

October 10, 2018

Mr. Doug Herling
Open Road Renewables
1105 Navasota Street
Austin, TX 78702

**Subject: Amendment to the Ecological Assessment
Hillcrest Solar Project
Brown County, Ohio**

Dear Mr. Herling:

Cardno is pleased to provide Open Road Renewables (ORR) with this summary of potential ecological impacts resulting from recent changes made to the Hillcrest Solar Project design, essentially expanding the project from 125 megawatt (MW) to 200 MW in generating power. ORR is seeking an amendment to the Certificate of Environmental Compatibility and Public Need (Certificate) issued for the Hillcrest Solar Project on February 15, 2018 (OPSB Case No. 17-1152-EL-BGN).

Enclosure 1 provides an Ecological Assessment (EA) Amendment, which summarizes the potential impacts to natural resources due to the construction changes in accordance with Ohio Administrative Code 4906-17-08 (B). This amendment is intended to update the information provided in Cardno's *Ecological Assessment – Hillcrest Solar Farm*, dated June 2017 (2017 EA), which supported the original OPSB Certification Application. The project design presented in the 2017 EA largely accommodated for the expansion of the project from 125 MW to 200 MW. This expansion is completely contained within the previously presented 2,083-acre Project Area. No new parcels or additional unsurveyed land was required for this amendment; therefore, no additional field surveys or delineations were conducted. Generally, the Project infrastructure and associated impacts proposed within the 1,855-acre Buildable Area did not change from the 2017 EA, with the exception of:

- addition of solar panels to upland areas,
- larger inverter pads in upland areas,
- two culverts to accommodate ditch crossings for access roads,
- eight additional temporary open cuts at ditches to accommodate collection lines crossings (all to be co-located with access road culverts);
- three additional ditches crossings horizontal directional drilling (HDD) technology to accommodate buried collection lines; and,
- four additional crossings utilizing HDD technology to accommodate buried collection lines across two wetlands and one perennial stream (twice).

Similar to the approach that ORR took in the 2017 Application for the 125 MW Project, ORR has again minimized environmental impacts through careful project design and siting for this 200 MW Project expansion. No new impacts to streams or wetlands, and no additional forested upland clearing are anticipated for the proposed 200 MW Project.

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Open Road Renewables
October 10, 2018



If you have any questions need any additional information please contact me at 302-395-1919 or ryan.rupprecht@cardno.com.

Sincerely,

A handwritten signature in black ink, appearing to read "Ryan Rupprecht", with a long horizontal flourish extending to the right.

Ryan Rupprecht
Project Scientist
Direct Line (302) 395-3344
Email: ryan.rupprecht@cardno.com

Enclosure 1
Ecological Assessment – Amendment
Hillcrest Solar Project
October 2018

1 Introduction

In June 2017, Open Road Renewables (ORR) submitted an Application to the Ohio Power Siting Board (OPSB) for a Certificate of Environmental Compatibility and Public Need (CECPN or Certificate, OPSB Case No. 17-1152-EL-BGN) for the construction of the 125 Megawatt (MW) Hillcrest Solar Project (the Project) ¹. The Hillcrest Solar Project was proposed within an area of approximately 2,083 acres (Project Area) located in a rural area of Ohio, just north of the village of Mt. Orab and approximately 30 miles east of Cincinnati. The Project is located entirely within Green Township, Brown County, Ohio. The predominant land use in the Project Area is agricultural (seasonal crops), with some deciduous forest areas (woodlots and windrows), and some developed/open space. Figure 1.1 shows the Hillcrest Solar Project Location, and Figure 1.2 provides an aerial overview of the Project Area.

Cardno provided ORR a report titled, *Ecological Assessment – Hillcrest Solar Farm*, dated June 2017, in support of the June 2017 Application (Exhibit H). The OPSB subsequently conducted a review of the Application and supporting documents, and issued a Certificate for the 125 MW Hillcrest Solar Project in February 2018.²

Recently, ORR has completed further Project planning, engineering and design, and is now proposing to expand the Hillcrest Solar Project up to 200 MW of generating power. To achieve this increase in generating power, the Project will require the addition of approximately 755 acres of solar arrays (panels). The 125 MW Project design included sufficient access roads and buried collection lines to account for a potential expansion to 200 MW. During the expansion planning, ORR was able to re-route and co-locate buried collection lines and access roads to be more efficient and minimize environmental impacts. This proposed Project expansion has been sited completely within the previously presented 2,083-acre Project Area. More specifically, the expansion (addition of infrastructure) utilizes the entire 1,855-acre Buildable Area identified as upland usable areas within the Project Area but does not exceed it. "Buildable Area" excludes resource areas, such as wetlands, waterbodies, woodlots, project-related restricted areas, and other land-types not suitable for project infrastructure.

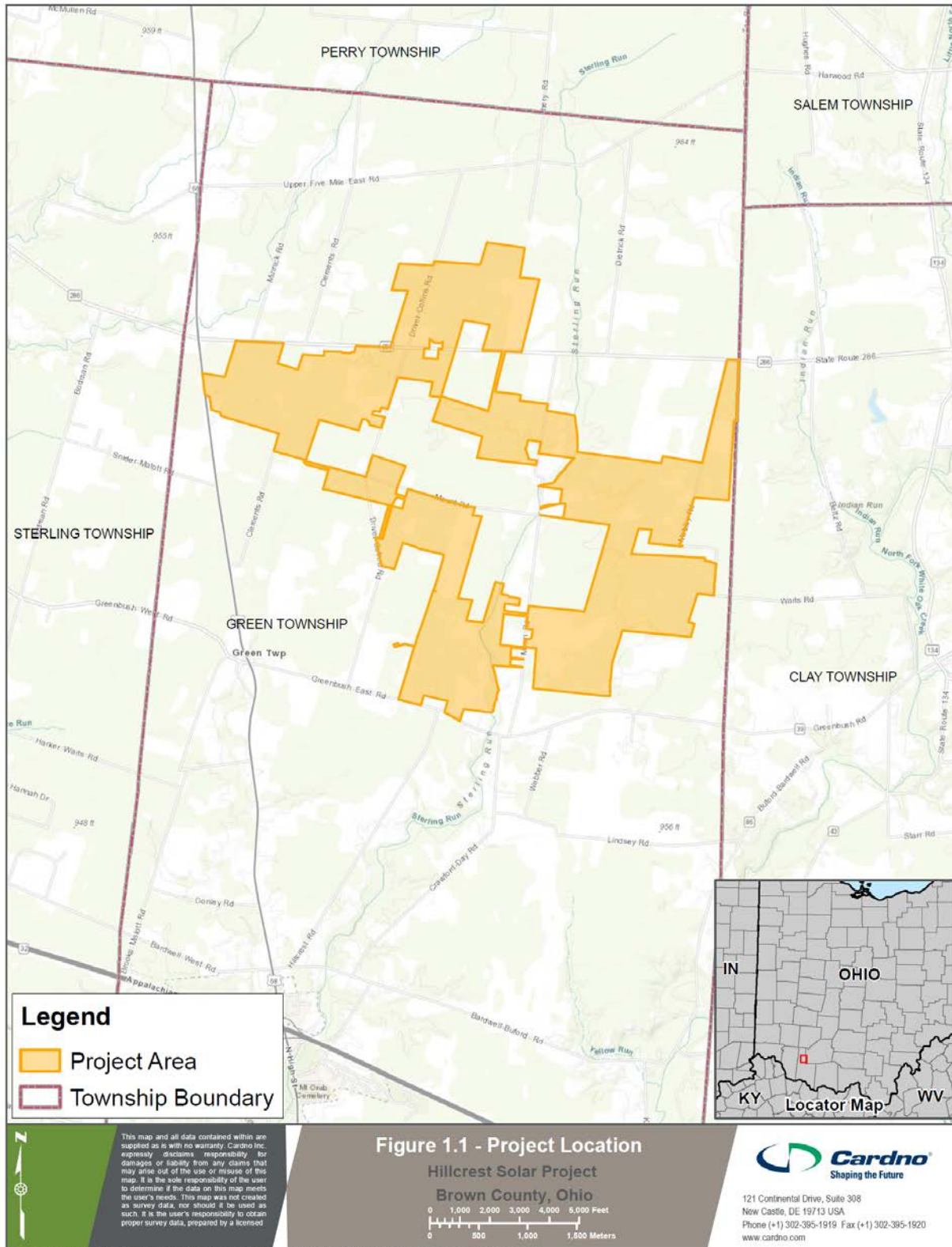
The entirety of the amended Project is located on lands that were assessed in Cardno's 2017 EA report; therefore, no new parcels or additional field surveys were required for this amendment. Further, no changes to desktop or field survey results presented in Cardno's 2017 EA are anticipated as a result of this expansion.

