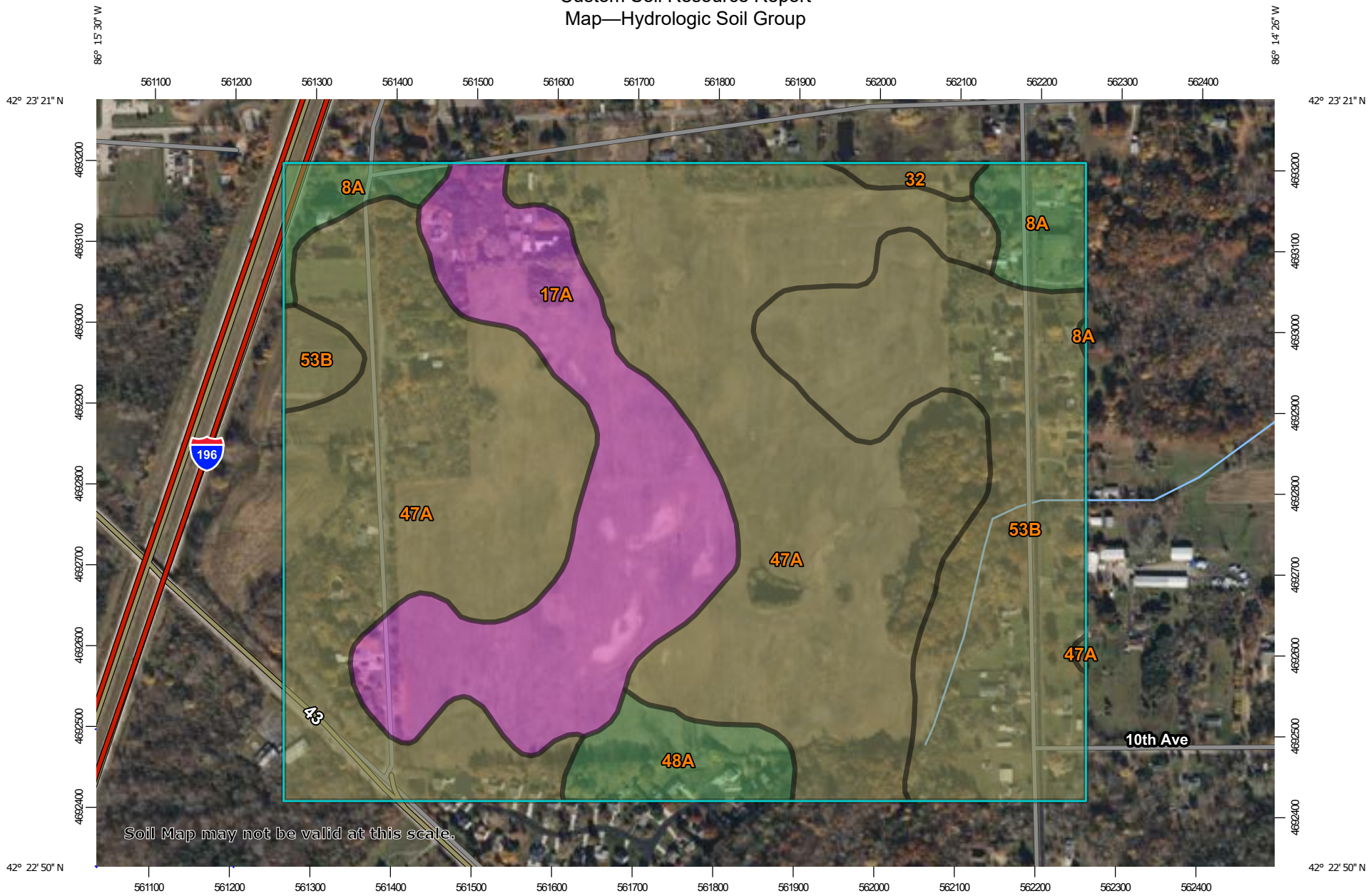
In conclusion, the South Haven Affordable Solar facility is anticipated to maintain or even enhance the current stormwater runoff characteristics. By repurposing agricultural land into meadow, the overall runoff potential of the site is expected to decrease. Solar panels will be installed on piles, allowing vegetation to thrive underneath, thereby minimizing the impact of on-site runoff volumes. Additionally, a combination of utilizing existing vegetation and employing BMPs, if necessary, will help mitigate any runoff from new access roads.

Please do not hesitate to contact me if you have any questions. We appreciate your continued partnership on this project.