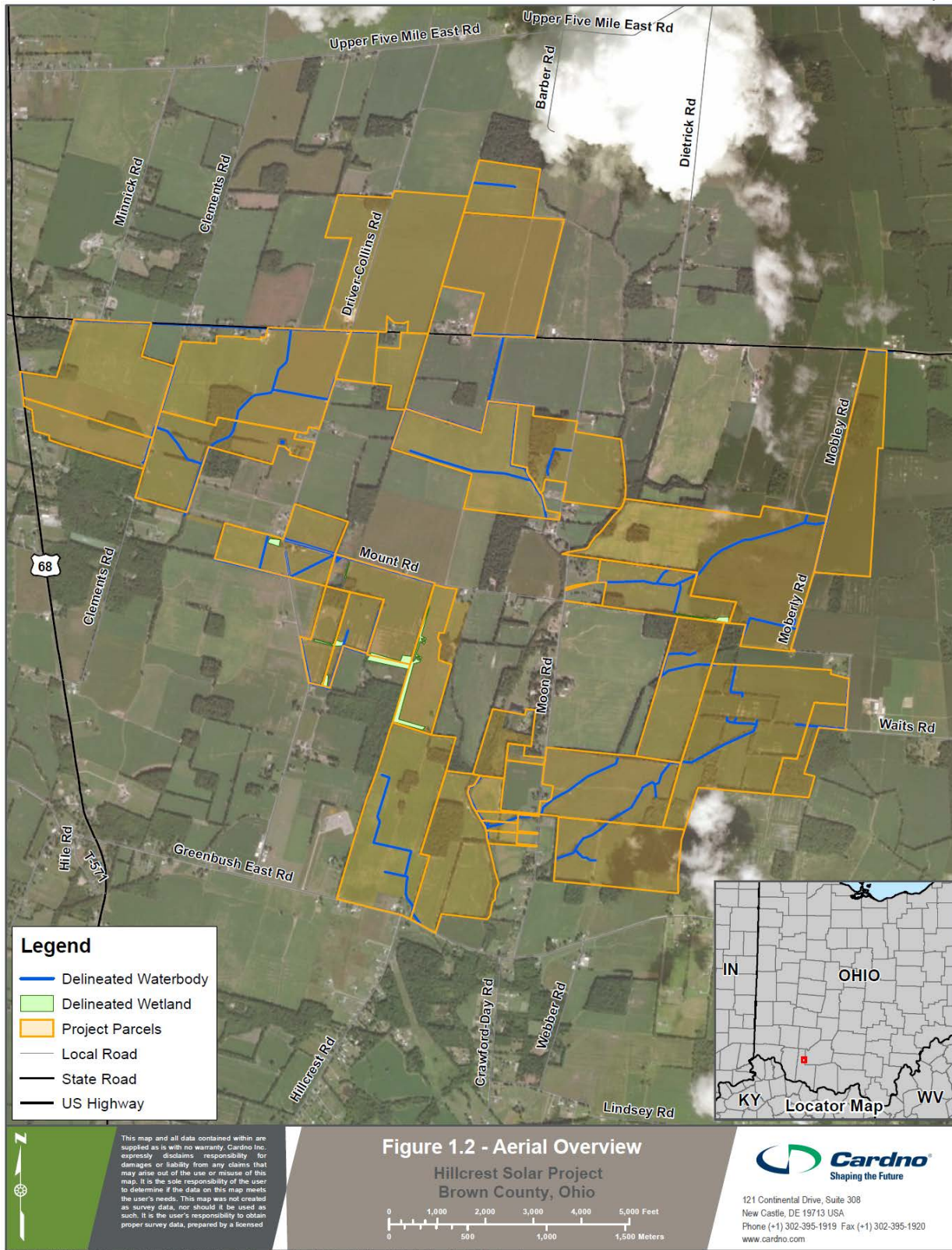
This Ecological Assessment Amendment provides a summary of the potential change in impacts to natural resources due to the additional infrastructure within the 2,083-acre Project Area. Overall, the modifications to the infrastructure have resulted in a net increase in temporary impacts to upland soils (+1.61 acres) and ditches (+174 linear feet associated with buried collection lines). Two additional culverts are proposed to cross ditch (DOH-020) for permanent access roads. Larger inverter pads are anticipated, resulting in 0.41 acres of inverter pads, as compared to previously proposed 0.05 acres. Upland forest clearing remained the same as proposed for the 125 MW Project, as all new infrastructure was sited to avoid additional tree clearing. Wetlands and stream crossing impacts will be minimized through the use of horizontal directional drilling (HDD) to install collection lines under a perennial stream (SOH-002, Sterling Run at 2 locations), and two wetlands (WOH-003 and WOH-007). No other changes to permanent infrastructure are anticipated for the expansion to the 200 MW Project, such as the proposed Project substation, fencing, meteorological/pyranometer stations, and communications infrastructure.

Appendix A includes Figure 1 – 200 MW Project Buildable Area, Appendix B includes Updated T&E Species Information, and Appendix C provides specific anticipated impacts to resources, Table C-1 - Anticipated Wetland Impacts for the Hillcrest Solar Project, and Table C-2 - Anticipated Waterbody Crossing Methods & Impacts for the Hillcrest Solar Project, highlighting those impacts that have changed from the 125 MW Project.

¹ Case Documents: <http://dis.puc.state.oh.us/CaseRecord.aspx?CaseNo=17-1152>

² Certificate: <http://dis.puc.state.oh.us/DocumentRecord.aspx?DocID=bf361411-0bc6-4584-becb-0a9c9fed424>





1.1 Project Description

The Hillcrest Solar Farm in Mt. Orab, Ohio, is a proposed solar PV generation facility of 200 MW within an area of approximately 2,083 acres (3.25 square miles) on private lands. The Project Area is entirely contained within Green Township, Brown County, Ohio.

Of the 2,083-acre Project Area, Cardno estimates that up to 1,855 acres (89% of the total Project Area) will be needed for permanent Project infrastructure for the 200 MW Project, an increase of 755 acres from the 125 MW Project due to the addition of solar panels. The Project Buildable Area is presented as Figure 1 in Appendix A.

As originally proposed for the 125 MW Project, the 200 MW Project will still ultimately connect to Duke Energy's Hillcrest 138 kV substation. ORR holds development rights to a parcel adjacent to the Hillcrest substation for the construction of a Project Substation (up to 3-acres), to connect via a <1,000-foot 138 kV generation tie line.

The proposed 200 MW Project includes the construction and operation of solar farm, with a maximum site footprint of 1,855 acres, including the following component that differs from the 125MW Project:

- > A solar field of PV panels mounted on fixed and/or tracking structures, organized into strings, and covering up to approximately 1,795 acres total.
- > The expanded project anticipates using a greater number of piles to support the additional panels, but will refine the impact per piling; each pile will impact less than ¼ square foot. Therefore, we anticipate the same (or less) permanent impacts to upland soils for the support pilings of the 200 MW Project.
- > The inverter pads originally estimated at 25 s.f. each are now proposed to be approximately 200 s.f. for each concrete pad. Using a high estimate of up to 90 inverter pads across the 200MW Project, these pads would total approximately 0.41 acres on upland soils (an increase of 0.36 acres for the inverter pads, as compared to the 125 MW Project).

Otherwise, the components remain the same for the 200 MW Project, as compared to the 125 MW Project as discussed in the June 2017 EA report.

1.2 Site Preparation

No changes to site preparation discussion will be needed for the 200 MW Project as compared to the 125 MW Project.

1.3 Solar Project Infrastructure

The same basic design for the 200 MW Project still applies, but with additional panels, and re-routes and co-locations of buried collection lines and access roads to be more efficient and minimize environmental impacts.

Project plans primarily remain the same, but for an increase in the number of panels, refined impacts for their support piles, and larger inverter pads. Similar to the originally proposed 125 MW Project, the 200 MW Project will utilize PV panels mounted on steel support structures that are fixed or on a tracking system. The support structures will be suspended above the ground by piles driven or screwed into the ground by a pile-driving machine to a depth of approximately 4 to 8 feet, but likely not greater than 10 feet. Driven support piles would have a permanent footprint of up to approximately 2.16 acres, dispersed over the 1,795-acre array area. Previously, pile impacts were calculated based on a larger diameter pile. The expanded project anticipates using a greater number of piles to support the additional panels, but will refine the impact per piling; each pile will impact less than ¼ square foot. Impacts were considered more conservatively in the June 2017 Application. Therefore, we anticipate the same (or less) permanent impacts to upland soils for the support pilings of the 200 MW Project.

Project plans have also refined the estimated footprint of the power conversion stations (inverter pads) with a DC to AC power inverters, a medium-voltage transformer, and an associated control cabinet used at each of the solar array blocks. The inverter pads originally estimated at 25 s.f. each are now proposed to be approximately 200 s.f.

for each concrete pad. Using a high estimate of up to 90 inverter pads across the 200MW Project, these pads would total approximately 0.41 acres on upland soils (an increase of 0.36 acres for the inverter pads, as compared to the 125 MW Project).

2 Desktop Ecological Assessment

Cardno's desktop assessment provided in the 2017 EA covers a review of Geographic Information Systems (GIS) data layers including, but not limited to, the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey for the Project Counties, historic aerial photographs or farmed wetland maps from the USDA Farm Service Agency (FSA), National Wetland Inventory (NWI) maps, Ohio Wetland Inventory (OWI) maps, U.S. Geological Survey (USGS) topographic maps, and recent aerial photographs.

2.1 Physical and Biological Resources

The proposed changes for the 200 MW Project are completely contained within the 2,083-acre Project Area footprint discussed in Cardno's 2017 EA; therefore, the proposed amendment does not change the results of the desktop assessment for land use, agricultural conversion considerations, geologic formations such as glacial drift, karst terrain, or soils. In addition, existing wildlife is anticipated to generally be comprised of the same species as discussed in the 2017 EA report. No additional impacts to these resources are anticipated based on the expanded 200 MW Project infrastructure.

2.2 Rare, Threatened & Endangered Species

Cardno reviewed the latest available rare, threatened, and endangered species public data as previously presented in Cardno's EA. The available information was consistent with previous findings; therefore, no additional agency consultation was conducted. A copy of the USFWS Brown County species list (updated January 29, 2018), and an updated IPAC is provided in Appendix B.

The 200 MW Project will aim to minimize any potential impacts to the habitats that may support significant wildlife by avoiding the majority of woodlots, and all perennial streams. Where possible, micro-siting of the Project infrastructure will further reduce or avoid potential impacts.

2.3 Wetlands/Water/Floodplain

An updated desktop screening was conducted using the USFWS NWI and USGS NHD remote data to review the Project Area for potential wetlands and waterbodies in the vicinity of the Project. Since the proposed changes for the 200 MW Project are completely contained within the 2,083-acre Project Area footprint discussed in Cardno's 2017 EA, the proposed amendment does not change the results of the desktop assessment for wetlands, navigable waterbodies, or floodplains. No additional impacts to these resources are anticipated based on the expanded 200 MW Project infrastructure.

3 Field Delineation Summary

Cardno conducted surface water delineations of the entire Project Area, plus a visual assessment on a ¼-mile buffer, during April 2017 to determine the extent and jurisdiction of wetlands and waterbodies, and ecological communities within the 2,083-acre Project Area. Wetland delineations were conducted according to the 1987 U.S. Army Corps of Engineers (USACE) *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the

applicable regional supplements; *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0)* (USACE 2010). The results of the surveys are presented in Cardno's 2017 EA report.

Since the proposed changes to the Project are completely contained within Cardno's 2017 Project Area; there were no new field-delineation surveys conducted for the 200 MW Project.

4 Regulatory Overview

The Hillcrest Solar Project was issued a CECPN on February 15, 2018 by the OPSB.

This EA Amendment summarizes the potential changes to impacts of the natural resources due to the 200 MW Project expansion in accordance with Ohio Administrative Code 4906-17-08 (B). This amendment is intended to update the information provided in Cardno's *Ecological Assessment – Hillcrest Solar Farm*, dated June 2017, which supported the original OPSB Certification application. Based on the above discussions, no new agency consultations have been conducted in regard to the 200 MW Project.

5 Proposed 200 MW Project Impacts

Below is a discussion of the 200 MW Project infrastructure and the associated environmental impacts, as they relate to the originally proposed 125 MW Project.

5.1 Project Infrastructure Summary

Of the 2,083-acre Project Area, Cardno estimates that up to 1,855 acres (89% of the total Project Area) will be needed for permanent Project infrastructure (solar arrays, roads, substations, etc.) and no longer be available for current land use (primarily rural agricultural land). The total acres of permanent impact may be reduced with revised Project siting and micro-siting of facilities to further minimize or avoid potential impacts. The Project Buildable Area is presented as Figure 1 in Appendix A. The original application for 125 MW project estimated a total of 1,100 acres for permanent Project infrastructure. The 755 acres of additional permanent infrastructure is primarily due to increased area of solar arrays needed for the 200 MW Project, as detailed below. Updated numbers are presented in ***bold italicized*** text.

The 200 MW Hillcrest Solar Project will generally consist of the following infrastructure, approximately:

Solar Panel Areas

- Typical PV panel size 4-feet by 6-feet, up to 14 feet at highest point
- Panel strings
- Panel support piles less than 1 s.f. each, directly driven 4 to 8 feet below ground surface up to 2.16 acres total, spread across the 1,855 acres
- 12 to 16 feet of open space between panel strings
- Up to ***200 s.f.*** concrete slab per Inverter Pad (up to 90 inverter pads total, ***18,000 s.f. or 0.41 acre***)
 - ***Larger inverter pads are anticipated, resulting in an increase of 0.36 acres of inverter pads, as compared to previously proposed 0.05 acres.***
- Up to ***1,795 acres*** of solar array blocks (5 to 10 acres per block)
 - ***Increase of 795 more acres of solar array blocks, as compared to previously proposed 1,000 acres.***

Collection Lines

- Up to 12.71 miles of buried collection line cable, 20-foot wide temporary work area (***17.84*** acres not co-located with access roads)
 - ***Temporary impacts to upland soils due to buried collection line installation increased by approximately 1.6 acres due to re-rerouting, and less co-locating with access roads.***
 - ***Temporary impacts to ditches increased by 166 lf due to collection line re-routes.***
 - ***No changes in total collection line length, as compared to the previously proposed project.***
- Collection lines are buried 36 inches below grade (outside fence lines)
- All jurisdictional perennial streams and wetlands will be avoided using HDD technology

Access Roads

- Up to 26.4 miles of access roads
 - ***No changes in total access road length, as compared to the previously proposed project.***
- Access roads will have a temporary impact width of up to 25 feet during construction (28.24 acres of uplands)
 - ***An additional 8 lf of ditches will be temporarily impacted due to re-routes of access roads. A net decrease of 20 lf is anticipated for the permanent impacts to ditches due to access road re-routes and culverts.***
- Following construction, gravel access roads will be maintained using a permanent up to 16-foot wide road for operations and maintenance (50.51 acres)

5.2 Wetlands

As detailed in the 2017 EA, Cardno delineated a total of six wetlands during field surveys, for a total of 11.61 acres of wetland within the Project Area. Wetland WOH-001 accounted for over 8 acres, with the other wetlands each accounting for less than 1 acre each. The majority of wetlands were identified as emergent, and scored as lower quality wetlands on the ORAM (all were Category 1).

The updated 200 MW Project proposes crossing two wetlands (WOH-003 and WOH-007), each by a buried collection line using HDD technology in an effort to avoid all impacts to these wetlands. No other changes to wetlands are anticipated for the 200MW Project.

5.3 Waterbodies

Several waterbodies were delineated within the Project Area, primarily agricultural ditches (n=34), four stream reaches and four ponds. The waterbodies identified were expected to be highly impacted by the surrounding agricultural land use. Although they may provide habitat, the water quality does not support the development of rich faunal communities. Due to the modification and disturbance present in the surrounding land use, and lack of flowing water, the agricultural ditches identified in the Project Area are unlikely to support aquatic communities.

The installation of the buried collection lines will require crossing both streams and ditches within the Project Area. ORR's 125 MW Project proposed to utilize HDD to allow for the installation of the line under two Category II perennial streams (SOH-001 and SOH-004) in an effort to avoid all impacts to these perennial streams. The 200 MW Project has added a two additional perennial stream crossings via HDD (for SOH-002, Sterling Run, at two separate locations). No other perennial streams are anticipated to be crossed by the collection line installation.

The 125 MW Project proposed 12 ditch crossings for buried collection lines, five via HDD and seven open cut crossings for a temporary impact of up to 83 linear feet (lf). The 200 MW Project proposes a total of 23 ditch crossings for collection lines, eight via HDD and 15 open cuts, for a temporary impact of up to 248 lf (+ 165 lf from previous). The four perennial ditches proposed for HDD include DOH-002 (two crossings), DOH-013, and DOH-027. Ten of the ditch crossings will be co-located with the access road culvert crossings, thus minimizing impacts to the ditch (DOH-007, DOH-008 (two crossings), DOH-010, DOH-020, DOH-027, DOH-029, DOH-031 (two crossings), DOH-032, and DOH-034). The other five ditch crossings (DOH-003, DOH-014, DOH-019, DOH-025, DOH-026, DOH-027, and DOH-031) propose using open cut will involve traditional excavation of the ditch for the collection line. The crossing of ditch DOH-020 was previously a planned HDD, but is now a proposed open cut. The crossing at ditch DOH-026 is planned as an open cut, but was not previously crossed. DOH-031 is crossed twice by collection lines, one crossing will be co-located with a culverted access road and one crossing will be open cut (previously only crossed for access road). DOH-034 was not previously a planned ditch crossing, but will now be crossed and co-located with a culverted access road. Where collection lines were co-located with culverted access roads, only impacts related to the access road were calculated to avoid double-counting the impact. The buried collection lines will be installed concurrently with the access road culverts, thus minimizing the impacts to the ditches.

Since the 200 MW Project plans did not necessitate additional access roads, only minor changes to waterbody impacts are anticipated due to re-routing proposed access roads. Project plans for the 125 MW Project called for a total of 30 ditch crossings using culverts, for a total of 389 lf of temporary impact and 649 lf of permanent impacts. The 200 MW Project includes an additional two access road culverts (both at DOH-020), for a total of 32 ditch crossings using culverts, and an overall increase of 12 lf of temporary impacts to ditches. Total temporary impacts to ditches due to the 200 MW Project's access roads now total 397 lf (+ 8 lf from previous), and total permanent impacts to ditches total 629 lf (-20 lf from previous).

Project designs maintain that no impacts to streams or ponds are anticipated due to access roads or collection lines; therefore, aquatic habitats are not anticipated to be impacted by the 200 MW Project. Due to the modification and disturbance present in the surrounding land use, and lack of flowing water, the agricultural ditches identified in the Project Area proposed for open cuts are unlikely to support aquatic communities.

5.4 Forested Uplands / Tree Clearing

No additional tree clearing is anticipated for the expansion to 200 MW Project.

5.5 Project Impact Comparisons

Table 5-1 provides a summary of the amended Project infrastructure located within the Project Area:

Table 5-1 Summary of Proposed Hillcrest Solar Project Permanent Infrastructure

Features	Potential Impacts for 125MW Project (2017 Application)	Potential Impacts for 200MW Project (2018 Amendment)
Project Generation Capacity	125 MW	200 MW
Project Area	2,083 acres	2,083 acres
Available Buildable Area	1,855 acres	1,855 acres
Project Construction Area	1,100 acres	1,855 acres
Solar Arrays	1,000 acres	1,795 acres
Solar Array Piles	Up to 2.16 acres	Up to 2.16 acres
Project Substation	3 acres	3 acres
Gravel-covered Parking / Laydown Area	5 acres	5 acres
Supporting Facilities (Pyranometer Stations, Inverter Pads)	0.05 acres	0.41 acres
Dead End Structure (Duke Energy's Hillcrest 138 kV Substation Parcel)	0.36 acres	0.36 acres
Generation Tie Line (buried)	1,000 feet	1,000 feet
Collection Lines (buried, not co-located with access roads)	12.71 miles	12.71 miles
Permanent Access Roads (gravel-covered)	26.4 miles 50.51 acres	26.4 miles 50.51 acres

The following tables focuses on the impacts of the proposed 200 MW Project, in comparison to the originally permitted 125 MW Project described in Cardno's 2017 EA. The overall Project Area acreage has not changed. The most significant changes have resulted from adding solar panels, increasing the inverter pads, and re-routing and co-locating buried collection lines and access roads to be more efficient and minimize environmental impacts, as presented in Tables 5-1 and 5-2 below.

Appendix C provides specific anticipated impacts to resources in Table C-1 - Anticipated Wetland Impacts for the Hillcrest Solar Project, and Table C-2 - Anticipated Waterbody Crossing Methods & Impacts for the Hillcrest Solar Project, highlighting those impacts that have changed from the 125 MW Project.

Table 5-2 Summary of Proposed 200 MW Hillcrest Solar Project Impacts -- TEMPORARY

Impact Type	Upland Soil (acres)	Forested Uplands (Tree Clearing) (acres)	Wetland (acres)	Streams (acres)	Ditches		Ponds (acres)
					(acres)	(linear feet)	
Access Roads	28.24	0	0.01	0	0.06	397.20	0
Buried Collection Line	17.84	0	0	0	0.05	248.48	0
Equipment Lay Down Area	15.00	0	0	0	0	0	0
Substation	0	0	0	0	0	0	0
Array Pilings	0	0	0	0	0	0	0
Inverter Pads	0	0	0	0	0	0	0
Pyranometer	0	0	0	0	0	0	0
Generation Tie Line	0.92	0	0	0	0	0	0
Dead End Structure	0	0	0	0	0	0	0
200 MW PROJECT Totals (changes in blue font)	61.08	0	0.01	0	0.12	645.68	0
125 MW PROJECT Totals	59.48	0	0.01	0	0.08	472.14	0
NET CHANGE	+ 1.61	(none)	(none)	(none)	+ 0.02	+ 173.54	(none)

Table 5-3 Summary of Proposed 200 MW Hillcrest Solar Project Impacts -- PERMANENT

Impact Type	Upland Soil (acres)	Forested Uplands (Tree Clearing) (acres)	Wetland (acres)	Streams (acres)	Ditches		Ponds (acres)
					(acres)	(linear feet)	
Access Roads	50.51	0	0.01	0	0.11	629.30	0
Buried Collection Line	0	0	0	0	0	0	0
Equipment Lay Down Area	5.00	0	0	0	0	0	0
Substation	3.00	0	0	0	0	0	0
Array Pilings	2.16	42.60	0	0	0	0	0
Inverter Pads	0.41	0	0	0	0	0	0
Pyranometer	0.00	0	0	0	0	0	0
Generation Tie Line	0	0	0	0	0	0	0
Dead End Structure	0.36	0	0	0	0	0	0
200 MW PROJECT Totals (changes in blue font)	61.45	42.60	0.01	0	0.11	629.30	0
125 MW PROJECT Totals	61.08	42.60	0.01	0	0.11	649.36	0
NET CHANGE	+0.36	(none)	(none)	(none)	(none)	-20.06	(none)

6 Conclusion

Cardno reviewed the proposed 200 MW Project expansion and the potential impacts to natural resources and ecological communities. Since the entirety of the amended Project is located on lands that were assessed in Cardno's 2017 EA report, no new parcels or additional field surveys were required for this amendment. Further, no changes to desktop or field survey results as presented in Cardno's 2017 EA are anticipated as a result of this expansion.