Theresa McGreevy
Kimley-Horn
Theresa.McGreevy@Kimley-Horn.com
312.924.7430

Attachment 1 – NRCS Hydrologic Soil Group Map

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:6,690 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Van Buren County, Michigan
Survey Area Data: Version 19, Aug 25, 2023

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

Date(s) aerial images were photographed: Oct 4, 2022—Oct 28, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8A	Morocco loamy sand, lake plain, 0 to 2 percent slopes	A/D	8.0	4.1%
17A	Brems sand, 0 to 2 percent slopes	A	34.4	17.6%
32	Colwood silt loam	C/D	1.4	0.7%
47A	Selfridge loamy sand, 0 to 3 percent slopes	C/D	104.2	53.4%
48A	Pipestone-Kingsville complex, 0 to 3 percent slopes	A/D	6.8	3.5%
53B	Capac loam, Lake Michigan lobe, 0 to 4 percent slopes	C/D	40.2	20.6%
Totals for Area of Interest			**195.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Attachment 2 –Hydrologic Soil Cover Complexes

(2) Use of table 9–1

Chapters 7 and 8 of NEH 630 describe how soils and covers of watersheds or other land areas are classified in the field. After the classification is completed, CNs are read from table 9–1 and applied as described in chapter 10. Because the principal use of CNs is for estimating runoff from rainfall, the examples of applications are given in chapter 10.

Table 9–1 Runoff curve numbers for agricultural lands [1/]

Cover description			CN for hydrologic soil group			
cover type	treatment [2/]	hydrologic condition [3/]	A	B	C	D
Fallow	Bare Soil	---	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C & T)	Poor	66	74	80	82
		Good	62	71	78	81
	C & T + CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C & T	Poor	61	72	79	82
		Good	59	70	78	81
	C & T + CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C & T	Poor	63	73	80	83
		Good	51	67	76	80

See footnotes at end of table.

Table 9–1 Runoff curve numbers for agricultural lands [1/] — Continued

Cover description			CN for hydrologic soil group			
cover type	treatment [2/]	hydrologic condition [3/]	A	B	C	D
Pasture, grassland, or range-continuous forage for grazing [4/]		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
Meadow-continuous grass, protected from grazing and generally mowed for hay		Good	30	58	71	78
Brush-brush-forbs-grass mixture with brush the major element [5/]		Poor	48	67	77	83
		Fair	35	56	70	77
		Good	30 [6/]	48	65	73
Woods-grass combination (orchard or tree farm) [7/]		Poor	57	73	82	86
		Fair	43	65	76	82
		Good	32	58	72	79
Woods [8/]		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	30	55	70	77
Farmstead--buildings, lanes, driveways, and surrounding lots		---	59	74	82	86
Roads (including right-of-way):						
Dirt		---	72	82	87	89
Gravel		---	76	85	89	91

1/ Average runoff condition, and I_a=0.2s.

2/ Crop residue cover applies only if residue is on at least 5 percent of the surface throughout the year.

3/ Hydrologic condition is based on combinations of factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good ≥20%), and (e) degree of surface toughness.
Poor: Factors impair infiltration and tend to increase runoff.
Good: Factors encourage average and better then average infiltration and tend to decrease runoff.
For conservation tillage poor hydrologic condition, 5 to 20 percent of the surface is covered with residue (less than 750 pounds per acre for row crops or 300 pounds per acre for small grain).
For conservation tillage good hydrologic condition, more than 20 percent of the surface is covered with residue (greater than 750 pounds per acre for row crops or 300 pounds per acre for small grain).

4/ Poor: < 50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.

5/ Poor: < 50% ground cover.
Fair: 50 to 75% ground cover.
Good: > 75% ground cover.

6/ If actual curve number is less than 30, use CN = 30 for runoff computation.

7/ CNs shown were computed for areas with 50 percent woods and 50 percent grass (pasture) cover. Other combinations of conditions may be computed from the CNs for woods and pasture.

8/ Poor: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed, but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 9–5 Runoff curve numbers for urban areas [1/]

Cover description cover type and hydrologic condition	Average percent impervious area [2/]	- - CN for hydrologic soil group - - A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)		77	86	91	94

1/ Average runoff condition, and $I_a = 0.2S$.

2/ The average percent impervious area shown was used to develop the composite CNs. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.

3/ CNs shown are equivalent to those of pasture. Composite CNs may be computed for other combinations of open space type.

4/ Composite CNs for natural desert landscaping should be computed using figures 9–3 or 9–4 based on the impervious area percentage (CN=98) and the pervious area CN. The pervious area CNs are assumed equivalent to desert shrub in poor hydrologic condition.

Attachment 3 – Runoff Erosion Diagram

RUNOFF/EROSION

Kimley»Horn

AGRICULTURAL FIELDS (BEFORE) VS. SOLAR FIELD (AFTER)