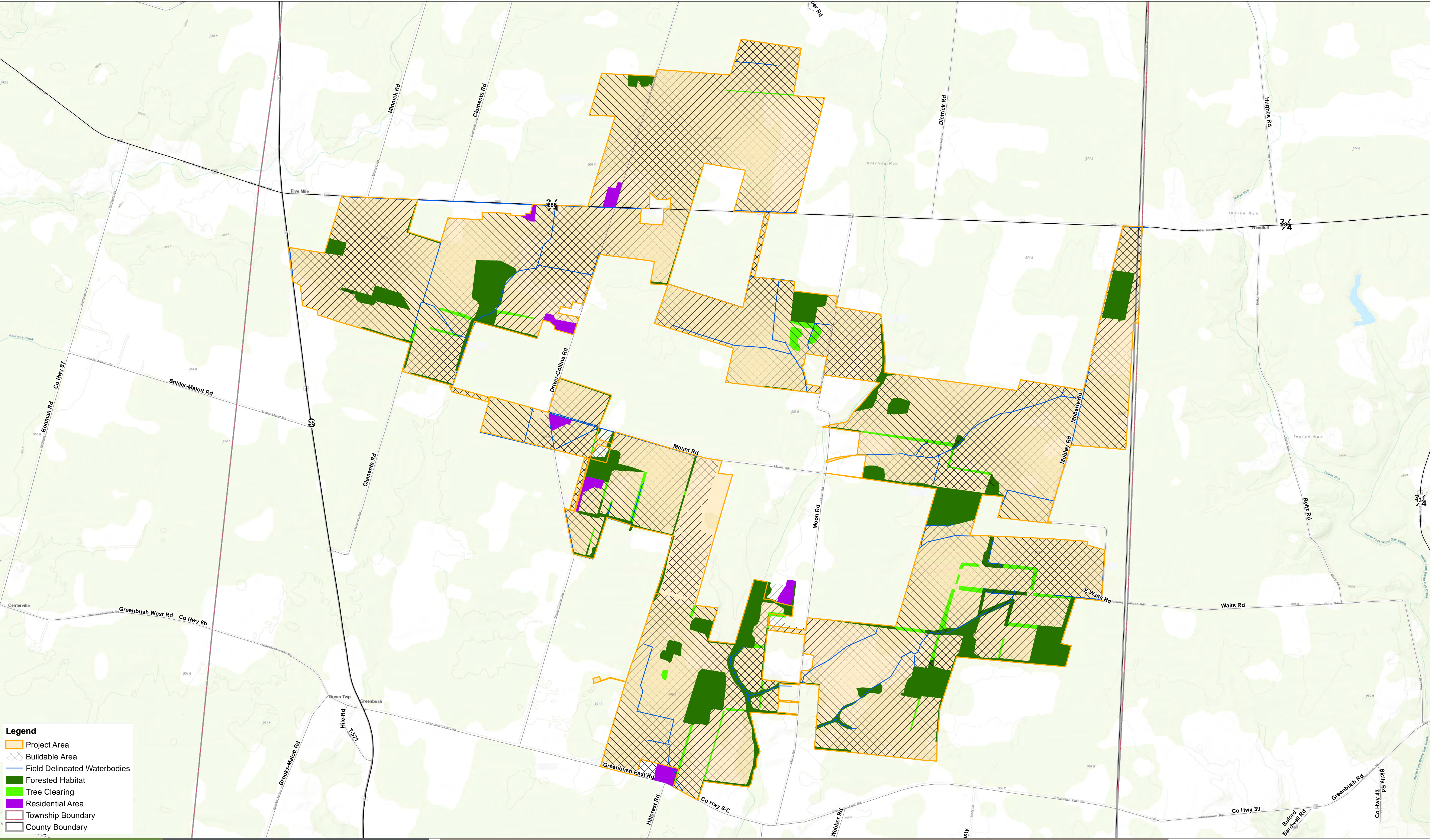
Overall, the modifications to the infrastructure have resulted in a net increase in temporary impacts to upland soils and ditches (associated with the addition of solar panels, larger inverter pads, and re-routes of buried collection lines). Eight additional temporary open cuts are proposed at ditches to accommodate collection lines crossings. Two additional culverts are proposed to cross ditch (DOH-020) for permanent access roads. Upland forest clearing remained the same, as all new infrastructure was sited to avoid additional tree clearing. Wetlands and stream crossing impacts will be minimized through the use of horizontal directional drilling (HDD) to install collection lines under a perennial stream (SOH-002, Sterling Run at two locations), and two wetlands (WOH-003 and WOH-007). No other changes to permanent infrastructure are anticipated for the expansion to 200 MW, including the proposed fencing, meteorological/pyranometer stations, and communications infrastructure.

The proposed changes do not represent a significant increase in environmental impacts to wetlands, waterbodies, or ecological communities in or near the Project Area. The addition of panels in uplands, re-routes and co-locations of buried collection line and access roads are contained within the proposed potential footprint of the previous 125 MW Project; therefore, no significant impacts to the Project Area are anticipated from the 200 MW Project as proposed. Additional micro-siting can further reduce these impacts as the final design progresses to construction.

APPENDIX

A

FIGURE 1 – BUILDABLE AREA



Legend

- Project Area
- Buildable Area
- Field Delineated Waterbodies
- Forested Habitat
- Tree Clearing
- Residential Area
- Township Boundary
- County Boundary

Data Source(s): Open Road (2017)
County Boundaries, Railroads:
ESRI Data and Maps (2014)
Township and City Boundaries
Ohio DOT (2010)
Geology: Ohio DNR (2007)
Roads: U.S. Census Bureau Tiger
Files (2016)

This map and all data contained within are supplied as is with no warranty. Cardno Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.

0 1,000 2,000 3,000 4,000 Feet
0 250 500 750 1,000 1,250 Meters

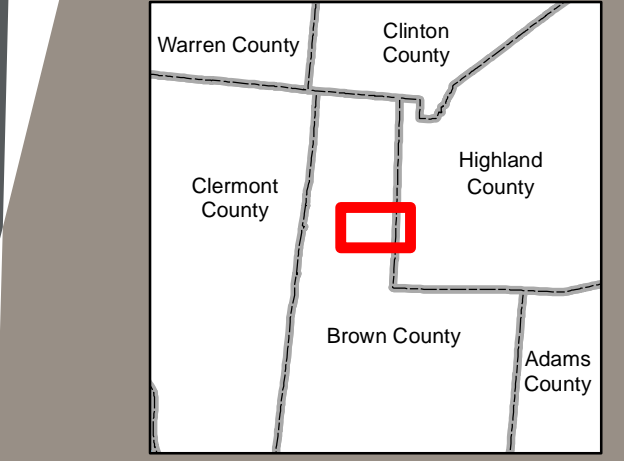


Figure 1 - Buildable Area
Hillcrest Solar Farm
Brown County, Ohio

Cardno
Shaping the Future

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Hillcrest Solar Project

APPENDIX

B

THREATENED & ENDANGERED
SPECIES INFORMATION

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

Last login July 31, 2018 06:40 PM MDT

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Project information

NAME

Brown Township Project

LOCATION

Brown and Highland counties, Ohio



Local office

Ohio Ecological Services Field Office

☎ (614) 416-8993

📠 (614) 416-8994

4625 Morse Road, Suite 104

Columbus, OH 43230-8355

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Log in to IPaC.
2. Go to your My Projects list.
3. Click PROJECT HOME for this project.
4. Click REQUEST SPECIES LIST.

Listed species

¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

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1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.
 2. [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.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Indiana Bat <i>Myotis sodalis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered

Clams

NAME	STATUS
Fanshell <i>Cyprogenia stegaria</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4822	Endangered
Pink Mucket (pearlymussel) <i>Lampsilis abrupta</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7829	Endangered
Rayed Bean <i>Villosa fabalis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5862	Endangered
Sheepnose Mussel <i>Plethobasus cyphus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6903	Endangered
Snuffbox Mussel <i>Epioblasma triquetra</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4135	Endangered

Flowering Plants

NAME	STATUS
Running Buffalo Clover <i>Trifolium stoloniferum</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2529	Endangered

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats 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.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.p>

MIGRATORY BIRD INFORMATION IS NOT AVAILABLE AT THIS TIME

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [E-bird Explore Data Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

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 AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

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.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

[PEM1A](#)[PEM1C](#)

FRESHWATER FORESTED/SHRUB WETLAND

[PFO1A](#)[PSS1A](#)[PSS1C](#)

FRESHWATER POND

[PUBGx](#)[PUBGh](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Ohio

County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species

January 29, 2018

County	Species	Status	Habitat
Adams	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Allen	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Ashland	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Ashtabula	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.

	Kirtland's warbler (<i>Dendroica kirtlandii</i>)	Endangered	Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October.
	Piping plover (<i>Charadrius melodus</i>)	Endangered	Beaches along shorelines of the Great Lakes
	Red Knot (Rufa) <i>Calidris canutus rufa</i>	Threatened	Present in Ohio during spring and fall migration
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Clubshell (<i>Pleurobema clava</i>)	Endangered	Found in coarse sand and gravel areas of runs and riffles within streams and small rivers
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Athens	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	American burying beetle (<i>Nicrophorus americanus</i>)	Endangered	
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irroration</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
Auglaize	Indiana bat	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Belmont	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Brown	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests

	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Fanshell (<i>Cyprogenia stegaria</i>) (= <i>C. irrorata</i>)	Endangered	Found in areas of packed sand and gravel at locations in a good current
	Pink mucket pearlymussel (<i>Lampsilis abrupta</i>)	Endangered	The lower Ohio River and its larger tributaries
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
	Sheepnose (<i>Plethobasus cyphus</i>)	Endangered	Shallow areas in larger rivers and streams
	Snuffbox (<i>Epioblasma triquetra</i>)	Endangered	Small to medium-sized creeks and some larger rivers, in areas with a swift current
	Running buffalo clover (<i>Trifolium stoloniferum</i>)	Endangered	Disturbed bottomland meadows; disturbed sites that have shade during part of each day
Butler	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Rayed bean (<i>Villosa fabalis</i>)	Endangered	Smaller, headwater creeks, but they are sometimes found in large rivers
Carroll	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
Champaign	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests
	Northern long-eared bat <i>Myotis septentrionalis</i>	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. During late spring and summer roosts and forages in upland forests.
	Eastern massasauga (<i>Sistrurus catenatus</i>)	Threatened	Wetlands and adjacent uplands
Clark	Indiana bat (<i>Myotis sodalis</i>)	Endangered	Hibernacula = Caves and mines; Maternity and foraging habitat = small stream corridors with well developed riparian woods; upland forests



OHIO'S LISTED SPECIES

**WILDLIFE THAT ARE CONSIDERED TO BE
ENDANGERED, THREATENED, SPECIES OF CONCERN,
SPECIAL INTEREST, EXTIRPATED, OR EXTINCT IN OHIO**



Blanding's turtle
Emydoidea blandingii

photo by TIM DANIEL



WILDLIFE THAT ARE CONSIDERED TO BE ENDANGERED, THREATENED, SPECIES OF CONCERN, SPECIAL INTEREST, EXTIRPATED, OR EXTINCT IN OHIO

The Division of Wildlife's mission is to conserve and improve the fish and wildlife resources and their habitats, and promote their use and appreciation by the public so that these resources continue to enhance the quality of life for all Ohioans. The Division has legal authority over Ohio's fish and wildlife, which includes about 56 species of mammals, 200 species of breeding birds, 84 species and subspecies of amphibians and reptiles, 170 species of fish, 100 species of mollusks, and 20 species of crustaceans. In addition, there are thousands of species of insects and other invertebrates which fall under the Division's jurisdiction. Furthermore, Ohio law grants authority to the chief of the Division to adopt rules restricting the taking or possession of native wildlife threatened with statewide extirpation and to develop and periodically update a list of endangered species (Ohio Revised Code 1531.25).

The status of native wildlife species is very important to the Division. While the listing process identifies individual wildlife species needing protection, it also serves as a powerful tool in the

Division's planning process. It provides direction for the allocation of personnel time and funds in Division programs and projects.

The first list of Ohio's endangered wildlife was adopted in 1974 and included 71 species. An extensive examination of the list is conducted every five years. The Division seeks input from our staff along with other noted professional and amateur wildlife experts across Ohio. In 2001, as part of our comprehensive management plan, the Division initiated a reevaluation of the endangered species list. During this process, the need for an additional state-list category was recognized and has been designated as "Special Interest." The name of the previous special interest category has been changed to "Species of Concern," but retains its original definition.

Therefore, in addition to endangered the Division uses five other categories: threatened, species of concern, special interest, extirpated, and extinct, to further define the status of selected wildlife. These categories and the species contained within them are dynamic and will be revised as our knowledge of the status of Ohio's wildlife evolves.

Definitions of these categories, a summary of the numbers of species and subspecies in each category, and the list of species and subspecies in each category follow:

ENDANGERED - A native species or subspecies threatened with extirpation from the state. The danger may result from one or more causes, such as habitat loss, pollution, predation, interspecific competition, or disease.

THREATENED - A species or subspecies whose survival in Ohio is not in immediate jeopardy, but to which a threat exists. Continued or increased stress will result in its becoming endangered.

SPECIES OF CONCERN - A species or subspecies which might become threatened in Ohio under continued or increased stress. Also, a species or subspecies for which there is some concern but for which information is insufficient to permit an adequate status evaluation. This category may contain species designated as a furbearer or game species but whose statewide population is dependent on the quality and/or quantity of habitat and is not adversely impacted by regulated harvest.

SPECIAL INTEREST - A species that occurs periodically and is capable of breeding in Ohio. It is at the edge of a larger, contiguous range with viable population(s) within the core of its range. These species have no federal endangered or threatened status, are at low breeding densities in the state, and have not been recently released to enhance Ohio's wildlife diversity. With the exception of efforts to conserve occupied areas, minimal management efforts will be directed for these species because it is unlikely to result in significant increases in their populations within the state.

EXTIRPATED - A species or subspecies that occurred in Ohio at the time of European settlement and that has since disappeared from the state.

EXTINCT - A species or subspecies that occurred in Ohio at the time of European settlement and that has since disappeared from its entire range.

**Number of Species in Major Taxa Classified as
Endangered, Threatened, Species of Concern, Special Interest,
Extirpated, or Extinct in Ohio**

Taxon	Endangered	Threatened	Species of Concern	Special Interest	Extirpated	Extinct
Mammals	3	2	20	1	10	0
Birds	12	6	20	39	6	2
Reptiles	5	4	11	0	0	0
Amphibians	5	1	2	0	0	0
Fishes	22	11	8	0	9	2
Mollusks	24	4	8	0	11	6
Crayfishes	0	2	3	0	0	0
Isopods	2	1	0	0	0	0
Pseudoscorpions	1	0	0	0	0	0
Dragonflies	13	3	1	0	0	0
Damselflies	3	3	0	0	0	0
Caddisflies	3	6	3	0	0	0
Mayflies	2	0	1	0	0	0
Midges	1	3	1	0	0	0
Crickets	0	0	1	0	0	0
Butterflies	8	1	2	1	1	0
Moths	14	4	22	11	0	0
Beetles	3	2	7	0	0	1
Total	121	53	110	52	37	11

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OHIO's ENDANGERED SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service)
listed endangered and threatened species respectively.

MAMMALS ENDANGERED

Indiana myotis *E	<i>Myotis sodalis</i>
Allegheny woodrat	<i>Neotoma magister</i>
Black bear	<i>Ursus americanus</i>

BIRDS ENDANGERED

American bittern	<i>Botaurus lentiginosus</i>
Northern harrier	<i>Circus cyaneus</i>
King rail	<i>Rallus elegans</i>
Piping plover *E	<i>Charadrius melodus</i>
Common tern	<i>Sterna hirundo</i>
Black tern	<i>Chlidonias niger</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Kirtland's warbler *E	<i>Setophaga kirtlandii</i>
Lark sparrow	<i>Chondestes grammacus</i>
Snowy egret	<i>Egretta thula</i>
Cattle egret	<i>Bubulcus ibis</i>
Upland sandpiper	<i>Bartramia longicauda</i>

REPTILES ENDANGERED

Copperbelly watersnake *T	<i>Nerodia erythrogaster neglecta</i>
Plains gartersnake	<i>Thamnophis radix</i>
Timber rattlesnake	<i>Crotalus horridus</i>
Massasauga	<i>Sistrurus catenatus</i>
Smooth greensnake	<i>Opheodrys vernalis</i>

AMPHIBIANS ENDANGERED

Eastern hellbender	<i>Cryptobranchus alleganiensis alleganiensis</i>
Blue-spotted salamander	<i>Ambystoma laterale</i>
Green salamander	<i>Aneides aeneus</i>
Cave salamander	<i>Eurycea lucifuga</i>
Eastern spadefoot	<i>Scaphiopus holbrookii</i>

FISHES ENDANGERED

Ohio lamprey	<i>Ichthyomyzon bdellium</i>
Northern brook lamprey	<i>Ichthyomyzon fossor</i>
Mountain brook lamprey	<i>Ichthyomyzon greeleyi</i>
Lake sturgeon	<i>Acipenser fulvescens</i>
Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>

Spotted gar	<i>Lepisosteus oculatus</i>
Shortnose gar	<i>Lepisosteus platostomus</i>
Cisco (or Lake herring)	<i>Coregonus artedii</i>
Goldeye	<i>Hiodon alosoides</i>
Shoal chub	<i>Macrhybopsis hyostoma</i>
Pugnose minnow	<i>Opsopoeodus emiliae</i>
Popeye shiner	<i>Notropis ariommus</i>
Longnose sucker	<i>Catostomus catostomus</i>
Northern madtom	<i>Noturus stigmosus</i>
Scioto madtom *E	<i>Noturus trautmani</i>
Pirate perch	<i>Aphredoderus sayanus</i>
Western banded killifish	<i>Fundulus diaphanus menona</i>
Spotted darter	<i>Etheostoma maculatum</i>
Iowa darter	<i>Etheostoma exile</i>
Gilt darter	<i>Percina evides</i>
Bigeye shiner	<i>Notropis boops</i>
Tonguetied minnow	<i>Exoglossum laurae</i>

MOLLUSKS ENDANGERED

Snuffbox *E	<i>Epioblasma triquetra</i>
Ebonyshell	<i>Fusconaia ebenas</i>
Fanshell *E	<i>Cyprogenia stegaria</i>
Butterfly	<i>Ellipsaria lineolata</i>
Elephantear	<i>Elliptio crassidens crassidens</i>
Purple catspaw *E	<i>Epioblasma obliquata obliquata</i>
White catspaw *E	<i>Epioblasma obliquata perobliqua</i>
Northern riffleshell *E	<i>Epioblasma torulosa rangiana</i>
Longsolid	<i>Fusconaia subrotunda</i>
Pink mucket *E	<i>Lampsilis orbiculata</i>
Pocketbook	<i>Lampsilis ovata</i>
Yellow sandshell	<i>Lampsilis teres</i>
Eastern pondmussel	<i>Ligumia nasuta</i>
Washboard	<i>Megalanaia nervosa</i>
Sheepnose *E	<i>Pleurobasus cyphus</i>
Clubshell *E	<i>Pleurobema clava</i>
Ohio pigtoe	<i>Pleurobema cordatum</i>
Pyramid pigtoe	<i>Pleurobema rubrum</i>
Rabbitsfoot *T	<i>Quadrula cylindrica cylindrica</i>
Monkeyface	<i>Quadrula metanevra</i>

MOLLUSKS (CONT.) ENDANGERED

Wartyback	<i>Quadrula nodulata</i>
Purple lilliput	<i>Toxolasma lividum</i>
Rayed bean *E	<i>Villosa fabalis</i>
Little spectaclecase	<i>Villosa lienosa</i>

DRAGONFLIES ENDANGERED

Hine's emerald *E	<i>Somatochlora hineana</i>
Mottled darner	<i>Aeshna clepsydra</i>
Plains clubtail	<i>Gomphus externus</i>
American emerald	<i>Cordulia shurtleffi</i>
Uhler's sundragon	<i>Helocordulia uhleri</i>
Frosted whiteface	<i>Leucorrhinia frigida</i>
Elfin skimmer	<i>Nannothemis bella</i>
Canada darner	<i>Aeshna canadensis</i>
Racket-tailed emerald	<i>Dorocordulia libera</i>
Brush-tipped emerald	<i>Somatochlora walshii</i>
Blue corporal	<i>Ladona deplanata</i>
Chalk-fronted corporal	<i>Ladona julia</i>
Yellow-sided skimmer	<i>Libellula flava</i>

DAMSELFLIES ENDANGERED

Lilypad forktail	<i>Ischnura kellicotti</i>
Seepage dancer	<i>Argia bipunctulata</i>
River jewelwing	<i>Calopteryx aequabilis</i>

CADDISFLIES ENDANGERED

—	<i>Chimarra socia</i>
—	<i>Oecetis eddlestoni</i>
—	<i>Brachycentrus nigrosoma</i>

MAYFLIES ENDANGERED

—	<i>Rhithrogena pellucida</i>
—	<i>Litobrantha recurvata</i>

MIDGES ENDANGERED

—	<i>Rheopelopia acra</i>
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BUTTERFLIES ENDANGERED

Persius dusky wing	<i>Erynnis persius</i>
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Frosted elfin	<i>Callophrys irus</i>
Karner blue *E	<i>Lycaeides melissa samuelis</i>
Purplish copper	<i>Lycaena helloides</i>
Swamp metalmark	<i>Calephelis muticum</i>
Regal fritillary	<i>Speyeria idalia</i>
Mitchell's satyr *E	<i>Neonympha mitchellii</i>
Grizzled skipper	<i>Pyrgus centaureae wyandot</i>

MOTHS ENDANGERED

Unexpected cynia	<i>Cynia inopinatus</i>
Graceful underwing	<i>Catocala gracilis</i>
—	<i>Spartiniphaga inops</i>
—	<i>Hypocoena enervata</i>
—	<i>Papaipema silphii</i>
—	<i>Papaipema beeriana</i>
—	<i>Lithophane semiusta</i>
—	<i>Trichoclea artesta</i>
—	<i>Tricholita notata</i>
—	<i>Melanchra assimilis</i>
Pointed swallow	<i>Epiglaea apiata</i>
—	<i>Ufeus plicatus</i>
—	<i>Ufeus satyricus</i>
Hebard's noctuid moth	<i>Erythroecia hebardii</i>

BEETLES ENDANGERED

Ohio cave beetle	<i>Pseudanophthalmus ohioensis</i>
American burying beetle *E	<i>Nicrophorus americanus</i>
Water penny beetle	<i>Dicranopselapus variegatus</i>

ISOPODS ENDANGERED

Fern cave isopod	<i>Caecidotea filicispeluncae</i>
—	<i>Caecidotea insula</i>

PSEUDOSCORPIONS ENDANGERED

Buckskin cave pseudoscorpion	<i>Apochthonius hobbsi</i>
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OHIO's THREATENED SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service)
listed endangered and threatened species respectively.

MAMMALS THREATENED

Eastern harvest mouse	<i>Reithrodontomys humulis</i>
Northern long-eared bat *T	<i>Myotis septentrionalis</i>

BIRDS THREATENED

Black-crowned night-heron	<i>Nycticorax nycticorax</i>
Barn owl	<i>Tyto alba</i>
Least bittern	<i>Ixobrychus exilis</i>
Rufa red knot *T	<i>Calidris canutus rufa</i>
Trumpeter swan	<i>Cygnus buccinator</i>
Sandhill crane	<i>Grus canadensis</i>

REPTILES THREATENED

Kirtland's snake	<i>Clonophis kirtlandii</i>
Spotted turtle	<i>Clemmys guttata</i>
Blanding's turtle	<i>Emydoidea blandingii</i>
Lake Erie watersnake	<i>Nerodia sipedon insularum</i>

AMPHIBIANS THREATENED

Mud salamander	<i>Pseudotriton montanus</i>
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FISHES THREATENED

Brook trout	<i>Salvelinus fontinalis</i>
Greater redhorse	<i>Moxostoma valenciennesi</i>
Channel darter	<i>Percina copelandi</i>
American eel	<i>Anguilla rostrata</i>
Paddlefish *M	<i>Polyodon spathula</i>
Bigmouth shiner	<i>Notropis dorsalis</i>
Lake chubsucker	<i>Erimyzon sucetta</i>
River darter	<i>Percina shumardi</i>
Tippecanoe darter	<i>Etheostoma tippecanoe</i>
Blue sucker	<i>Cycleptus elongatus</i>
Mountain madtom	<i>Noturus eleutherus</i>

MOLLUSKS THREATENED

Black sandshell	<i>Ligumia recta</i>
Threehorn wartyback	<i>Obliquaria reflexa</i>
Fawnsfoot	<i>Truncilla donaciformis</i>
Pondhorn	<i>Unimerus tetralasmus</i>

CRAYFISHES THREATENED

Sloan's crayfish	<i>Orconectes sloanii</i>
Cavespring crayfish	<i>Cambarus tenebrosus</i>

DRAGONFLIES THREATENED

Riffle snaketail	<i>Ophiogomphus carolus</i>
Harlequin darter	<i>Gomphaeschna furcillata</i>
Green-faced clubtail	<i>Gomphus viridifrons</i>

DAMSELFLIES THREATENED

Boreal bluet	<i>Enallagma boreale</i>
Northern bluet	<i>Enallagma cyathigerum</i>
Marsh bluet	<i>Enallagma ebrium</i>

CADDISFLIES THREATENED

–	<i>Psilotreta indecisa</i>
–	<i>Hydroptila albicornis</i>
–	<i>Hydroptila artesa</i>
–	<i>Hydroptila koryaki</i>
–	<i>Hydroptila talledaga</i>
–	<i>Hydroptila valhalla</i>

MIDGES THREATENED

–	<i>Bethbilbeckia floridensis</i>
–	<i>Apsectrotanypus johnsoni</i>
–	<i>Radotanypus florens</i>

BUTTERFLIES THREATENED

Silver-bordered fritillary	<i>Boloria selene</i>
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MOTHS THREATENED

Wayward nymph	<i>Catocala antinympha</i>
–	<i>Spartiniphaga panatela</i>
–	<i>Fagitana littera</i>
The pink-streak	<i>Faronta rubripennis</i>

BEETLES THREATENED

–	<i>Cicindela hirticollis</i>
Cobblestone tiger beetle	<i>Cicindela marginipennis</i>

ISOPODS THREATENED

Frost cave isopod	<i>Caecidotea rotunda</i>
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OHIO's SPECIES of CONCERN

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service)
listed endangered and threatened species respectively.

MAMMALS SPECIES OF CONCERN

Pygmy shrew	<i>Sorex hoyi</i>
Star-nosed mole	<i>Condylura cristata</i>
Eastern small-footed bat	<i>Myotis leibii</i>
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>
Little brown bat	<i>Myotis lucifugus</i>
Big brown bat	<i>Eptesicus fuscus</i>
Tri-colored bat	<i>Perimyotis subflavus</i>
Woodland jumping mouse	<i>Napaeozapus insignis</i>
Badger	<i>Taxidea taxus</i>
Ermine	<i>Mustela erminea</i>
Smoky shrew	<i>Sorex fumerus</i>
Deer mouse	<i>Peromyscus maniculatus</i>
Prairie vole	<i>Microtus ochrogaster</i>
Woodland vole	<i>Microtus pinetorum</i>
Southern bog lemming	<i>Synaptomys cooperi</i>
Silver-haired bat	<i>Lasionycteris noctivagans</i>
Red bat	<i>Lasiurus borealis</i>
Hoary bat	<i>Lasiurus cinereus</i>
Snowshoe hare	<i>Lepus americanus</i>
Gray Fox	<i>Urocyon cinereoargenteus</i>

BIRDS SPECIES OF CONCERN

Sharp-shinned hawk	<i>Accipiter striatus</i>
Sedge wren	<i>Cistothorus platensis</i>
Marsh wren	<i>Cistothorus palustris</i>
Henslow's sparrow	<i>Ammodramus henslowii</i>
Cerulean warbler	<i>Setophaga cerulea</i>
Prothonotary warbler	<i>Protonotaria citrea</i>
Bobolink	<i>Dolichonyx oryzivorus</i>
Northern bobwhite	<i>Colinus virginianus</i>
Common moorhen	<i>Gallinula chloropus</i>
Great egret	<i>Ardea alba</i>
Sora rail	<i>Porzana carolina</i>
Virginia rail	<i>Rallus limicola</i>
Ruffed grouse	<i>Bonasa umbellus</i>
American coot	<i>Fulica americana</i>
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>
Common nighthawk	<i>Chordeiles minor</i>
Eastern whip-poor-will	<i>Caprimugus vaciferus</i>

Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>
Vesper sparrow	<i>Pooecetes gramineus</i>
Grasshopper sparrow	<i>Ammodramus savannarum</i>

MOLLUSKS SPECIES OF CONCERN

Purple wartyback	<i>Cyclonaias tuberculata</i>
Wavyrayed lampmussel	<i>Lampsilis fasciola</i>
Round pigtoe	<i>Pleurobema sintoxia</i>
Salamander mussel	<i>Simpsonaias ambigua</i>
Deertoe	<i>Truncilla truncata</i>
Elktoe	<i>Alasmidonta marginata</i>
Kidneyshell	<i>Ptychobranchus fasciolaris</i>
Creek heelsplitter	<i>Lasmigona compressa</i>

REPTILES SPECIES OF CONCERN

Woodland box turtle	<i>Terrapene carolina carolina</i>
Ouachita map turtle	<i>Graptemys ouachitensis</i>
Black kingsnake	<i>Lampropeltis getula nigra</i>
Eastern gartersnake (melanistic)	<i>Thamnophis sirtalis sirtalis</i>
Northern rough greensnake	<i>Opheodrys aestivus</i>
Eastern foxsnake	<i>Pantherophis gloydi</i>
Queensnake	<i>Regina septemvittata</i>
Little brown skink	<i>Scincella lateralis</i>
Smooth earthsnake	<i>Virginia valeriae</i>
Short-headed gartersnake	<i>Thamnophis brachystoma</i>
Eastern hognose snake	<i>Heterodon platirhinos</i>

AMPHIBIANS SPECIES OF CONCERN

Four-toed salamander	<i>Hemidactylium scutatum</i>
Eastern cricket frog	<i>Acris crepitans crepitans</i>

FISHES SPECIES OF CONCERN

Lake trout	<i>Salvelinus namaycush</i>
Lake whitefish	<i>Coregonus clupeaformis</i>
Burbot	<i>Lota lota</i>
Muskellunge	<i>Esox masquinongy</i>
Least darter	<i>Etheostoma microperca</i>
Blue catfish	<i>Ictalurus furcatus</i>
Longnose dace	<i>Rhinichthys cataractae</i>
Western creek chubsucker	<i>Erimyzon clariformis</i>

CRAYFISHES SPECIES OF CONCERN

Great Lakes crayfish	<i>Orconectes propinquus</i>
Northern crayfish	<i>Orconectes virilis</i>
Allegheny crayfish	<i>Orconectes obscurus</i>

DRAGONFLIES SPECIES OF CONCERN

Tiger spiketail	<i>Cordulegaster erronea</i>
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MAYFLIES SPECIES OF CONCERN

–	<i>Maccaffertium ithica</i>
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MIDGES SPECIES OF CONCERN

–	<i>Cantopelopia gesta</i>
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CADDISFLIES SPECIES OF CONCERN

–	<i>Hydroptila chattanooga</i>
–	<i>Asynarchus montanus</i>
–	<i>Nemotaulius hostilis</i>

BUTTERFLIES SPECIES OF CONCERN

Two-spotted skipper	<i>Euphyes bimacula</i>
Dusted skipper	<i>Atrytonopsis hianna</i>

MOTHS SPECIES OF CONCERN

Milnei's looper moth	<i>Euchlaena milnei</i>
Buck moth	<i>Hemileuca maia</i>
One-eyed sphinx	<i>Smerinthus cerisyi</i>
Precious underwing	<i>Catocala pretiosa</i>
–	<i>Macrochilo bivittata</i>
–	<i>Phalaenostola hanhami</i>
–	<i>Paectes abrostolella</i>
–	<i>Capis curvata</i>
–	<i>Tarachidia binocula</i>
–	<i>Apamea mixta</i>
–	<i>Agroperina lutosa</i>
Columbine borer	<i>Papaipema leucostigma</i>
Bracken borer moth	<i>Papaipema pterisii</i>
Osmunda borer moth	<i>Papaipema speciosissima</i>
–	<i>Chytonix sensilis</i>
–	<i>Amolita roseola</i>
Goat sawfly	<i>Homoglaea hircina</i>
–	<i>Brachylomia algens</i>

Purple arches	<i>Polia purpurissata</i>
Scurfy quaker	<i>Homorthodes furfurata</i>
–	<i>Trichosilia manifesta</i>
–	<i>Agonopterix pteleae</i>

BEETLES SPECIES OF CONCERN

Six-banded longhorn beetle	<i>Dryobius sexnotatus</i>
–	<i>Cicindela splendida</i>
–	<i>Cicindela ancocisconensis</i>
–	<i>Cicindela cursitans</i>
–	<i>Cicindela cuprascens</i>
–	<i>Cicindela macra</i>
Whirligig beetle	<i>Gyretes sinuatus</i>

CRICKETS SPECIES OF CONCERN

Laricis tree cricket	<i>Oecanthus laricis</i>
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OHIO's SPECIAL INTEREST

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service)
listed endangered and threatened species respectively.

MAMMALS SPECIAL INTEREST

Evening bat	<i>Nycticeius humeralis</i>
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BIRDS SPECIAL INTEREST

Canada warbler	<i>Wilsonia canadensis</i>
Magnolia warbler	<i>Setophaga magnolia</i>
Northern waterthrush	<i>Seiurus noveboracensis</i>
Winter wren	<i>Troglodytes troglodytes</i>
Black-throated blue warbler	<i>Setophaga caerulescens</i>
Brown creeper	<i>Certhia americana</i>
Chuck-will's-widow	<i>Caprimulgus carolinensis</i>
Bell's vireo	<i>Vireo bellii</i>
Long-eared owl	<i>Asio otus</i>
Mourning warbler	<i>Oporornis philadelphia</i>
Northern saw-whet owl	<i>Aegolius acadicus</i>
Pine siskin	<i>Carduelis pinus</i>
Purple finch	<i>Carpodacus purpureus</i>
Red-breasted nuthatch	<i>Sitta canadensis</i>
Short-eared owl	<i>Asio flammeus</i>
Western meadowlark	<i>Sturnella neglecta</i>
Golden-crowned kinglet	<i>Regulus satrapa</i>
Blackburnian warbler	<i>Setophaga fusca</i>
Wilson's snipe	<i>Gallinago delicata</i>
Gadwall	<i>Anas strepera</i>
Green-winged teal	<i>Anas crecca</i>
Northern pintail	<i>Anas acuta</i>
Northern shoveler	<i>Anas clypeata</i>
Redhead	<i>Aythya americana</i>
Ruddy duck	<i>Oxyura jamaicensis</i>
American black duck	<i>Anas rubripes</i>
Wilson's phalarope	<i>Phalaropus tricolor</i>
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>
Common raven	<i>Corvus corax</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Yellow-crowned night-heron	<i>Nyctanassa violacea</i>
Hermit thrush	<i>Catharus guttatus</i>
Least flycatcher	<i>Empidonax minimus</i>
Nashville warbler	<i>Oreothlypis ruficapilla</i>
Veery	<i>Catharus fuscescens</i>
Common merganser	<i>Mergus merganser</i>

Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>
Golden-winged warbler	<i>Vermivora chrysoptera</i>
Blue-headed vireo	<i>Vireo solitarius</i>

BUTTERFLIES SPECIAL INTEREST

Olympia marble	<i>Euchloe olympia</i>
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MOTHS SPECIAL INTEREST

Slender clearwing	<i>Hemaris gracilis</i>
—	<i>Sphinx lucitosa</i>
—	<i>Tathorhynchus exsiccatus</i>
—	<i>Catocala marmorata</i>
—	<i>Catocala maestosa</i>
Subflava sedge borer moth	<i>Archana subflava</i>
—	<i>Caradrina meralis</i>
—	<i>Calophasia lunula</i>
—	<i>Leucania insueta</i>
—	<i>Protorthodes incincta</i>
Variegated orange moth	<i>Epelis truncataria</i>

OHIO's EXTIRPATED SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service)
listed endangered and threatened species respectively.

MAMMALS EXTIRPATED

Rice rat	<i>Oryzomys palustris</i>
Porcupine	<i>Erethizon dorsatum</i>
Timber wolf	<i>Canis lupus</i>
Marten	<i>Martes americanus</i>
Fisher	<i>Martes pennanti</i>
Mountain lion	<i>Puma concolor</i>
Lynx	<i>Lynx canadensis</i>
Wapiti (Elk)	<i>Cervus elaphus</i>
Bison	<i>Bison bison</i>
Southern red-backed vole	<i>Clethrionomys gapperi</i>

BIRDS EXTIRPATED

Swallow-tailed kite	<i>Elanoides forficatus</i>
Greater prairie-chicken	<i>Tympanuchus cupido</i>
Ivory-billed woodpecker	<i>Campephilus principalis</i>
Bachman's sparrow	<i>Aimophila aestivalis</i>
Golden-winged warbler	<i>Vermivora chrysoptera</i>
Bewick's wren	<i>Thryomanes bewickii</i>

FISHES EXTIRPATED

Alligator gar	<i>Lepisosteus spatula</i>
Pugnose shiner	<i>Notropis anogenus</i>
Longhead darter	<i>Percina macrocephala</i>
Diamond darter	<i>Crystallaria cincotta</i>
Spoonhead sculpin	<i>Cottus ricei</i>
Blackchin shiner	<i>Notropis heterodon</i>
Blacknose shiner	<i>Notropis heterolepis</i>
Mississippi silvery minnow	<i>Hybognathus nuchalis</i>
Great Lakes mottled sculpin	<i>Cottus bairdii kumlieni</i>

MOLLUSKS EXTIRPATED

Orangefoot pimpleback *E	<i>Plethobasus cooperianus</i>
Rough pigtoe *E	<i>Pleurobema plenum</i>
Fat pocketbook *E	<i>Potamilus capax</i>
Winged mapleleaf *E	<i>Quadrula fragosa</i>
Mucket	<i>Actinonaias l. ligamentina</i>
Spectaclecase	<i>Cumberlandia monodonta</i>
Cracking pearly mussel *E	<i>Hemistena lata</i>
White wartyback	<i>Plethobasus cicatricosus</i>
Hickorynut	<i>Obovaria olivaria</i>
Ring pink	<i>Obovaria retusa</i>
Scale shell	<i>Leptodea leptodon</i>

BUTTERFLIES EXTIRPATED

Mustard white	<i>Pieris napi</i>
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OHIO's EXTINCT SPECIES

NOTE: *E & *T denote federal (U.S. Fish and Wildlife Service)
listed endangered and threatened species respectively.

BIRDS EXTINCT

Passenger pigeon	<i>Ectopistes migratorius</i>
Carolina parakeet	<i>Conuropsis carolinensis</i>

FISHES EXTINCT

Harelip sucker	<i>Lagochila lacera</i>
Blue pike	<i>Sander vitreus glaucus</i>

MOLLUSKS EXTINCT

Leafshell	<i>Epioblasma flexuosa</i>
Forkshell	<i>Epioblasma lewisi</i>
Round snuffbox	<i>Epioblasma personata</i>
Cincinnati riffleshell	<i>Epioblasma phillipsi</i>
Scioto pigtoe	<i>Pleurobema bournianum</i>
Tubercled blossom	<i>Epioblasma torulosa torulosa</i>

BEETLES EXTINCT

Kramer's cave beetle	<i>Pseudanophthalmus krameri</i>
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Brown County

Scientific Name	Common Name	Last Observed	State Status	Federal Status
<i>Astragalus canadensis</i>	Canada Milk-vetch	2005-07-11	T	
<i>Bartonia paniculata</i>	Screw-stem	2004-03-19	T	
<i>Corallorhiza wisteriana</i>	Spring Coral-root	2001-04-11	P	
<i>Erysimum capitatum</i>	Western Wallflower	2013-05-19	E	
<i>Juncus secundus</i>	One-sided Rush	1968-08-11	P	
<i>Opuntia humifusa</i>	Common Prickly Pear	1975-04-01	P	
<i>Passiflora incarnata</i>	Maypop	2002-09-02	T	
<i>Phacelia bipinnatifida</i>	Fern-leaved Scorpion-weed	2014-04-25	P	
<i>Ribes missouriense</i>	Missouri Gooseberry	2014-04-25	T	
<i>Salix caroliniana</i>	Carolina Willow	2004-05-04	P	
<i>Sida hermaphrodita</i>	Virginia-mallow	2002-09-02	P	
<i>Sparganium androcladum</i>	Keeled Bur-reed	2002-08-08	T	
<i>Spermacoce glabra</i>	Smooth Buttonweed	2008-09-06	P	
<i>Symphyotrichum oblongifolium</i>	Shale Barren Aster	1997-10-02	T	
<i>Trifolium stoloniferum</i>	Running Buffalo Clover	2009-06-01	E	FE
<i>Urtica chamaedryoides</i>	Spring Nettle	2013-05-19	E	
<i>Viburnum molle</i>	Soft-leaved Arrow-wood	2009-10-18	T	
<i>Viburnum rufidulum</i>	Southern Black-haw	2005-04-21	P	



Ohio Division of Wildlife

Ohio Natural Heritage Database

Date Accessed: March 6, 2015

Status based on 2014-15 Rare Plant List.

Status:

X = Extirpated

E = Endangered

T = Threatened

List Created: July 2016



Brown County

Scientific Name	Common Name	Last Observed	State Status	Federal Status
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P = Potentially Threatened

BROWN COUNTY

State Status	Federal Status	County	Category	Species	CommonName	Sensitive Species	Most Recent Record	FWS
Endangered		Brown	Bird	Lanius ludovicianus	Loggerhead Shrike	No	1992	
Endangered		Brown	Insect - beetle	Pseudanophthalmus ohioensis	Ohio Cave Beetle	No	2007	
Endangered	Endangered	Brown	Invert. - fw bivalve	Cyprogenia stegaria	Fanshell	No	1930	*
Endangered		Brown	Invert. - fw bivalve	Ellipsaria lineolata	Butterfly	No	1989	
Endangered		Brown	Invert. - fw bivalve	Elliptio crassidens crassidens	Elephant-ear	No	1987	
Endangered	Endangered	Brown	Invert. - fw bivalve	Epioblasma triquetra	Snuffbox	No		*
Endangered		Brown	Invert. - fw bivalve	Fusconaia ebena	Ebonyshell	No	1987	
Endangered		Brown	Invert. - fw bivalve	Fusconaia maculata maculata	Long-solid	No	1930	
Endangered	Endangered	Brown	Invert. - fw bivalve	Lampsilis abrupta	Pink Mucket	No		*
Endangered		Brown	Invert. - fw bivalve	Lampsilis teres	Yellow Sandshell	No	2013	
Endangered		Brown	Invert. - fw bivalve	Megalania nervosa	Washboard	No	2012	
Endangered	Endangered	Brown	Invert. - fw bivalve	Plethobasus cyphus	Sheepnose	No		*
Endangered		Brown	Invert. - fw bivalve	Pleurobema cordatum	Ohio Pigtoe	No	2013	
Endangered		Brown	Invert. - fw bivalve	Quadrula nodulata	Wartyback	No	1998	
Endangered	Endangered	Brown	Invert. - fw bivalve	Villosa fabalis	Rayed Bean	No	1990	
Endangered		Brown	Invert. - fw bivalve	Villosa lienosa	Little Spectaclecase	No	1990	
Endangered	Endangered	Brown	Mammal	Myotis sodalis	Indiana Myotis	Yes	2013	
Threatened		Brown	Fish	Notropis boops	Bigeye Shiner	No	2006	
Threatened		Brown	Fish	Percina copelandi	Channel Darter	No	1991	
Threatened		Brown	Fish	Percina shumardi	River Darter	No	1993	
Threatened		Brown	Invert. - fw bivalve	Obliquaria reflexa	Threehorn Wartyback	No	2013	
Threatened		Brown	Invert. - fw bivalve	Truncilla donaciformis	Fawnsfoot	No	1930	
Species of Concern		Brown	Amphibian - Frog / Toad	Acris crepitans crepitans	Eastern Cricket Frog	No	1971	
Species of Concern		Brown	Amphibian - Salamander	Hemidactylium scutatum	Four-toed Salamander	No	1904	
Species of Concern		Brown	Bird	Accipiter striatus	Sharp-shinned Hawk	No	1999	
Species of Concern		Brown	Bird	Ammodramus henslowii	Henslow's Sparrow	No	1995	
Species of Concern		Brown	Bird	Colinus virginianus	Northern Bobwhite	No	2007	
Species of Concern		Brown	Bird	Coragyps atratus	Black Vulture	No	2007	
Species of Concern		Brown	Bird	Dendroica cerulea	Cerulean Warbler	No	1998	
Species of Concern		Brown	Fish	Moxostoma carinatum	River Redhorse	No	2007	
Species of Concern		Brown	Invert. - fw bivalve	Simpsonia ambigua	Salamander Mussel	No	1930	
Species of Concern		Brown	Invert. - fw bivalve	Truncilla truncata	Deertoe	No	1997	
Species of Concern		Brown	Mammal	Eptesicus fuscus	Big Brown Bat	No	2013	
Species of Concern		Brown	Mammal	Lasiurus borealis	Red Bat	No	2013	
Species of Concern		Brown	Mammal	Lasiurus cinereus	Hoary Bat	No	2013	
Species of Concern		Brown	Mammal	Microtus ochrogaster	Prairie Vole	No	1971	
Species of Concern		Brown	Mammal	Microtus pinetorum	Woodland Vole	No	1950	
Species of Concern		Brown	Mammal	Myotis lucifugus	Little Brown Bat	No	2013	
Species of Concern	Threatened	Brown	Mammal	Myotis septentrionalis	Northern Long-eared Bat	No	2013	
Species of Concern		Brown	Mammal	Perimyotis subflavus	Tri-colored Bat	No	2013	
Species of Concern		Brown	Mammal	Peromyscus maniculatus	Deer Mouse	No	1993	
Species of Concern		Brown	Mammal	Synaptomys cooperi	Southern Bog Lemming	No	1993	
Special Interest		Brown	Bird	Sturnella neglecta	Western Meadowlark	No	1997	
Special Interest		Brown	Mammal	Nycticeius humeralis	Evening Bat	No	2013	

APPENDIX

C

IMPACT TABLES

Table C-1 - Anticipated Wetland Impacts for the 200MW Hillcrest Solar Project

Wetland ID	County	Latitude of Center Point	Longitude of Center Point	Acres within Project Area	Wetland Type	ORAM Score	Wetland Category	Anticipated Jurisdictional	Drainage Basin	Crossed (Yes/No)	ACCESS ROADS				COLLECTION LINES			
											TEMPORARY IMPACTS		PERMANENT IMPACTS		TEMPORARY IMPACTS		PERMANENT IMPACTS	
											Access Road Impact (s.f.)	Access Road Impact (acre)	Access Road Impact (s.f.)	Access Road Impact (acre)	Collection Line Impact (l.f.)	Collection Line Impact (acre)	Collection Line Impact (l.f.)	Collection Line Impact (acre)
WOH-001	Brown	39.0857	-83.90175	8.59	PEM/PSS	20.5	Category 1	No	Sterling Run	Yes	593	0.01	466	0.01	0	0	0	0
WOH-003	Brown	39.09099	-83.90761	0.11	PEM	18	Category 1	No	Sterling Run	Yes	0	0	0	0	(HDD)	0	0	0
WOH-004	Brown	39.0869	-83.90824	0.93	PEM	23	Category 1	Yes	Sterling Run	No	0	0	0	0	0	0	0	0
WOH-005	Brown	39.08477	-83.90906	0.53	PEM	21	Category 1	Yes	Sterling Run	No	0	0	0	0	0	0	0	0
WOH-006	Brown	39.09267	-83.913	0.64	PEM/PFO	21.5	Category 1	No	Sterling Run	Sterling Run	0	0	0	0	0	0	0	0
WOH-007	Brown	39.08863	-83.88083	0.81	PEM	28.5	Category 1	Yes	Sterling Run	Yes	0	0	0	0	(HDD)	0	0	0
Wetland Totals				11.61							593	0.01	466	0.01	0	0	0	0

Values that have changed from the 125MW Project to the 200MW Project are presented in bold, blue font.

Stream ID	ACCESS ROADS						COLLECTION LINES					
	CROSSINGS		TEMPORARY IMPACTS		PERMANENT IMPACTS		CROSSINGS		TEMPORARY IMPACTS		PERMANENT IMPACTS	
	Number of Crossings	Crossing Method	Access Road Impact (l.f.)	Access Road Impact (acre)	Access Road Impact\ (l.f.)	Access Road Impact (acre)	Number of Crossings	Crossing Method	Collection Line Impact (l.f.)	Collection Line Impact (acre)	Collection Line Impact (l.f.)	Collection Line Impact (acre)
DOH-001	2	Culvert	18.42	0.001	32.74	0.002	1	HDD	0.00	0.000	n/a	n/a
DOH-002	1	Culvert	9.00	0.003	16.00	0.006	2	HDD	0	0.000	0	0
DOH-003	1	Culvert	9.00	0.001	16.01	0.001	1	Open Cut	20.03	0.002	0	0
DOH-004	1	Culvert	9.18	0.002	16.32	0.003	0	n/a	n/a	n/a	n/a	n/a
DOH-005	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-006	1	Culvert	9.38	0.001	16.68	0.002	1	HDD	0.00	0.000	n/a	n/a
DOH-007	2	Culvert	32.42	0.003	57.63	0.005	1	Open Cut*	26.23	0.002	0	0
DOH-008	2	Culvert	21.98	0.008	39.07	0.013	2	Open Cut*	48.35	0.017	n/a	n/a
DOH-009	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-010	4	Culvert	37.46	0.004	66.59	0.007	1	Open Cut*	16.17	0.002	0	0
DOH-011	1	Culvert	21.43	0.002	38.10	0.003	0	n/a	n/a	n/a	n/a	n/a
DOH-012	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-013	0	n/a	n/a	n/a	n/a	n/a	1	HDD	0	0.000	0	0
DOH-014	0	n/a	n/a	n/a	n/a	n/a	1	Open Cut	21.03	0.001	0	0
DOH-015	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-016	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-017	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-018	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-019	0	n/a	n/a	n/a	n/a	n/a	1	Open Cut	20.72	0.011	0	0
DOH-020	4	Culvert	61.23	0.017	108.86	0.030	1	Open Cut*	0.00	0.000	0	0
DOH-021	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-022	1	Culvert	9.26	0.003	16.46	0.005	1	HDD	0.00	0.000	n/a	n/a
DOH-023	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-024	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-025	1	Culvert	9.01	0.002	16.01	0.003	1	Open Cut	20.73	0.004	0	0
DOH-026	0	n/a	n/a	n/a	n/a	n/a	1	HDD	0.00	0.000	0	0
DOH-027	4	Culvert	38.92	0.004	69.19	0.007	2	(1) HDD (1) Open Cut*	20.6	0.002	0	0
DOH-028	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-029	2	Culvert	18.43	0.005	32.77	0.009	1	Open Cut*	14.21	0.004	0	0
DOH-030	1	Culvert	9.08	0.001	16.13	0.001	0	n/a	n/a	n/a	n/a	n/a
DOH-031	2	Culvert	18.13	0.003	32.24	0.006	2	Open Cut Open Cut*	20.01	0.004	0	0
DOH-032	1	Culvert	55.80	0.005	21.97	0.005	1	Open Cut*	20.4	0.005	n/a	n/a
DOH-033	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
DOH-034	1	Culvert	9.08	0.001	16.52	0.002	1	Open Cut*	0	0	0	0
Ditch Subtotals	32	(32) Culvert	397.20	0.06	629.30	0.11	23	(8) HDD (15) Open Cut	248.48	0.05	0	0
POH-001	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
POH-002	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
POH-003	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
POH-004	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
Pond Subtotals	0	--	0	0	0	0	0	--	0	0	0	0
SOH-001	0	n/a	n/a	n/a	n/a	n/a	1	HDD	0	0	0	0
SOH-002 ^a	0	n/a	n/a	n/a	n/a	n/a	2	HDD	0	0	0	0
SOH-003	0	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
SOH-004	0	n/a	n/a	n/a	n/a	n/a	1	HDD	0	0	0	0
Stream Subtotals	0	--	0	0	0	0	4	(4) HDD	0	0	0	0
Project Totals	32	(32) Culvert	397.20	0.06	629.30	0.11	27	(12) HDD (15) Open Cut	248.48	0.05	0	0

* - Crossing is co-located with an access road culvert.

a - SOH-002 (Sterling Run) was delineated in the southern portion of the project, additional stream length in the northern portion of the Project Area was supplemented using NHD data.

Values that have changed from the 125MW Project to the 200MW Project are presented in bold, blue font.

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in

Case No(s). 18-1267-EL-BGA

Summary: Amended Application Updated Exhibit H electronically filed by Mr. MacDonald W Taylor on behalf of Hillcrest Solar I, LLC